**PHYSICAL REHABILITATION INTERVENTION FOR COVID 19.**

**1 Dr.S.Senthilkumar, 2Dr.Anjali suresh, 3Dr.S.Jeyakumar**

1. Professor & Research Supervisor, School of Health Sciences, Department of Physiotherapy, Gardencity University, Bangalore, Karnataka.
2. Professor & HOD, School of Health Sciences, Department of Physiotherapy, Gardencity University, Bangalore, Karnataka.
3. Professor & Research Supervisor, School of Health Sciences, Department of Physiotherapy, Gardencity University, Bangalore, Karnataka.

**ABSTARCT**

COVID-19, an ongoing pandemic of respiratory disease, is the latest menace to global health ever since its outbreak in December 2019 in Wuhan, China. It has generated a major distress due to the high percentage of death it has caused globally and non-availability of valid treatment till date. This explains that the new virus COVID-19 is extremely contagious crossing specific barriers and causing illness in human ranging from common cold (mimicking flu or influenza) to severe disease patterns such as Middle East Respiratory Syndrome and Severe Acute Respiratory Syndrome leading to serious public health risk1. The continuum of severity of the disease varies from subclinical illness, upper respiratory tract disease, serious breathing failure, viral pneumonia, and/or death. Existing studies suggest that 80% of cases are asymptomatic; 15% serious (oxygen-requiring illness); and 5% cases are crucial who require ventilator support system. Globally, physical therapy associations have made dire attempts to set guidelines and recommendations to treat COVID-19 patients in conjunction with the intensivists and nursing staff1. A document by the World Confederation of Physical Therapy (WCPT) has provided guidelines for physical therapists working in hospital that would assist physical therapists in the management of confirmed or suspected cases of COVID-19.It has been anticipated that physical therapy could be beneficial in respiratory problems and physical rehabilitation in patients with COVID-19 having profuse secretions that are difficult to clear independently by the patient. Techniques such as airway clearance and positioning may assist the ventilated patient in maintaining bronchial hygiene2. Prone positioning could help acute respiratory distress syndrome (ARDS) patients improve ventilation. Since the prevalence of ARDS in COVID patients is 17%, it can be considered as a treatment option to decrease mortality in patients with impaired oxygenation in the initial hours of disease. It also helps in recruiting the dorsal lung regions and thereby increasing end expiratory lung volume, increasing the chest wall elastic, decreasing alveolar shunt, and also improving tidal volume. It has been reported that COVID-19 patients on prolonged ventilator support, sedatives, neurogenic inhibitors, analgesics, and antibiotics are susceptible to develop ICU-acquired illness that may worsen the morbidity and mortality. In order to avoid this, it is important to anticipate early rehabilitation of patients with respiratory disease to avoid ICU-induced weakness and enhance early recovery2. Physical therapist plays an extensive role in providing exercise therapy, mobilization, and rehabilitation interventions to COVID-19 survivors in order to enable functional recovery. This advocates that physical therapy is significant in early recovery of COVID patients2.

**KEY WORDS**: Covid19, Physiotherapy, Rehabilitation, Breathing, Intervention

**1.Introduction:**

In the present COVID-19 pandemic in India, although there are >1 lakh affected cases, 61,149 active cases, 42,297 cases recovered, and 3303 deaths as per Aarogya Setu database of the Ministry of Health and Family Welfare, Government of India, dated May 20, 2020, there is a lack of training and participation of physical therapists or rehabilitation practitioners as vital components of the health-care system2. Physical therapists have been set aside a little with the cancellation and restriction of ambulatory and hospital facilities to some degree. However, as per the recent WCPT guidelines, physical therapist definitely plays a vital role in meeting patient's needs. In India, a report published in Tribune News Service on outcome of physiotherapy in COVID-19 patients showed beneficial effects of age-old postural therapy technique (also known as postural drainage) for the early recovery of COVID patients with hypoxemia, which may result in preventing development of frank respiratory failure3. Hence, physical therapists in India should be given the opportunity and training to apply the various rehabilitation strategies that would help recover confirmed or suspected patients with COVID-19. It also helps in recruiting the dorsal lung regions and thereby increasing end expiratory lung volume, increasing the chest wall elastic, decreasing alveolar shunt, and also improving tidal volume It has been reported that COVID-19 patients on prolonged ventilator support, sedatives, neurogenic inhibitors, analgesics, and antibiotics are susceptible to develop ICU-acquired illness that may worsen the morbidity and mortality. In order to avoid this, it is important to anticipate early rehabilitation of patients with respiratory disease to avoid ICU-induced weakness and enhance early recovery3. Physical therapist plays an extensive role in providing exercise therapy, mobilization, and rehabilitation interventions to COVID-19 survivors in order to enable functional recovery. This advocates that physical therapy is significant in early recovery of COVID patients4. Although the guidelines for physical therapy are recommended, there are still many queries unanswered and risky like the usage of the aerosol generating procedures, use of bubble positive expiratory pressure, use of mechanical insufflations, exsufflations, and humidification. However, they may be used under instruction, disposable circuits with consultation, and agreement. Manual hyperinflation or Ambuing is recommended to be avoided as it involves disconnection and opening of ventilator circuit. Besides the recommended guidelines in ICU by physical therapy associations, the head of physical therapist team may frame screening and treatment guidelines. These guidelines may be framed and documented as per their hospital policy in a manner that may include detection of mild, moderate, and severe cases of COVID-19 and physiotherapy measures for confirmed and suspected cases in separate isolation areas4.

**1.1 TELE REHABILITATION:**

Physiotherapy plays a significant role in rehabilitation. However, the emergence of the coronavirus disease 2019 (COVID-19) has posed a big challenge to its practice, especially regarding the level of contact with patients. There is a dire need for the exploration of rehabilitation options, other than in-person contacts, to limit the spread of the virus5.This explores telerehabilitation, its outcomes, and the challenges involved in the continuum of care of patients by physiotherapists in the face of the pandemic. Tele rehabilitation is a vital tool which utilizes technology to link practitioners to patients. With its previous history of favourable outcomes for the rehabilitation of certain conditions, telerehabilitation has been widely recommended. However, issues exist on how well it can bridge the gap of physical touch in physiotherapy, its effectiveness in terms of outcomes and satisfaction across various conditions and large population sizes, and finally, its cost and effects, especially in developing countries5. Conventionally, for an individual to access the services of a physiotherapist, there is a need for a scheduled physical appointment to meet with the physiotherapist at a designated location. However, the advent of technology has bridged the gap that might exist between locations, practitioners, and patients . With continually improving communication technology, technology has been employed to provide remote healthcare services , and this is the concept of telerehabilitation. Brennan et al. (2010) described telerehabilitation as habilitation or rehabilitation services that are provided by a rehabilitation professional remotely, which is useful for assessment, monitoring, prevention, intervention, supervision, education, consultation, and counselling. It comprises the use of videoconferencing via the internet, phone calls, and virtual reality systems, where remote interaction with patients can either be real-time or pre-recorded6.

**1.2 PERSONAL PROTECTIVE EQUIPMENT:**

Several procedures performed by physiotherapists may generate aerosols and droplets, which are sources of lung and respiratory pathogens. These procedures include non-invasive ventilation, high-flow oxygenation, endotracheal intubation, airway tracheostomy and endotracheal tube suction,cardiopulmonary7 resuscitation, high-frequency oscillatory ventilation, chest physiotherapy, prone patient positioning, disconnection of the ventilator, administration of nebulized treatment, and sputum induction. Furthermore, severe acute respiratory syndrome coronavirus 7 can remain in the air for hours and on surfaces of various materials for days upon aerosolization, with risks of possible human infection. However, when aerosol-generating procedures cannot be avoided, they should be performed in a negative-pressure room. In the absence of negative-pressure rooms, the procedures must be performed in a room with closed doors and open windows; with minimum number of qualified professionals to perform the procedures; with appropriate PPE; and avoiding the presence other people. Therefore, physiotherapists must adopt protective measures to avoid aerosol exposure and for contact isolation by using adequate PPE, namely, surgical caps, safety goggles, face shields, N95 masks or equivalent, gowns, and gloves8.

**2.CHEST PHYSIOTHERAPY:**

Currently, no evidence exists indicating that conventional chest physiotherapy changes the course of COVID-19 in the acute phase of the disease in patients with hypoxemic respiratory failure and dry cough. However, some patients with productive cough may benefit from bronchial hygiene maneuvers and techniques that stimulate coughing 8. Patients with a mild form of the disease should be instructed to perform breathing exercises independently. Patients with moderate and severe conditions should be constantly monitored for pulmonary disease . In these cases, physiotherapists should contact the patient only for respiratory and pulmonary assessments, especially during orotracheal intubation and oxygen supplementation and for patients who are candidates for non-invasive ventilation or high-flow oxygen administration . The professional exposure time should be the minimum necessary for evaluation and assistance8 .

* Manual Techniques (e.g. Percussion/Manual Assisted Cough) that may lead to coughing and expectoration of sputum
* Use of Positive Pressure Breathing Devices (e.g. IPPB), Mechanical Insufflation-Exsufflation (Cough Assist) Devices, Intra/Extra Pulmonary High Frequency Oscillation Devices (e.g. the Vest / MetaNeb / Percussionaire etc.)
* Any Mobilisation or Therapy that may result in Coughing and Expectoration of Mucus
* Any Diagnostic Interventions that involve use of Video Laryngoscopy that can result in Airway Irritation and Coughing (e.g. Direct Visualisation during airway clearance techniques or when assisting Speech and Language Therapists perform Fibreoptic Endoscopic Evaluation of Swallow)

**2.1Acute Phase:**

In the early stages of COVID-19 and respiratory distress, care is advised when planning a treatment programme. Common modalities often used by respiratory physiotherapists may be contraindicated in the acute phase as they may further compromise the increased work of breathing.

**Contraindicated** interventions include:9

* [Diaphragmatic breathing](https://www.physio-pedia.com/Diaphragmatic_Breathing_Exercises)
* Pursed lips breathing
* Bronchial hygiene/lung re-expansion techniques (PEP Bottle, EzPAP®, cough machines, etc.)
* [Incentive spirometry](https://www.physio-pedia.com/Incentive_Spirometry)
* Manual mobilisation techniques or stretching of the rib cage
* Nasal washings
* [Respiratory muscle training](https://www.physio-pedia.com/Respiratory_Muscle_Training)
* Exercise training
* Patient mobilisation during clinical instability

Physiotherapists should continue to actively screen and/or accept referrals for mobilisation, exercise and rehabilitation. When screening, discussion with nursing staff, the patient (e.g. via phone) or family is recommended before deciding to enter the patient’s isolation room. For example,to try to minimise staff who come in to contact with patients with COVID-19, physiotherapists may screen to determine an appropriate aid to trial. A trial of the aid may then be performed by the nursing staff already in an isolation room, with guidance provided if needed by the physiotherapist who is outside the room9.

**2.2 Rehabilitation Phase:**

This is where we will see the main role of the physiotherapist in the management of the patient with COVID-19. There is strong evidence to suggest that early mobilisation with a focus on returning to functional activities helps in reducing the length of hospital stay and minimising functional decline, thus the sooner patients start mobilising, the sooner they can leave the ICU, and potentially have better long-term outcomes. This phase of management should incorporate a multi-disciplinary approach including measures to prevent avoidable physical and non-physical morbidity, support adequate nutrition (particularly following the effects of prone ventilation) and an individualised, structured rehabilitation programme. This phase should follow the typical approach for rehabilitation and [exercise within the Intensive Care Unit](https://www.physio-pedia.com/Exercise_in_Critical_Care), followed by transfer to ward-based rehabilitation10.

* Passive, Active Assisted, Active, or Resisted Joint Range of Motion Exercises to maintain or improve joint integrity and range of motion and muscle strength; [[6]](https://www.physio-pedia.com/Respiratory_Management_of_COVID_19#cite_note-:9-6)
* Mobilisation and Rehabilitation (e.g. bed mobility, sitting out of bed, sitting balance, sit to stand, walking, tilt table, standing hoists, upper limb or lower limb ergometry, exercise programs11.

**2.3 Exercise and early intervention:**

Patients usually present with a debilitated physical condition because of the disease, which reduces their exercise capacity, especially when they present with fever, dyspnea, myalgia, and fatigue the debilitated physical condition can also be a result of prolonged mechanical ventilation and immobilization. Hospitalized patients, even those with moderate disease severity, can spend weeks in hospital isolation, with a significant decrease in their activity levels, and are thus prone to a reduction in their muscle strength and cardiorespiratory capacity 12. Therefore, patients in the acute phase with mild disease should be encouraged to perform light-intensity exercises to maintain minimal functional capacity. The exercises can be tailored for maintenance of a Borg rating of <3 (on a 10-point scale) . Although there are no studies specific to patients with COVID-19, classically critical patients who underwent early mobilization showed a reduction in delirium and duration of mechanical ventilation ; thus, early mobilization should be started as soon as possible, as long as the patient presents suitable clinical conditions. This mobilization can include neuromuscular stimulation, therapeutic exercises, and early verticalization 13.

**2.4 Oxygen Therapy:**

The prevalence of hypoxic respiratory failure in adults with COVID-19 is 19%; thus, oxygen therapy represents a major treatment intervention for patients with severe pulmonary dysfunction Adults with COVID-19 should be started on supplemental oxygen if the peripheral oxygen saturation (SpO2) is <93% and maintained oxygen saturation is no higher than 96% . Mechanical ventilation may be necessary in cases of respiratory failure refractory to oxygen therapy .The interfaces used for oxygen supplementation can generate aerosols14. Therefore, health care workers should take adequate precautions and wear proper PPE when providing respiratory support to patients with COVID-19 complicated by respiratory failure. Oxygen humidification should not be used .The prescription of moisturizers such as self-applied nasal sodium chloride gel may be suggested for complications such as dryness of the upper airways or epistaxis. The oxygen supply device should be changed if these complications persist15.

**2.5 NON INVASIVE VENTILATION AND HIGH FLOW OXYGEN**

For the treatment of acute hypoxemic respiratory failure, the use of high-flow nasal oxygen is suggested over conventional oxygen therapy and non-invasive positive pressure ventilation . If high-flow nasal oxygen is not available, a trial of non-invasive ventilation is suggested. An experiment in a human model showed that non-invasive ventilation or high-flow nasal oxygen, when well applied with an optimal fit, resulted in minimal aerosolization of exhaled air. However, the specific models of masks and interfaces tested in the study are not universally used in all hospitals16. Therefore, to avoid potential harm, we recommend using adequate precautions and PPE and discourage the use of this procedure if an airborne infection isolation room is unavailable. Monitoring for worsening respiratory status and subsequent early intubation is recommended16.

**3.1 ENDOTRECHEAL INTUBATION:**

Patient candidates for non-invasive ventilation admitted to the ICU in negative-pressure rooms must be ventilated with positive end-expiratory pressure (PEEP) ≥8 cmH2O, support pressure for a tidal volume (TV) ≤8 mL/kg of the predicted weight, and fraction of inspired oxygen (FiO2) to maintain SaO2 >92%. Facial or full-face masks must be used during application of the ventilator. Devices with double branches for ventilation are indicated in these cases, with a heat moisture exchange filter (HMEF) between the face mask and the device and another high-efficiency particulate arrestance (HEPA) filter on the exhalation outlet of the ventilator. For high-flow oxygen, a flow rate of 40 to 50 L/min should be maintained, and FiO2 to maintain SaO2 >92% should be started.The criteria for orotracheal intubation and invasive mechanical ventilation are FiO2 >60% in non-invasive ventilation or TV ≥9 mL/kg or inability to tolerate <2 hours without non-invasive ventilation or presence of other organic dysfunctions. For high-flow oxygen, the criteria for orotracheal intubation are FiO2 >60% or signs of respiratory distress, or other organic dysfunctions. It is important to reassess the patient after 30 to 60 minutes; if there is no improvement or if there is worsening of ventilatory parameters, endotracheal intubation and invasive mechanical ventilation should be considered17.

When aerosol-generating procedures are required, they are recommended to be performed in a negative-pressure room and with the use of appropriate PPE . Only the professionals needed to perform orotracheal intubation should remain in the room.Patients with COVID‐19 are at risk of a rapid decrease in arterial oxygen levels; therefore, effective pre-oxygenation is mandatory18. Patients must be administered a sufficient oxygen flow to maintain SpO2 >93%, and intubation should be performed with a rapid sequence of induction and intubation. Pre-oxygenation with a non-rebreather mask with the lowest possible airflow to maintain effective oxygenation (SpO2 >93%) is required. It is also important to avoid assisted ventilation with the Bag-Valve-Mask device or the use of a supraglottic device because of the potential for aerosolization and contamination of health workers. However, if necessary, we suggest adding a filter between the simple respirator and the Bag-Valve-Mask or artificial airway during use to reduce the spread of the virus in the patient's airway to the indoor air19 .

**3.2 PROTECTIVE MECHANICAL VENTILATION:**

Invasive mechanical mode volume-controlled ventilation (in the presence of neuromuscular block or the absence of inspiratory effort) or pressure-controlled ventilation (in the absence of neuromuscular block and mild respiratory effort and asynchrony) should be performed with lower TVs (4 to 6 mL/kg predicted body weight) and lower inspiratory pressures, reaching a plateau pressure (Pplat) of <28-30 cmH2O. The PEEP must be as high as possible to maintain the driving pressure (Pplat − PEEP) as low as possible (<15 cmH2O) and SpO2 88-95% . Moreover, disconnection from the invasive mechanical ventilator must be avoided to prevent loss of PEEP and consequent atelectasis20.

**4.1 MANAGEMENT OF MECHANICAL VENTILATION IN SEVERE AND REFRACTORY CASES OF HYPOXEMIA:**

For patients with PaO2/FiO2 <150 and an inability to maintain protective ventilation or with the presence of asynchrony or severe hypercapnia (pH <7.25), we suggest sedation and continuous neuromuscular block to reduce respiratory drive and maintain protective ventilation21.

The multidisciplinary team can discuss the following:

1. prone positioning;

2. alveolar recruitment maneuvers and PEEP adjustment for better pulmonary compliance;

3. recruitment in the prone position for patients who responded to the supine recruitment maneuver;

4. nitric oxide administration in cases with a clinical history of “cor pulmonale” or as a recruitment maneuver for hypoxemia;

5. extracorporeal membrane oxygenation (ECMO) .

**4.2 PRONE POSITION:**

Prone ventilation for 12 to 16 hours a day is recommended in adult patients with severe ARDS (PaO2/FiO2 <150), . It is strongly recommended for adult patients with severe ARDS but requires sufficient human resources and knowledge to be performed safely. Protocols and videos are available in the study by Guérin et al., 2013. A satisfactory response is defined as a patient achieving an increase of 10 mmHg in PaO2 or an increase of 20 mmHg in the PaO2/FiO2 ratio. Prone positioning should be repeated when a PaO2/FiO2 ratio <150 mmHg is observed after 6 hours in the supine position. PaO2/FiO2 reductions of 20% in the supine position should be considered criteria for interrupting the prone position after two consecutive attempts at pronation or hemodynamic instability21.

**4.3 CUFF PRESSURE:**

Invasive mechanical ventilation is a risk factor for aerosols. Therefore, it is important to maintain a cuff pressure between 20 and 30 cmH2O or 25 and 35 mmHg, with sufficient pressure to prevent leakage and aerosol spread. We suggest cuff measurement either at every shift or at least daily22.

**4.4 TUBE AND NASOTRACHEAL SUCTION:**

Suction of the artificial airway because of ventilator disconnection must be avoided so that there is no loss of pressure in the respiratory system, atelectasis, or spread of aerosols in the room. The use of a closed suction system in all cases of intubation and invasive mechanical ventilation is recommended. In situations requiring open suction, we suggest the use of the “stand by” mode of the mechanical ventilator to minimize the spread of aerosols. Nasotracheal suction should be performed with careful evaluation by the physiotherapist because of the generation of aerosols. To perform these procedures, the use of proper PPE is recommended. Whenever possible, this procedure should be performed in a negative-pressure room23.

**5.1 HUMIDIFIRES FOR VENTILATED PATIENTS:**

Heat and moisture exchangers or heated humidifiers are more effective in preventing complications such as airway blockages and pneumonia in adults who receive invasive mechanical ventilation. Therefore, patients with COVID-19 should use devices that humidify and filter their inhaled and exhaled air, respectively. Thus, HMEF is more suitable for the humidification of exchanged air as it also has filtering capacity for viruses and bacteria, thus reducing air contamination. Additional protection can be provided by placing a HEPA filter on the exhalation valve of the mechanical ventilator. The use of heated humidifiers is discouraged in these patients24.

**5.2 WEANING FROM MECHANICAL VENTILATION AND EXTUBATION:**

All patients must be evaluated daily regarding the eligibility criteria for the spontaneous breathing test, considering adequate oxygenation: PaO2/FiO2>200 with PEEP ≤5-7 cmH2O, hemodynamic stability with low and stabilized doses or without vasopressor drug infusion, an adequate level of consciousness (easily awake or wakened), and adequate cough and secretion management with the presence of a cough reflex during closed aspiration.To wean patients with COVID-19 from mechanical invasive ventilation, we recommend the use of the pressure support ventilation (PSV) mode for spontaneous breathing tests. The use of the T-tube method should be avoided as it can increase aerosolization25.

Patients who pass the spontaneous breathing test should preferably be extubated in a negative-pressure room or in respiratory isolation. Physiotherapists and other health professionals present in the environment during extubation must follow PPE aerosol isolation precautions. During the procedure, extra care must be taken during extubation, including keeping the HMEF and closed endotracheal suction (e. g. Trach-Care) connected to the endotracheal tube when deflating the cuff. The endotracheal tube should be removed as gently as possible to avoid vigorous manipulation and coughing. If it is necessary to stimulate the patient's cough, the patient should be instructed to adopt cough etiquette. The tube must be discarded in the infectious waste collector26. In the ICU, the availability of a professional with experience in intubation is always recommended during the extubation of patients diagnosed with COVID-19, in case rapid reintubation is necessary. The rate of reintubation of these patients should be as low as possible; therefore, we recommend that the decision regarding the patient's extubation be rigorously discussed within the multidisciplinary team.

Tracheostomy may be indicated for patients who consecutively fail to wean or with long periods of intubation. Tracheostomy is considered a high-risk procedure for the formation of aerosols. Weaning patients using tracheostomy masks (e.g., Trach-Vent® and T-tube) is not recommended for patients with COVID-19. Rather, for spontaneous breathing training periods, the use of HMEF connected to Trach-Care, with oxygen supplementation directly in the HMEF to maintain SpO2 between 93 and 96%, is recommended. If aspiration is required during the spontaneous breathing test, the closed suction system must be used. We emphasize that the use of HMEF to wean tracheostomized patients requires constant assessment of clinical signs of discomfort or instability. Spontaneous breathing time should be progressive as patients improve breathing performance and resistance26.

**5.3 SUPPORT FOR REHABILITATION SELF MANAGEMENT AFTER COVID 19 RELATED TO ILLNESS:**

World Health Organization guidelines for following areas27:

* Managing breathlessness
* Exercising after leaving hospital
* Managing problem with your voice
* Managing eating, drinking and swallowing
* Managing problems with attention, memory, and thinking
* Managing activities of daily living
* Managing stress problems
* Contact to health care professionals

**5.4 MANAGING BREATHLESSNESS:**

It is common to experience breathlessness after being in hospital losing strength and fitness.

Positions to ease breathlessness27

1. High side lying: lying on your side propped up by pillows, supporting your head and neck, with your knees slightly bent.
2. Forward lean sitting: Sitting at a table, lean forwards from the waist with your head and neck resting on the pillow, and your arms resting on the table. You can also try this without the pillows.
3. Forward lean sitting no table in front: Sitting on a chair, lean forwards to rest your arms on your lap or the armrests of the chair.
4. Forward lean standing: While standing, lean forwards onto a windowsill or other stable surface.
5. Standing with back support: Lean with your back against a wall and your hands by your side. Have your hands by your side. feet about a foot away from the wall slightly apart

**5.5 BREATHING TECHNIQUES:**

* Sit in a comfortable and supported position28
* Put one hand on your chest and the other on your stomach
* Only if it helps you to relax, close your eyes (otherwise leave them open) and focus on your breathing
* Slowly breathe in through your nose (or mouth if you are unable to do this) and then out through your mouth.
* As you breathe, you will feel the hand on your stomach rise more than the hand on your chest
* Try to use as little effort as possible and make your breaths slow, relaxed, and smooth.

**CONCLUSION:**

In conclusion, Physiotherapy will directly affect the physical function of patients, especially the respiratory function. PT intervention during ICU stay can help in earlier transfer of patients to the general wards[15](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7443542/#r15)). ADL and exercise endurance training will also allow discharged patients to return to social work. It indirectly reduces the probability of medical collapse and could help maintain national and social stability.the physical therapy of COVID-19 patients will not only reduce the mortality rate of patients, hospital admission time and medical expenses29, but also save medical resources, reduce personal and national economic losses, and the probability of adverse social stability events such as medical collapse. Therefore, physical therapy should be introduced into the mainstream treatment of COVID-19 patients as early as possible31. Acutely unwell confirmed or suspected COVID-19 patients should NOT be routinely referred to physiotherapy. There are currently no reports that suggest COVID-19 patients have high secretion loads requiring intensive respiratory physiotherapy/airway clearance. Physiotherapy intervention is likely to be of limited benefit in the acute stages and most beneficial use of physiotherapy resources will be to facilitate the treatment and discharge of non-infected patients as well as training and supporting our colleagues in managing the acutely unwell. Physiotherapists will have a role in the rehabilitation of COVID-19 patients who have not returned to their functional baseline once they are no longer acutely unwell.31

**REFERENCES:**

 [1]. Borges do Nascimento IJ, Cacic N, Abdulazeem HM, et al. : *Novel coronavirus infection (COVID-19) in humans: a scoping review and meta-analysis*. J Clin Med, 2020, 9: 941. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7230636/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32235486)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Clin+Med&title=Novel+coronavirus+infection+(COVID-19)+in+humans:+a+scoping+review+and+meta-analysis&volume=9&publication_year=2020&pages=941&)]

[2] Ohtake PJ, Lee AC, Scott JC, et al. : *Physical impairments associated with post-intensive care syndrome: systematic review based on the World Health Organization’s international classification of functioning, disability and health framework. Phys Ther*, 2018, 98: 631–645. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/29961847)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Phys+Ther&title=Physical+impairments+associated+with+post-intensive+care+syndrome:+systematic+review+based+on+the+World+Health+Organization%E2%80%99s+international+classification+of+functioning,+disability+and+health+framework&volume=98&publication_year=2018&pages=631-645&pmid=29961847&)]

[3] Cieloszczyk A, Lewko A, Śliwka A, et al. : *Recommendations for physiotherapy of adult patients with COVID*  <https://www.wcpt.org/sites/wcpt.org/files/files/wcptnews/images/Recommendations%20for%20physiotherapy%20of%20adult%20patients%20with%20COVID-19_POLISH.pdf>.

[4]Harari SA, Vitacca M, Blasi F, et al. : *European Respiratory Society. Managing the respiratory care of patients with COVID-19*. 2020. <https://www.ersnet.org/covid-19-blog/sharing-italian-recommendations> (Accessed Mar. 23, 2020)

[5] Hough A: Hough’s *cardiorespiratory care: an evidence-based, problem-solving approach*, 5th ed. London: Elsevier Health Sciences, 2018. [[Google Scholar](https://scholar.google.com/scholar?q=Hough+A+:+Hough%E2%80%99s+cardiorespiratory+care:+an+evidence-based,+problem-solving+approach,+5th+ed.+London:+Elsevier+Health+Sciences,++2018+.+)]

 [6]Enrico C, Michele V, Mauro C, et al. : *Joint statement on the role of respiratory rehabilitation in the COVID-19 crisis:* the Italian position paper. 2020. [https://www.ersnet.org/covid-19-blog/rehabilitation-with-covid19–italian-guidance](https://www.ersnet.org/covid-19-blog/rehabilitation-with-covid19%E2%80%93italian-guidance) (Accessed Mar. 30, 2020) [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7316664/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32428909)]

[7]Thomas P, Baldwin C, Bissett B, et al. :*Physiotherapy management for COVID-19 in the acute hospital setting: clinical practice recommendations.* J Physiother, 2020, 66: 73–82. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7165238/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32312646)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=J+Physiother&title=Physiotherapy+management+for+COVID-19+in+the+acute+hospital+setting:+clinical+practice+recommendations&volume=66&publication_year=2020&pages=73-82&pmid=32312646&)]

[8] Jiménez-Pavón D, Carbonell-Baeza A, Lavie CJ: *Physical exercise as therapy to fight against the mental and physical consequences of COVID-19 quarantine: Special focus in older people.*Prog Cardiovasc Dis, 2020, 24: S0033-0620(20)30063-3. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7118448/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32220590)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Prog+Cardiovasc+Dis&title=Physical+exercise+as+therapy+to+fight+against+the+mental+and+physical+consequences+of+COVID-19+quarantine:+Special+focus+in+older+people&volume=24&publication_year=2020&pages=S0033-0620(20)30063-3&)]

[9]Kirigia JM, Muthuri RN: *The fiscal value of human lives lost from coronavirus disease (COVID-19) in China.* BMC Res Notes, 2020, 13: 198. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7110291/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32238182)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=BMC+Res+Notes&title=The+fiscal+value+of+human+lives+lost+from+coronavirus+disease+(COVID-19)+in+China&volume=13&publication_year=2020&pages=198&pmid=32238182&)]

[10]M, Afzal MS, Khan A, et al. : *COVID-19 pandemic and economic cost; impact on forcibly displaced people.* Travel Med Infect Dis, 2020, 6: 101661. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7136875/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32272198)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Travel+Med+Infect+Dis&title=COVID-19+pandemic+and+economic+cost;+impact+on+forcibly+displaced+people&volume=6&publication_year=2020&pages=101661&)]

[11] Kumar A, Rahman M, Trivedi AN, et al. :*Comparing post-acute rehabilitation use, length of stay, and outcomes experienced by medicare fee-for-service and medicare advantage beneficiaries with hip fracture in the United States: a secondary analysis of administrative data*. PLoS Med, 2018, 15: e1002592. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6019094/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/29944655)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=PLoS+Med&title=Comparing+post-acute+rehabilitation+use,+length+of+stay,+and+outcomes+experienced+by+medicare+fee-for-service+and+medicare+advantage+beneficiaries+with+hip+fracture+in+the+United+States:+a+secondary+analysis+of+administrative+data&volume=15&publication_year=2018&pages=e1002592&pmid=29944655&)]

 [12]Duarte A, Bojke C, Cayton W, et al. : *Impact of specialist rehabilitation services on hospital length of stay and associated costs.*Eur J Health Econ, 2018, 19: 1027–1034. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC6105206/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/29282588)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Eur+J+Health+Econ&title=Impact+of+specialist+rehabilitation+services+on+hospital+length+of+stay+and+associated+costs&volume=19&publication_year=2018&pages=1027-1034&pmid=29282588&)]

[13] *COVID-19 Japan: Anti-coronavirus dashboard*. <https://www.stopcovid19.jp/> (Accessed Apr. 19, 2020)

 [14]Coccolini F, Sartelli M, Kluger Y, et al. : *COVID-19 the showdown for mass casualty preparedness and management: the Cassandra Syndrome. W*orld J Emerg Surg, 2020, 15: 26. [[PMC free article](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7145275/)] [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32272957)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=World+J+Emerg+Surg&title=COVID-19+the+showdown+for+mass+casualty+preparedness+and+management:+the+Cassandra+Syndrome&volume=15&publication_year=2020&pages=26&pmid=32272957&)]

[15]Lazzeri M, Lanza A, Bellini R, et al. : *Respiratory physiotherapy in patients with COVID-19 infection in acute setting: a Position Paper of the Italian Association of Respiratory Physiotherapists* (ARIR). Monaldi Arch Chest Dis, 2020, 90. [[PubMed](https://www.ncbi.nlm.nih.gov/pubmed/32236089)] [[Google Scholar](https://scholar.google.com/scholar_lookup?journal=Monaldi+Arch+Chest+Dis&title=Respiratory+physiotherapy+in+patients+with+COVID-19+infection+in+acute+setting:+a+Position+Paper+of+the+Italian+Association+of+Respiratory+Physiotherapists+(ARIR)&volume=90&publication_year=2020&)]

[16] L, Qiu H, Wan L, Ai Y, Xue Z, Guo Q, Deshpande R, Zhang L, Meng J, Tong C, Liu H. *Intubation and Ventilation amid the COVID-19 Outbreak: Wuhan's Experience. Anesthesiology*. 2020 Mar 19.

[17] Metro North, *Interim infection prevention and control guidelines for the management of COVID-19 in healthcare settings,* 2020:

[18]Alhazzani, W., M. Moller, Y. Arabi, M. Loeb, M. Gong, E. Fan, S. Oczkowski, M. Levy, L. Derde, A. Dzierba, B. Du, M. Aboodi, H. Wunsch, M. Cecconi, Y. Koh, D.*Surviving sepsis campaign: Guidelines of the Management of Critically Ill Adults with Coronavirus Disease 2019 (COVID-19).* Critical Care Medicine, 2020. EPub Ahead of Print.

[19] *Associazione Riabiliatori Dell’Insufficienza Respiratoria. Indicazioni Per La Fisioterapia Respiratoria In Pazienti Con Infezione Da COVID-19.* Updated 16/03/202 Australian and New Zealand Intensive Care Society. ANZICS COVID-19 Guidelines. Melbourne: ANZICS  2020

[20] Ñamendys-Silva SA. *Respiratory support for patients with COVID-19 infection. The Lancet Respiratory Medicine.* 2020 Mar 5.

[21]David J Brewster, Nicholas C Chrimes, Thy BT Do, Kirstin Fraser, Chris J Groombridge, Consensus Statement: *Safe Airway Society principles of airway management and tracheal intubation specific to the COVID-19 Adult Patient Group.* Medical Journal of Australia. Updated 17 March 2020

[22] Adam Rochester, *NIV Lead for Respiratory Support Services. Standard Operating Protocol for the setup and Use of Non-Invasive Ventilation or HiFlow Oxygen (AirVo) for Patients with Suspected or Confirmed Coronavirus.*Royal Brompton and Harefield NHS Trust. Version 1.7 – March 17th, 2020

[23]Messerole E, Peine P, Wittkopp S, Marini JJ, Albert RK. *The pragmatics of prone positioning. American journal of respiratory and critical care medicine.* 2002 May 15;165(10):1359-63

[24] *Critical Care & Major Trauma Network. Prone Position 1. Available from*: [http://www.youtube.com/watch?v=bE4mmGdjA5I](https://www.youtube.com/watch?v=bE4mmGdjA5I)[last accessed 17/03/2020]

[25] *Rachael Moses. Physiotherapy Interventions for COVID-19*.March 2020. <https://vimeo.com/398333258> Accessed 18 March 2020

[26] Lazzeri M, Lanza A, Bellini R, Bellofiore A, Cecchetto S, Colombo A, D'Abrosca F, Del Monaco C, Gaudellio G, Paneroni M, Privitera E. *Respiratory physiotherapy in patients with COVID-19 infection in acute setting: a Position Paper of the Italian Association of Respiratory Physiotherapists (ARIR). Monaldi Archives for Chest Disease.* 2020 Mar 26;90(1).

[27][Simon Hayward and Dr Chris Duncan.](https://www.acprc.org.uk/Data/Resource_Downloads/PhysioLUSCOVID-19.pdf?date=17/03/2020%2021:55:53" \t "_blank) *[Physiotherapists use of Lung Ultrasound during the COVID-19 Pandemic - A Practical Guideline on supporting Acute Hospital Colleagues.](https://www.acprc.org.uk/Data/Resource_Downloads/PhysioLUSCOVID-19.pdf?date=17/03/2020%2021:55:53" \t "_blank)* [2020](https://www.acprc.org.uk/Data/Resource_Downloads/PhysioLUSCOVID-19.pdf?date=17/03/2020%2021:55:53" \t "_blank)

[28]Peng, Q.Y., X.T. Wang, L.N. Zhang, and G. Chinese *Critical Care Ultrasound Study, Findings of lung ultrasonography of novel corona virus pneumonia during the 2019-2020 epidemic*. Intensive Care Med, 2020.

[29]Tang C, Wang Y, Lv H, Guan Z, Gu J. [*Caution against corticosteroid-based COVID-19 treatment.*](https://www.ncbi.nlm.nih.gov/pmc/articles/PMC7247780/#bib11) The Lancet. 2020 May 25.

[30]M, Lanza A, Bellini R, Bellofiore A, Cecchetto S, Colombo A et al. *Respiratory physiotherapy in patients with COVID-19 infection in acute setting: a Position Paper of the Italian Association of Respiratory Physiotherapists (ARIR). Monaldi Archives for Chest Disease.* 2020;90(1).

[31]Meng L, Qiu H, Wan L, Ai Y, Xue Z, Guo Q, Deshpande R, Zhang L, Meng J, Tong C, Liu H. *Intubation and Ventilation amid the COVID-19 Outbreak: Wuhan's Experience. Anesthesiology.* 2020 Mar 19.