

Joint statement
on the role
of respiratory rehabilitation
in the COVID-19 crisis:
the Italian position paper

A cura di

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Introduction

The global outbreak of COVID-19 is having a dramatic effect throughout the world.^{1,2} The widespread diffusion of the virus in Italy³ has led national and regional authorities to institute extraordinary measures to contain the spread. The disease can cause major alveolar damage resulting in hypoxemic acute respiratory failure (ARF), which necessitates mechanical ventilation in a high proportion of cases.⁴⁻⁶

Italian societies of respiratory health care professionals promoted an audit among pulmonologists directly involved in the treatment of COVID-19 with the aim to formulate guidelines and propose a common management algorithm to apply in treating this condition in hospital setting.⁷ The audit identified two urgent areas for action: organization and treatment. The latter, we believe, should also include respiratory rehabilitation, as it is an important component of the therapeutic management of these patients. Respiratory rehabilitation (RR) is defined as "*a multidisciplinary intervention based on personalized evaluation and treatment which includes, but is not limited to, exercise training, education, and behavioral modification designed to improve the physical and psychological condition of people with respiratory disease*".⁸ In this context, and in relation to the topic of this document - patients affected by COVID-19 - physiotherapy interventions are particularly important.

Based on our general experience so far in dealing with the disease and on the existing knowledge (albeit still limited and evolving), we here propose a Consensus Statement on Respiratory Rehabilitation in patients with COVID-19. It represents an expert opinion of clinicians engaged in the field of RR, called - together with other specialties - to face with this emergency.

Literature search

We carried out a search of the published literature in PubMed, Ovid, Embase online databases and relevant websites from the construction of databases to March 19, 2020 in order to retrieve guidelines and recommendations, meta-analyses, systematic reviews, state of the art, and randomized trials. The search terms were: "Coronavirus pneumonia", "ARDS", "Acute Hypoxemic Respiratory Failure", "SARS", "MERS", "Influenza", "Pulmonary Rehabilitation or Physical Therapy AND Infectious diseases, or Acute Respiratory Failure or Mechanical Ventilation" , "Noninvasive ventilation AND Acute hypoxemic respiratory failure", "Weaning from mechanical ventilation".

Generation of recommendations and consensus

Based on the literature search, a small group of professionals produced a preliminary document which was then submitted to the participants. Consensus on the final document was achieved through a video conference meeting.

Below we summarize the recommendations that we consider most appropriate and urgent.

General recommendations

- The group takes into account the definition of severity based on Italian Health Organisation⁹:
 - a) mild condition: patient with pneumonia (clinical or radiological diagnosis) without any signs of severe pneumonia; b) severe condition: fever or suspected respiratory infection, respiratory frequency >30 b/min, dyspnoea, SpO₂ < 90% on room air; c) very severe condition (assumed to mimicking ARDS): bilateral interstitial radiological signs, paO₂/FiO₂ <300

- Healthcare operators assigned to RR need to be sufficiently skilled (appropriate CV and experience with respiratory physiotherapy); if a dedicated staff is not present, health professionals must pass a training test on few but clear principles of behavior and action
- Operators and patients must follow all precautionary and preventive measures and wear all the protective gear specified in the relevant documents¹⁰⁻¹¹
- RR is structured non-pharmacological therapy with a process delivered in three phases: assessment, intervention and re-assessment (the assessment is above all of a functional nature, with particular attention paid to the state of consciousness, respiratory, cardiological, motor function, and quality of life)
- All interventions and activities must be performed to avoid or reduce the risk of droplets production (particularly concerning airway clearance interventions)¹²
- Regardless of the type of intervention, the intensity, timing and modality must be tailored to the individual patient's needs, in particular for those with severe/critical illness, elderly patients, obesity, comorbidity and other complications^{13,14}
- Assessment and monitoring should continue throughout the entire rehabilitation process. Patients who do not meet the standards set need to be reassessed daily.
- RR operators can also attend to reduce anxiety and depression in patients experiencing delirium, anger, fear, dysthymia, insomnia, panic attack, or sense of abandonment during isolation and intensive treatment, or exhibiting risk of non-collaboration or non-compliance with treatment.

Acute phase (very severe respiratory condition)

Setting: Emergency Room, First aid, emergency care unit, intensive care unit (ICU), step-up sub-intensive care.

- The rehabilitative intervention in this phase had to be started when patient has reached a 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 FiO₂ >50% during noninvasive ventilation (NIV), positive end expiratory pressure (PEEP)/continuous positive airway pressure (CPAP) >10 cm H₂O; respiratory distress, arterial hypertension, brady- or tachycardia, intercurrent arrhythmias, shock, deep sedation, evidence of radiological lesions' progression (>50%) within 24-48 h¹⁵
- The usual respiratory physiotherapy procedures aimed at promoting the reduction of dyspnea, the tracheobronchial clearance, the training of the skeletal muscle and the maintenance / recovery of the ADL are contraindicated as they can determine a further loading of the respiratory system exposing the patient to an increased risk of distress
- When treating ARF by NIV or weaning from mechanical ventilation [MV] it is recommended to use similar protocols to those indicated for *de novo* ARF (e.g. FiO₂ reduction, PEEP reduction)¹⁶⁻¹⁹
- Airways clearance techniques are not recommended during the acute phase in patients without major problems of bronchial obstruction. Indeed, the hypothetical benefits do not outweigh the contamination risks for operators. The risk/benefit ratio should be evaluated on a single case basis in patients with bronchiectasis or with evident bronchial encumbrance, using tools that guarantee a safe distance from the patient¹⁵
- Twice per day evaluation of respiratory clinical parameters (temperature, SaO₂, SpO₂/FiO₂, cough, dyspnea, respiratory rate, thoraco-abdominal dynamics) is indicated. We recommend to develop an algorithm to manage the assessment/intervention
- Evaluation of the peripheral muscle strength trend (by the Medical Research Council [MRC] scale and dynamometers) should be made as soon as practicable
- Frequent changes of posture, passive mobilization and/or neuromuscular electrical stimulation should be planned in the unconscious patient.^{15, 17-30}

- Positional therapy (seated, semi-orthopneic, prone) with close monitoring is indicated in order to improve the ventilation/perfusion ratio and to prevent damage from immobilization.^{15, 17-30}

Table 1. Physiotherapy for COVID-19 patients in the critical phase

Ventilation support/Weaning
○ Monitoring of clinical conditions (parameters and signs)
○ Adjustment of the mechanical support and oxygen therapy
○ Extubation protocols with or without NIV/CPAP
Disability Prevention
○ Passive/active mobilization
○ Frequent posture changes
○ Therapeutic postures (early sitting/pronation)
○ Neuromuscular electrical stimulation

Acute phase (severe condition)

Setting: Non-intensive acute care hospital (internal medicine, respiratory, infectious diseases, or other wards)

- In hospitalized patients with mild/moderate disease, RR can improve symptoms (dyspnea, anxiety and depression), physical capacity and quality of life, at least potentially ^{10-13, 17, 19-30}
- 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 O₂ or NIV support, evidence of radiological lesions' progression (>50%) within 24-48 h ¹⁵

Table 2. Physiotherapy for COVID-19 patients in the acute phase

Ventilation support/Weaning
○ Monitoring of clinical conditions (parameters and signs)
○ Adjustment of oxygen therapy
Disability prevention
○ Mobilization (getting patient out of bed)
○ Frequent posture changes/continuous rotational therapy
○ Therapeutic postures (early sitting/pronation)
○ Active limb exercises (also with dedicated devices) and muscle reconditioning
○ Strengthening the peripheral muscles
○ Neuromuscular electrical stimulation
○ Respiratory muscle training in case of inspiratory muscle weakness

Chest physiotherapy
○ Non-productive dry cough should be sedated to avoid fatigue and dyspnea
○ Bronchial clearance techniques are indicated in hypersecretive 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).

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

Setting: Respiratory rehabilitation department, other units for specialist and maintenance rehabilitation, intermediate care facilities, subacute wards

- Similarly to patients recovering from ARDS due to H1N1 infection³¹⁻³³, those with an acute COVID event may present disability and functional damage (respiratory function, critical illness myopathy and neuropathy), reduced participation and deterioration in quality of life, either in the short and long time 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) dysfunction³⁴. Patients with comorbidities will take a longer period to return to their former condition
- Protocols for evaluating clinical parameters (temperature, SaO₂, SpO₂/FiO₂, cough, dyspnea, respiratory rate, thoraco-abdominal dynamics) are indicated on a daily basis^{12,15}
- Simple and repeatable treatment protocols to wean oxygen therapy are indicated
- It is recommended to evaluate peripheral muscle strength with the MRC scale, manual muscle test, isokinetic muscle test and measurement of joint range of motion (ROM)
- In weaned patients and those with prolonged weaning from mechanical ventilation and oxygen use, reconditioning interventions are indicated in order to improve the physical status

and to correct the motor and cognitive effects of prolonged immobilization in the intensive care area³⁵⁻⁴³

- As the effect of muscle activity in infections related to viral agents is not known, exercise aiming¹² with gradual load increase based on subjective symptoms are recommended to maintaining a normal function
- Low intensity exercise (<3.0 METs), daily patient counseling and education are indicated.
12,15
- For patients i isolation, rehabilitation programs can be eventually conducted remotely by tele-health system (educational videos, tele-consultation, webcams etc., with disinfectable tools)^{12,15}
- 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)
- As soon as possible, assessment of exercise capacity, oxygenation response during effort (by the 6-min walk test-6MWT) and night-time should be planned.

Table 3. Physiotherapy for COVID-19 patients during the post-acute phase

Weaning
○ Monitoring of parameters
○ Mechanical ventilation weaning in tracheostomized patients
○ Management of problems related to tracheostomy (phonation, secretions encumbrance)

○ Adjustment of oxygen therapy
Recovery from disability
○ Mobilization (getting patient out of bed)
○ Frequent posture changes (sitting posture, prone positioning)
○ Strengthening of peripheral muscles
○ Reconditioning with specific aids (upper/lower limb devices/cycle-ergometer)
○ Neuromuscular electrical stimulation
○ Respiratory muscle training in case of inspiratory muscle weakness
Chest physiotherapy
○ Non-productive dry cough should be sedated to avoid fatigue and dyspnea
Bronchial clearance techniques are indicated in hypersecretive 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).
○ Pre-discharge counseling concerning physical activity
○ Support to the care team
○ Psychological advice and support

Organizational changes

The "war-time" emergency which developed within few weeks has forced the world of Rehabilitation to adapt to the circumstances and place itself at the disposal of the Regional/National Public Health Crisis Units.

- Hospitals dedicated to rehabilitation have expressed their willingness to set up, with flexibility, internal areas to cater for different categories of patients:

- a) isolated patients with suspected infection, awaiting confirmation of diagnosis;
 - b) symptomatic positive patients;
 - c) positive patients with respiratory failure on oxygen therapy, CPAP and NIV;
 - d) negative patients who require post COVID rehabilitation programs
- Rehabilitation teams coordinated by pulmonologists and respiratory therapists have now:
 - a) become part of the hospital programs for COVID-19 patients
 - b) made their services available to other rehabilitation professionals and professional nurses to create multidisciplinary groups able to support the high load of demand for care and assistance
 - c) shared with the other professionals protocols useful for clinical decision making "*ceiling of treatment*" (oxygen only, NIV/CPAP only, sedation), based on agreed criteria (patient characteristics, age, etc.)

Reorganization of the rehabilitation pathway for NON-COVID patients

- Following the organizational changes determined by the COVID-19 epidemic, it is abundantly clear that all the other non infected patients with chronic respiratory diseases are suffering from these changes in their usual reference facilities as well as in the clinical and rehabilitative pathways
- For the full period of emergency and in the post-emergency period, the need for RR of patients not affected by COVID-19 infection will still have to be met, probably by new and diversified modalities of delivery (e.g. tele-rehabilitation paths, etc.).^{44,45}

Conclusions

The dramatic spread of the current COVID-19 epidemic in Italy has spurred into action also respiratory rehabilitation specialists (pulmonologists and respiratory therapists), who have been engaged for years in the care of patients with disabilities secondary to respiratory diseases and/or conditions. Their experience acquired in the management of chronic and acute respiratory failure is proving to be a fundamental asset for the management of patients during COVID-19 epidemic. Hence, it is likely that the reorganization involved in taking care of this scenario will not be a short-term matter.

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