Beyond the ICU: The Association Between Post Intensive Care Syndrome and Survivors of Severe COVID-19

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Introduction: Severe COVID-19 is associated with high rates of intensive care unit (ICU) delirium and prolonged mechanical ventilation due to acute respiratory distress syndrome. We hypothesize that COVID-19 ICU survivors are at high risk for developing post-intensive care syndrome (PICS), namely long-term cognitive, psychiatric, and physical impairments which persist after ICU hospitalization. Methods: We conducted a prospective observational study at two sites of 49 patients who met the following inclusion criteria: age 18 or older, admitted to the medical ICU, had a positive COVID-19 nasopharyngeal swab, and attended at least one outpatient visit at the Indiana University School of Medicine's Critical Care Recovery Center (CCRC). Patients were administered assessments by trained personnel of cognition (Mini Mental State Exam [MMSE] or Montreal Cognitive Assessment [MoCA]) and self-reported scales for depression (Patient Health Questionarre-9 [PHQ-9]), anxiety (General Anxiety Disorder-7 [GAD-7]), post-traumatic stress disorder (Post Traumatic Symptom Scale-10 [PTSS-10]), quality of life and physical functioning (EuroQol-5D Quality of Life questionnaire [EQ5D QoL], EuroQol-5D5L [EQ5D5L], Healthy Age Brain Care Monitor Self Report [HABC-SR]). Descriptive statistics were computed as frequency, mean, and standard deviation using SPSS. Results: A total of 49 patients were included in the study with 30.6% female, mean age of 51.89 (SD 13.95). Nearly all patients (93.9%) required mechanical ventilation while hospitalized. The average hospital length of stay was 23.06 days (SD 12.3) and the mean days from discharge to initial evaluation in the CCRC was 87.3 (SD 43.2). Scores suggestive of mild cognitive impairment were seen in 23.3% (n = 36) of patients who performed the MMSE and in 37.5% (n = 16) of patients who completed the MoCA. Of the patients who participated in the PHQ-9, 33.3% (n = 36) had an abnormal score consistent with at least mild depression. 21.1% (n = 47) of the patients had abnormal scores on the functional subscale of the HABC-SR. Most notably, the mean quality of life score was 67.8 (SD 19.08) using the EQ5D QoL. Conclusions: ICU hospitalization for severe COVID-19 symptoms may be associated with long-term impairments in cognition, mental health, and physical function consistent with PICS. Larger observational cohort studies are needed to have a deeper understanding of COVID-19-related PICS, risk factors for COVID-19 PICS, and factors affecting recovery from PICS. These results emphasize the importance of continued focused assessment of ICU survivors to help identify and treat impairments in these domains in order to improve quality of life.

Table 1. Demographics and Clinical Characteristics of COVID-19 ICU Survivors

Age, mean (SD)	51.89 (13.95)
Sex, n (%)	
Female	15.0 (30.6)
Race, n (%)	
African American	15.0 (30.6)
Hispanic	22.0 (44.9)
White	9.0 (18.4)
Other	3.0 (6.1)
Education*, n (%)	
High School	7.0 (46.7)
Some College	4.0 (26.7)
College	3.0 (20.0)
Graduate School	1.0 (6.7)
Clinical Characteristics	
Underwent Invasive Mechanical Ventilation	46.0 (93.9)
Underwent ECMO, n (%)	6.0 (12.2)
Duration of ECMO, days (SD)	7.0 (3.79)
Mean duration of Hospital Stay, days (SD)	23.06 (12.3)
Mean days from Discharge to 1st Visit, days (SD)	87.3 (43.2)
Discharge Disposition, n (%)	
Home	33.0 (70.2)
Acute Rehab	9.0 (19.1)
LTACH	4.0 (8.5)

N = 49 for all variables unless indicated otherwise.
*N = 18.
All continuous variables are described as mean (SD), and all dichotomous variables are described as mean (SD) unless indicated otherwise.
Extracorporeal membrane oxygenation = ECMO. Long term acute care facility = LTACH

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