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European Journal of Physical and Rehabilitation Medicine 2020 August;56(4):515-24
DOI: 10.23736/S1973-9087.20.06317-0

SPECIAL ARTICLE

COVID-19 pandemic. What should Physical and Rehabilitation Medicine specialists do? A clinician's perspective

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ABSTRACT

COVID-19 pandemic is rapidly spreading all over the world, creating the risk for a healthcare collapse. While acute care and intensive care units are the main pillars of the early response to the disease, rehabilitative medicine should play an important part in allowing COVID-19 survivors to reduce disability and optimize the function of acute hospital setting. The aim of this study was to share the experience and the international perspective of different rehabilitation centers, treating COVID-19 survivors. A group of Physical Medicine and Rehabilitation specialists from eleven different countries in Europe and North America have shared their clinical experience in dealing with COVID-19 survivors and how they have managed the re-organization of rehabilitation services. In our experience the most important sequelae of severe and critical forms of COVID-19 are: 1) respiratory; 2) cognitive, central and peripheral nervous system; 3) deconditioning; 4) critical illness related myopathy and neuropathy; 5) dysphagia; 6) joint stiffness and pain; 7) psychiatric. We analyze all these consequences and propose some practical treatment options, based on current evidence and clinical experience, as well as several suggestions for management of rehabilitation services and patients with suspected or confirmed infection by SARS-CoV-2. COVID-19 survivors have some specific rehabilitation needs. Experience from other centers may help colleagues in organizing their services and providing better care to their patients.

(*Cite this article as:* Carda S, Invernizzi M, Bavikatte G, Bensmaïl D, Bianchi F, Deltombe T, *et al.* COVID-19 pandemic. What should Physical and Rehabilitation Medicine specialists do? A clinician's perspective. Eur J Phys Rehabil Med 2020;56:515-24. DOI: 10.23736/S1973-9087.20.06317-0)

KEY WORDS: COVID-19; Rehabilitation; Complications; Organization and administration.

SARS-CoV-2 infection and consequent coronavirus disease 2019 (COVID-19) are dramatically spreading all over the world, with consequences that are at present time (May 12th, 2020) still unpredictable.

The world-wide situation is rapidly evolving. Since the WHO declaration of pandemic on 11th March, 2020, the epicenter of the disease originally located in China and its neighboring countries has now shifted to Europe and USA. Several countries as USA, UK, Italy, Spain, and France had been severely touched, in term of deaths, severe cases and risk of healthcare and economic system collapse.

Case-fatality rate from Chinese data was of 2.3%, but what was most impressive was that 18.5% of cases were considered as severe or critical, thus necessitating hospitalization in an Intensive Care Unit (ICU).[1] Data from 2634 patients hospitalized in the New York City area shows that 14.2% needed a treatment in the ICU, and the overall mortality was 21%,[2] in line with data from Italy.[3]

Data from European countries who were first affected by the SARS-CoV-2 pandemic show that the rapid spread of the infection and disease severity has quickly overloaded their national health systems, who are among the most efficient in the World, and their main efforts are currently aimed at containing the acute phase of the disease through the increase of COVID-19 dedicated acute care (AC), subintensive and ICU wards in order to avoid health systems collapse.[4]

After the first shock over the acute care system, now health care systems are facing with a growing proportion of patients with COVID-19 infection related sequelae and disability, and a quick response from Physical and Rehabilitation Medicine (PRM) specialists is warranted. Thus, SARS-CoV-2 pandemic will rapidly create a challenge for all PRM specialists and considering the load on national health care systems, it is crucial to define the precise settings and methods of intervention through which PRM could maximize its contribution to the pandemic containment.

Even if the COVID-19 infection has different clinical features, and a common classification is not yet available, for sake of clarity we propose those based on Chinese National Health Commission[5] which classifies COVID-19 in 4 classes: Mild, Moderate, Severe and Critical.

Details are summarized in Table I.

In Italy, data on 218997 diagnosed cases showed that 22.8% were asymptomatic, 26.4% had limited symptoms (unspecified symptoms 11.1% and few symptoms 15.3%), 32.8% had a mild disease, 15.2% had severe disease and 2.8% had a critical disease.[6]

COVID-19 infection sequelae

Usually, patients with mild and moderate forms of COVID-19 recover completely without any long-term consequence, as well as most of the patients with severe forms. However, in patients with severe or critical forms, conse-

TABLE I.—*Chinese classification of COVID-19 severity.*

	Chinese National Health Commission Classification			
	Mild	Moderate	Severe	Critical
Fever	Yes	Yes	Yes	Yes
Respiratory symptoms (cough, nasal congestion)	Yes	Yes	Yes	Yes
Dyspnea	No	Yes	Yes	Yes
Hypoxia	No	Yes	Yes	Yes
RR			>30	
SatO2	Normal	98-94	≤93	
P/F			≤300	
Radiologic signs of pneumonia	No	Yes	Progression of lesion >50% over 24-48h	Bilateral or multi-lobes infiltration or rapid progression
O2 Supplementation	No	Possible	Yes, NIV	Yes, mechanical ventilation
Other				Lactate increase, peripheral lymphopenia, increase in IL-6/CRP, possible multi-organ failure, shock

RR: Respiratory rate; SatO2: arterial blood oxygen saturation; P/F: ratio of arterial oxygen partial pressure to fractional inspired oxygen;IL-6: Interleukin-6; CRP: C-reactive protein; NIV: non-invasive ventilation.

quences of COVID-19 infection can impact several systems.

At present time, there are no published data on COVID-19 mid- and long-term sequelae.

However, as a source of possible information, we collected some empirical data from clinicians following the first survivors from ICU in European and North America Countries, some sparse published evidence and the past experience with SARS-CoV and MERS-CoV epidemics.

Hereafter, we summarize the main complications in our clinical experience:

- respiratory sequelae;
- cognitive sequelae, Central and Peripheral Nervous System;
- deconditioning;
- critical-illness related myopathy and neuropathy (CRIMYNE);
- dysphagia;
- joint stiffness and pain;
- psychiatric problems.

Respiratory sequelae

A prospective study on 97 SARS survivors (with only 6 of them requiring mechanical ventilation), at 1 year follow-up, 23.7% of them had reduced Diffusion of Lung Carbon Monoxide (DL_{CO}) and exercise capacity was significantly reduced compared to age-matched healthy subjects.[7]

First data from Chinese patients, with mild and severe forms of COVID-19 show abnormalities in DL_{CO} and total lung capacity.[8] In this cohort of 110 patients, those with most severe forms had most serious lung impairment. This study however, did not recruit patients who needed mechanical ventilation. In patients with critical COVID-19 disease, empirical data show that some patients have a rapidly favorable progression, with full-near functional and respiratory recovery. These patients seem to be younger, with less severe involvement of lungs and shorter ICU length of stay. Other patients show persistent dyspnea, that can be present at rest, on passive mobilization or only under effort.

Persistent oxygen desaturation (at rest or during passive/active mobilization) has also been reported by some Authors of this paper, and usually can be associated with worsening of dyspnea.

Patients with persisting dyspnea and/or oxygen desaturation after the acute phase could probably be those at higher risk to develop long-term sequelae such as lung fibrosis.

Cognitive sequelae, central and peripheral nervous system

The interest and reports on neurological manifestations of SARS-CoV-2 infection are rapidly growing. We can divide these problems in two groups.

Group 1: problems related to the prolonged mechanical ventilation

Mao *et al.* reported that the most common symptoms were dizziness and headache, but also impaired consciousness (14.8%).[9]

Clinical experience suggests that a relevant proportion of patients after critical COVID-19 infections may show memory and executive function deficits, and elderly patients with severe type can also show confusion and executive problems.[10] This has been recently reported also by Helms and coworkers, in France,[11] on 58 patients. They showed that 69% of patients were agitated after the sedation was withheld, and bilateral pyramidal signs were present in 67% of them and 33% had dysexecutive syndrome at discharge from ICU.

Current evidence shows that after Acute Respiratory Distress Syndrome (ARDS) of origin other than SARS-CoV-2 infection up to 70-100% of patients at discharge and 20% at 5 years[12] showed cognitive problems like impaired executive function, short-term memory deficit and anxiety.[13] Considering that nearly 50% of ARDS survivors showed cognitive sequelae at 2 years after the injury,[14] these deficits could play a significant role in overall disability after critical COVID-19.

Group 2: problems directly or indirectly related to viral infection

A direct mechanism of CNS lesion of SARS-CoV-2 has been suggested since Coronaviruses have demonstrated some neurotropism,[15] and a review of the possible pathophysiological mechanisms has been recently published by Sasannejad *et al.*[16]

However, at present time, there are some reports of COVID-19 related encephalopathy but no solid evidences of encephalitis directly due to the virus. The most frequently reported neurological disturbances of COVID-19 are anosmia and ageusia, who can be present in more than 80% of symptomatic patients,[17] and may be related to the involvement of peripheral or CNS.

The most frequent mechanism of CNS lesion is probably indirect. The first group of such conditions are cerebrovascular diseases. Varga *et al.* showed clearly that SARS-

CoV-2 can produce an endothelitis, which can explain several pathological conditions that have been reported in several patients (visceral, renal, cutaneous and cerebral ischemia).[18] Oxley and colleagues described five young patients with large-vessels strokes, in which the most probable explication was the vascular endothelial dysfunction provoked by SARS-CoV-2.[19] In the French series of patients hospitalized in the ICU, 3 out of 13 patients who underwent a MRI has small asymptomatic ischemic strokes.[11] At present time there are several reports of cerebrovascular events that have been considered as related to COVID-19, but in which the causality seems to be less tight.

The other group of diseases are those immune-mediated, as Guillain-Barré Syndrome (GBS) and inflammatory meningoencephalitis.

Fifteen cases of GBS has been reported recently; most reports are single case only, while Toscano *et al.*[20] described five patients with SARS-CoV-2 related GBS, in which the most frequent feature was axonal involvement. Other Authors have described Miller-Fisher form of GBS[21] with severe polyneuritis cranialis. The prevalence of GBS and other form of autoimmune manifestations of SARS-CoV-2 infection are probably underestimated. Recently Zanin *et al.* have reported a case of cerebral and spinal cord demyelination occurring during COVID-19.[22]

Deconditioning

Deconditioning is invariably associated to the prolonged immobilization for patients with critical illness (related or not to COVID-19), but can also be seen in elderly subjects or in those showing some pre-existent degree of disability (mainly motor), even in the case of moderate forms of COVID-19.

Hui *et al.* showed that most of SARS survivors had significant lower performance on 6-minutes walking test than age-matched healthy subjects.[23] This was somehow contrasting with the relatively preservation of lung function in their cohort (in which less than one third required ICU). So, deconditioning may not only be due to immobilization but also to other factors, such as myopathy, cardiac and autonomic dysfunction.

Similar results had been also published by other Authors,[24] showing a reduced exercise capacity that could not only be due to the limited impairment of pulmonary function.

The frequency and severity of deconditioning and its functional sequelae, can significantly reduce the safe discharge to home of patients from AC and ICUs. In light of these considerations, reconditioning should be considered as a clinical and rehabilitative priority.

Critical-illness related myopathy and neuropathy (CRIMYNE)

CRIMYNE is a well described nosological entity,[23, 25] frequently seen in patients with prolonged ICU hospitalizations, independent of the admission diagnosis.

At present time, published evidences about CRIMYNE in COVID-19 patients are lacking.

However, there are growing clinical reports among clinicians in Italy and France of CRIMYNE associated to COVID-19, mainly myopathic forms, with severe proximal muscle wasting, and, less frequently, peripheral nerve deficits of lower and upper limb (from early neurophysiological data, we have mainly observed distal axonal lesions).

In SARS survivors Lau *et al.* have described a proximal muscle impairment at 3-months follow-up[26] and similarly, Lee *et al.* reported that 61% of SARS patients had myalgia and Creatine Kinase elevation during the acute phase of the disease,[27] suggesting a viral-induced myositis at initial presentation. Lastly, CRIMYNE has been also reported in SARS survivors.[28, 29]

It is therefore highly probable that in COVID-19 this issue will be present too.

Dysphagia

Postextubation dysphagia (PED) has been reported in up to 62% of patients requiring mechanical ventilation for ARDS.[30] Even if the exact pathophysiological mechanisms of dysphagia in patients with COVID-19 is unclear, it is likely that mechanical causes, diminished proprioception and laryngeal injury can be implied.

Dysphagia and consequent aspiration pneumonia is one of the most important cause of re-hospitalization and mortality in patients released from the ICUs.[31]

Therefore, the screening for dysphagia is compulsory in critical COVID-19 patients, and this should be probably also proposed in older patients with severe forms.

In survivors from critical COVID-19, the prevalence of dysphagia is not known, however anecdotical reports show that this is a frequent issue.

Joint stiffness and pain

Immobilization and joint stiffness are frequently associated to ICU hospitalizations, in both the elderly and young patients. In the latter case, it should be noted that patients with ARDS from COVID-19 infection usually require mechanical ventilation in pronation. The difficulties with mobilization in those circumstances (associated to the need

to minimize risk exposure of health personnel) could increase the risk for joint trauma or dislocations, mainly at the shoulder.

Moreover, previous data on 254 SARS survivors showed that 53% of patients had joint pain,[32] which was more frequently multi-articular, at the knee (41%), shoulder (34%), hip (20%) and ankle (18%). A minority of patients (5%) had also radiological signs of osteonecrosis of the femur and tibia, which was related to high-dose steroid use in the acute phase.

Psychiatric problems

During SARS epidemic several Authors reported a relevant psychological impact of the outbreak. Early reports from China, during the COVID-19 epidemic, have focused on psychiatric issues among patients, healthcare workers and general population.[30, 33] Most frequently reported problems were anxiety, depression, fear and anger, and post-traumatic stress disorder, either in patients, relatives and clinicians. This was related to the similar impact that SARS outbreak had on both patients and healthcare workers.[34, 35] For most of them, emotional and behavioral responses can be considered as a part of the adaptation process to an unusual stress.[34]

In critical and severe COVID-19 disease, it could be difficult to differentiate a psychiatric complication from delirium, due to the effect of hypoxia, brain lesions, corticosteroids and, for elderly patients, isolation.

Subjects with mild forms or even asymptomatic, but isolated or in quarantine, may experience boredom, loneliness and anger,[36] who can be exacerbated by pre-existent executive deficits, for example in patients with cerebral lesions.

Organization of rehabilitation settings in COVID-19 pandemic

The rapid spread of the COVID-19 pandemic will probably modify the organization and functioning of PMR services. Many countries have reduced rehabilitation treatments for outpatients with chronic conditions in response to social distancing policies implemented to reduce the spread of the infection through the population.

To deal with the COVID-19 pandemic consequences, an ideal organizational treatment template simply does not exist. Authors are aware that each setting and country has its peculiarities and any recommendation will have to be adapted individually.

However, the experience from the field, show that some suggestions have to be considered and should be shared among the PMR community.

The first consideration is that due to the speed and severity of COVID-19 pandemic, rehabilitation specialists must be aware that their set-up should rapidly be adaptable to highly changing situations.

The second consideration, coming from direct clinical experience, is that COVID-19 patients with severe and critical forms can be potentially unstable and have a low exercise tolerance, irrespective of age.

This means that the role of active physical therapy in the AC units and in the ICUs is limited, except for respiratory physiotherapy.[37] The role of PMR specialists should then be limited to the rehabilitation services and to evaluate high complexity patients in the ICU.

Potential staff exposure and lack of human and material resources (either personal protective equipment (PPE), technical equipment and drugs) is becoming a global issue.

Another important consideration is the lack of ICU and AC beds.

Since ICU and AC beds are aimed for patients with severe or unstable conditions, they must be considered as the main pillar of the healthcare system, and preserved as much as possible.[4]

So, the potential instability of COVID-19 patients should be always be kept in mind, and the transfer to a rehabilitation setting should be done only if the referring clinician in the AC is reasonably sure that the patient will not worsen and need to return back to the ICU or AC setting. A premature transfer of a potentially unstable patient increases the risk of readmission to AC wards, in a condition of sustained bed saturation. Therefore, we strongly recommend that the transfer criteria from ICU and AC to PRM services should be clearly stipulated across different clinical settings.

Our recommendations for transferring patients to rehabilitation are outlined below.

Patients from ICUs after extubation

As a general rule, the direct transfer of a patient from the ICU to the rehabilitation services should be avoided. For patients in the ICUs after extubation, if the complexity is low (cardiovascular and respiratory stability, no evidence of cognitive problems and no signs of CRIMYNE), they could be directly discharged home, with an active surveillance from their general practitioner or be transferred to AC units for a short period of time before going home.

For patients with complex clinical issues, they should be transferred first from ICU to AC units.

Patients with severe forms from AC

Our advice is that these patients should be transferred to PMR only if they have stable $SatO_2$ and respiratory rate (RR), and radiological progression of the disease has been ruled out. These patients are mainly deconditioned elderly patients or younger patients with persistent respiratory problems (desaturation and dyspnea under effort).

When the patient is stabilized for at least 3 days (no recurrence of fever, both RR and $SatO_2$ stable), they can be transferred to PMR settings (Figure 1).[38]

Our suggestion is also to divide, the PMR units in COVID+ and COVID-. The separation of units and staff is needed to minimize the risk of internal contamination and to improve the appropriate use of PPE and staff safety. All staff working in the COVID+ unit should be screened before and after each shift for symptoms and fever. Some procedures, as treatment of dysphagia should be considered at high risk of contamination (the same as aerosol producing procedures), and clinicians should be aware that, every patient should be considered as potentially infective, until proven otherwise.

We strongly advise these services to implement teleconsultation and, where possible, tele-rehabilitation, to minimize exposure risk.

COVID+ units should be able to admit and keep patients with moderate (Type 2) presentation. When patients in COVID+ units become unstable they should be transferred back to the AC. In some cases this may need to be done in exchange for another more medical stable patient. Treatment must be provided separately from other patients, ideally in the room, even if it will limit treatment possibilities.

In summary, we suggest the following admission criteria (Table II):[38]

- ≥7 days from diagnosis of COVID-19;
- at least 72 hours with no fever and no fever reducing medication;
- stable RR and $SatO_2$;
- clinical and/or radiological evidence of stability (CT-scan or lung ultrasound).

Another scenario to consider is the development of COVID-19 infections in patients already hospitalized in the PMR settings for other conditions. The impact can vary from minor health problems to life-threatening conditions, mainly for elderly patients or younger patients with severe neurological conditions (*i.e.* neuromuscular disorders or severe TBI or cervical SCI).

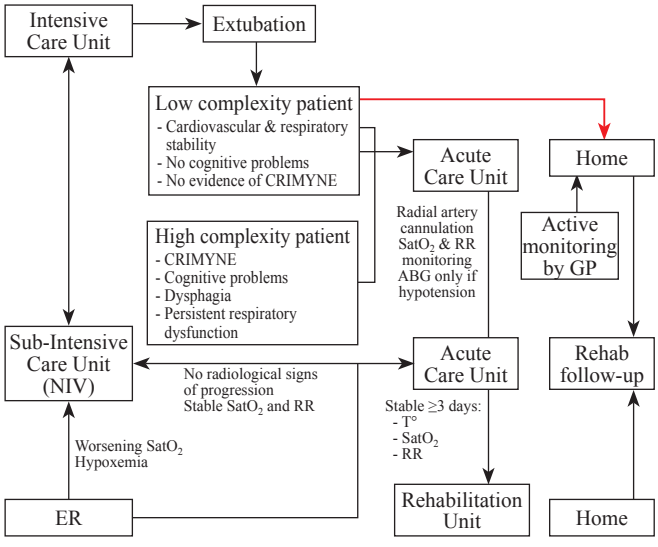

Figure 1.—Modified from Carda *et al.*[38]
Dotted line (red in the online version): in case of congestion of acute care unit services.
ER: emergency room; NIV: Noninvasive ventilation; SatO2: arterial oxygen saturation; RR: respiratory rate; ABG: arterial blood gas; GP: general practitioner.

TABLE II.—*Suggested admission criteria for physical medicine and rehabilitation (PMR) for COVID-19 patients.*[38]

≥7 days from diagnosis of COVID-19
At least 72 h with no fever and no fever-reducing medication
Stable RR and $SatO_2$
Clinical and/or radiological evidence of stability (CT-scan or lung ultrasonography).
Clinical messages (lessons learned from experience)
The clinical condition of COVID-19 patients can rapidly evolve in the first 7–10 days. The risk of deterioration should be carefully evaluated before early transfer of such patients to PMR services.
If possible, COVID-19–positive and–negative PMR services should be physically separated and have different staff.
Dysphagia evaluation and rehabilitation should be considered potentially an aerosol-producing maneuver. Therefore, all patients with dysphagia (from stroke or other reason), unless the contrary is proven, should be considered to have COVID-19 (with the need to use appropriate personal protective equipment according to the country or institution guidelines).
Preferably admit COVID-19–negative patients with non-invasive ventilation to single rooms only. If they become infected during the rehabilitation, the risk of staff and roommate infection is very high.
Careful consideration should be given to problems related to in-hospital isolation of patients with severe cognitive and communication deficits.
Carefully consider the impact of psychiatric consequences of COVID-19 patients (severe and critical forms), their families and the staff. Consider also the impact on patients with chronic disability (primarily cognitive disability) living at home or in an institution.
Consider access to rehabilitative care for patients with chronic and acute disabilities during the COVID-19 pandemic.

RR: respiratory rate; $SatO_2$: blood oxygen saturation.

Since transferring a patient with relevant disability in a AC setting during a COVID-19 epidemic can be arduous, PRM clinicians should clearly keep in mind that these patients need a strict surveillance to identify rapid degradation of their clinical condition.

Experience in several hospitals show that a non-ICU specialist can be trained to effectively detect clinical deterioration, for example using NEWS2 score.[39] We suggest to develop a schedule to monitor and check these evaluations during the day.

Patients with moderate COVID-19 forms frequently show a reduced tolerance to exercise and fatigue. Moreover, it is common to see patients who have severe radiological abnormalities and very low arterial O_2 concentrations presenting with relatively few symptoms. Physical activity should be limited unless it has been ruled out that the clinical form is mild.

Authors would like to highlight the potentially relevant role of new technologies, such as continuous monitoring of RR and $SatO_2$ and tele-rehabilitation systems. From the experience of some centers that have implemented the use of tele-consultation and tele-rehabilitation, there is a significant reduction of PPE use and potential healthcare personnel exposure.

Moreover, clinicians should be open to implement a creative use of communication technologies to help patients and families in reducing barriers imposed by isolation and thus maintaining human relationships. This aspect, perhaps little considered in the midst of many other important clinical issues, has been reported to be crucial not only by patients and caregivers, but also by the healthcare providers themselves.

Rehabilitation of specific problems

Lung fibrosis

Rehabilitation of patients with lung fibrosis secondary to ARDS is still debated. There is scarce evidence about the efficacy of specific rehabilitation techniques. We suggest the treatment that is usually recommended in primary lung fibrosis. A detailed review was published in 2013 by Kenn and coworkers.[40]

Treatment is based on exercise and breathing training.

Exercise training

• Endurance training: this treatment can be conducted using a cyclo-ergometer or a treadmill or even over ground walking. Current evidence recommends a training time between 5-30 minutes for each session, with an intensity of 50% to 80% of the peak work rate. Target is usually 60% of maximal age-corrected HR, or 80% gait speed obtained during 6 minutes walking test (monitoring $SatO_2$);

• strength training: should include upper and lower extremities, with a frequency of 1 to 3 sessions of 10 repetitions each. The level of intensity is not well described in published studies.

Breathing training

• Pursed-lip-breathing: this technique is largely utilized in patients with chronic obstructive pulmonary disease as a treatment for dyspnea (https://www.lung.org/lung-health-diseases/lung-disease-lookup/copd/patient-resources-and-videos/pursed-lip-breathing-video). The mechanism of action produces a positive end expiration pressure and the benefit may arise from the control of breathing rate and of unnecessary hyperventilation usually present in these patients;

• diaphragmatic control techniques: this technique, is aimed to control the respiration rate, reducing hyperventilation and unnecessary respiratory work (https://www.lung.org/lung-health-diseases/wellness/breathing-exercises);

• thoracic expansion techniques: thoracic expansion technique may be useful to reduce the increase in thoracic rigidity associated with pulmonary fibrosis;

• thoracic muscle training: training of accessory respiratory muscles may help in reducing respiratory fatigue, in patients with lung fibrosis.

However, the frequency and intensity of breathing training has not been studied in detail. At present, even if there is some evidence about its effectiveness on exercise tolerance and dyspnea control, we cannot recommend a specific program.

For the evaluation of the patients and for the assessment of the results of treatment, we strongly recommend the use of validated measurement instruments, such as St-George Respiratory Questionnaire[41] and the 6 minutes walking test.[42]

Deconditioning

Muscle fatigue plays a significant role in exercise limitation in patients with lung disease.[43] This is probably due to muscle wasting occurring in chronic diseases and, in survivors from severe COVID-19, also to prolonged bed confinement and hypoxia.[44]

Experience in COPD patients shows that oxygen sup-

plementation during exercise is associated with faster and higher increase of working load.[45] This observation could be useful for patients with pulmonary fibrosis, or for patients who previously had some degree of COPD as well. From our experience, we recommend monitoring HR, RR and $SatO_2$ during exercise, especially in the early phases.

CRIMYNE

Early rehabilitation protocols in the ICU are currently recommended to reduce the consequence and maybe the risk of developing CRIMYNE, even if supporting evidence is still low. However, these recommendations are not applicable in patients with COVID-19, considering the risk of staff contamination. So, the rehabilitative treatment should be started only after the patient has been extubated and, probably, has left the ICU.

However, CRIMYNE can be one of the most important contributors to persistent disability, mainly if the neuropathic component is relevant.

Moreover, CRIMYNE is associated with reduced respiratory muscle strength, complicating the effect of lung fibrosis, and reducing exercise tolerance.

Postextubation dysphagia

When identified and treated, the mid- and long-term prognosis of PED is usually good. In a prospective 5-year longitudinal study by Brodsky and coll.[46] one third of patients that survived from ARDS had swallowing problems after extubation and, all patients recovered at 5 years follow-up, with 77% of patients recovering in the first 6 months.

Screening with the 50-mL water swallowing test is recommended, and quantification of dysphagia can be done with the Sydney Swallowing Questionnaire[47] or by fibroscopy (or fluoroscopy).

Treatment of PED is usually based on dietary texture modifications (both solid and liquid thickness modifications) and postural changes and/or compensatory maneuvers.[48]

It is important to pay attention to the nutritional status of COVID-19 patients, mainly for those showing PED.

Cognitive problems

Considering the prevalence of cognitive problems in ARDS survivors, a bedside screening of executive functions and memory is highly recommended. We recommend bedside screening using rapid tests such as Montreal Cognitive Assessment (MoCA)[49] and Frontal Assessment Battery.[50]

A detailed description of treatment of these cognitive problems is beyond the scope of this paper. Since most of these patients will be treated several days after the development of the infection, the contamination risk for the staff is probably very limited, and these patients may be treated individually as well as in group.

Psychiatric problems

PMR specialist should also consider the impact of psychiatric complications of COVID-19 on the long-term functioning of patients, rehabilitation team components and of people with disability confined at home. It should also be noted that most healthcare providers are not formally trained to provide mental health care so, this work should be done in association with psychiatrists, psychologists, psychiatry nurses and volunteers.

It is recommended to start at different degrees:[30]

- hospitals and PMR services should provide a regular communication plan to the healthcare personnel, to avoid circulation of fake information and increase the sense of community;
- a telephonic helpline for outpatients and families should be considered;
- patients and personnel should be regularly be screened for any sign of depression and/or suicidality. Consider also rotation of the personnel working in COVID-19+ services;
- support the use of tele-consulting for psychological evaluation and help, as well as for communication between patients and their families.

Conclusions

The COVID-19 pandemic is developing as a great challenge for healthcare and economic systems all over the World. PMR specialists will be confronted to treat in a short amount of time, a new population of patients with disability, in the context of possible lack of resources and during which our consolidated decision paradigms will face with a lack of robust studies to support evidence-based solutions.

However, we strongly support the idea that rehabilitation will be an important link in the chain of care strategies for patients with severe and critical COVID-19 infections and in the post-AC phase.

The reorganization and the structure of rehabilitation services in such a time of crisis is strongly dependent on an immediate definition of its specific setting, goals and interventions, integrating as much as possible in the organizational model of AC and defining explicit and shared admission criteria.

We should also consider the threats and challenges imposed by COVID-19 pandemic as an opportunity to reorganize and improve rehabilitation services, and at the same time prospectively collect data to promote clinical research. We should also be motivated in these times of crisis to consider implementing new technologies and treatment modalities to help improve the quality of life or our patients and to protect our physicians and allied health care colleagues.

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Conflicts of interest.—The authors certify that there is no conflict of interest with any financial organization regarding the material discussed in the manuscript.

Authors' contributions.—Stefano Carda and Marco Invernizzi equally contributed to the paper.

History.—Article first published online: May 19, 2020. - Manuscript accepted: May 19, 2020. - Manuscript revised: May 16, 2020. - Manuscript received: April 14, 2020.