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Review Article

Post-ICU Discharge Management of Covid-19 Patients

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Abstract

Introduction: The Coronavirus disease (COVID-19), which was initially reported in December 2019 in Wuhan, China, has proven to be the worst enemy of humanity and has had huge impacts on the healthcare system of the world. On March 11, 2020, it was declared as a pandemic by WHO. While the healthcare workers are fighting the current covid 19 pandemic, another challenge that has developed is the aftermath of covid 19 patients that have been discharged from a medical facility after being severely ill in an intensive care unit (ICU).

Aim of Work: This review aims at highlighting various problems faced by covid-19 patients who have been discharged from the ICU and their subsequent management.

Methodology: The review is a comprehensive research of PUBMED, Google Scholar, and WHO official page from the year 2009 to 2021.

Conclusion: COVID-19 has affected almost every country in the world and has become the worst pandemic the world could see. Patients with severe pulmonary conditions or other comorbidities are critically ill and are being transferred to the Intensive Care Unit. Such patients have a prolonged stay in critical care and hence develop various mental and physical issues post their discharge. Various rehabilitation programs have been in function after the pandemic, which focuses on the overall welfare of the patient, including physical, psychosocial, mental, and cognitive welfare. Such rehabilitation programs should be encouraged, and patients should be kept under constant follow-up post their discharge.

Keywords: *RCOVID-19; PICS; Intensive Care Unit; Telerehabilitation*

Introduction

The Coronavirus disease (COVID-19), which was initially reported in December 2019 in Wuhan, China, has proven to be the worst enemy of humanity and has had huge impacts on the healthcare system of the world. It spread rapidly throughout the world, and on March 11, 2020, it was declared as a pandemic by the World Health Organisation. Many countries like Singapore, India, Europe, USA saw a sharp increase in the number of cases within a few months which eventually led to an acute shortage of hospital beds, medicines, and other medical facilities [1].

The symptoms of Covid 19 are mostly related to the respiratory tracts, which includes cough, fever, shortness of breath, loss of smell (anosmia), fatigue, body aches, pain in the joints; other symptoms were manifested in the gastrointestinal tract like acid reflux, diarrhea,

loss of taste, etc [2]. Any patient with the above symptoms and a positive lab report, irrespective of critical illness is considered a confirmed case. Around the world, a number of covid cases have reached up to 142,727,374, with 3,043,703 deaths across 200 countries. The percentage of people developing serious symptoms have been reported to be around 14%, with a death rate of about 4.2% [1].

While the healthcare workers are fighting the current covid 19 pandemic, another challenge that has developed is the aftermath of covid 19 patients that have been discharged from a medical facility after being severely ill and in an intensive care unit (ICU). The effects of Covid 19 in the long term after the patient has survived the disease is now a concern for the clinicians, and many types of research are being conducted for the same. There has been evidence about the chronic manifestation of the virus or late ill effects seen in a few patients. This pattern of the disease has been termed PICS which stands for post-intensive care syndrome. PICS is mainly formed of three subgroups that concentrate on the overall patient welfare. Covid patients seem to face the same issues as patients recovering from critical illness, with the added problem of the virus being novel because of which the progression of this disease is not known [3].

Methodology

The review is a comprehensive research of PUBMED, Google Scholar, and WHO official page from the year 2009 to 2021. Crossref was used to check the result of search. The output of search was screened and only relevant articles were included. The terms used for the search were: COVID-19, ICU discharges, ICU related complications in COVID 19 infected patients.

Post ICU discharge symptoms of patients

Covid 19 in its severe form causes pneumonia leading to acute respiratory distress syndrome, in which case the patients have to be admitted to the intensive care unit (ICU) for a long period of time. In the long stay of ICU, the patient suffers from severely low blood oxygen levels, organ failures beyond the pulmonary organ, and increased markers of inflammation. A study conducted by Stewart., *et al*. where they studied a young population below the age of 30 with no comorbidities and severe illness, showed that once the patient has been admitted to the ICU for such a long time, there has been an incidence of organ reprogramming for them [4]. Such patients who have survived the disease later tend to develop loss of weight, severe weakness, infirmity, and cognitive impairment. The recovery of body mass index lags behind in various tissues due to disruption in metabolic control, leading to type 2 diabetes and gain in body fat. A lot of patients develop damage at the microscopic level in many organs during the time when the inflammation is at its peak, which does not get repaired perfectly and leads to a chronic state of disease in the concerned organs, mostly chronic kidney disease and posts ICU cardiovascular events [5]. These symptoms occur in the patients due to their immunosuppressed state and low-grade inflammation post their admission in ICU, which makes them liable to such secondary infections [5]. In such cases, the disease caused by sedentarism is generally countered by physical activity, but infections present do not get affected by physical activity and require medical intervention [6]. When patients suffering from severe illness develop chronic inflammation or thrombosis, inhibitors of such processes play a pivotal role in benefitting the survivors. The CANTOS trial that was conducted in 2017 showed that patients with cardiac disease, lung cancer, and blood disorders, when treated with Interleukin-β (IL-β), showed evidence of improvement [7]. In the trial, it was seen that when the administration of IL-β was stopped for patients recovering in ICUs, the risk of infection increased for such patients [7].

COVID 19 patients, apart from suffering the above-mentioned issues as faced by patients recovering from any critical disease, also suffer an additional problem of not knowing the progression of the disease, causing uncertainty during the recovery phase.

PICS and its domains have played an important role in the recovery phase of the patient PICS are mainly formed of three subgroups that concentrate on the overall patient welfare (Figure 1) [3].

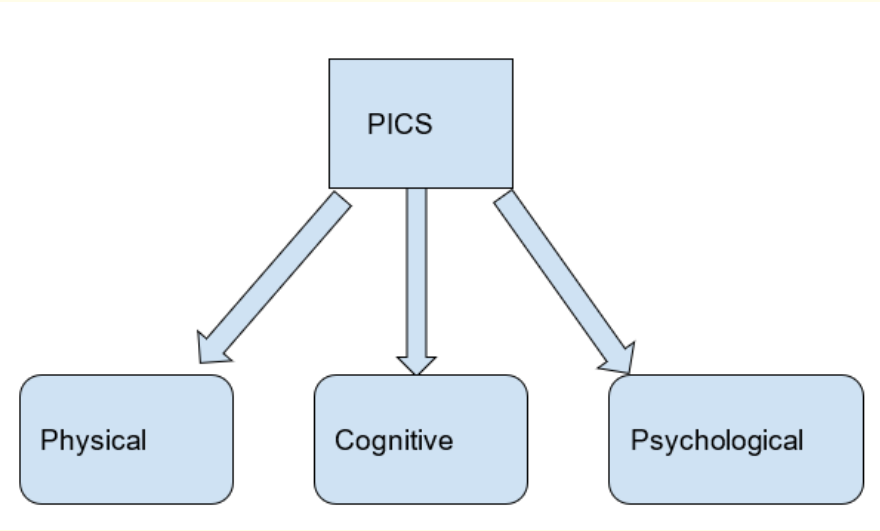

Figure 1: *Domains of PICS [3].*

Once the patient is discharged from the ICU, the main question that arises is who will take care of the patient after that. The team present in ICU is trained to take care of the patient after their critical illness phase is over. They focus on what the need is during the recovery phase and refers them to the appropriate facility as per the patient's need. Some patients have a critical recovery period requiring community rehabilitation facilities, cardiopulmonary rehabilitation, cognitive rehabilitation, psychological guidance or vocational support, etc. These services, when working in full coordination with the hospital, tend to make the best network providing the patient a completely optimized recovery phase [8].

Covid 19 recovery unit

The covid recovery unit aims at dealing with the complex after-effects of the disease and a faster recovery as compared to the conventional shift from ICU to surgery ward to a rehabilitation unit. The Weill Cornell Medical Center came up with a 30 bed unit for covid patient recovery that provided a multidisciplinary approach for a comprehensive treatment plan which included medical rehab and neuro-psychological needs. The recovery team included consultants from various departments like Nephrology, Pulmonary medicine, Gastrointestinal, Geriatrics, etc.

The eligibility criteria for inclusion that the hospital made for patient's admission in the covid recovery unit were as followed (Table 1) [9].

Inclusion Criteria	Exclusion Criteria
The patient should be able to condone at least 30 mins of physical therapy	The patient should not be suicidal or be undergoing dementia or full-time care.
The patient should be able to communicate well with the e hospital staff and other inpatients	Patients who are bedridden and have a low expectation about getting back to normal physical strength
The patient should not need any peritoneal dialysis	Patients who were on a ventilator, who still require high amounts of oxygen for survival
Final discharge for the patient is anticipated to be in acute or subacute rehabilitation	

Table 1: *Inclusion and exclusion criteria for patients do enter the recovery unit post-Covid as per hospital guidelines [9].*

Once the recovery unit was created and patients admitted, the patients were made to follow a certain set of activities to improve physical and mental health; after recovering from Covid 19 in the ICU, there are certain things that go through the survivor's mind, including survivor's guilt, patient recovery units like these helped the patients to interact and socialize soon after their ICU stay thereby removing the fear of facing society after the ICU stay. The multidisciplinary approach used by the hospital where they combined medical, psychological, and physical rehabilitation prove to be a good stimulant in the recovery process of the patients recovering from COVID 19 [9].

Possible impairments after COVID-19 ICU discharge and their management

Impairments in the physical well-being of the patients are a common symptom after critical illness and ICU stay. In such cases, muscle wasting and weakness are commonly seen due to prolonged hospital stay. In serious cases of COVID, the patient requires prolonged ICU stay with mechanical ventilation and neuromuscular blockade, and immobility, which further puts the patient at a higher risk for physical impairments. Due to an extended duration of stay on the ventilator, the patient may suffer injury in the larynx, diaphragm due to the intubation done by the tube [10]. Another after-effect was seen in patients post-COVID 19 is impairment in cognitive abilities, leading to loss of memory and delirium. This happens as a result of a prolonged isolated stay in the ICU with heavy sedatives in the body and inability to interact with any family member as a result of increased risk of infection exposure, this effect of reduced interaction with humans causes further deterioration in the patient's condition [11]. Patients with underlying blood sugar issues like diabetes mellitus suffered increased levels of blood sugar; the patients also showed increased inflammatory responses due to delayed action of TH1/TH17 [12]. A higher mortality rate and increased admission in the Intensive care unit were also seen in patients with kidney impairments [13].

In a recent study conducted by Huand., *et al*. [14], they studied a patient who was admitted to the critical care unit for 12 days due to respiratory failure and was again readmitted due to respiratory reinfection due to a recurrent episode of pneumonia for another 15 days. Once the patient was discharged, he was put on a rehabilitation program; the main problems faced by the patient in the rehabilitation unit were proximal muscle weakness, musculoskeletal wasting, tremors as a result of weakness, reduced pulmonary activity, problems in swallowing food as a result of impaired muscle functions, psychological and emotional issues, and loss in appetite. The patient was not able to walk for more than 60m without supervision and was not motivated for the rehabilitation process. Although after his second stay in the ICU, his respiratory issues were solved to an extent he was kept incentive spirometer use 3 times a day for 15 minutes where the tidal volume was set at > 400 - 600mL per breath, 10 - 20 breaths/minute. Physiotherapy was started for the patient, which included standing balance, weight training, using resistance bands, half squats, circuit training, and progression in ambulation, with the resting interval getting shorter at every appointment. Due to difficulty in swallowing food, the patient was kept on a nasogastric tube for food intake, later the patient was kept under dysphagia therapy which improved his swallowing ability, and he was able to take food through the oral passage. Customized home exercises were done for the patient for physical strengthening, which included [14].

1.	Calisthenic exercises which induced strength training that exercised large muscle groups like standing, pushing, climbing stair, etc.
2.	Various range of motion exercises
3.	Exercises for limb strengthening
4.	Energy conserving exercises like pacing and prioritization of activities
5.	Breathing exercises for the diaphragm
6.	Devices for walking with assistance

Table 2: *Customised discharge program for a patient recovering from ICU post-Covid-19 [14].*

The entire program and the patient were monitored through calls, messages, telecommunication, and video conferencing as the nationwide lockdown was still enforced [14].

Healthcare providers and their concerns after patient discharge post-COVID 19

The main concern for the healthcare workers is infecting their family and friends, which is very realistic considering the way pandemic is spreading all across the world; in such times, veterans who have already helped the patients during previous virus outbreaks are a great source of inspiration for the younger staff. Admission to the rehab facilities was also delayed due to various COVID 19 protocols, including negative reports for a retest, which took a long time. This problem was solved after recent research showed that a viable virus was removed from the body post the first phase of sickness [15]. Psychosocial, emotional health took the longest time to recover in the case of COVID 19 because of various stigma attached to the disease, especially of contagion. The family members also kept their distance even after the patient's discharge because of the fear of exposure. Psychiatric interference, including counseling and reassurance of the patient as well as the family members, played an important role in overcoming the stigma. Telerehabilitation has proven to be a great source for communication and rehabilitation in patients recovering from COVID 19 [16]. Post-discharge instructions are printed and provided an as hard copy to patients, which is then monitored through various calling and messaging media. Various applications with recorded exercises were helpful for patients recovering from physical impairments [16].

The survival of Covid 19 depends highly on the amount of evidence-based care given to the patient accompanied by early rehabilitation, which focuses on the overall welfare of the patient, which includes an equal contribution from all departments, be it medical, physiotherapy, psychiatrically and sufficient social support [17]. Due to the virus being so novel, critical care for the patient is highly condition-based, and the best care given should be evidence-based treatment according to the patient's condition. A multidisciplinary approach for rehabilitation should be started at an early stage in the recovery process, most likely after cardio-pulmonary stability is achieved. The patient's participation in his rehabilitation process gives him/her a feeling of normalcy and control around him and in his recovery. The patient feels more in charge of his own recovery, thereby improving his mental status [18].

Conclusion

COVID-19 has affected almost every country in the world and has become the worst pandemic the world could see. Patients with severe pulmonary conditions or other comorbidities are critically ill and are being transferred to the Intensive Care Unit. Such patients have a prolonged stay in critical care and hence develop various mental and physical issues post their discharge. Various rehabilitation programs have been in function after the pandemic, which focuses on the overall welfare of the patient, including physical, psychosocial, mental, and cognitive welfare. Such rehabilitation programs should be encouraged, and patients should be kept under constant follow-up post their discharge.

Bibliography

1. World Health Organization. WHO Timeline-COVID-19 (2020).

2. Docherty A B., *et al*. "Features of 20 133 UK patients in hospital with covid-19 using the ISARIC WHO Clinical Characterisation Protocol: prospective observational cohort study". *BMJ* (2020): 369.

3. Flaatten H and Waldmann C. "The Post-ICU Syndrome, History and Definition". In Post-Intensive Care Syndrome Springer, Cham (2020): 3-12.

4. Stewart I J., *et al*. "Retrospective analysis of long-term outcomes after combat injury: a hidden cost of war". *Circulation* 132.22 (2015): 2126-2133.

5. Yende S., *et al*. "Long-term host immune response trajectories among hospitalized patients with sepsis". *JAMA Network Open* 2.8 (2019): e198686-e198686.

6. Griffith D M., *et al*. "Systemic inflammation after critical illness: relationship with physical recovery and exploration of potential mechanisms". *Thorax* 71.9 (2016): 820-829.

7. Baylis R A., *et al*. "The CANTOS trial: one important step for clinical cardiology but a giant leap for vascular biology". *Arteriosclerosis, Thrombosis, and Vascular Biology* 37.11 (11): e174-e177.

8. British Society of Rehabilitation Medicine. Rehabilitation for patients in the acute care pathway following severe disabling illness or injury: BSRM core standards for specialist rehabilitation (2014).

9. GhoshArnab K., *et al*. "A Paradigm for the pandemic: a Covid-19 recovery unit". *NEJM Catalyst Innovations in Care Delivery* (2020).

10. Brodsky M B., *et al*. "Laryngeal injury and upper airway symptoms after oral endotracheal intubation with mechanical ventilation during critical care: a systematic review". *Critical Care Medicine* 46.12 (2018): 2010.

11. Pandharipande P P., *et al*. "Long-term cognitive impairment after critical illness". *New England Journal of Medicine* 369.14 (2013): 1306-1316.

12. Zhang J J., *et al*. "Clinical characteristics of 140 patients infected with SARS-CoV-2 in Wuhan, China". *Allergy, the official journal of the European Academy of Allergy and Clinical Immunology* (2020).

13. Cheng Y., *et al*. "Kidney impairment is associated with in-hospital death of COVID-19 patients". *Med Rxiv* (2020).

14. Ramalingam M B., *et al*. "Rehabilitation of a Post–Intensive Care Unit Patient After Severe COVID-19 Pneumonia". *American Journal of Physical Medicine and Rehabilitation* 99.12 (12020): 1092-1095.

15. MIN C O W. "Position Statement from the National Centre for Infectious Diseases and the Chapter of Infectious Disease Physicians, Academy of Medicine, Singapore: Period of Infectivity to Inform Strategies for De-isolation for COVID-19 Patients (2020).

16. Medica EM. "Telemedicine from research to practice during the pandemic". Instant paper from the field" on rehabilitation answers to the Covid-19 emergency (2020).

17. Hosey M M and Needham DM. "Survivorship after COVID-19 ICU stay". *Nature reviews Disease primers* 6.1 (2020): 1-2.

18. Korupolu R., *et al*. "Rehabilitation of critically ill COVID-19 survivors". *The Journal of the International Society of Physical and Rehabilitation Medicine* 3.2 (2020): 45.

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