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**SPECIAL COMMUNICATION**

# What Now for Rehabilitation Specialists? Coronavirus Disease 2019 Questions and Answers



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## Abstract

Recognizing a need for more guidance on the coronavirus disease 2019 (COVID-19) pandemic, members of the *Archives of Physical Medicine and Rehabilitation* Editorial Board invited several clinicians with early experience managing the disease to collaborate on a document to help guide rehabilitation clinicians in the community. This consensus document is written in a “question and answer” format and contains information on the following items: common manifestations of the disease; rehabilitation recommendations in the acute hospital setting, recommendations for inpatient rehabilitation and special considerations. These suggestions are intended for use by rehabilitation clinicians in the inpatient setting caring for patients with confirmed or suspected COVID-19. The text represents the authors’ best judgment at the time it was written. However, our knowledge of COVID-19 is growing rapidly. The reader should take advantage of the most up-to-date information when making clinical decisions.

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Severe acute respiratory syndrome coronavirus 2 emerged as a novel coronavirus in December 2019 and resulted in a pandemic that has affected the lives of billions of people worldwide. While

much of the early focus has been on acute diagnosis and treatment, it has become clear that many patients who survive coronavirus disease 2019 (COVID-19), particularly those with prolonged stays in intensive care units (ICUs), have significant functional deficits. Our lack of knowledge about this novel disease and the rapidly evolving nature of this pandemic has made providing rehabilitation services very challenging. However, early rehabilitation in hospitalized patients with COVID-19, including those who are critically ill, is recommended.<sup>1</sup> Unfortunately, despite the importance of rehabilitation services for individuals with disabilities, a

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World Health Organization survey found that rehabilitation services were disrupted in 63% of countries surveyed.<sup>2</sup> There are currently no rehabilitation guidelines for COVID-19, and confusion about appropriate rehabilitation measures still exists. In response to this knowledge gap, members of the Editorial Board of this journal recruited a number of clinicians with content expertise in ICU rehabilitation and hospital epidemiology and from areas that had high numbers of patients with COVID-19 early in the pandemic. These areas included New York, Boston, Baltimore, and the National Capital Area. Our aim was to use their expertise and early experience to produce a consensus document that might help rehabilitation clinicians navigate this public health emergency (PHE).

The document is organized around questions and answers. We categorized the questions under 4 major topics: (1) pathophysiology and clinical manifestations of COVID-19, (2) rehabilitation in the acute hospital setting, (3) rehabilitation in an inpatient rehabilitation facility (IRF) setting, and (4) special considerations. More details are provided in the table of contents below.

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- 1) Pathophysiology and clinical manifestations of COVID-19 pertinent to physical medicine and rehabilitation
  - a) What are the range of illnesses among COVID-19 hospitalized patients?

Clinical syndromes currently known and associated with COVID-19 include the following<sup>3</sup>:

- i. Mild illness with uncomplicated upper respiratory tract viral infection and nonspecific symptoms such as fever, fatigue, cough, anorexia, malaise, muscle pain, sore throat, dyspnea, nasal congestion, or headache. Although less common, patients may also present with diarrhea, nausea, and vomiting.
- ii. Pneumonia with no need for supplemental oxygen.
- iii. Severe pneumonia with respiratory rate >30 breaths/min; or oxygen saturation as measured by pulse oximetry  $\leq 93\%$  on room air.
- iv. Acute respiratory distress syndrome with acute onset of severe oxygenation impairment and chest imaging with bilateral opacities.<sup>4</sup>
- v. Sepsis with life-threatening organ dysfunction that may include hypoxemia, hypotension, altered mental status, renal impairment, and/or reduced urine output, thrombocytopenia, and hyperbilirubinemia.<sup>5</sup>
- vi. Coagulopathy, including arterial and venous thromboses, often characterized by very high D-dimer levels, hemorrhage, and disseminated intravascular coagulation.
- vii. Septic shock with persisting hypotension despite volume resuscitation, requiring vasopressors to maintain mean arterial pressure  $\geq 65$  mmHg and serum lactate level  $>2$  mmol/L.

Direct lung damage and concurrent injuries to other organs and systems due to COVID-19 are all important considerations when creating a rehabilitation treatment plan for recovering patients.

- b) What are the system-based manifestations and impairments?
  - i. Pulmonary<sup>6,7</sup>: The lung damage of COVID-19 leads to an impairment of gas exchange, with potential for impaired pulmonary function. As a result, many patients report prolonged dyspnea and chest tightness, although the dyspnea may not be commensurate with the degree of hypoxia. Pulmonary fibrosis is another factor that may affect long-term lung function.
  - ii. Cardiac<sup>8-10</sup>: Complications can include hypotension, arrhythmia, reduced ejection fraction, troponin

#### List of abbreviations:

<b>ADL</b>	<b>activities of daily living</b>
<b>AM-PAC</b>	<b>Activity Measure for Post-Acute Care</b>
<b>AGP</b>	<b>aerosol-generating procedure</b>
<b>CAA</b>	<b>coronary artery aneurysm</b>
<b>CDC</b>	<b>Centers for Disease Control and Prevention</b>
<b>CIM</b>	<b>critical illness myopathy</b>
<b>CIP</b>	<b>critical illness polyneuropathy</b>
<b>CMS</b>	<b>Centers for Medicare and Medicaid Services</b>
<b>COVID-19</b>	<b>coronavirus disease 2019</b>
<b>ICU</b>	<b>intensive care unit</b>
<b>IRF</b>	<b>inpatient rehabilitation facility</b>
<b>KD</b>	<b>Kawasaki disease</b>
<b>LTAC</b>	<b>long-term acute care</b>
<b>PHE</b>	<b>public health emergency</b>
<b>PPE</b>	<b>personal protective equipment</b>
<b>SNF</b>	<b>skilled nursing facility</b>

- elevation, and myocarditis. Left ventricular dysfunction in the acute phase may be attributed to markedly increased cytokine levels. Activation or enhanced release of inflammatory cytokines can lead to necrosis of myocardial cells and exacerbations of coronary atherosclerotic plaques, making them prone to rupture. An intense inflammatory response superimposed on preexisting cardiovascular disease may precipitate cardiac injury. Myocardial damage might result in long-term dysfunction and must be taken into consideration for patients entering rehabilitation. Although most patients develop persistent tachycardia, it has been found to be relatively benign and self-limiting.
- iii. Neurologic<sup>11-13</sup>: Acutely, 36% of patients with COVID-19 develop neurologic symptoms, including headaches, altered consciousness, seizures, absence of smell and taste, paresthesias, and stroke. Posterior reversible encephalopathy syndrome, which causes headache, confusion, seizures, and visual loss can be a complication. COVID-19-associated viral encephalitis has also been rarely reported. Patients are found to have very high D-dimer levels and hypercoagulability, in turn potentially increasing the risk of acute cerebrovascular events. As with many viral syndromes, Guillain-Barré syndrome, acute demyelinating encephalopathy, acute necrotizing hemorrhagic encephalopathy, and acute transverse myelitis have also been rarely reported. Myopathy with severe muscular symptoms is commonly observed among moderate and severe cases.
  - iv. Renal<sup>14,15</sup>: Patients severely affected by COVID-19 are more likely to have acute kidney injury. Studies have shown that among those with normal creatinine levels on admission, most will recover from an acute kidney injury. However, proteinuria and hematuria can be prolonged. It is recommended that patients with acute kidney injury be regularly assessed for 3-6 months after discharge.
  - v. Hematologic<sup>16-19</sup>: Patients severely affected by COVID-19 are at high risk for a hypercoagulable state, characterized by very high D-dimer levels, thromboembolism, and stroke. In one review, thromboembolism was documented in as many as 1 in 5 patients and strokes occurred in 3%. Thromboembolic events occur despite prophylactic use of anticoagulants, and both venous and arterial thrombosis occurs. In addition, severe COVID-19 infection appears to be associated with bleeding complications, an increased risk for intracranial hemorrhage, and, in some instances, disseminated intravascular coagulation.
  - vi. Skin<sup>20</sup>: COVID-19-associated skin lesions include (from most common to least common) maculopapular eruptions, urticarial, acral erythema with vesicles or pustules (pseudo-chilblains), vesicular eruptions, and livedo reticularis. Frank necrosis, secondary to vasculopathy, can also occur and may result in limb loss. Because of prone positioning, facial wounds may occur among survivors and could be problematic because of secondary infections and necrosis.
  - vii. Liver<sup>21</sup>: COVID-19-related liver dysfunction with abnormal liver enzymes (mainly elevated serum aspartate aminotransferase levels) may occur. This may be the result of secondary liver damage caused by hepatotoxic drugs, an inappropriate inflammatory response, hypoxia, hypotension, and multiple organ failure. It is important to monitor liver laboratory tests and avoid hepatotoxic medications during the recovery phase.
  - viii. Other complications<sup>22-25</sup>: Survivors of acute respiratory distress syndrome with mechanical ventilation are reported to have complications such as laryngeal injury, tracheal stenosis, heterotopic ossification, contractures, adhesive capsulitis, decubitus ulcers, dysphonia, dysphagia, sensorineural hearing loss, brachial plexus injuries, and peripheral neuropathies (peroneal and ulnar).
  - ix. Functional impairment<sup>26-28</sup>: Weakness and decreased exercise capacity are the most common symptoms after prolonged ICU stay and immobility. Critical illness polyneuropathy (CIP), critical illness myopathy (CIM), and muscle atrophy are major causes of functional impairment related to COVID-19. CIP and CIM are characterized by generalized and symmetrical weakness, atrophy, and decreased or absent deep tendon reflexes and can cause difficulty weaning from mechanical ventilation because of associated respiratory muscle weakness. CIP and/or CIM co-occur with other symptoms or complications, including pain, reduced range of motion, fatigue, incontinence, and dysphagia. Other, physical sequelae of prolonged immobility may also occur, including cardiorespiratory deconditioning, postural instability, venous thromboembolism, muscle shortening, contractures, and pressure injuries. Many of these secondary complications are preventable if appropriate rehabilitation is provided early in the disease course.
  - x. Cognitive impairment and psychological sequelae<sup>29,30</sup>: COVID-19 can produce prolonged hypoxia that may lead to both acute and long-term neuropsychological dysfunction. The further elements of prolonged ventilation, use of sedatives, prone positioning, human isolation, and extended time away from social contacts may contribute to severe delirium. All components of cognition can be affected, including attention, visual-spatial abilities, memory, and higher order executive functions. Common adverse psychological effects include posttraumatic stress disorder, insomnia, depression, and general anxiety, and they can be exacerbated by fear, stigma, and isolation.
- Rehabilitation specialists must address those complications early on in the COVID-19 pandemic recovery phase for better outcomes. The first 3 months after discharge are critical to recognize and address emerging problems such as reduced exercise capacity, loss of function, cognitive impairment, pain, and depression. Long-term rehabilitation must be an ongoing process to ensure individual function and biopsychosocial profiles are restored as much as possible so these individuals can return to previous roles and continue contributing successfully to society.
- c) What are the special considerations for children? Children account for a growing proportion of COVID-19 cases. The American Academy of Pediatrics reported that children represented 9.1% of all cumulative COVID-19 cases in the United States as of August 2020. Moreover, COVID-19 cases among

children increased by 24% between late July and mid-August.<sup>31</sup> Because children may be asymptomatic or have milder disease than adults, this number likely underestimates the true number of infected children. Diagnostic findings in children are similar to adults, with fever and respiratory symptoms being prevalent, but fewer children seem to have developed severe pneumonia. Elevated inflammatory markers are less common in children, and lymphocytopenia seems rare. With the clinical spectrum yet to be clearly defined, children presenting with fever alone or primarily with other organ system involvement, such as gastrointestinal symptoms, may be missed if testing is restricted to those with respiratory complaints alone. While deaths in children have been extremely rare, there are reports of a unique, potentially lethal, syndrome that includes multisystem inflammatory symptoms with features of atypical Kawasaki disease (KD) and atypical toxic shock syndrome.<sup>32,33</sup> Kawasaki-like signs of this COVID-19–related inflammatory syndrome include an erythematous rash, conjunctivitis and glossitis, high fever, abdominal pain, gastrointestinal symptoms, cardiac inflammation, and coronary artery aneurysm (CAA). Supportive laboratory testing includes elevated erythrocyte sedimentation rate, C-reactive protein, D-dimer and other inflammatory markers. Testing for COVID-19 should be performed in all children with clinical symptoms suggestive of this condition because COVID-19 is considered the probable diagnosis. First-line providers encountering febrile children with a rash and other symptoms must consider the potential for this diagnosis to avoid a missed or late KD diagnosis. Further description of the clinical course of pediatric patients with COVID-19 diagnosis is required, particularly regarding the potential for CAA in KD. Prompt diagnosis of KD and treatment with intravenous immunoglobulin may prevent coronary artery abnormalities including CAA, which may occur in up to 25% of patients with KD.

2) Rehabilitation of patients with COVID-19 in the acute hospital Early rehabilitation during acute hospitalization plays an important role in preventing complications. A transdisciplinary approach where rehabilitation and medical team members (speech language pathologists, physical therapists, occupational therapists, physiatrists, rehabilitation psychologists, nurses, ICU physicians, etc) work closely together is vital to the outcome of critically ill patients. Maximization of available resources allows for the enhanced delivery of rehabilitation to expedite patient recovery. Repurposing rehabilitation staff (eg, physical therapists) to support respiratory therapy and prone team efforts provides critical interventions to minimize complications. Redeployment of available physiatry and outpatient rehabilitation team members to acute and/or ICU medical care and acute hospital rehabilitation increases capacity for early and frequent intervention for activity, mobility, and functional recovery.

a) What is the role of the rehabilitation team in preventing COVID-19 complications?

Patients with COVID-19 and severe acute respiratory failure may be sedated, paralyzed, and in the prone position during mechanical ventilation. Paralysis via neuromuscular blockade, along with muscle wasting and weakness, may reduce support of the joints and increase strain on the ligaments, increasing the risk for joint subluxation or dislocation. Prolonged time in one position increases the risk for decubitus ulcers especially around the bony prominences, such as trochanters, sacrum, and malleoli. Additionally, prolonged proning may affect the skin integrity of the face, ears, or genitals and places the patient at risk for corneal injury. Attention must be placed on monitoring skin and bony

prominences in those patients who spend significant amounts of time in prone position. Frequent changes in position and the use of supports to float the bony prominences are required. Interdisciplinary collaboration between the rehabilitation team, nursing, and respiratory therapy is crucial to provide frequent pressure relief. Prone teams that include physical or occupational therapists and are available 24 hours per day 7 days per week may be helpful in reinforcing proper technique to minimize injuries.<sup>34</sup>

For noncritically ill inpatients, daily out-of-bed mobility and participation in activities of daily living (ADL) helps to promote functional recovery and improve delirium. Interdisciplinary collaboration between the rehabilitation team, nursing team, and physicians to bundle care and promote mobility activities is recommended to reduce immobility-related harm while ensuring efficient use of resources. Rehabilitation team members play a crucial role in educating nursing and other team members on the safe progression of patient mobility. Education about engaging patients in daily therapeutic exercises, ADLs, and cognitive stimulation tasks is recommended for carry over from therapy sessions to amplify functional recovery.

b) How do you maximize mobilization while minimizing risk and use of PPE?

Mobilizing patients during the pandemic calls for innovative and creative ways to conserve use of scarce PPE resources. Some patients with COVID-19 may need extra personnel to assist rehabilitation therapists when mobilizing. Strategies include the following:

- i. Screening: Thorough chart review to determine medical stability to participate in therapy prior to donning PPE.
- ii. Communication: Effective communication with nurses and physicians to understand the patient's functional status and response to in-bed or out-of-bed mobility since the previous therapy session and for any medical updates that may affect the therapy session.
- iii. Planning: Gathering all the supplies such as nonskid socks and assistive devices before donning PPE.
- iv. Interdisciplinary collaboration: Scheduling therapy sessions when nursing is providing care so that the rehabilitation team and nursing can assist each other. This collaboration promotes participation in functional activities, especially for very weak, complex, or obese patients who require additional personnel for safe progression of mobility.
- v. Telehealth: Providing remote intervention for patients who have the cognitive and physical ability to manage telehealth technology provides an option to perform mobility and ADLs or preparatory tasks while minimizing exposure. Remote phone consultation, particularly for sedated patients, can help guide nursing on the application and scheduling of splints.
- vi. Transdisciplinary care: Engaging in a transdisciplinary approach guides all team members to progress the patient toward a common goal. The approach allows for redundancy in care as all team members no matter the discipline, advance mobility, perform ADLs, and reinforce cognitive training.

c) What are the considerations regarding titrating oxygen needs?

Successful mobilization of an acutely ill patient requires careful attention to the delivery of supplemental oxygen. Oxygen delivery is often set for resting conditions. However, when participating in mobility activities, the oxygen demand



may increase substantially. In addition to incorporating breathing exercises and pacing techniques while being mobilized, clinicians should discuss the upward titration of oxygen with the medical and nursing team to ensure safety and optimize patient participation. If the patient is receiving support from a mechanical ventilator, rehabilitation clinicians should consider ventilator settings, including respiratory rate, fraction of inspired oxygen, and positive end-expiratory pressure prior to mobilization.<sup>35</sup> Rehabilitation interventions should be tailored based on vital signs, response to activity and exercises, and clinical discussion on risks and/or benefits with the primary medical and nursing team to ensure safety.

d) How to triage patients with COVID-19 most efficiently and safely? Which functional assessment tools are most valid?

While the need for an acute triage strategy for overwhelmed health systems has passed in most areas in the United States for now, this may change over time. In addition, there are many places in the world where the pandemic is worsening. Therefore, triage efforts related to provided appropriate levels of care and preserving PPE are still very important.

COVID-19 patient care requires a strategic approach to engaging with patients safely, managing their ability to participate in treatment, determining the rehabilitation plan of care, and advancing the patient to a potentially challenged discharge environment (eg, home to self-isolation, decreased access to routine outpatient services).

Triage strategies include the following:

- i. Collaboration with the medical team is imperative to determine appropriate timing of rehabilitation intervention to decrease use of PPE and to determine patient's potential tolerance and/or response to activity. Effective triage in the pandemic environment expands to include physiatrists to support the identification of patient readiness for early rehabilitation intervention.
- ii. A defined rehabilitation strategy bridges the patient's current level of function, prior level of function, and discharge options, allowing for an efficient triage strategy focused on early, frequent intervention and patient-centered goals. A key component in a rehabilitation strategy is the inclusion of functional assessment tools that can guide care delivery and measure outcomes. Reliable and valid functional assessment tools, such as the Functional Status Score for the Intensive Care Unit,<sup>36</sup> Johns Hopkins Highest Level of Mobility Scale, Activity Measure for Post-Acute Care (AM-PAC) 6 Clicks Inpatient, and AM-PAC Low Level measures can guide the clinicians' assessment of progress during the hospital stay and in the postacute care setting.<sup>37-42</sup> Tools such as AM-PAC 6 Clicks not only predict discharge destination but also serve as screening tools to determine when to initiate physical therapy and/or occupational therapy consults.<sup>37,43,44</sup>
- iii. A transdisciplinary approach to discharge planning requires consideration of minimum discharge requirements and should incorporate the entire hospital team. The approach considers the unique challenges facing individual patients on discharge, the available discharge options, and the unpredictable number of COVID-19 cases and hospital admissions affecting pressures to discharge patients and bed availability in the community. Defined minimum standards for the patient to discharge home, where they may need to

function in possible self-isolation, can guide the team in triaging patient rehabilitation needs.

e) Disposition of patients with COVID-19 from acute care: where do they go?

Because the COVID-19 pandemic is a new condition, we cannot say for certain what percentage of patients hospitalized with COVID-19 will need inpatient rehabilitation services. Often the postacute care disposition will depend on a number of factors including whether the local community has been forced to convert IRF beds to treat acutely ill patients with COVID-19 as happened during the surge in New York City. Local availability of home services, IRFs, long-term acute care (LTAC) hospitals, and skilled nursing facilities (SNFs) will also determine the distribution of patient disposition.

One major challenge affecting discharge to SNF and LTAC hospital settings is the history of COVID-19 outbreaks in nursing homes causing excess mortality. Many facilities may not accept new patients for admission or may require serial coronavirus testing or a 14-day waiting period prior to admission. In these cases, coordination with home health care providers can allow for patients with functional limitation and need for oxygen weaning to go home with close follow-up and home exercise and therapy programs.

As an example, in Montefiore Medical Center, 5691 patients with COVID-19 were admitted by June 3, 2020. The average age of the patients was  $63.0 \pm 17.9$  years, with 53% of the patients being male. Of those, our best estimates suggest that, 1291 (22.7%) died, and 4400 (77.3%) were discharged alive. Of the discharges, approximately 300 (6.8%) were discharged to IRFs, 450 (10.2%) were discharged with home care, 220 (5.0%) were discharged to SNFs, and 3400 (77.3%) were discharged home without services. Less than 10 patients were discharged to an LTAC hospital because these services have a very low availability in the New York area. Home care services and SNF availability were very constrained because of safety and distancing limitations during the surge. There would have been more patients admitted to IRFs, but bed availability was constrained because of the need to convert IRF beds to acute care during the surge.

f) What happens if your area is experiencing a COVID-19 surge?

Admitting patients with COVID-19 to inpatient rehabilitation facilities in the current pandemic presents a series of novel challenges, but these are not insurmountable. It is helpful to examine the admission of these patients in 2 scenarios: (1) facilities in the middle of a COVID-19 surge with acute care facilities and communities overwhelmed with patients and (2) facilities in areas with limited numbers of COVID-19-positive patients. Specifics for management of admissions and expected percent of acutely hospitalized patients admitted for COVID-19 rehabilitation will vary as the health system becomes overwhelmed.<sup>42</sup>

For institutions within a surge area, there may be conversion of rehabilitation units to acute care for medical surgical patients. Once the surge ends, there often are many patients who are recovering who have severe functional limitations. Some COVID-19 complications such as myopathy, encephalopathy, Guillain-Barré-like symptoms, stroke, and even amputation are optimally treated with inpatient rehabilitation. However, isolation and infection control needs can be challenging in settings with a lower but consistent number of COVID-19-positive patients, where it may not be feasible to set up an

entire COVID-19 ward.<sup>41,45-47</sup> To preserve PPE and concentrate risk, COVID-19–designated units are likely more efficient; however, feasibility for establishing such units is largely dependent on volume of patients, with challenges at the very high and low ends. In some cases, segregating patients on specific units is nearly impossible, and adaptations such as in-room therapy may make more sense.

### 3) Rehabilitation of patients with COVID-19 in an IRF

There are a few references for treating patients with COVID-19 in rehabilitation units.<sup>48-54</sup> It is important to remain maximally flexible, recognizing that one solution may not suit all situations. Additionally, new evidence constantly arises: the Cochrane Rehabilitation website is regularly updated with COVID-19 literature.<sup>55</sup> Professionals urge the importance of an individually tailored approach to care that considers the severity of the patient's symptoms, their membership in special groups (eg, elderly, immunocompromised, stroke, etc), and other factors.<sup>48-51</sup> At this time, the optimal timing of rehabilitation is unknown and influenced by care delivery factors. Although early interventions in the ICU can improve strength and functional outcomes, factors such as PPE shortages, high risk of transmission, and other logistics present barriers to care.<sup>48,53</sup> For these reasons, experts generally recommend that patients (particularly those with severe symptoms) are medically stable prior to intervention and that the patient's condition is continually monitored to avoid exacerbating symptoms.<sup>48-52</sup>

As follows, we present a range of actions, for sites in surge situations with an overwhelming number of patients as well as in locations with lower numbers of patients in a more controlled setting.

#### a) What are the special precautions needed on rehabilitation units?

The issues of infection control and isolation are part of a number of medical issues that need to be addressed in patients with COVID-19. Ideally, all staff and patients as well as visitors to the facility should wear a mask and practice good hand hygiene. In most hospitals, providers are strongly encouraged and mandated to wear face shields for patient care. Limiting the number of visitors for a patient is also advisable except in certain cases. For therapists working with isolation patients, full PPE is recommended including an N95 mask (or equivalent), face shield, body suit, and gloves. Patients admitted to an IRF who are not recovering from a COVID infection should be frequently screened for symptoms and tested prior to being admitted to IRF and as appropriate. They should also wear masks when in the company of others, and visitors should be limited as much as possible.

One important medical issue for patients with COVID-19 in rehabilitation is hypoxemia. Patients should be monitored frequently because many patients will experience significant hypoxemia and feel relatively asymptomatic. Oxygen should be provided to maintain resting saturations >95% at rest and above 88%-90% with exercise. In very severe patients, the level of tolerated desaturation may be as low as 85% with exercise as long as there is no other change in vital signs and a rapid recovery of oxygen desaturation with the cessation of activity. Oxygen supplementation can be delivered at rest up to 6 L via nasal-cannula. Patients with resting oxygen needs above this likely cannot tolerate acute level rehabilitation, and admission should be delayed until they improve. With exertion, supplemental oxygen can be delivered with nonbreather mask or other higher flow systems to maintain desired oxygen saturation levels.

Many patients also experience cardiac involvement in the severe forms of COVID-19. A transient myocarditis with a decreased

ejection fraction may occur, but it can resolve within a week or 2. These patients may still be recovering when admitted to IRFs. For patients with severe myocardial involvement, telemetry monitoring for arrhythmia may be indicated. Blood pressure should be maintained in normal ranges with between 90-180 mmHg (systolic) and 50-100 mmHg (diastolic) and exercise stopped for any decrease in systolic blood pressure >20 mmHg. Heart rates similarly should be between 50%-70% of age predicted maximum for exercise. Patients with COVID-19 who have been hospitalized in ICU settings may have renal dysfunction, and a high number may be on hemodialysis after their acute course. Causes for readmission to acute hospital care are usually related to worsening hypoxemia and thrombotic events. Monitoring oxygen levels and evaluation, treatment, and close monitoring for deep vein thrombosis is essential for the prevention of acute care readmissions.<sup>45-47</sup>

#### b) What is the expected length of stay and outcomes for patients with COVID-19?

Montifiore Health System in New York has admitted nearly 300 rehabilitation inpatients with COVID-19 as a primary or secondary diagnosis to their Burke Rehabilitation Hospital. The average length of stay overall has been 17 days, and about 85% of the patients were discharged home. About 10% had acute care transfers and 5% went to an SNF. The length of stay was slightly longer in part because SNF transfers were delayed because of the risks for infection in those facilities. Overall, the patients with COVID-19 have done well in acute rehabilitation and have functional and medical outcomes similar to other patients admitted with debility or post-ICU stays.

#### c) How do you provide appropriate rehabilitation in patients with active COVID-19?

Reduced access to PPE and the need to protect other patients and staff cause some limitations in the provision of therapy services to patients with active COVID-19. An adequate, if suboptimal, solution for the provision of rehabilitation services to these patients is to provide in-room bedside therapy for most services. This will require that there are modified expectations and goals. This type of program might focus on physical conditioning and gentle strengthening. Bedside equipment can be provided, including stair stepers, bedside ergometers, light weights, and therapeutic elastic bands, with the understanding that this is not equivalent to traditional rehabilitation but is done to maximize recovery while maximizing safety for patients and staff. Accommodations will need to be made for ADL training and some instrumental ADL and higher-level therapy interventions. On return to home, exercise can also be done safely with coordination from home care agencies or remote management. Having a manual of exercise is also helpful because it allows for appropriate staging of exercise.<sup>56</sup> A particular challenge is doing family training when hospital visitation is limited, but the use of tablets and video and/or telemedicine solutions can help in this area. In certain situations, a single caregiver can come in for training but needs to be socially distanced and fully screened before coming into the facility.

#### d) What are the most important COVID-19–related changes to CMS regulations?

- i. Intensity of therapy requirement (“3-hour rule”): The Coronavirus Aid, Relief, and Economic Security Act waives the “3-hour rule.” This waiver provides flexibility for IRFs to provide care for patients who may be unable to participate in 3 hours of therapy a day during the COVID-19 pandemic.
- ii. Standards to rehabilitate patients: Medicare payment regulations require IRFs to meet certain standards to

rehabilitate patients, including ensuring that admitted patients are stable enough for rehabilitation therapy, need at least 2 types of therapy, and develop plans of care. During the PHE, these standards do not apply to patients who are admitted to freestanding IRFs solely for surge capacity reasons in a state that is currently in Phase 1 or has not yet entered the “Opening Up America Again” phase. However, the standards would continue to apply to patients who are admitted for the IRFs’ typical rehabilitative services.

iii. Post admission evaluations: Physicians are no longer required to conduct and document postadmission evaluations for Medicare patients admitted to an IRF during the PHE.

iv. Flexibility for inpatient rehabilitation facilities “60% rule”: CMS is waiving requirements and allowing IRFs to exclude patients from their inpatient population for purposes of calculating the applicable thresholds associated with the requirements to receive payment as an IRF. However, these patients must be admitted solely to respond to the emergency, and the patient’s medical record must properly identify the patient as such. In addition, during the waiver time period, this exception will also apply to facilities that are attempting to be but are not yet classified as an IRF.<sup>57</sup>

v. Care for excluded inpatient rehabilitation unit patients in the acute care unit of a hospital: CMS is allowing acute care hospitals with excluded distinct part inpatient rehabilitation units that, as a result of a disaster or emergency, need to relocate inpatients from the excluded distinct part rehabilitation unit to an acute care bed and unit as a result of this PHE. The hospital should continue to bill for inpatient rehabilitation services under the inpatient rehabilitation facility prospective payment system for these patients and annotate the medical record to indicate the patient is a rehabilitation inpatient being cared for in an acute care bed because of capacity or other exigent circumstances related to the disaster or emergency. This waiver may be used where the hospital’s acute care beds, such as a negative pressure room, are appropriate for providing rehabilitation care to patients and such patients continue to receive intensive rehabilitation services.<sup>57</sup>

#### 4) Special considerations

a) What special precautions are needed when performing procedures in the rehabilitation setting?

There are a number of procedures that occur during acute hospitalization and inpatient rehabilitation care that can produce aerosolized droplets. Because this is one primary mechanism of viral transmission, special precautions should be exercised when these procedures occur. These procedures include the following: tracheostomy care, high-flow O<sub>2</sub>, and pulmonary function and cardiopulmonary exercise tests.<sup>58</sup> Although clinical/bedside swallowing evaluation, flexible endoscopic evaluation of swallowing, and videofluoroscopic swallowing studies are likely not always aerosol-generating procedures (AGPs), there is potential they can become AGPs with the elicitation of gagging, cough, and sneezing.<sup>59,60</sup> Each institution will have different policies on how to manage these procedures based on the underlying prevalence of the disease in the local community, their ability to test for the virus, and their access to PPE. It is important to consider these factors in addition to some general guidelines:

i. AGPs on infectious COVID-19 patients should be completed on a case-by-case basis in collaboration with the medical team. If AGPs are required, staff should don full PPE, including a respirator (N95 or powered air purifying respirator), eye protection (face shield, goggles, or powered air purifying respirator), gown, and gloves.

ii. It is vastly preferred to perform potentially AGPs in an airborne infection isolation room, which has negative pressure. If no such room is available and the procedure must be performed, particular attention should be paid to air handling in the room. Ideally the room would be negative to the corridor. If neutral or positive (it is very concerning doing such a procedure in a room that is measurably positive), the room should be sealed from the corridor during the procedure (eg, with plastic and duct tape). A stand-alone high-efficiency particulate air filter unit may mitigate risk. The fewest number of people possible should be in the room. One may also want to consider using either end-of-the-day procedures for COVID-19—positive patients and/or back-to-back procedures with those who are COVID-19—positive. Alternatively, at least 1 hour between procedures may be a mitigation strategy, given the median half-life of the virus is ~1 hour.<sup>61</sup>

iii. AGPs for patients whose COVID-19 status is unknown, even if the patient is asymptomatic, still require precautions because the virus can be transmitted from asymptomatic individuals. If adequate PPE is available, the safest course would be to require staff to wear full PPE during any potentially AGP. However, if PPE is scarce, less PPE may be required if the patient has 2 negative polymerase chain reaction tests 24 hours apart just prior to the procedure. However, please note that recent reports suggest that patients who have had an established lower respiratory infection (eg, bilateral lower lobe pneumonia) may have a negative nasopharyngeal test but a positive bronchoalveolar lavage, emphasizing the importance of obtaining a lower respiratory sample to establish the patient’s level of infectivity.

iv. For injections and other nonaerosolized procedures, universal precautions and appropriate gowns, N95 masks, and face shields should be used in patients with active disease in accordance with local policy and measures.<sup>50,52</sup> Procedures should be reserved for patients who are in urgent need during their infectious period, otherwise delaying the procedure until after recovery may be more appropriate.<sup>37,49,52</sup>

b) When can you discontinue isolation precautions for patients with COVID-19?

To determine when a patient is no longer infectious, the Centers for Disease Control and Prevention (CDC) allow both a test-based strategy and a symptom-based strategy when testing is not available. Below are the CDC guidelines:

Test-based strategy— The patient should have resolution of fever (without the use of fever-reducing medications) and improvement in respiratory symptoms (eg, cough, shortness of breath), AND negative results of a Food and Drug Administration Emergency Use Authorized COVID-19 molecular assay for detection of severe acute respiratory syndrome coronavirus 2 RNA from at least 2 consecutive respiratory specimens collected  $\geq 24$  hours apart (total of 2 negative specimens).<sup>62</sup>

Symptom-based strategy: At least 3 days (72h) have passed since recovery, defined as resolution of fever without the use of fever-



reducing medications and improvement in respiratory symptoms (eg, cough, shortness of breath), AND at least 10 days have passed since symptoms first appeared (20d for immunocompromised hosts).<sup>63</sup>

- c) What do you do when a staff member gets symptomatic and/or tests positive?

Staff members who are symptomatic should not come to work. Symptoms of COVID-19 illness include cough, shortness of breath or difficulty breathing, fever, chills, muscle pain, sore throat, new loss of taste or smell, nausea, vomiting, or diarrhea. If a staff member develops symptoms consistent with COVID-19, the health care worker should immediately call her/his Occupational Medical Service or personal physician who can arrange for testing. If a health care worker tests positive, the individual should immediately be placed on home quarantine, and contact tracing should be performed by staff familiar with this task or relevant authorities such as Departments of Health. In many hospitals, this task will be accomplished by the hospital epidemiology team. Because all staff should be now be wearing “source control” face masks and practicing good hand hygiene, most of the contacts of a positive staff member will be low-risk exposures. In most institutions, staff that have low-risk contact are permitted to return to work wearing a mask while closely monitoring their symptoms (facility-specific policies may vary). Higher-risk exposed staff may need to be quarantined for 14 days.

Currently, the CDC return-to-work guidelines differ based on whether individuals have had symptomatic or asymptomatic infection and whether or not testing is used to make the return-to-work determination. These criteria are similar to those for removing patients from isolation. If an institution is using the symptom-based return-to-work approach, symptomatic staff who have suspected or confirmed COVID-19 may return to work if at least 3 days (72h) have passed since clinical recovery (defined as resolution of fever without the use of fever-reducing medications and improvement in respiratory symptoms (eg, cough, shortness of breath) AND at least 10 days have passed since symptoms first appeared.<sup>63</sup> If the test-based strategy is used to permit a return to work for symptomatic individuals, staff may return if their fever has resolved without the use of fever-reducing medications and there is improvement in respiratory symptoms (eg, cough, shortness of breath) AND they have had 2 negative COVID-19 tests performed 24 hours or more apart. For asymptomatic individuals, staff who have laboratory-confirmed COVID-19 can return to work after 10 days have passed since the date of their first positive COVID-19 diagnostic test. Alternatively, if the test-based strategy is being used, individuals may return to work if they have 2 negative COVID-19 tests within 24 hours. Use of the test-based strategy has been problematic for some centers, because COVID-19 RNA has been detected for as long as 90 days after infection in some patients. Neither cultivable virus nor transmission has been detected from patients (even those whose COVID-19 polymerase chain reaction remain positive) who meet the above clinical criteria and are 2 weeks into their recovery. Further details on the CDC criteria are available online.<sup>64</sup>

- d) What models of care should we use to manage the rehabilitation of COVID-19?

Two of the more challenging aspects of care for the patient recovering from COVID-19 are (1) the effect on multiple organ systems simultaneously (partly because of the pathophysiology of the virus itself and partly because of the vulnerabilities of any given patient) and (2) the increased prevalence of severe

COVID-19 in the older population. Lessons from geriatric rehabilitation may therefore be germane—multimorbidity is common in the geriatric population<sup>65-68</sup> and among COVID-19 survivors, and the concept of frailty is pertinent to the presentation of and recovery from COVID-19 in many patients.<sup>69,70</sup>

Frailty corresponds to a patient’s resistance to withstand a stressor such as a viral infection. Frailty is recognized as a vulnerability to stressors as determined by decline in multiple organ systems, and a frailty score can predict the future likelihood for adverse health outcomes. While first recognized in the older population, frailty can affect younger persons as well. Frailty is commonly defined as either a frailty phenotype noted by some combination of weakness, slow walking speed, weight loss, low energy, and low physical activity or as a frailty index derived from totaling the number of deficits across multiple domains of a comprehensive geriatric assessment.<sup>70,71</sup> Both approaches can result in a score that identifies patients that may do worse and need greater support in the face of a given stressor. Foundational to both definitions is a focus on baseline physical function, such as gait speed or patient-reported functioning. Important as well is our emerging understanding of the complex relationship between frailty and resilience, the latter being defined as the ability to withstand and recover from an acute or chronic stressor, such as COVID-19.<sup>62,72,73</sup> It is likely that frailty is a major contributor to the reason why COVID-19 mortality increases substantially with age and is so very prominent in the nursing home population. Therefore, assessing COVID-19 patients for frailty will be a helpful step in treatment planning.

It has become clear that COVID-19 itself may result in a variety of complications affecting multiple organ systems, and the increased incidence of severe COVID-19 among older persons and among those with risk factors such as diabetes means that many patients have underlying comorbid conditions.<sup>65,66</sup> To address this concern, application of the geriatric care principles for care of persons with multimorbidity may be helpful.<sup>74</sup> In particular, the 5 M’s approach may be helpful for COVID-19 survivors: Mind (Cognition), Mobility (Function), Medications (Optimizing simplifying Medications), Multicomplexity (managing the complex medical/social issues of a given patient), and Matters Most (what patients value most for their care).<sup>75,76</sup> For geriatric rehabilitation and also in our COVID-19 survivors, it is also important to consider Motivation (factors affecting behavior change and/or health) as being critical factors in our rehabilitative care.<sup>69</sup> Thus, it may be more optimally efficient to frame the treatment plan for an all patients recovering from COVID-19 around the 6 M’s used in geriatric care to ensure that care is both comprehensive and easily communicated to care providers and patients.

## Conclusions

The COVID-19 pandemic represents the biggest health care challenge of our lifetime. This document, produced by content experts with early experience managing patients with COVID-19, outlines the clear need for rehabilitation intervention in both the acute and postacute phases of the disease. While there are substantial challenges to performing rehabilitation in this new environment, with appropriate safeguards, high-quality rehabilitation can still be delivered.

The information provided in this document is not designed to replace local policies and should not replace clinical reasoning for individual patient management. The text represents the authors’ best judgment at the time it was written. However, our knowledge

of COVID-19 is growing rapidly. The reader should take advantage of the most up-to-date information when making clinical decisions.

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