Proposed Workflow for Rehabilitation in a Field Hospital Setting during the COVID-19 Pandemic

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The novel coronavirus disease 2019 (COVID-19) pandemic has challenged healthcare facilities throughout the world. Historic models project that 30% of hospitalized COVID-19 patients will need rehabilitation following their illness, and 20% more will need in-home care. These numbers likely represent hundreds of thousands of patients worldwide and may underestimate the actual need because of the increased risk of functional decline seen in high-risk groups such as older patients and patients with preexisting comorbidities. Additionally, COVID-19 has been associated with significant cardiopulmonary impairment including arrhythmia, myocardial injury, and acute respiratory distress syndrome and numerous potential neurologic deficits, including ataxia, encephalopathy, myopathy, and cerebral vascular accidents, with more severe cases carrying an increased risk of neurologic injury.

Providing sufficient rehabilitation care is a particular challenge for regions with high per-capita infections that have to rely on temporary field hospitals to supplement over-capacity hospitals. Unfortunately, there exists no framework for distributing rehabilitation care in field hospitals during a pandemic, and traditional models for disaster care focus on triaging patients after traumatic events (natural disaster, war zone). Field hospitals are designed to maximize bed capacity and likely do not allocate space solely for rehabilitation; providers must therefore think of innovative ways to deliver care in this atypical setting. In the case of the authors’ field hospital, original plans were for one physical therapist per 100 patients until members of the Department of Physical Medicine and Rehabilitation became involved in facility planning.

Complicating matters, typical options for post-illness rehabilitation may not be available - skilled nursing facilities (SNFs) and inpatient rehabilitation facilities (IRFs) may not accept COVID-19 positive patients because of a lack of resources and concern for infectious spread among existing patients. Furthermore, even if these facilities accept COVID-19 positive patients, there are not enough beds nor personal protective equipment (PPE) to accommodate all patients who will require rehabilitation following acute hospitalization.

Without rehabilitation, numerous patients may require extra days in the field hospital setting, taking up needed bed space and increasing use of PPE and healthcare personnel. The best way to prevent COVID-19 hospitalizations is to prevent viral spread; the best way to improve throughput and reduce length of stay once hospitals are full is to address modifiable factors. Much of the disablement related to COVID-19 is likely modifiable with rehabilitation interventions.

We propose the following framework to triage rehabilitation care in a resource-limited environment during a pandemic, such as a field hospital (Figure 1).

Traditional Hospital-Based Acute Care Therapy: Change the Trajectory

Acute care represents the time when patients first develop impairments from the disease, and therefore rehabilitation is an essential intervention for patients with functional deficits who can participate. Rehabilitation at this level is likely more accessible than in a field hospital but should still be dosed to accommodate staffing and PPE limitations. For more functionally impaired patients, twice-daily therapy - similar to what one would receive at a skilled nursing facility - should be offered if available, and patients with barriers to discharge involving physical limitations should be prioritized.
The goal of hospital-based therapy is to “change the trajectory” that patients are on. That is, reducing debility through early intervention may obviate the need for patients to be discharged to a SNF or IRF, reduce the level of rehabilitation needed in the more resource-constrained field hospital, and/or reduce overall length of stay.

Field Hospital Rehabilitation

In resource-constrained environments such as field hospitals, rehabilitation must be distributed strategically to patients. We propose a hierarchy of need based on patients who are clinically stable and who have barriers
to discharge home that can be overcome with rehabilita-
 tion (Table 1).

To distribute resources, we developed the Rapid
COVID-19 Rehabilitation Assessment (RCovR) to iden-
tify patients with rehabilitation needs (Figure 2). This
assessment tool was created based on clinical charac-
teristics of COVID-19 patients and from components of
an assessment published by the International Rehabili-
tation Forum7 and the Barthel Index.8 The assessment
is designed to be brief given the high volume and rapid
rate of patients admitted to the field hospital setting,
so it does sacrifice granularity for the sake of being
administered in this setting.

We will determine the RCovR tool’s content validity
based on its accuracy of identifying patients who need
(and do not need) rehabilitation care. This includes
reviewing how many patient scores indicated high reha-
bilitation needs and whether those patients ended up
receiving therapy. Patients who continued to receive
therapy during their stay at the field hospital would be
considered to have actually needed rehabilitation
because a physical therapist or physiatrist would have
evaluated the patient and continued (or discontinued)
therapies based on the patient’s clinical presentation.
Additionally, the RCovR tool will be evaluated from a fea-
sibility standpoint, as the providers who screen patients
with this tool will be asked to evaluate its effectiveness
and ease of use. The number of times the tool was used
compared to the number of patients admitted to the field
hospital will also be recorded, because if the tool is ardu-
ous to use or perceived to be inaccurate, triage personnel
may stop using it. Unfortunately, it would be difficult to
compare the RCovR tool with other assessments, as triage
must be efficient and field hospital care and extra assess-
ments for the purposes of clinical research should be
minimized.

In addition to function, the assessment also evaluates
patients based on their clinical status with regard to
COVID-19, such as how much oxygen they require and
whether their status is worsening or stable. Unstable
patients may need to transfer to a traditional hospital
setting, and patients with high supplemental oxygen
demands may not be able to participate in therapy. It also
takes into account cognition, as deficits may be a sign of
neurologic damage from the disease (and therefore reha-
bilitation is indicated). Of course, patients with impaired
cognition may have delirium without a brain injury and
still benefit from field hospital rehabilitation. In addition
to adding exercise to their field hospital care, skilled
therapy and/or physiatry evaluation allows for routine
reassessments of their cognitive status, which may
improve during their stay at the field hospital. Regardless
of the degree of cognitive impairment, these patients will
likely benefit from seeing a physiatrist and/or other reha-
bilitation team members as an outpatient once dis-
charged. Evaluating cognition on admission would
presume to increase the likelihood that patients with def-
cits are seen by appropriate providers and eventually be
transitioned to outpatient care.

Patients with more impaired function and who have
clear barriers to discharge modifiable with rehabilita-
tion intervention - including not being able to navigate
steps to enter their house and requiring assistance for
transfers - will be triaged to receive as much physical
and occupational therapy as resources allow, with physiatry
involvement as indicated to help with dis-
charge planning and symptom management. This may
reduce length of stay by addressing a patient’s physical
barriers to discharge during the time they would be
under medical observation and allow discharge as soon
as they are clinically stable (eg, afebrile for 3 d with
stable oxygen demand).

The second level of need is for patients with less
clearly defined goals, which will receive rehabilitation
care if available. Patients in this category may have
an uncertain caregiver situation, have delirium or
other cognitive deficit limiting their ability to carry
over learned information, or have too many impair-
ments to realistically be able to be discharged home
directly from a field hospital with the rehabilitation
resources available. These patients should still receive
physical and/or occupational therapy if available but
may still require discharge to a SNF or IRF when that
level of care is available. A third level is for patients
who either do not require rehabilitation or are too ill
to participate (eg, too high or worsening oxygen
requirements, or obtunded). All therapies should be
tailored to individual needs as much as possible.

To increase physical activity options for patients,
rehabilitation personnel should be utilized in flexible
positions. For example, many rehabilitation technicians
and physical therapy assistants could carry out the work
of a medical or nursing assistant (such as checking vitals)
while also being able to mobilize patients with proper
mobility techniques to enhance physical activity (eg,
walking programs). As an example, during down time
or at the time of checking routine vital signs, a physical
therapy assistant can walk with a patient. This not only

| Table 1 | Hierarchy for distributing rehabilitation care in resource-limited field hospitals |
|---------|----------------------------------|
| Clinical need | Moderate need | Little/no need |
| Clinically stable >24 h | Severe disability (discharge to inpatient rehabilitation) | Clinically unstable |
| Has focused, attainable rehabilitation goals | High oxygen demands | Cannot tolerate therapy |
| Physical impairment is barrier to discharge | Rehabilitation may not overcome barriers to discharge | No significant physical or cognitive impairments |

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increases the amount of physical activity in the day but also allows for measuring of oxygen saturation and blood pressure during activity.

All patients should receive education about exercises they can perform while in bed and information about ensuring a safe discharge (Figure 3).

Field Hospital: Acute Inpatient and Subacute Rehabilitation

The rehabilitation course of patients at field hospitals will be dependent on available therapy and equipment resources. Patients with greater need should be prioritized,
such as those with premorbid disabling conditions. Given the high volume of patients in a field hospital setting, identifying patients who need rehabilitation may be inaccurate at times and lack granularity. Using the previously described triage system, however, is one way for patients to be evaluated by a physiatrist or physical and/or occupational therapist. From there, a more specific triage of needs is possible. For example, the RCovR tool may indicate that 25% of patients admitted to the field hospital require rehabilitation, triggering an evaluation by a rehabilitation team member. That team member may then discover that the patient is severely impaired from critical illness neuropathy and require

Figure 3. Education sheet to be given to all patients.
intensive rehabilitation in an IRF setting when available. Other times, it may be clear that with 1-2 sessions a day of skilled therapy, a patient will be able to overcome barriers to discharge without additional rehabilitation beyond the field hospital.

If patients are considered good candidates for an ongoing inpatient rehabilitation program, transition to an accepting inpatient rehabilitation facility or subacute rehabilitation facility can be considered. If these programs are not available to infected patients, the physical and occupational therapists should continue to follow these patients as frequently as they are able.

Field hospitals are designed to efficiently house as many patients as possible in a defined area, but if sufficient space is available at a field hospital, we recommend that therapy equipment such as exercise bikes, treadmills, and training mats be made available, particularly for patients requiring more intensive rehabilitation and/or aerobic conditioning. If space is limited, priority should be given to pieces of equipment that represent the best balance between optimal therapeutic utility and ease/effectiveness of decontamination. Available space and what the health system can purchase or bring from the main hospital will ultimately dictate what equipment can be used.

When a field hospital has no dedicated space for rehabilitation, patients should receive appropriate ongoing therapies and be provided with information regarding bed exercises, exercises with family, and home exercise programs that appropriately address the symptoms of the disease. Digital resources represent an appealing medium as most rehabilitation providers in developed nations can access them, and they can be updated as more information becomes available.

**Discharge and Home Care**

Typical discharge planning services, such as social work and care management providers, may not be available to patients in a field hospital. Additionally, discharge teaching and education may be abbreviated or eliminated altogether given the high volume of patients and chaotic nature of the setting. To prevent lapses in postdischarge care, and to give patients guidance on what to do after they leave the field hospital, all patients discharged from a field hospital setting should be provided with education explaining steps they can take to optimize their overall health and function once home (Figure 3). If available, virtual visits by home care physical and/or occupational therapists should be arranged for those who need it.

Records of the patients who required increased rehabilitation care at the field hospital should be kept in a secure manner so that these patients can be contacted postdischarge to establish follow-up rehabilitation care.

**Conclusion**

Many COVID-19 patients admitted to field hospitals will require rehabilitation care and there may not be a clear discharge pathway to SNFs and IRFs. Given the resource-constrained nature of the field hospital, with limited staffing and equipment, identifying patients with severe disability and/or rehabilitation-modifiable barriers to discharge should be prioritized for interventions such as skilled physical therapy and physiatrist consultation.

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**Disclosure**

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