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Running head: COVID-19 Functional Decline

Title: Functional Decline in Hospitalized Patients with COVID-19 in the Early Months of the
Pandemic

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Abstract:

Introduction

COVID-19 survivors are at risk of functional decline. To address the current gap in knowledge about post-acute needs of those infected by COVID-19, we examined discharge function data to better prepare patients, providers, and health systems to return patients to optimal levels of functioning.

Objective

This study examines the prevalence of functional decline and related rehabilitation needs at hospital discharge.

Design

Prospective chart review.

Setting

Academic tertiary care hospital

Participants

Hospitalized adults with a laboratory confirmed COVID-19 diagnosis, with admission dates between March 4, 2020 and May 1, 2020

Interventions

Not applicable

Main Outcome Measures

Discharge location; need for outpatient physical, occupational, or speech therapy; need for durable medical equipment at discharge; presence of dysphagia at discharge; functional decline.

Results

Three hundred eleven potential cases were reviewed. The final number of cases included in analysis was N=288, ranging in age from 20-95 years old (mean 66.80±15.31 years). Nearly

twenty percent of COVID-19 survivors discharged to a location other than their home. Forty-five percent of survivors experienced functional decline impacting their discharge. Eighty-seven (80.6%) of survivors who showed functional change during hospitalization were referred for additional therapy at discharge. At least 73 (67.6%) of these patients required DME at discharge (in 12 cases this was not clearly documented). Twenty-nine (26.7%) of the survivors who showed functional changes had ongoing dysphagia at the time of hospital discharge. Ninety-seven of the survivors (40.6%) were never assessed by a PM&R physician, physical therapist, occupational therapist, or speech language pathologist during their hospitalization.

Conclusions

COVID-19 mortality rates are frequently reported in the media, while the effects on function are not as well described. The information provided here highlights the need for rehabilitative services during and after hospitalization for COVID-19.

Key words

COVID-19, physical medicine and rehabilitation, functional decline, rehabilitation, functional impairment, discharge, inpatient

Key words:

COVID-19, physical medicine and rehabilitation, functional decline, rehabilitation, functional impairment.

Abbreviations:

SARS-CoV-2: Severe Acute Respiratory Syndrome Corona Virus 2, COVID-19: Corona Virus Disease 2019, MERS: Middle East Respiratory Syndrome, PM&R: Physical Medicine & Rehabilitation, LTACH: Long Term Acute Care Hospital, SAR: Sub Acute Rehabilitation, SNF: Skilled Nursing Facility

Introduction:

The novel coronavirus, SARS-CoV-2, and the disease COVID-19, have led to a global pandemic with millions of cases in the United States alone, resulting in the deaths of over 200,000 Americans at the time of this writing¹. The virus spreads via respiratory droplets, in some cases

leading to acute respiratory distress syndrome requiring intensive care admission, with associated morbidity and mortality. It has been widely reported that critical illness due to any etiology can result in acute changes in functioning², and it is known that the related viruses, SARS-CoV and MERS, resulted in significant new impairments in functioning for many patients³.

There is a growing body of literature regarding the systemic effects of SARS-CoV-2 on various organ systems, frequently resulting in new neurological and musculoskeletal impairments^{4,5}. However, the impact on daily functioning has not been described. This has important clinical and public health implications, as impairments in functioning will impact hospital discharge planning, distribution of post-acute resources, and accurate assessment of prognosis. This is particularly true given the magnitude of the public health crisis underway. For example, endotracheal intubation is known to be associated with dysphagia/aspiration⁶, and it is likely that many patients will require assessment for these impairments and appropriate treatment following infection with COVID-19.

Under typical circumstances, hospitals and rehabilitation teams may have protocols in place to assess and mitigate the deleterious effects of severe illness. However, given the limited resources and constantly evolving knowledge about COVID-19's spread and effects, typical hospital protocols may be adapted or abandoned to function properly during the pandemic. This observational study presents medical records discharge data from our institution in the greater Detroit metro region during the early months of the pandemic. This information should prove useful to better prepare patients, providers, and health systems for the post-acute needs of those infected with COVID-19.

Methods:

DataDirect © software was used to identify people admitted to a single tertiary care hospital in the Detroit metro area, with a laboratory confirmed diagnosis of COVID-19. An internal institutional review board was consulted and the project was allowed under secondary research exemption. Individual medical records were reviewed by practicing PM&R physicians. Each case was confirmed to have a laboratory verified diagnosis of COVID-19 occurring during the time of a hospitalization. Patients who were not SARS-CoV-2 positive during an admission were excluded. Children under the age of 18 were also excluded from analysis.

Individual hospital medical records were reviewed, including admission and discharge notes; physical, occupational, and speech language pathology records; case management notes; and relevant PM&R or neurology consultations. For those who survived to hospital discharge, charts were further reviewed to identify and understand changes in physical functioning that were impacting the patient at the time of discharge. Changes from functional baseline were documented as those requiring additional physical, occupational, or speech therapy at discharge; additional caregiver assistance for mobility or activities of daily living; new durable medical equipment needs (excluding home oxygen alone); or diet modifications for dysphagia. When none of these characteristics was present, it was assumed that no functional decline was apparent.

Data distribution analyses and non-parametric mean differences test (Mann Whitney U test) were conducted to address study aims. Statistical analysis was performed using IBM SPSS® Statistics for Windows (Version 25.0, released 2017) software.

Results:

Subject Characteristics

Three hundred eleven potential cases were reviewed, with admission dates between March 4, 2020 and May 1, 2020. Six were excluded from analysis due to age less than 18. Sixteen cases were excluded due to asynchronous COVID-19 diagnosis and hospitalization dates (i.e., the person was never SARS-CoV-2 positive during the time of the inpatient admission). One was excluded from analysis due to being currently admitted at the time of data analysis. The final number of cases included in analysis was N=288, ranging in age from 20-95 years old (mean 66.80 ± 15.31 years). Additional subject characteristics are detailed in Table 1.

Table 1	N/%
Sex	

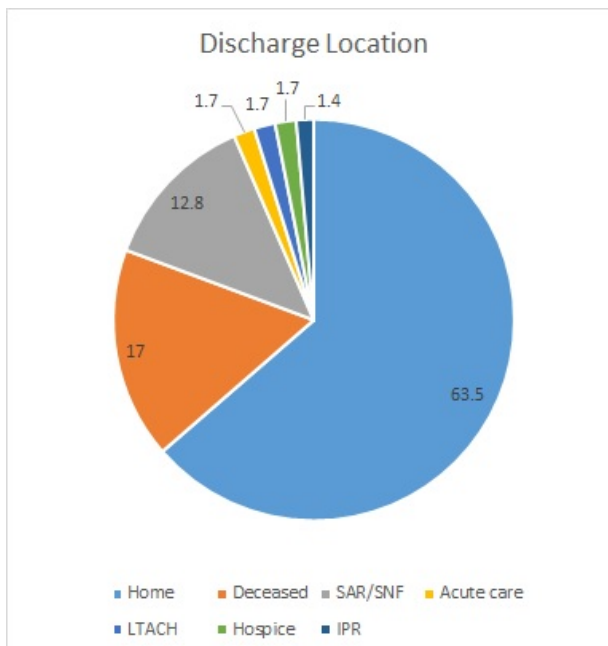
Female	122/42.4%
Male	166/57.6%
Race	
Caucasian	125/43.4%
African American	125/43.4%
Asian	10/3.5%
Hispanic	1/0.3%
Other	12/4.2%
Unknown	15/5.2%
Transfer from outside hospital	54/18.8%
	Mean \pm SD (min-max)
Length of stay (all)	13.40 \pm 12.84 (0-75) days
Length of stay (survivors) n=239	13.21 \pm 13.16 (0-75)days
Length of stay (deceased) n=49	14.31 \pm 11.24 (1-65) days

Table 1: Study participant characteristics

Discharge Location

Discharge location is summarized in Figure 1. Two hundred thirty-nine survived to discharge from our hospital. The mean age for the surviving group was 60.38 ± 15.15 years old (range 20-95), which was significantly younger than the mean age of the deceased 68.67 ± 14.32 years (range 30-90, $F(1,287) = 12.40$ $p < 0.001$). Home was the most common discharge location (N=183, 63.5%). Five people (1.7%) were transferred to another acute care hospital or field hospital, and five (1.7%) were transferred to a LTACH. Additionally, four people (1.4%) transferred to an unaffiliated acute inpatient rehabilitation hospital; the inpatient rehabilitation unit within the academic center was closed during this time period. Thirty-seven (12.8%) required a SAR or SNF. Five (1.7%) transferred to hospice care. Forty-nine people (17%) were deceased at the time of discharge.

Figure 1: Discharge Location



Survivor Functional Decline

Of the 239 people who survived to discharge or transfer, 108 (45.2%) experienced a significant functional decline. Eighty (74.1%) of those experiencing functional decline had previously been independent or modified independent with mobility and activities of daily living; this information was unavailable in 13 cases. Eighty-seven (80.6%) of survivors who showed functional change during hospitalization were referred for additional therapy at discharge. At least 73 (67.6%) of these patients required DME at discharge (in 12 cases this was not clearly documented). Twenty-nine (26.7%) of the survivors who showed functional changes had ongoing dysphagia at the time of hospital discharge. Ninety-seven of the survivors (40.6%) were never assessed by a PM&R physician, physical therapist, occupational therapist, or speech language pathologist during their hospitalization. The mean length of stay for this group was 4.51 ± 3.55 days, which is significantly lower than the mean length of stay those who did receive therapy referral (mean = 19.16 ± 14.00 Mann Whitney U Z = -10.65, $p < 0.001$).

Length of stay as well as days on ventilator differed significantly between those who did and did not show functional declines. Those who showed functional decline had significantly longer length of stay (mean = 21.70 ± 14.64 ; median = 18, IQR = 10.25, 18, 30.75) compared to those who did not show functional decline (mean = 6.21 ± 5.61 ; median = 5 IQR = 3, 5, 7 ; Mann Whitney U Z = -10.29, $p < 0.001$). Similarly, those who showed functional change were mechanically ventilated longer (mean = 6.96 ± 9.69 ; median = 0, IQR = 0, 0, 13) compared to those

who did not show function change (mean = 0.17 ± 0.85 ; median=0, IQR = 0,0,0 ; Mann Whitney U Z= -8.03, p <0.001).

Discussion:

COVID-19 mortality rates are frequently reported in the media, while the effects of the infection on function are not as well described. The data reported here is likely an underrepresentation of COVID-19 survivors' true rehabilitation needs. Baseline functional status was not always noted in the medical record, making changes from baseline more difficult to assess. Furthermore, it is possible that some patients had unrecognized functional loss, as evidenced by the large proportion of patients who were never assessed by a PM&R physician or therapist. This may be secondary to efforts to minimize staff exposure to COVID-19, preserve personal protective equipment, and the fact that the hospital's inpatient rehabilitation unit was closed temporarily due to increased demand for acute care beds.

Study Limitations

The data presented above has some limitations. The findings represent outcomes from a single center navigating the “first wave” of COVID-19 admissions, and include only a portion of all of the patients admitted at this institution. This information is only descriptive of rehabilitation needs at acute care discharge, and does not provide insight to the longer term functional trajectory. This recovery may be protracted, particularly for those who suffer from rarer complications such as organ failure, stroke, or critical illness myopathy and neuropathy. This is especially true given the limited availability of inpatient rehabilitation beds at the time of the study. Survival rates and complication rates may change as therapeutics and interventions evolve throughout the pandemic, and it is yet unknown what implications this will have on morbidity. Additionally, this study did not include data regarding functional decline due to psychological sequelae, which can be a prominent issue during and after critical illness.

Conclusions:

Further efforts are needed to meet the complex rehabilitation needs of COVID-19 survivors. Comprehensive and multidisciplinary follow-up programs, standardized outcomes assessments, and additional research regarding functional outcomes should be considered as the pandemic continues. This information should prove useful to better prepare our healthcare systems to meet

the needs of those who survive COVID-19. Additionally, it may serve as a caution to citizens who may be unaware of the physical challenges associated with COVID-19 hospitalizations.

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Figure Legend:

Figure 1: Percent of patients discharged by location type.

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Manuscript Title: Functional Decline in Hospitalized Patients with COVID-19

Manuscript number (if known): PMR-20-0826

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Date: 04/05/2021

Your Name: Edward Claflin, MD

Manuscript Title: Functional Decline in Hospitalized Patients with COVID-19

Manuscript number (if known): PMR-20-0826

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Manuscript Title: Functional Decline in Hospitalized Patients with COVID-19

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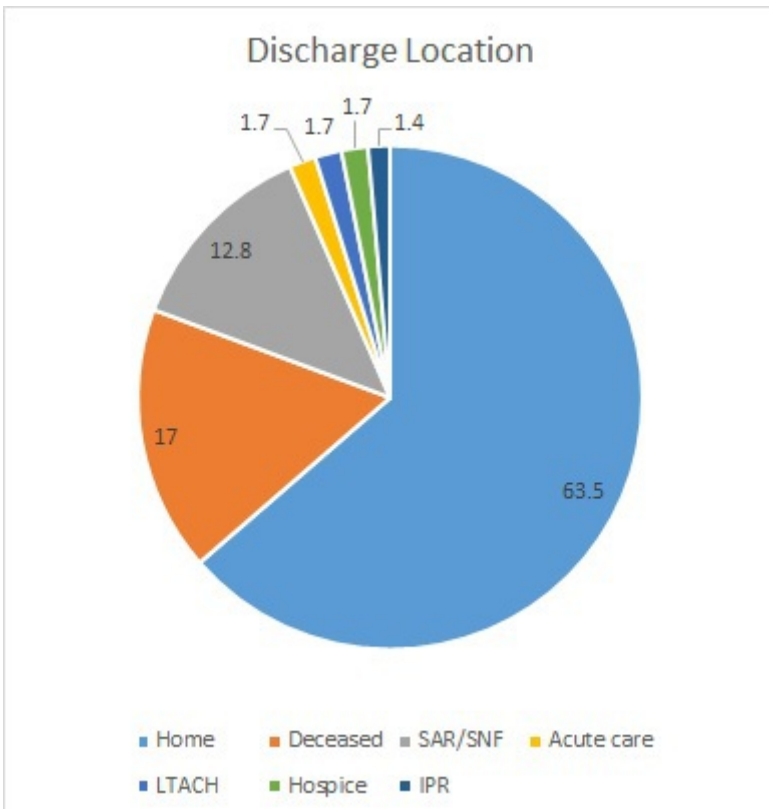
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