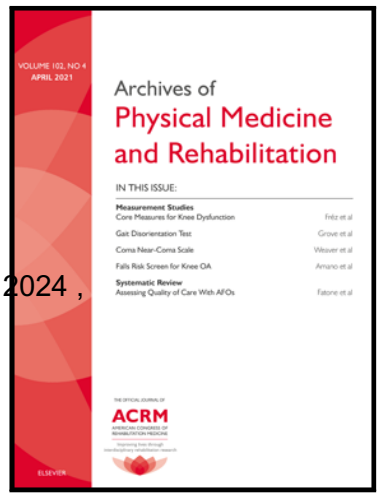

Acute Occupational and Physical Therapy for COVID-19 Patients: A Retrospective Cohort Study

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Author Disclosures:

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Highlights

- **What is Known:** Severe illness and prolonged hospitalization can lead to functional impairments. Access to rehabilitation in the acute care can promote positive functional outcomes. Limited research exists for patients with COVID-19.
- **What is New:** Patients with COVID-19 receiving rehabilitation services in the intensive care unit (ICU) were more likely to have impaired cognition, strength, and sensation compared to non-ICU patients. 76% of patients with COVID-19 evaluated by therapy were recommended to receive rehabilitation services at discharge. Patients with COVID-19 in the ICU who received rehabilitation services were able to reach the same functional level as non-ICU patient at discharge from the hospital.

Title:

Acute Occupational and Physical Therapy for COVID-19 Patients: A Retrospective Cohort Study

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Abstract

Objective: To describe the function of patients with COVID-19 admitted to an acute care hospital early in the pandemic and to characterize change in function among those admitted to intensive care units (ICU) and to non-critical care services.

Design: This descriptive, retrospective cohort study examined patients infected with SARS-CoV-2 admitted to a tertiary care medical center during the first wave of the pandemic in 2020. Included patients were stratified into four cohorts based on whether or not they received therapy

during their hospitalization and whether or not their hospitalization included time in the intensive care unit (ICU). Data on demographics, functional impairments, medical interventions, and functional outcomes were collected.

Setting: Hospital

Participants: 432 adult patients were included in this study.

Results: ICU patients receiving therapy were more likely to have impaired cognition, impaired strength, and impaired sensation than non-ICU patients receiving therapy. Patients made improvements from evaluation to discharge on the Functional Status Score for the ICU, AM-PAC Daily Activity, and AM-PAC Basic Mobility Short Forms.

Conclusion: Patients admitted with COVID-19 experienced significant functional impairments, but also demonstrated improvement during the course of their hospitalizations. This study can facilitate healthcare provider awareness of the detrimental functional impacts of COVID-19 and the potential role of rehabilitation services for these patients.

Key Words: COVID-19, acute rehabilitation, physical therapy, occupational therapy

ICU: intensive care unit

FSS ICU: Functional Status Score for the ICU

AM-PAC: Activity Measure for Post-Acute Care

WHO: World Health Organization

ARDS: Acute Respiratory Distress Syndrome

REDcap: Research Electronic Data Capture database.

LTACH: Long term acute care hospital

ECMO: Extracorporeal membrane oxygenation

SD: Standard deviation

Acute Occupational and Physical Therapy for COVID-19 Patients: A Retrospective Cohort Study

In March 2020, the World Health Organization (WHO) declared the novel coronavirus strain SARS-CoV2 (the virus causing COVID-19) a global pandemic.[24] The severity of illness in those exhibiting symptoms ranges from mild (cough, shortness of breath, fatigue) to severe (acute respiratory distress syndrome (ARDS), thrombosis, stroke, and death).[4,11] Patients have also acquired acute polyradiculoneuritis (Guillain Barre syndrome) at a disproportionately high rate, contributing to functional limitations that require specialized and intensive rehabilitation.[18]

Research on critically ill patients performed prior to 2020 suggests that the cumulative impact of various medications, sedation, and ventilation can lead to post-intensive care syndrome (PICS), which includes cognitive, physical, and psychological health complications.[18] Early and intensive rehabilitation efforts are effective in preventing and addressing delirium in critically ill patients, and have promoted prompt return to valued daily occupations.[6,19] Sedation interruption and early mobilization and activity provided by physical and occupational therapy improves functional performance in activities of daily living and functional mobility.[17] Many patients with COVID-19 experience prolonged lengths of stay in the acute care setting, increasing their risk of PICS and need for rehabilitation services.[5,10]

Given the wide range of disease severities in COVID-19 illness, it is critical that clinicians appreciate the degree of functional impairment in COVID patients and the availability of therapy for both ICU and non-ICU patients. In particular, widely utilized functional outcome

measures for hospitalized inpatients should be disseminated in order to facilitate further research on the effects of therapy in the acute setting. The purpose of this study was to describe the function of patients with COVID-19 admitted to the hospital early in the pandemic, and to characterize the change in function among patients admitted to intensive care units (ICU) and to non-critical care services.

Methods

Data Collection

Data for this study was collected through a retrospective chart review of patients admitted to Loyola University Medical Center (LUMC) during April and May 2020. Data was obtained through the internal LUMC COVID registry and the electronic medical record. The Institutional Review Board deemed this study exempt from review. All adult patients (ages 18+) admitted to LUMC who tested positive for COVID-19 were included in the analysis. All the data was de-identified upon collection and stored on a secure Research Electronic Data Capture (REDCap) database.

Early in the surge, patients infected with SARS-CoV-2 were identified through targeted testing of probable cases based on clinical judgment; later the institution transitioned to universal testing of all hospitalized patients. LUMC administered a combination of polymerase chain reaction assays (either the Abbott M2000 or Cephid Xpert) and nucleic acid amplification testing (Abbott IDNow). The following data was collected from medical records of positive cases: demographics (age, sex, race, ethnicity), known comorbidities (chronic lung disease, diabetes, cardiovascular disease, renal disease, liver disease, immunosuppressive disorders, neurologic disorders, cancer), smoking status, mechanical ventilation, extracorporeal membrane oxygenation (ECMO) use, receipt of neuromuscular blockade, length of hospital stay, and

discharge destination. Known comorbidities were recorded when there was mention of the disease in the admission notes; data on the severity of each comorbidity were not available.

Additional data was collected for those who received physical and/or occupational therapy services while hospitalized. This included functional impairments in the following areas: proximal strength (trunk and proximal extremities), distal strength (distal extremities) cognition, sitting and standing balance, sensation of upper and lower extremities, proprioception of upper and lower extremities, coordination of upper and lower extremities, and activity tolerance. Also collected were scores on functional outcome measures Functional Status Score for the Intensive Care Unit (FSS-ICU) and the Boston Activity Measure for Post-Acute Care (AM-PAC) "6 clicks" Mobility and Daily Activity Short Forms.

The presence or absence of functional impairments was recorded during chart review of therapists' initial assessment for every patient receiving therapy services. Occupational and physical therapists would complete the evaluation template and check whether or not patients demonstrated impairments in the assessment. The evaluation form at the institution includes standard assessment of cognition via orientation, memory, and command following, strength via manual muscle testing, sensation and proprioception via light touch and position sense. Balance, coordination, and activity tolerance were determined to be impaired or not based on therapist observation of patient during evaluation tasks such as bed mobility, activities of daily living, and ambulation. These are foundational tests and measures taught in the education and training of physical and occupational therapist and all therapists at the institution demonstrate competency upon hire.

The discharge destination (long-term acute hospital, acute inpatient rehabilitation, skilled nursing facility/subacute rehabilitation, home therapy, outpatient therapy, or long-term care) was

recorded from discharge summaries. Acute inpatient rehabilitation requires patients to be able to tolerate 3 or more hours of therapy daily[21]. Patients who were discharged to skilled nursing facilities could receive continued occupational and physical therapy (subacute rehabilitation).[22] This level of care was differentiated from long-term care facilities or nursing homes. Medical interventions commonly employed in the ICU were also recorded, including time spent on mechanical ventilation, time spent on neuromuscular blockade, and time on ECMO. Rehabilitation-specific data was also collected from the medical record, including whether or not the patient had physical and/or occupational therapy, recommended frequency of physical and occupational therapy in the hospital, and whether therapy was recommended at discharge. The recommendations for therapy frequency and discharge destination were made based on the evaluating therapists' clinical reasoning.

Functional outcome measure scores were collected during initial evaluation and every treatment session after. These included the FSS-ICU and Boston AM-PAC "6 Clicks" Basic Mobility and Daily Activity Inpatient Short Forms. These assessments have both demonstrated reliability and validity in the literature.[7,8] The FSS-ICU is a measure of physical function of ICU patients that can help predict the likelihood of a patient being discharged to a home setting.[7,20] At the institution where this research took place, both occupational therapists and physical therapists administer the FSS-ICU. This assessment has 5 basic functional mobility tasks that are rated from 0-7. A score of 0 indicates unable to complete and 7 indicates independence with task. Higher scores on this assessment (35 being the highest) indicate greater independence with functional mobility and lower scores (0 being the lowest) indicate more dependence in functional mobility.[7] All therapists are trained in the assessment and patients are scored each visit they are seen by therapy in the ICU. The FSS-ICU was only administered when patients were in the ICU

therefore the score was recorded for ICU patients at the initial therapy evaluation as well as the score on their last day treated in the ICU. The minimally important difference in FSS-ICU scores for discharge found in the literature is between 2.0-5.0.[7] Higher FSS-ICU scores have been associated with shorter length of stay in hospital after discharge from ICU. For each 1.0 point increase in FSS-ICU score, it is estimated the post-ICU length of stay will be reduced by .27 days.[7]

The Boston AM-PAC "6 Clicks" Basic Mobility and Daily Activity Inpatient Short Forms are standardized assessments of the activity limitations in the acute care setting.[8] At this institution, occupational therapists administer the Daily Activity Short Form and physical therapists administer the Basic Mobility Short Form. Both assessments contain 6 domains related to amount of assist a patient needs with activities of daily living and functional mobility respectively. Each domain is scored from 1 to 4 with one meaning the patient is dependent and 4 meaning the patient is independent. A higher score (24 being the highest) on each of these assessments indicates greater independence in activities of daily living and functional mobility, whereas lower scores (6 being the lowest) indicates greater dependence for task completion.[8]

All therapists are trained in the assessment and patients are scored each visit they are seen by therapy when admitted to a non-critical care service. The AM-PAC score was recorded for all non ICU patients. The AM-PAC score was also recorded for ICU patients once and if they transitioned out of the ICU. The timing of when patients were seen for their first therapy visit after transferring to a non-critical care service varied based on their recommended frequency. For those patients who were previously in the ICU, AM-PAC scores were recorded at their first therapy session on the floor and then again recorded at the final therapy session. For patients who were never in the ICU, the AM-PAC scores were recorded at initial therapy evaluation and

at the final therapy session. For both the Basic Mobility and Daily Activity Short Forms, lower scores indicate greater degrees of functional impairment.[6] Minimal detectable changes with 90% confidence level are 4.72 and 5.49 for Basic Mobility and Daily Activity scores, respectively. The Boston AM-PAC "6 Clicks" Basic Mobility and Daily Activity Inpatient Short Form scores have been found to predict discharge destination. A Basic Mobility score of at least 40.78 (raw score 16) and Daily Activity score of at least 40.22 (raw score 19) has been found to predict discharge to home environments.[23]

Statistical analysis

Included patients were divided into four cohorts according to whether they received therapy during their hospitalization, and whether their hospitalization included time in the intensive care unit (Figure 1). Normally distributed variables are presented as means and standard deviations (SD); non-normally distributed variables are presented as medians and quartiles. Paired t-tests were used to compare pre- and post- outcomes measures within a group, where the patient served as their own controls. All analyses were performed using SAS 9.4 (Cary, NC); p-values <0.05 were deemed statistically significant.

Results

During the study period, 432 adult patients were admitted with COVID-19 (Figure 1). Patient characteristics differed among the four cohorts regarding age, ethnicity, and the presence of cardiovascular disease (Table 1). Of the 207 patients with an ICU admission, 111 (67%) received therapy; of the 225 patients without an ICU admission, 54 of them (33%) received therapy. Of the patients spending time in the ICU, a greater percentage of those not receiving therapy died during the hospital stay, compared with those who did receive therapy (64% versus 17%). Patients who were seen by therapy in and out of the ICU were found to have impairments

in cognition, strength, balance, activity tolerance, sensation, coordination, and proprioception (Table 2). All impairments were more prevalent in those individuals seen within the ICU except for sensation and balance. The difference in balance percentage was only 3% (89% outside of ICU and 86% within ICU). Cognitive impairments were seen in 67% of patients in the ICU and 43% of patients seen outside of the ICU. Impaired activity tolerance was seen in nearly all individuals, with 97% of patients having impaired activity tolerance within the ICU and 94% outside of the ICU. Strength was impaired in 75% of patients within the ICU and 56% outside of the ICU with proximal strength being more impaired than distal strength. Impaired coordination was noted in 38% of those within the ICU and 28% without an ICU stay. Impaired proprioception was only seen in 8% of those seen within an ICU and 6% outside of the ICU.

For both physical and occupational therapy, the most recommended therapy frequency was 4-5 times per week. Those without an ICU admission had lower recommended frequencies of therapy per week recommended compared to those who had an ICU stay (Table 2). Of all the patients seen by therapy, therapists recommended 123 patients (76%) to receive therapy services after hospital discharge.

Patients made improvements from evaluation to discharge on the FSS-ICU and AM-PAC Daily Activity and AM-PAC Basic Mobility Short Forms (Table 3). Those with an ICU stay demonstrated significantly lower median AM-PAC scores compared to those without an ICU stay. However, by discharge, there were no significant differences between the two groups, indicating these patients were able to make significant progress while receiving physical and occupational services and eventually reach the same functional level as those who were not in the ICU. Those with an ICU stay had significant improvement in FSS-ICU, AM-PAC Basic Mobility, and AM-PAC Daily Activity scores between evaluation and discharge. Those median

AM-PAC Basic Mobility and AM-PAC Daily Activity scores increased for those who did not spend time in an ICU, but only the change in AM-PAC Basic Mobility score reached statistical significance.

Among the 261 patients who were discharged home, 197 (75%) did not spend time in the intensive care unit. Sixty-four of the 207 ICU patients (31%) were discharged home. Among the 111 ICU patients who received therapy, 40 (43%) were discharged home, 1 (1%) went to a nursing facility, 34 (37%) went to a rehabilitation facility for either subacute rehabilitation or acute inpatient rehabilitation, 17 (18%) went to a long-term acute care facility or were transferred to another acute care hospital, and 19 (17%) died while inpatient.

Therapy was provided to a number of patients who received mechanical ventilation, neuromuscular blockade, and ECMO support during their hospitalization. All ECMO patients (n=6) received therapy. More patients on mechanical ventilation received therapy than not (72% versus 67%). There were similar percentage of patients receiving therapy between those treated and not treated with neuromuscular blockade (36% versus 34%) (Table 4).

Discussion

In this retrospective cohort study of patients admitted to a tertiary care hospital with COVID-19 during the first surge, patients who were admitted to the ICU demonstrated greater functional impairments and had more rehabilitation needs than those who were never admitted to the ICU. Patients who were admitted to the ICU but did not receive therapy services were more likely to die in the hospital.

On average, both critically-ill and noncritically-ill patients who received therapy services made functional gains in the hospital. Even in the very acute stages of illness patients improved their functional status. Due to the fact that functional outcomes measure scores were available

only for patients who received therapy, it cannot be inferred that these improvements were due to receiving therapy services in the acute care setting. However, we can conclude that patients with severe COVID illness are capable of achieving functional gains commensurate with those of the non-critically ill population.

Patients demonstrated improvements from evaluation to discharge on the FSS-ICU, AMPAC Daily Activity, and AMPAC Basic Mobility Short Forms. The mean improvement in FSS-ICU scores was 2.5 points, which is consistent with the minimally important difference in scores (2.0-5.0) for ICU discharge found in prior studies.[7] This study's results are consistent with those of Johnson et al.,[19] which found that patients with COVID-19 who received a higher frequency of physical therapy services demonstrate improved mobility and increased likelihood of returning home instead of discharge to a rehabilitation facility.[9] Abramoff and colleagues[1] reported that patients who were hospitalized with COVID-19 reached the same functional level upon discharge as those hospitalized without COVID-19.[1] Another study by Busching et al. found that rehabilitation can improve physical function and participation in daily activities for patients with COVID-19 including those with severe disease.[2] These studies are consistent with this study's findings that patients with severe cases of COVID-19 can make functional gains in function while receiving rehabilitation services.

Patients admitted to the hospital with COVID-19 frequently presented with impairments in activity tolerance, strength (trunk, proximal extremities, and distal extremities), sitting and standing balance, and cognition. Impairments in upper and lower body coordination, proprioception, and sensation were also present but less frequent. Overall, patients in the ICU were more likely to demonstrate functional impairments during therapy evaluations than non-ICU patients. Other studies have documented similar findings regarding functional impairments.

Musheyev et al.[12] found that non-critically ill survivors demonstrated functional scores on the ICU Mobility scale and modified Barthel Index that were below normal.[12] Another study by the same author found that many critically ill patients were functionally independent prior to their illness, but were not independent at hospital discharge.[13] Identification of functional impairments in this population has important implications for early discharge planning. Roberts et al.[16] showed that functional status is a strong predictor of discharge destination, underscoring the utility of physical and occupational therapy involvement during these patients' hospitalization.[16] A comprehensive understanding of the functional needs of COVID-19 patients is imperative for occupational and physical therapists to guide interventions to optimize recovery across all settings. It is also important for medical providers to be aware that patients may present with these challenges and that referral to rehabilitation may be beneficial. Physical and/or occupational therapy was recommended after discharge from the hospital for 76% of the patients who were evaluated by therapy, suggesting that therapists in a multitude of settings (long-term acute care hospitals, acute inpatient rehabilitation, subacute rehabilitation, home therapy, and outpatient therapy) will work with patients who are affected by COVID-19.

The severity and prolonged nature of the symptoms and impairments post COVID-19 were not realized initially, which also contributed to a delay in orders and lack of protocols with this population. A study by Myszenski and colleagues[14] suggested a similar delay in the initiation of physical and occupational therapy early in the first surge.[14] Protocols to include rehabilitation in future health disaster response could promote earlier engagement in physical activity and activities of daily living and potentially reduce the negative impacts of immobilization, as well as potential long-term effects of illness.

Limitations

This study has several limitations. First, the sample size of 432 was relatively small and the sample size of patients with therapy (165) was even smaller. Patients were not randomly assigned to receive therapy but ordered per physician discretion, so the two cohorts were subject to selection bias. Patients who did not receive therapy were not evaluated for functional impairments, therefore it is unknown how much they improved. Another limitation was the inconsistency of placing therapy orders and/or timing of placement of orders. This was due in large part to the novelty of this virus and rapidly occurring changes in medical management as well as medical personnel.

One limitation of the outcome measure data is that the AM-PAC Basic Mobility and AM-PAC Daily Activity short form scores were only obtained when patients were on a non-critical care service and FSS-ISU scores were only collected in the ICU. For patients who were admitted first to the ICU and then transitioned to a non-critical care service, the same outcome measure was not administered from initial therapy evaluation to discharge. In future studies, utilizing a consistent outcome measure throughout the entire stay would more accurately capture the improvements made by patients. Although the recommended physical and occupational therapy frequencies were recorded, data was not collected on whether these frequencies were met or not. This is something to be considered for future studies in order to help gain a more accurate portrayal of a patient's tolerance and response to higher or lower frequencies of therapy.

This study provides insight into the functional characteristics of patients with COVID-19 and changes in function between the start and end of their COVID hospitalizations. This study shows rehabilitation services can be provided to COVID-19 patients in the ICU as well as those with milder cases not in the ICU, and that positive functional outcomes can be achieved even among ICU patients. This data can provide reference values for future studies examining the

function and rehabilitation needs of patients with COVID-19. Considerable work remains in the effort to better understand this disease and patient population.

Conclusions

This study can facilitate healthcare provider awareness of the detrimental functional impacts of COVID-19 and the role of rehabilitation services for this patient population. Although the initial surge of COVID-19 occurred in 2020, the pandemic continues, and this illness will likely be a part of healthcare for years to come. Individuals will continue to become newly infected with COVID-19 and/or experience long term effects of this illness for the foreseeable future. In addition to acute COVID-19 illness, long-term effects of COVID-19 can occur.[3] The data presented in this study can contribute to preparing medical professionals and rehabilitation providers to respond to the acute and long-term needs of COVID-19 patients and anticipate the care needs of this population in terms of staffing, personal protective equipment, and therapy equipment.

Conflicts of Interest

The researchers do not report any conflicts of interest. All authors were employed by the academic medical center at the time of the research.

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Figure Legend

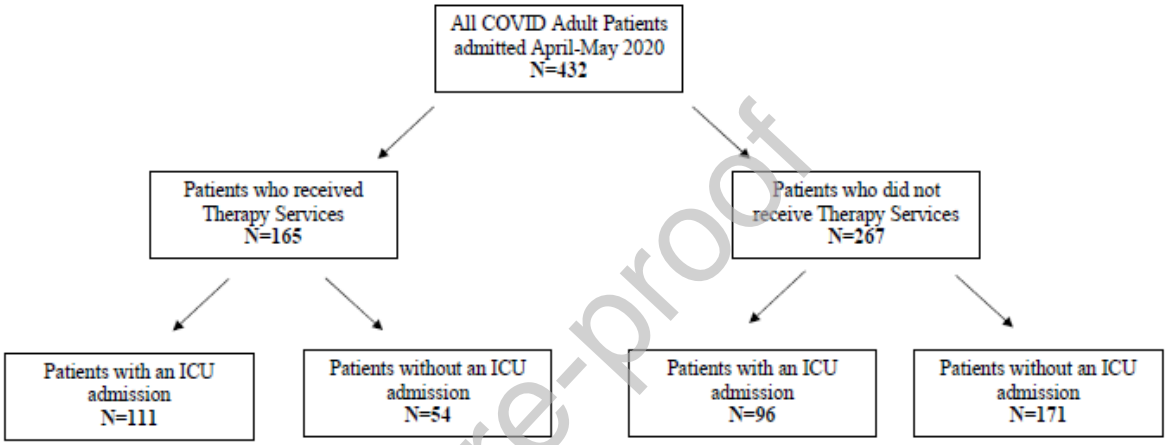

Figure 1. Patient cohorts by therapy and ICU status.

Table 1. Patient Characteristics by Therapy and ICU status.

Table 2. Therapy details by ICU status

Table 3. Functional Outcome Measures by ICU Status

Table 4. Patient Interventions and Discharge Destinations by Therapy and ICU Status

Table I. Patient Demographics and Comorbidities by Therapy and ICU status.

Factor	All, N=432 # (%)	No Therapy, No ICU N=171 # (%)	No Therapy, ICU N=96 # (%)	Therapy, No ICU N=54 # (%)	Therapy, ICU, N=111 # (%)
Age, Mean (SD)	58 (16)	54 (16)	61 (16)	68 (16)	58 (15)
Male	238 (55)	92 (54)	57 (59)	26 (48)	63 (57)
Race					
White	202 (47)	77 (45)	46 (48)	19 (35)	60 (54)
Black	120 (28)	50 (29)	25 (26)	22 (41)	23 (21)
Other	108 (25)	43 (25)	25 (26)	13 (24)	27 (25)
Hispanic	210 (50)	89 (53)	50 (55)	13 (25)	58 (54)
Chronic Lung Disease	73 (17)	28 (17)	15 (16)	13 (25)	17 (16)
Diabetes	197 (47)	66 (40)	46 (51)	28 (53)	57 (52)
Cardiovascular Disease	287 (68)	96 (57)	69 (76)	46 (87)	76 (69)
Renal Disease	77 (18)	24 (14)	17 (19)	12 (23)	24 (22)
Liver Disease	23 (5)	8 (5)	6 (7)	5 (9)	4 (4)

Factor	All, N=432 # (%)	No Therapy, No ICU N=171 # (%)	No Therapy, ICU N=96 # (%)	Therapy, No ICU N=54 # (%)	Therapy, ICU, N=111 # (%)
Immunosuppressive Comorbidity	42 (10)	17 (10)	11 (12)	4 (8)	10 (9)
Neurologic Comorbidity	56 (13)	14 (8)	16 (17)	10 (19)	16 (15)
Cancer	33 (8)	11 (7)	8 (9)	8 (15)	6 (6)
Current Smoker	17 (5)	7 (5)	0 (0)	4 (8)	6 (6)

Missingness: Age 2, Gender 2, Race 2, Ethnicity 13, Chronic Lung Disease, 14, Diabetes 13, Cardiovascular Disease 11, Liver Disease 12, Renal Disease 12, Immunosuppressive Comorbidity 15, Neurologic Comorbidity 12, Cancer 15, Current Smoker 58.

Table 2. Therapy details by ICU status

Therapy Details	All, N=165 # (%)	Therapy, No ICU, N=54 # (%)	Therapy, ICU, N=111 # (%)

Therapy Details	All, N=165 # (%)	Therapy, No ICU, N=54 # (%)	Therapy, ICU, N=111 # (%)
OT Frequency			
None	29 (18)	16 (30)	13 (12)
1-4x/week	82 (50)	33 (61)	49 (44)
4-5x/week, 1-3x/day	54 (33)	5 (9)	49 (44)
PT Frequency			
None	8 (5)	4 (7)	4 (4)
1-4x/week	60 (36)	27 (50)	33 (30)
4-5x/week, 1-3x/day	97 (59)	23 (43)	74 (67)
Impairment			
Impaired cognition	97 (59)	23 (43)	74 (67)
Impaired strength	113 (68)	30 (56)	83 (75)
Impaired proximal strength	102 (64)	25 (48)	77 (72)
Impaired distal strength	79 (50)	19 (37)	60 (56)
Impaired balance	144 (87)	48 (89)	96 (86)
Impaired activity tolerance	158 (96)	50 (94)	108 (97)
Impaired sensation	18 (11)	9 (17)	9 (8)
Impaired coordination	57 (35)	15 (28)	42 (38)
Impaired proprioception	12 (7)	3 (6)	9 (8)
Therapy recommended at discharge	123 (76)	37 (71)	86 (78)

Missingness: Cognition 1, Proximal strength 6, Distal strength 6, Activity Tolerance 1, Coordination 1, Therapy recommended at discharge 3,

Table 3: Functional Outcome Measures by ICU Status

Group	Measure	Pre, Mean (SD)	Post, Mean (SD)	Difference (Post-Pre), Mean (SD)
Therapy, No ICU	AM-PAC Basic Mobility, Raw	17.1 (4.3), n=51	17.9 (4.1), n=36	1.0 (2.3)*, n=35
	AM-PAC Basic Mobility, t-Scale Score	43.3 (7.9), n=51	44.8 (8.0), n=36	2.0 (4.9)*, n=35
	AM-PAC Daily Activity, Raw	17.1 (3.9), n=42	16.7 (3.7), n=18	0.7 (2.0), n=18
	AM-PAC Daily Activity, t-Scale Score	37.9 (6.6), n=42	37.2 (5.7), n=18	1.2 (3.4), n=18
Therapy, ICU	FSS-ICU	9.0 (7.3), n=82	10.6 (6.6), n=67	2.5 (5.6)*, n=66
	AM-PAC Basic Mobility, Raw	14.1 (5.4), n=79	16.7 (5.7), n=72	2.8 (3.9)*, n=69
	AM-PAC Basic Mobility, t-Scale Score	38.4 (9.6), n=79	43.3 (10.7), n=72	5.2 (7.2)*, n=69
	AM-PAC Daily Activity, Raw	15.4 (4.3), n=65	16.4 (4.0), n=51	1.2 (3.3)* n=48
	AM-PAC Daily Activity, t-Scale Score	35.7 (7.3), n=65	36.8 (7.0), n=51	1.6 (5.4)*, n=48

*Paired t-test difference (Post-Pre) significantly different from zero (0), p <.05

Table 4. Patient Interventions and Discharge Destinations by Therapy and ICU Status

Factor	All, N=432 # (%)	No Therapy, No ICU N=171 # (%)	No Therapy, ICU N=96 # (%)	Therapy, No ICU N=54 # (%)	Therapy, ICU, N=111 # (%)
Ever Mechanically Ventilated	144 (33)	--	64 (67)	--	80 (72)
If ever mechanically ventilated, Total Days Median (Q1, Q3)	12 (5, 22)	--	10 (4, 17)	--	13.5 (6, 23.5)
Ever on ECMO	6 (1)	--	0 (0)	--	6 (5)
If ever on ECMO, Total Days, Median (Q1, Q3)	2.5 (1, 5)	--	--	--	2.5 (1, 5)
Ever Paralyzed with Neuromuscular Blockade	77 (37)	--	35 (36)	--	42 (38)
If ever paralyzed, Total Days, Median (Q1, Q3)	3 (1, 6)	--	2 (1, 6)	--	3 (2, 6)
Length of Stay, Median (Q1, Q3)	7 (3, 17)	3 (2, 5)	10 (6, 18)	6 (3, 9)	22 (13.5, 37)

Factor	All, N=432 # (%)	No Therapy, No ICU N=171 # (%)	No Therapy, ICU N=96 # (%)	Therapy, No ICU N=54 # (%)	Therapy, ICU, N=111 # (%)
Died in Hospital	82 (19)	1 (1)	61 (64)	1 (2)	19 (17)
Discharge Location*					
• Home, Home w/ Help, Home Health care, Outpatient therapy	261 (75)	161 (95)	24 (69)	36 (68)	40 (43)
• Long-term care facility	15 (4)	7 (4)	4 (4)	3 (6)	1 (1)
• Acute inpatient rehabilitation or Skilled Nursing Facility/Subacute rehabilitation	50 (14)	1 (1)	1 (3)	14 (26)	34 (37)
• Other: LTACH, Transfers	24 (7)	1 (1)	6 (17)	0 (0)	17 (18)

* Column percentages based on those discharged, excluding those who died in hospital