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Inpatient Rehabilitation Issues Related to COVID-19

Amanda A. Kelly, MD*, Caroline A. Lewis, MD[1], Miguel X. Escalon, MD, MPH

KEYWORDS

• Rehabilitation • COVID-19 • Inpatient • PICS

KEY POINTS

- Patients who are hospitalized due to COVID-19 are likely to require acute inpatient rehabilitation.
- Multiple factors have posed challenges to inpatient rehabilitation during the COVID-19 pandemic.
- Studies have shown lower rates of transfer to acute care, higher rates of discharge home, and equal or more functional gains in survivors of COVID-19 following acute rehabilitation.

INTRODUCTION

Patients hospitalized due to COVID-19 can develop neurologic, neuromuscular, cardiovascular, pulmonary, musculoskeletal, cognitive, and psychiatric impairments that predispose them to require acute inpatient rehabilitation. Preliminary studies have shown that up to 50% of patients diagnosed with COVID-19, developed neurologic pathologies including stroke, disorders of consciousness, encephalopathy, and polyneuropathy. Amputations of digits and/or limbs, dysphagia, pressure injuries, and dysautonomia were also observed in this population.[1] Additionally, containment measures imposed on patients with COVID-19 to reduce the spread of the virus lead to severe limitations in mobility. As a result, immobilization syndrome was observed in patients even with mild COVID-19 symptoms such as fever, fatigue, and muscle pain.[2]

Patients who require prolonged stay in an intensive care unit (ICU) due to acute respiratory distress syndrome (ARDS), are at risk of ICU acquired (ICUAW) resulting in functional impairment. One study showed that patients with ICUAW had increased mortality and significantly decreased strength, function, and quality of life up to 5 years later.[1] Approximately 50% of patients with ICUAW were unable to return to work 1 year

Department of Rehabilitation and Human Performance, Icahn School of Medicine at Mount Sinai (Mount Sinai), One Gustave L Levy Place, Box 1240B, New York, NY 10029, USA
[1] Present address: 1677 Lexington Avenue, Apartment 6A, New York, NY 10029.
* Corresponding author. One Gustave L Levy Place, Box 1240B, New York, NY 10029
E-mail address: DrAmandaAKelly@gmail.com

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after hospital discharge due to functional deficits.[1] Although data on long-term outcomes of survivors of severe COVID-19 are not currently available, it is clear that many persons suffering from COVID-19 have had prolonged ICU lengths of stay with ARDS, and any person in that situation is at high risk of ICUAW and its long-term deleterious effects.

One of the unique challenges for ICU survivors from severe COVID-19 acute respiratory distress syndrome (CARDS) versus patients with ARDS is the need for higher amounts of analgesics and sedation while on mechanical ventilation.[3] This is thought, in part, to be due to the need for deeper sedation to avoid patient–ventilator dyssynchrony in the setting of high respiratory drive, as well as to avoid self-inflicted lung injury.[3] One study evaluated the effects of early rehabilitation and weaning from mechanical ventilation in patients with CARDS, and its results showed significant improvement in physical and mental recovery, with functionality and frailty scores comparable to pre-ICU admission.[4] These data suggest that early ICU respiratory rehabilitation in CARDS patients could prevent post-intensive care syndrome (PICS), and improve the 1-year outcome of survivors.[4] This is in line with studies of other ICU populations showing that early and continued rehabilitation is crucial to functional outcomes and independence.[5–7]

Despite the higher medical acuity and complications of many patients with COVID-19, studies have shown significant improvements in functionality and better ability to perform activities of daily living (ADLs) following acute rehabilitation.[2] Although multiple factors posed and continue to pose challenges to inpatient rehabilitation for survivors of COVID-19, rehabilitation plays a key role for this patient population.

DEMOGRAPHICS

The leading comorbidities in patients with COVID-19 include hypertension (55%), coronary artery disease and stroke (32%), and diabetes (31%).[8] In a case series involving patients admitted with COVID-19 to New York hospitals, 6% were discharged to facilities, such as skilled nursing facilities, other than their homes.[9] Studies suggest that men 50 to 70 years of age have a higher prevalence of severe COVID-19 infection.[1]

A study comparing the demographics between patients that were COVID-19 positive (those who tested positive within 3 months of admission to rehabilitation) and COVID-19 negative admitted to a rehabilitation facility noted that patients with COVID-19 were younger (mean age 59.4 years vs 62.9 years; $P = .04$) and had a higher mean body mass index (BMI) (32 vs 28; $P < .01$).[10] Another study analyzing persons with COVID-19 admitted to acute inpatient rehabilitation facilities in New Jersey and New York reported that patients were mostly men and White (41%), with an average age of 61.9 years. Most of these institutions admitted significantly younger patients during the height of the pandemic (May and June 2020) compared to pre-pandemic times. The average length of acute hospital stay was 24.5 days and the mean length of stay in acute inpatient rehabilitation was 15.2 days.[1]

Additionally, a retrospective cohort study involving 132 academic medical centers found that adults hospitalized with COVID-19 discharged to inpatient rehabilitation facilities were more likely to have received intensive care and mechanical ventilation while hospitalized ($P < .001$), be more medically complex, and have longer lengths of stay ($P < .0001$). Even so, those discharged to inpatient rehabilitation facilities showed 1.4 times lower odds of readmission within 30 days of hospital discharge compared to those discharged to skilled nursing facilities.[11]

COMMON PRESENTATIONS

There are several ICU-associated sequelae seen in survivors of COVID-19 after a prolonged stay and immobilization in the ICU. One study showed that 4% to 11% of all patients with COVID-19 required admission to the ICU, with the most severely ill of those patients developing ARDS.[12] In another study, 14% of patients hospitalized with COVID-19 were treated in the ICU and 12% required mechanical ventilation.[9]

In a study, 46% of patients who were admitted to the ICU with ARDS due to any underlying diagnosis presented with critical illness polyneuropathy (CIP), which is a mixed sensorimotor neuropathy that results in axonal degeneration.[12,13] Patients with CIP can have significant functional limitations. It can present with generalized, symmetric weakness affecting the distal more than proximal extremities, as well as distal sensory loss, atrophy, and decreased/absent deep tendon reflexes. It can also result in diaphragmatic weakness resulting in difficulty weaning from mechanical ventilation.[13] Another ICU-related condition that has been seen in patients with COVID-19 is critical illness myopathy (CIM), which is a diffuse myopathy associated with fatty degeneration, fiber atrophy, and fibrosis, and is associated with exposure to corticosteroids, paralytics, and sepsis.[13] CIM presents similarly to CIP, however, CIM typically results in more proximal than distal weakness and sensory preservation and has a quicker recovery. Similar to CIP, CIM can result in poor endurance that may persist for up to 2 years or longer.[13] The decreased strength, sensation, and endurance associated with ICU sequelae result in functional impairments necessitating inpatient physical rehabilitation to promote functional recovery and independence.

Additionally, PICS is commonly seen after COVID-19 infection. PICS is a collection of symptoms that persist once a patient leaves the ICU. It is characterized by the possession of any impairment in the physical, psychiatric, or cognitive domains due to a critical illness. In patients with a critical illness related to COVID-19 infection requiring an ICU stay of 7 days or more, 91% fit the diagnostic criteria for PICS with 87%, 48%, and 8% of patients having impairments in the physical, psychiatric, and/or cognitive domains, respectively.[14] Psychiatric conditions affecting survivors of ARDS due to any cause include anxiety (38%), depression (32%), and PTSD (23%), with 52% having prolonged psychiatric morbidity in one of the three areas with a mean total duration of 33 to 39 months in one study.[15] PICS is associated with decreased pulmonary function, decreased inspiratory muscle strength, decreased range of motion, strength, and endurance.[13] Other ICU-related presentations include entrapment neuropathies related to prone positioning with the majority affecting peripheral nerves of the upper limb. The most common presentations include hyposthenia, hypoesthesia, and paresthesia along the affected nerve distributions.[16] The most frequent injury sites include the ulnar nerve, radial nerve, sciatic nerve, brachial plexus, and median nerve.[17]

Furthermore, many patients with COVID-19 also present with malnutrition due to a hyper-catabolic state. The prevalence of malnutrition is greater than 50% in severe COVID-19 infections. In one study involving 37 patients admitted to a rehabilitation facility following admission to reanimation or intensive care units for COVID-19, 81% of patients presented with severe malnutrition and 11% presented with moderate malnutrition. This study also showed that malnutrition had a significantly negative correlation with functional independence ($P < .05$).[18] Malnutrition can also lead to weight loss, and when it is observed to be $\geq$ 5% with noted functional impairment and metabolic derangement, cachexia in patients with COVID-19 can be diagnosed. In a study that evaluated weight loss and cachexia in patients with COVID-19, the frequency of cachexia was revealed to be 37%. Contributing factors to body wasting associated

with COVID-19 are thought to include loss of appetite, loss of taste and smell, fever, immobilization, general malnutrition, catabolic–anabolic imbalance, and endocrine, cardiac, and renal dysfunction related to COVID-19 complications.[19]

Many patients also present with tachypnea, oxygen desaturation with exertion, and tachycardia, which can make mobilization difficult.[1] Additionally, patients may exhibit other cardiovascular, autonomic, pulmonary, neurologic, cognitive, immunologic sequelae, and post-exertional fatigue, which will be further described in more detail in subsequent articles.

Lastly, patients with COVID-19, particularly those with prolonged stays in the ICU, are susceptible to pressure injuries given inactivity, use of artificial airways, and prone positioning. Pressure injuries must be closely monitored and treated as they cause 60,000 deaths annually in the United States. One study in Iran involving pressure injuries in patients with COVID-19 with a Braden score of less than 14 admitted to the ICU, showed an incidence ratio of 47% and prevalence of 80%.[20] A United Kingdom retrospective study involving patients admitted to the ICU with COVID-19 showed that the incidence of developing a pressure injury was 76%, and that 71% of patients were put in prone positioning for ARDS; 88% of anterior surface ulcers were located on the head and neck, with the remaining percentage on the genitalia, fingers, and anterior torso. The most common site for pressure injuries was oral commissures (35%) related to endotracheal tube placement. Other facial pressure injuries included the nose (12%), central lip (9%), ear (7%), cheek (5%), and periorbital area (3%).[21]

Patients with COVID-19 are predisposed to numerous complications and sequelae that lead to poor endurance, decreased strength, and severe functional limitations. Acute inpatient rehabilitation facilities have the ability to address these issues with multidisciplinary teams including physiatrists, therapists, neuropsychologists, nutritionists, and wound care teams. Despite the obstacles faced at the start of the pandemic and the unique functional demands of this patient population, rehabilitation facilities have become accustomed to treating the challenging conditions that patients with COVID-19 present with, which will better equip facilities in the event of similar circumstances.

ADMISSION CRITERIA

Discharge from acute care hospitals with admission to acute rehabilitation facilities was initially dependent on state and centers for disease control and prevention (CDC) guidelines, which were constantly changing at the start of the pandemic. Obtaining insurance authorization was a barrier to timely discharge to inpatient acute rehabilitation given that evaluations from several disciplines were required. During the pandemic, the centers for medicare & medicaid services (CMS) 1135 rule waiver declared a public health emergency and waived the normal insurance authorization process. This allowed for faster transfers from acute care hospitals to inpatient rehabilitation facilities, thus increasing bed availability and turnover.[1] Institutions developed their own set of admission criteria with consideration of factors such as the number of days since initial symptom onset, number of days since resolution of fever, negative COVID-19 testing, infection control clearance, and oxygen requirements.

Though facilities have their own unique admission criteria, it is reasonable to outline certain acceptance guidelines based on current practices.[1,10] A recommendation of admission criteria can include.

- Patients admitted to inpatient rehabilitation with a primary diagnosis unrelated to COVID-19 should test negative for COVID-19 within 72 hours of admission.
- Patients admitted to inpatient rehabilitation with a primary diagnosis related to COVID-19 should meet the following criteria:

- At least 7 days since initial symptom onset
- Afebrile for at least 3 days without the use of antipyretics
- Exhibit clinical improvement in symptoms
- Cleared by infection control at the acute care hospital before transfer
- Require less than or equal to 5 L of oxygen via nasal cannula or stable on current ventilatory settings if tracheostomy is in place

CHALLENGES TO INPATIENT REHAB

At the start of the pandemic, numerous inpatient rehabilitation facilities were temporarily closed to allow for reallocation of beds and staff to COVID-19 units.[22] Those that remained open were forced to address challenges specific to the pandemic. Utilization of physical space was adjusted to comply with constantly evolving social distancing and infection prevention guidelines, and some facilities needed to rapidly create new therapy gyms and units to treat patients on precautions.

There was also a considerable shift from frequent socialization of patients and staff to isolation when not in therapies as well as the use of personal protective equipment (PPE) to minimize the spread of infection.[1] Because staff and patients were required to wear PPE covering most of the face, and time spent face-to-face was limited to decrease infection risk, communication became more difficult and impersonal.[23]

Units were also faced with staffing shortages from sickness and reassignment to medical units. Physicians were deployed to acute care teams and physical and occupational therapists were reallocated to prone teams. To combat staffing shortages and limit unnecessary infectious exposure, CMS 1135 rule waiver temporarily lifted the normal therapy requirement of 15 hours per week of inpatient therapy for patients admitted to inpatient rehabilitation facilities and authorized the use of telehealth in place of traditional in-person therapies.[1]

One of the other challenges faced by acute inpatient rehabilitation facilities was the risk of COVID-19 outbreaks. One study focused on the impact a COVID-19 outbreak had within a 27-person neuromusculoskeletal rehabilitation unit, in which patients were exposed to an asymptomatic health care professional. Because patients who tested positive were transferred to isolation rooms, therapy mainly took place in the patient's rooms, and many were given instructions on self-training with smaller therapy devices. Furthermore, exposed patients on average received 2.5 therapy sessions/day and 81.9 therapy minutes/day during isolation compared to 3.5 sessions/day and 132.3 minutes/day before COVID-19 exposure. Ten of the affected patients (37%) required supplemental oxygen and two patients (7%) had to be transferred to the acute hospital secondary to respiratory failure, leading to one death. Overall, patients who were exposed to COVID-19 during inpatient rehabilitation received less frequent therapy, with less intensity, and limited resources with a significantly longer length of stay compared to non-COVID patients.[24]

The staff also experienced anxiety and uncertainty related to COVID-19 and burnout. They faced numerous obstacles including increased workload caused by staff shortages related to hospital outbreaks, fear of infection of oneself and loved ones in the setting of limited information regarding a novel disease, staying informed of frequently changing guidelines, shortages of PPE, caring for patients who can deteriorate quickly, and social isolation. The staff may have also felt culpable for preventing patients' family and friends from visiting the hospital setting. Health care workers who were exposed to and/or infected with COVID-19 were forced to quarantine and may have felt guilty about leaving the frontlines understaffed.[23]

Currently, challenges such as oxygen requirements, pressure injuries, and malnutrition continue to be prevalent in acute rehabilitation facilities for patients with COVID-19, especially those post-ICU. Close monitoring of oxygen saturations during therapy sessions is essential and the involvement of auxiliary teams such as wound care, nutrition, and neuropsychology for behavioral and social challenges continue to be utilized during the rehabilitation course for this population. To help address anxiety and burnout of staff at the start of the pandemic, facilities provided food, mental health services, and recharge/respite rooms which continue to be resources offered today. It is vital for institutions to continue to collaborate to discuss the challenges faced during the pandemic, share experiences, and introduce adaptations and solutions for providing rehabilitation services for patients with COVID-19.[1]

MULTIDISCIPLINARY SERVICES

Many team members were forced to adapt to new roles. Rehabilitation physicians needed to adjust to a new patient population with different symptoms. They were required to stay up to date on the latest COVID-19 presentations and treatment. Given the various COVID-19 sequelae affecting various body systems such as pulmonary, cardiovascular, cognitive, neurologic, psychiatric, musculoskeletal, etc. rehabilitation physicians needed to coordinate care between a larger variety of team members.

Physical and occupational therapists addressed significant weaknesses from CIM, CIP, vital sign derangements for autonomic dysfunction, limitations in positioning due to pressure injuries, and more limited interaction with family members and caregivers due to isolation guidelines. Speech therapists were essential in addressing swallowing deficits related to ventilator use, communication with speaking valves in patients with tracheostomies, and cognitive deficits related to COVID-19. Psychologists were important in treating anxiety, depression, adjustment disorder, and other psychiatric issues related to prolonged hospital stay and immobilization seen in patients with COVID-19. Respiratory therapists were essential in managing ventilatory status, and nutritionists were necessary for the management of malnutrition commonly seen in this patient population.

Nurses carefully monitored vital signs and respiratory status, played important roles in caring for pressure injuries, including pressure relief positioning for patients debilitated with significant weakness, and assisting in ADLs such as eating, bathing, and dressing. Recreational therapists were also useful in providing relaxing and entertaining activities during a time when patients often felt bored and isolated. Lastly, social workers were crucial in addressing discharge needs, often having to communicate with family members virtually, and keeping note of which home services remained available to patients during the pandemic.

DISCHARGE PLANNING

Planning for safe discharge proved to be difficult during the pandemic. Family training plays a significant role in arranging appropriate care, supervision, and support when patients are discharged home. However, during the height of the pandemic, most facilities instituted a “no visitor policy” to minimize infectious exposure. Instead, there was a reliance on telehealth for communication and education by physicians, therapists, social workers, and off-site family education. There was also a lack of resources, such as oxygen, which were necessary for discharge home. Family members of patients with prolonged lengths of stay were also more anxious about caring for their loved ones and were fearful for their own safety, necessitating education, counseling, and access to PPE. Numerous home health care agencies required negative COVID-

19 tests before allowing staff to enter patients' homes, further adding to caregiver anxiety and delaying discharge home.

Patients who were unable to be safely discharged home were recommended for subacute rehabilitation (SAR), however, family members were apprehensive given the high COVID-19 infection rates and mortality. This may have led to an increased length of stay.[1] A retrospective observational study using US Medicare claims and Minimum Data Set 3.0 compared skilled nursing facilities with at least one active COVID-19 case in 2020 to their pre-pandemic baselines and reported that mortality increased by about 2%. Furthermore, patients required assistance with an additional 0.36 ADLs, lost 3.1 pounds more weight, and were 4% more likely to have worsened symptoms of depression.[25] The regulation of SAR admission also served as another obstacle. For example, in New York, SARs were prohibited from accepting patients with COVID-19 and then instructed to refuse admissions simply based on patients' COVID-19 status.[1]

As COVID-19 guidelines continue to change, hospitals at this time have lifted the "no visitor policy," making it easier for family training to take place for safe discharge planning. There is also more abundance in resources such as oxygen and PPE, compared to during the height of the pandemic, making the transition home for survivors of COVID-19 smoother and less taxing for families. Additionally, the rollout of COVID-19 vaccines and boosters has provided families and caregivers with greater peace of mind at the time of discharge home for this patient population. As more family members return to work, however, there may be less help available at home at the time of discharge, leading to greater need for home attendants. Lastly, most SAR facilities still require a negative COVID test, which will likely continue to increase the length of stay for patients who are unable to be safely discharged home.

OUTCOMES

Studies showed that survivors of COVID-19 who underwent inpatient rehabilitation had great functional gains with home discharge rates that were similar to that of the pre-pandemic inpatient rehabilitation period and these persons had low complication rates. Some inpatient rehabilitation facilities had higher rates of patients discharged home during the pandemic compared to the prior period. Possible reasons include increased caregiver availability as family members were able to work from home, hesitancy of family members discharging loved ones to SAR, as well as SAR admission regulations, decreased amounts of physical assistance needed as compared to patients who suffered a brain or spinal cord injury, and different admission criteria.[1]

Furthermore, a study involving several acute rehabilitation facilities reported higher GG scores for mobility and self-care in patients with COVID-19, with each patient gaining two levels on functional and self-care outcomes. A GG score is a measure of functional status that replaced the Functional Independence Measure in inpatient rehabilitation facilities and is based on the US Centers for Medicare and Medicaid Services (CMS) mandated section GG Functional Abilities and Goals of the Improving Post-Acute Care Transformation Act, with a greater change in GG score indicating increased improvement in functional independence. In context, this gain is equivalent to improving from maximal assistance to supervision levels. This accomplishment increases the probability of patients discharging home and illustrates the significance of providing rehabilitation for patients with COVID-19.[1] Another study demonstrated that patients with COVID-19 had equivalent or increased improvements in functional ability measures in self-care (FA-SC), mobility (FA-Mob), functional change efficiency, length of stay, and rate of return to the community when compared to patients without

COVID-19.[10] This further shows that patients with COVID-19 who qualify for inpatient rehabilitation can benefit at least as much from inpatient rehabilitation as patients without COVID-19. With regard to hospital readmission rates, the overall acute care transfer rate across seven New York and New Jersey inpatient rehabilitation facilities was about 8% (27/320 patients) among patients with COVID-19, with the range of individual institution rates being 0% to 25%, overall lower compared to 17% from the Uniform Data System and 12% from the eRehabData during 2019 (pre-pandemic).[1] This suggests that acute inpatient rehabilitation provides a safe disposition option for survivors of COVID-19.

Most studies to date have discussed outcomes in these patients during earlier stages of the pandemic; however, there is a need for data on the current challenges, measures of mobility, length of stay, and return to community for patients with COVID-19. Despite the vast amount of complications and higher medical acuity of many patients with COVID-19, studies have shown the significant role acute rehabilitation has played during the pandemic for this population. These patients not only had higher rates of discharge home, but equal or more functional gains compared to patients without COVID-19, with a lower rate of transfer. It is essential to continue to encourage acute rehabilitation for survivors of COVID-19, to optimize the recovery, functionality, and safe discharge for this patient population.

CLINICS CARE POINTS

- Patients hospitalized due to COVID-19 are at risk of multisystem impairments that predispose them to require acute inpatient rehabilitation.
- Challenges to inpatient rehabilitation facilities during the pandemic included temporary closure, social distancing and isolation of patients, staffing shortages, anxiety and burnout, COVID-19 outbreaks, and adaptation of new roles by team members.
- Multidisciplinary teams in acute inpatient rehabilitation facilities, such as physiatrists, therapists, neuropsychologists, nutritionists, and wound care teams, can address the numerous complications and sequelae of patients with COVID-19.
- Studies showed that survivors of COVID-19 who underwent inpatient rehabilitation had great functional gains and can benefit at least as much from inpatient rehabilitation as patients without COVID-19.
- It is essential to continue to encourage acute rehabilitation for survivors of COVID-19 to optimize recovery, functionality, and safe discharge.

DISCLOSURE

The authors have nothing to disclose.

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