

PHYSICAL THERAPY INTERVENTION FOR THE HOSPITALIZED COVID-19 PATIENT

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Abstract

The COVID-19 pandemic was discovered in Wuhan, China that has spread throughout the world. Physical therapy also plays an important role in the recovery of patients from COVID-19 who are hospitalized and working with a multidisciplinary team. We were using the database of Scopus, ScienceDirect, and ProQuest to search for all the articles, following PRISMA guidelines. There were a total of eight articles found and included for the final of analysis. It was found that all studies have various of interventions for COVID-19 patients in the hospital, while in the ICU or critical illness and ward-based isolation with mild symptoms. Physical therapy interventions for COVID-19 hospitalized patients have a significant impact on facilitating their recovery. A various interventions, it is necessary to control a patient's condition with clinical reasoning, using the standardized PPE to reduce the risk of contagious virus

Kata kunci: Physical Therapy; Physiotherapy; COVID-19; Hospitalization

Introduction

COVID-19 also known as Coronavirus Disease 2019, a new coronavirus known as Severe Acute Respiratory Syndrome Coronavirus-2 which causing disease (SARS-CoV-2) (WHO, 2021). December 31, 2019, WHO learned this new virus on after a cluster of cases of 'virus pneumonia' was reported in Wuhan, China. (WHO, 2021). Respiratory secretions are used to spread the virus from one person to another. Large droplets fall to surfaces within 2 meters of an infected person when they cough, sneeze, or have rhinorrhea. SARS-CoV-2 remains infectious for at least 8 hours on soft surfaces and up to 24 hours on hard surfaces (Doremalen et al., 2020). Acute respiratory distress, such as shortness of breath, fever, cough and symptoms of COVID-19 infection, while severe cases of COVID-19 can cause acute respiratory syndrome, pneumonia, and kidney failure, event death. (Kemenkes, 2020). COVID-19 infection can cause different symptoms and treatment in each individual, mild and moderate illness present in 80% of cases, severe illness present in 15% of cases that requires hospital treatment, and critical illness present in 5% of cases that requires ICU care, according to recently data from Italy and China (CDC, 2020; Remuzzi & Remuzzi, 2020; Tingbo, 2020; Wu & McGoogan, 2020). Fever, muscle soreness, fatigue, cough, and difficulty of breathing

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are among the symptoms experienced by COVID-19 hospitalized patients (WHO, 2020). The most common respiratory symptoms reported by 14 percent, 16 percent, 37 percent, and 52 percent of COVID-19 infection survivors are fatigue, cough, dyspnoea, and chest pain. (Cares-Marambio et al., 2021). Patient-reported outcomes, such as dyspnoea or fatigue, play an important role in improving health systems, increasing patient engagement, and ensuring person-centered clinical care and research. (Wong et al., 2020).

Health professionals and clinicians all over the world suggest respiratory rehabilitation as an important component of respiratory disease management (Farah et al., 2021). Physical therapy is a vital part of the healthcare field that deals with human functions, movements, and the maximization of physical potential through body movements. In health professions that focus on human function, movement, and maximizing physical potential through body movement, physical therapy is critical. (Alaparthi et al., 2021). For patients with COVID-19 related viral pneumonia, pulmonary rehabilitation is critical (Yang et al., 2020). The previous research has shown that pulmonary rehabilitation and chest physical therapy are most effective treatments for chronic obstructive pulmonary disease and other chronic respiratory disorders (Zhu et al., 2020). Early pulmonary rehabilitation was found to be safe and practicable in patients with acute exacerbations of lung illnesses, and it improved physical performance and quality of life (He, et al., 2015; Hoffman, et al., 2017). However, physical therapists must be aware of potential difficulties when treating COVID-19 patients (Felten-Barentsz et al., 2020).

As a physical therapist especially in the COVID-19 pandemic era to carry on is necessary to gain a better understanding of the functional consequences of COVID-19 in order to determine the best approach to the patient. Physical therapists plays a vital role in providing respiratory support and active movement to hospitalized patients (Felten-Barentsz et al., 2020). In especially for individuals with severe/critical disease, those over the age of 70, obesity, comorbidities, and other difficulties, which in terms of frequency, intensity, type, and timing of interventions, physiotherapeutic care must be tailored to the individual needs of the patient. (Ambrosino & Clini, 2015; Wouters et al., 2018). The standardized of Personal Protective Equipment (PPE) must be required while providing physical therapy services (Thomas et al., 2020). As a result, the goal of this review is to assess scientific evidence on physical therapy and functional in the hospitalized patient, especially patients above the age of 18 and not in pregnancy.

Method

We used Preferred Reporting Items for Systematic Reviews and Meta-Analyses (PRISMA) statement to make a systematic review reporting more transparent and complete (Page et al., 2021). Three database sources we utilize are Scopus, ScienceDirect, and ProQuest in this review to identify all published articles that contain the keywords of “physical therapy”, “physiotherapy”, “COVID-19”, and “hospitalization”.

In order to obtain the desired literature quantitative and qualitative study (i.e. retrospective observational study, scoping review, case report, literature review, and observational study), we had some criteria, such as confirmed positive patients with Polymerase Chain Reaction (PCR) in hospitalization, acute-subacute of COVID-19, published article from January 1st, 2020 to November 30th 2021, any English-language publication from any country was eligible for inclusion in the review. While the exclusion criteria are irrelevant based on the title and abstract, protocol, ongoing, letter to the editor, not focused on physical therapy and physiotherapy, chronic or long-COVID-19, using telerehabilitation, over 18 years old, not in pregnancy, and review articles.

A data collecting form was used to record the authors, title, design of the study, interventions, results, and conclusion for the final sample of studies. Because we expected to discover few quantitative studies would feature very varied operationalization of 'barriers', we adopted a narrative method to data synthesis. Furthermore, qualitative synthesis was seen to be the most effective way to describe qualitative research.

Results and Discussions

A. Result

The article we were found from three databases is 608 articles. We assessed from the titles and abstracts, there are 25 articles that were duplicated on each database. Therefore, 8 publications were matched the eligibility criteria in this review. A PRISMA flowchart is illustrated in Figure 1.

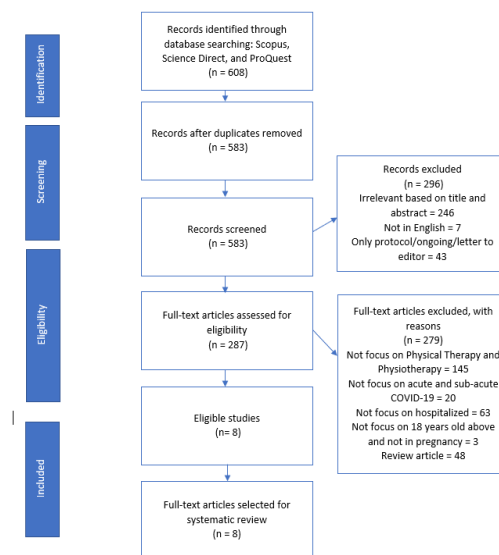


Figure 1
Prisma Flowchart

Furthermore, we found one scoping review (Bernal-Utrera et al., 2021), one literature review (da Silva e Silva et al., 2020), one retrospective observational

cohort study (Tatlow et al., 2021), one retrospective case series (Pancera et al., 2021), one observational study (Taskiran et al., 2021), and three case report (Eggmann et al., 2021; Gaspari et al., 2020; Li et al., 2021) are listed in Table 1.

Each study identified any recommendation of intervention due to clinical reasoning and clinical setting before the physical therapists doing the all treatment. There are various intervention options that can be given to patients, started by the prone position and positioning, respiratory physiotherapy, strengthening exercises, Neuromuscular Electrical Stimulation (NMES), ambulation, mobilization, and aerobic exercise depends on patient’s condition.

Table 1
Extraction Articles

N o.	Title (Author, Year)	Design	Intervention	Result	Conclusion
1	A retrospective cohort study of physiotherapy-assisted prone position or modified prone position in ward-based COVID-19 patients (Tatlow et al., 2021).	Retrospective observational cohort study	- Assisted prone position - Modified prone positions	There were thirteen patients in total. Nine of the thirteen needed physical therapy and switched to the 13/8 position. SpO2 increased in 27 of 32 sessions, with a mean increase of 94 percent after 15 minutes from 90 percent pre-positioning. Desaturation of oxygen and discomfort occurred in three sessions, but were quickly resolved by returning to the supine position.	A physiotherapy-assisted prone position or a modified prone position could be viable options for improving awake oxygenation in the short term.
2	Can physiotherapeutic interventions be used to treat COVID-19 patients who are critically ill?	Scoping review	- Respiratory physiotherapy, Inspiratory Musculature Technique (IMT), and	Respiratory PT: - Italian guideline: respiratory PT was not recommended for COVID-19 patients caused by maneuvers	Implementing physiotherapy for COVID-19 patients admitted to the ICU is a critical approach because it can help prevent

(Bernal-Utrera et al., 2021).	postural drainage with manual techniques - Positioning - Mobilization - Exercise therapy	of lungs for airways clearance needs strictly supervision, is dangerous, and is not required. In other studies, COVID-19 requires respiratory PT under collaboration with a multidisciplinary team. - IMT for post-extubation occurred little risky on the vital values after mechanical ventilation. Nonetheless, the advantages of activating inspiratory muscles are significant. Because of the impact on health and quality of life, it will be used on sub-acute patients. - Postural drainage is assisted by manual techniques (percussion and vibration). Positional treatment - Patients who do not require	problems and stabilize patients during critical times, allowing them to recover faster. Initially, respiratory physiotherapy was discovered to help with pulmonary ventilation, secretion mobilization and excretion, and respiratory muscle activation. Second, positional care has been proposed to improve the ventilation/perfusion index (V/P). Finally, exercise therapy may aid in the recovery of COVID-19 patients admitted to the ICU by improving immune function and reducing complications. A clinical reasoning process should be followed before implementing this process, and physical therapy treatment
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					mechanical ventilation are advised to change positions, such as dynamic positions.	should be tailored to the clinical setting.
					- In all studies, prone position for 12-16 hours per day is highly suggested.	
					Mobilization and exercise therapy	
					- Passive mobilization to reduce skin lesions and the effects of immobilization. More discussions with the multidisciplinary team are required for active mobilization/progressive intervention.	
3	The West China hospital experience with physical therapist management of COVID-19 in the intensive care unit (Li et al., 2021).	Case report	- Respiratory physical therapy (Acapella and IMT) - Functional mobility	Despite the fact that most outcome measures were close to normal for the majority of patients, 61 percent and 31 percent of these patients had a peak expiratory flow rate (PEFR) and maximal inspiratory pressure (MIP) on discharge from the ICU that were less than 80 percent of predicted values,		Some patients, respiratory like PEFR and MIP values and physical functions remained poor after they were discharged from the ICU, implying that they may require long-term rehabilitation to improve their functional

				respectively, and ability. 46 percent had a De Morton Mobility Index value that was less than normative values.
4	A case report series on initial physical therapist intervention for COVID-19 patients in an acute care hospital. (Eggmann et al., 2021).	Case report	<ul style="list-style-type: none"> - Prone position - Respiratory physical therapy - Mobilization 	<p>Among the interventions are respiratory care, patient education, early mobilization, and prone position. Patients were frequently unstable, with rapid symptom exacerbation and inconsistent recovery. Furthermore, many critically ill patients had severe weakness, dysphagia after extubation, weaning failure, anxiety or delirium. The majority of patients followed the recommended treatment plans, and their lung function and physical strength improved with time.</p>
5	Physical therapy in a neurosurgery center converted to a COVID-19 center in Brazil for the	Case report	<ul style="list-style-type: none"> - Prone position - Progressive mobility exercise 	<p>To improve oxygenation, assume a prone position. After the patient's breathing has stabilized, physiotherapist interventions focus</p>
				<p>Physiotherapists can and should play a role in the COVID-19 pandemic. Based on their experience in Switzerland, physical therapists should routinely screen and assess patients in the acute ward for respiratory symptoms and exercise tolerance. Treatment for critically ill patients should begin as soon as possible to avoid future complications. More research is needed on the initial breathing exercises, prone position, and post-COVID therapy.</p> <p>Throughout the whole hospitalization period, the physical therapist's participation in the treatment of</p>

	first 60 days. (Gaspari et al., 2020).			on restoring physical function. When a patient lacks body control, physical therapists frequently use an inclined table, and prior to discharge, all patients sit on the edge of the bed, stand, and walk throughout the physical therapy session.	COVID-19 patients has been critical. Because of the availability and expertise of physical therapists on their ICU, patient placement, intubation, extubation, ventilatory modifications, and functional training have all been made easier.
6	Evidence-based physiotherapy and functionality in COVID-19 adult and pediatric patients (da Silva e Silva et al., 2020).	Literature Review	<ul style="list-style-type: none"> - Respiratory physical therapy - Ambulation - Mobilization and exercise therapy 	<p>Recommendations for physical therapy management in patient with respiratory disease caused by COVID-19</p> <ol style="list-style-type: none"> 1. Mucous hypersecretion, exudative consolidation, wet speech, difficulty to clearing secretion, SpO₂ < 90% and O₂ therapy 5l/min - Secretion removal techniques - Directed cough - Oscillating Positive Expiratory Pressure (OPEP) <p>Note: the</p>	<p>COVID-19 causes significant changes in lung function, hypoxemia, decreased lung compliance, and cardiovascular effects. For these patients, these changes necessitate physiotherapy as well as oxygen therapy management and ventilatory support (invasive and non-invasive).</p>

				majority of patients do not have a productive cough and are able to expectorate on their own.	
				2. Severe muscle weakness e.c. prolonged mechanical ventilation, increasing hospitalized Length of Stay (LoS) and mortality, reducing Quality of Life (QoL)	
				- Early mobilization	
				- Exercise for muscle strengthening (progressive)	
				- Ambulation	
7	A	Case retrospective studies in retrospect	<ul style="list-style-type: none"> - Pulmonary rehabilitation - Neuromuscular electrical stimulation (NMES) - Early mobilization - Aerobic training and strengthening exercise 	<ul style="list-style-type: none"> - In the Barthel Index and Short Physical Performance Battery (SPPB) tests, all patients were able to move independently and recovered motor function at T1, except for the first patient who had fully recovered at T2. - Medical Research Council (MRC) score and muscle 	This study demonstrated that patients with severe COVID-19 are feasible to get a subacute rehabilitation as soon as they are discharged from the ICU. Allows for a smooth transition from treatment to full functional recovery.

				<p>strength had been increased at T1 and T2.</p> <ul style="list-style-type: none"> - The Barthel Index Dyspnea (BID) score indicated a significant improvement in activity-related dyspnea between T0 and T1, except for case 1, which had more dyspnea at T1 and case 2, which started from a lower value at baseline. - The Maximal Inspiratory Pressure (MIP) and Maximal Expiratory Pressure (MEP) values vary widely
8	Physical rehabilitation in the Intensive Care Unit for COVID-19 patients with acute respiratory distress syndrome (Taskiran et al., 2021).	Observational study	<ul style="list-style-type: none"> - Neuromuscular electrical stimulation (NMES) - Passive/active-assisted/active ROM exercise - Mobilization (clinical reasoning) 	<ul style="list-style-type: none"> - The whole treatment program cannot be run completely. For example, exercise was not performed by instability in blood pressure, desaturation, and heart rate instability. NMES was not given due to positioning. - During the exercise or NMES applications, no <p>The findings found no evidence that acute rehabilitation in the ICU improves survival, muscle strength, or shortens the length of stay or duration of mechanical ventilation (MV). The presence of more patients with pulmonary and neurologic disorders in the rehabilitation</p>

significant hemodynamic instability was noticed, indicating that the sessions should be ended.

group, on the other hand, emphasizes the importance and usefulness of rehabilitation.

- There were no significant changes in MV length, mortality, or LoS in the ICU and hospital.

In their study, [Tatlow et al. \(2021\)](#) identified 13 patients. To determine short-term changes in oxygenation, success rates in achieving prone or modified positions, changes in oxygen saturation (SpO₂ assessed by pulse oximetry), and oxygen demand (liters of oxygen (L/min) before and 15 minutes after prone or prone position modification were used. Any transient oxygen desaturation, oxygen, or intravenous tube displacements were also recorded during the physiotherapy sessions. SpO₂ increased after 15 minutes in modified cartilage or cartilage in 27/32 (84 percent) of 32 sessions, 1–3 percent in 27/9 (33 percent), and >4 percent in 18/27 (84 percent) (67 percent). Because the patient had a negative response to position, physical therapy was modified in 3/32 sessions. One patient reported that one session was limited to 15 minutes due to self-reported pain and observed increased work of breathing, which decreased with supine repositioning. Other patients had two or four sessions that were limited to 90 minutes or 25 minutes due to a 3% decrease in oxygen saturation during each session.

There are four main interventions in this study ([Bernal-Utrera et al., 2021](#)). These include respiratory physical therapy, positional, mobilization, and exercise therapy. From the various studies in this article, there is contradictions in the treatment of physical therapy, especially respiratory physical therapy in the Italian guidelines, it is stated that this procedure is not recommended because maneuvers from the lungs for airway clearance are quite dangerous and are deemed unnecessary. Meanwhile, in other studies, respiratory physical therapy intervention, such as inspiratory musculature technique (IMT) and assisted postural drainage are needed by involving a multidisciplinary team with clinical reasoning and patient's conditions (post-extubation cannot doing IMT, it can occurred risky for vital values). Positional treatment is not intended for patients who are on a mechanical ventilation, but it is recommended to frequently change positions in other patients for at least 12-16 hours per day. For mobilization and exercise therapy, passive movements can reduce skin lesions and immobilization sequelae. Then, for active exercise, it needs to be discussed by a multidisciplinary team too.

This study which was an experience of The West China hospital with 16 patients involved (Li et al., 2021). On nasal cannulae or high-flow nasal oxygenation, 13 of the 16 patients were breathing spontaneously. The improvement of PEFr was occurring only at 61%, while the MIP was only 31%. This is below the standard of the ICU, which is under 80%. In other reasons, this study did not take into account the absence of respiratory and mobility interventions in the early stages of the disease. So, the researcher doesn't know the relation of physical therapy interventions in the early-middle stages of the disease and how much the intervention had influenced.

Similar to the previous study, Eggmann et al. (2021) used some intervention, like prone positioning, respiratory physical therapy, and mobilization. Patient education program was included in this study to be successful in the therapeutic process. However, the unstable condition of patients followed by rapid symptom exacerbation (such as pulmonary and hemodynamic instability, dyspnoea, delirium, ICU-acquired weakness, sputum, anxiety, and post-extubation dysphagia) and the inconsistency of recovery process makes physical therapist had to be regularly monitored to ensure a safe implementation of interventions.

Gaspari et al. (2020) using prone position and progressive mobility exercise interventions to the COVID-19 patient. Because the prone posture improves oxygenation, it can be used to maintain physical function after respiratory therapy. Even if the patient is unable to maintain their position, the patient can use a tilting table (for patients who are extremely frail), progressive exercise is done gradually. The recovery process can quicken by gradually increasing the amount of exercise.

The evidence-based of physical therapy intervention is described in this study for COVID-19 patients da Silva e Silva et al. (2020) which using respiratory physical therapy, ambulation, mobilization and exercise therapy. There are all recommendations on how to do the intervention, including a clinical reasoning and clinical setting was mentioned.

The study of Pancera et al. (2021) were slightly different with another study, they used NMES and aerobic exercise as an additional intervention. However, it remains the same intervention as previous studies. This study uses several tools for assessing functional activity, namely Barthel Index, Short physical Performance Battery (SPBB), Medical Research Council (MRC), and Barthel Index Dyspnoea (BID) as the main assessment. Very varied changes in each patient measured using many tools reflect which are also different with patient condition. But overall, these interventions can be used as long as it keeps attention to the patient's safe.

The study conducted by Taskiran et al. (2021) was almost the same as the study by Pancera et al. (2021), which also used NMES on patients, but in the ICU's setting. In this study, it was stated that not all of the existing interventions could be carried out. There are certain conditions where intervention cannot be carried out, for example, instability of blood pressure and heart rate and desaturation of oxygen level, which causes, intervention in the form of exercise cannot be given for a while.

B. Discussion

We identified eight articles to investigate the results and the impact of each intervention which applied by physical therapists in a few countries. The research on physical therapy intervention for COVID-19 hospitalized patients still requires more references. Physical therapy, in conjunction with other pharmaceuticals from another multidiscipline, is an attempt to accelerate the recovery process, particularly functional ability. To limit the high-risk transmission of COVID-19, the use of Personal Protective Equipment (PPE) when physical therapy treats COVID-19 patients must be followed. This review focuses on the various therapies that are used to maintain the respiratory system and functional ability of each COVID-19 patient who is being treated in a hospital throughout the world.

The first review of articles by [Tatlow et al. \(2021\)](#), the feasibility and short-term change in oxygenation in awake, ward-based COVID-19 patients using physical therapy assisted prone or modified prone positioning. Although there are several findings of conditions during the prone position, both assisted and modified prone which can only be performed for 15 minutes due to increasing work of breathing, feels discomfort, and a drop in oxygen saturation which is resolved with supine position. In addition, there are also several other conditions, including as musculoskeletal pain, obesity, and after neck surgery so that only modified prone can be conducted.

The combination of several interventions, such as respiratory physical therapy, positioning, mobilization and exercise therapy based on clinical reasoning and under the monitoring multidisciplinary teams in critical ill COVID-19 patients, allowing them to recover more quickly ([Bernal-Utrera et al., 2021](#)). Meanwhile, this study needs to assess the effectiveness or ineffectiveness of interventions which is conducted of physical therapy caused by in this review just want to know the different kinds of interventions, clinical guideline, and not to be assessed in terms of quality.

The study of [Li et al. \(2021\)](#) support the use of physical therapy to maintain airway clearance, respiratory capacity, and functional capacity in patients with COVID-19-related severe and critical illness. Unfortunately, the intervention of this study is a respiratory physical therapy using Acapella and IMT, and also functional mobility status remained poor after discharge, implying that long-term pulmonary and functional rehabilitation required more research.

In the study of [Eggmann et al. \(2021\)](#), clinical reasoning is very important in deciding interventions. A researcher recommends that all COVID-19 patients in hospitals be evaluated on a regular basis by a physical therapist to assess indications and treat them using clinical reasoning and previously established evidence-based procedures.

According to [Gaspari et al. \(2020\)](#), the exercise helps to speed up the recovery process for COVID-19 patients even on the ICU. Physical therapists have played a critical role in the treatment of COVID-19 patients thus far, and this has been true

throughout the hospitalization stay. Because of the availability and skill of physical therapists in our ICU, intubation, extubation, ventilatory modifications, patient placement, and functional training have all been made easier.

The patient's condition described in the study [Pancera et al. \(2021\)](#) such as shortness of breath caused the BID value to be below the lower limit. However, this situation can be handled well, so that significant changes occur in all values, especially in T2.

The study of [Taskiran et al. \(2021\)](#) was not found any evidence that acute rehabilitation in the ICU could improves muscle strength, survival or length of stay in the hospital, or MV duration. The research sample is too small, making it difficult to make conclusions about the intervention of physical therapy in COVID-19 patients in the ICU, which prevents muscle weakness. If the patient indicates of muscle weakness after being discharged from the ICU, additional physical therapy intervention will be needed

Conclusion

Physical therapy interventions for COVID-19 hospitalized patients have a significant impact on facilitating their recovery. In the critical to the recovery phase, the prone position, respiratory physical therapy or breathing exercises, muscle strengthening, ambulation, mobilization, and also the applied of NMES which refers to the patient's functional abilities, become the main focus. A clinical reasoning and clinical setting would be the first things evidence-based for each patient before we undergo the intervention and also the use of standardized PPE to reduce the risk of contagious virus.

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