Functional Outcome after Clinical Recovery from Moderate to Critical COVID-19 among Patients Admitted to the Philippine General Hospital: A Prospective Cohort Study

Micah G. Catalan, MD and Sharon D. Ignacio, MD

Department of Rehabilitation Medicine, Philippine General Hospital, University of the Philippines Manila

ABSTRACT

Background and Objective. COVID-19 is a novel disease primarily affecting the respiratory system. Of those infected, approximately 20% require management in a hospital-setting which may lead to deconditioning. Measures implemented to control spread of the virus also restricted mobility both in the hospital and community setting. The goal of this study was to describe the patient characteristics (age, sex, comorbidities), hospitalization (length of hospital stay, ICU stay, referral to Rehabilitation Medicine), and long-term functional outcome of patients who have clinically recovered from moderate to critical COVID-19 in terms of participation in activities of daily living.

Methods. This was a descriptive prospective cohort study conducted at a tertiary government hospital with participant recruitment from September 2020 to February 2021 consisting of clinically recovered adult patients managed as COVID-19 Confirmed via rRT-PCR with moderate, severe, or critical risk status. Descriptive statistics were obtained and multiple regression analysis was done to determine associations between patient demographics and their Barthel Index Scores on follow-up at discharge, one month post-discharge, and six months post-discharge.

Results. A total of 63 patients were recruited to our study with an average age of 52.4 years. More recovered patients had fulfilled the criteria of moderate illness (46%), with the most common comorbidity being chronic lung disease (42.1%) and diabetes (42.1%). Almost all had total independence pre-morbidly with better baseline functional scores for the COVID-19 severe population. Majority of the patients (63.5%) were not referred for Rehabilitation services. Across all patients, Barthel Index Score at discharge indicated a significant decline from slight dependence to moderate dependence in performing activities of daily living with the pre-morbid status significantly predicting scores at discharge ($\beta = 0.621$, $p = 0.001$) on multiple regression analysis. Patient demographics, hospitalization and ICU stay and outcome, and referral to Rehabilitation Medicine were not found to be significant factors. In the course of follow up, a high dropout rate was observed across the population and by the end of the study, 57.1% of the participants were alive while among those lost to follow up, 20.6% had expired and the remaining 22.2% had an unknown status.

Conclusion. COVID-19 significantly affects the functional outcome of patients in terms of activities of daily living as measured by the Barthel Index. Preliminary data gathered from our study and the high dropout rate supports the need for better follow-up and selecting a tool that is better able to describe the non-demographic factors affecting functionality and participation in activities of daily living.

Keywords: COVID-19, patient-relevant outcome, activities of daily living, rehabilitation, cohort studies

Paper presentation – Annual Research Forum, December 5, 2022, Main Conference Room, Department of Rehabilitation Medicine, Philippine General Hospital, University of the Philippines Manila.

eISSN 2094-9278 (Online)
Published: November 15, 2024
https://doi.org/10.47895/amp.v58i20.8479

Corresponding author: Micah G. Catalan, MD
Department of Rehabilitation Medicine
Philippine General Hospital
University of the Philippines Manila
Taft Avenue, Ermita, Manila 1000, Philippines
Email: mgcatalan.md@gmail.com
ORCiD: https://orcid.org/0009-0009-0708-5557

INTRODUCTION

SARS-CoV-2, or Severe Acute Respiratory Coronavirus 2, was the latest coronavirus to be discovered, causing COVID-19,[1] a disease that mainly affected the respiratory system with critical cases necessitating airway support. First detected in Wuhan, China last December 2019 and declared a Public Health Emergency of International Concern at the end of the following month by the World Health Organization,[1] the virus had spread rapidly across the world with consequences not just for the infected individual but also on a national level with governments utilizing a multisectoral approach to curb the pandemic. In the Philippines, community quarantines were enforced since mid-March 2020 which included implementation of curfews, suspension of mass public transport, and the suspension of non-essential businesses. Hospitals had to adjust clinical services to handle the influx of possible COVID-19 patients, with large tertiary centers designated as COVID-19 referral hospitals, including the Philippine General Hospital (PGH). As of April 25, 2020, Department of Health recorded the total number of confirmed COVID-19 cases nationwide at 7,294 with 792 recoveries.[2] Of those infected with SARS-CoV-2, approximately 15% of the population developed a severe infection which requires oxygenation while 5% require ventilatory support.[1] While the presentation was mostly pneumonia, there were also reports of the virus causing neurological conditions such as encephalitis and Guillain-Barre syndrome.[3] Some patients also deteriorated with sepsis and multi-organ dysfunction complicating management.

Given the presentation and clinical course of patients with COVID-19, we expected a similar functional outcome to those previously infected with SARS-CoV, another respiratory coronavirus first detected in 2003 with genetic make-up similar to SARS-CoV-2.[1] In terms of lung function and psychological status, a review of the long-term outcomes of patients with SARS (Severe Acute Respiratory Syndrome) were likened to those with Acute Respiratory Distress Syndrome (ARDS)[4] which revealed that at six months post-SARS recovery, the aerobic capacity was below the normal range, even beyond the expected outcome from lung function impairment. Furthermore, those who required Intensive Care Unit (ICU) admission had lower scores possibly due to muscle deconditioning as well as steroid myopathy,[5] which was one of the management strategies for SARS then. For survivors of ARDS, it was found that even after one year from recovery, patients had functional limitations as shown in below average performance in various measures including the 6-minute walk test, that can mostly be attributed not to poor lung function, but to muscle wasting and weakness as a consequence of critical illness. In addition, only 49% of these patients were able to return to work.[6]

In response to COVID-19, there has been a call to institute rehabilitation in the acute setting in the anticipation of the disease leading to ARDS and ICU admission, mainly to address respiratory rehabilitation and deconditioning

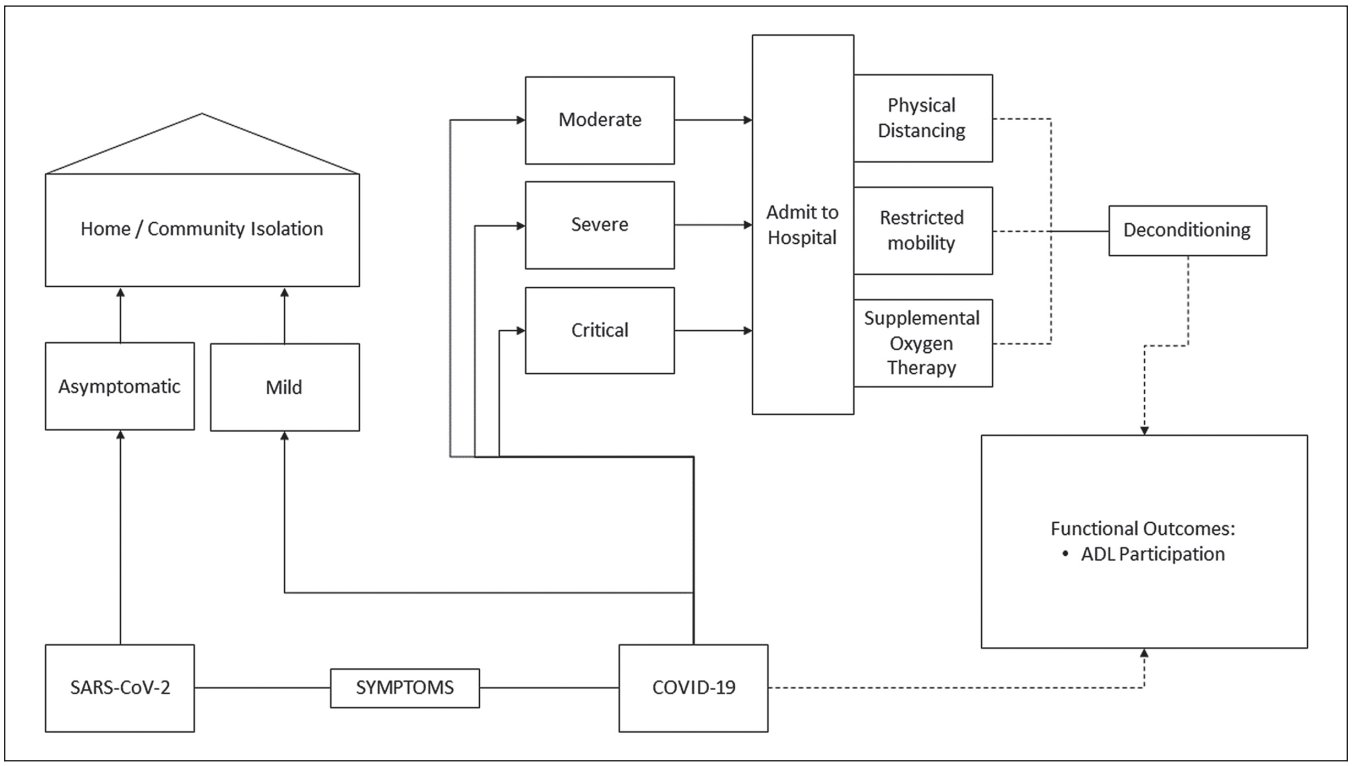

Figure 1. Conceptual framework. ADL: Activities of Daily Living.

as consequences of immobilization.[7] Data gathered by the World Health Organization from Chinese and European cohorts showed an average of two weeks from onset to clinical recovery in milder cases with more severe cases averaging at three to six weeks.[8,9] Moreover, the average number of days in which a patient required respiratory support was at 13 days but could extend up to several weeks.[9] Prolonged hospital admission greatly increased the risk for deconditioning due to the restricted mobility and decreased participation in activities of daily living (ADLs), in addition to having this disease that required the admission in the first place. Taking this into account, it was important to note if recovery from COVID-19 was complicated by deconditioning not limited to the ICU population (Figure 1). Patients who presented with mild symptoms were advised home quarantine while more severe manifestations require hospitalization for close monitoring and management, with the same principles of physical distancing and restricted (hospital) community mobility.

Previous studies have already been conducted on the functional outcomes of the ICU population after discharge.[10,11] In a review of various scales used for this patient population, researchers found that no standard measure has been used in general due to the various conditions for which the patients require intensive care.[10] Among the reviewed scales were the Functional Independence Measure (FIM), Barthel Index (BI), and Disability Rating Scale (DRS), all used to measure long-term outcomes affecting not just the individual but also their caregivers and community. Compared to the FIM and DRS, the Barthel Index was found to be more widely used because it was simpler to administer.[10] As a guiding principle, due to the need for more research into these tools for ICU populations post-discharge, choice of which scale to use would depend on the diagnosis, phase of rehabilitation, and psychological properties of the scale.[10,11]

Outcome Measures

To measure long-term functional outcome, the study focused on ADL participation as measured by the Barthel Index, a ten-item tool answerable by self-report via interview or direct observation of the patient's performance (Appendix A).[12] In light of physical distancing measures, there was a need for patients to be more independent in performing self-care activities. The BI has been used in stroke studies as a proxy of patient functioning at home and thus predicting return to home with adequate reliability and validity in various populations, including good reliability established in telephone administered tests.[13,14] In application, a quick assessment could be performed to determine if patients would be able to safely attend to their needs in a 14-day quarantine period as mandated then by the Department of Health after discharge from the hospital.[15] However, the tool is limited by the depth of information gathered as to the qualitative and experiential aspects of independence and participation in the specified tasks.

Table 1. Interpretation of Barthel Index Score

Barthel Index Score	Level of Independence in Activities of Daily Living
0 – 20	Total Dependence
21 – 60	Severe Dependence
61 – 90	Moderate Dependence
91 – 99	Slight Dependence
100	Independent of Assistance from Others

At the time of the study, no Filipino translation for the Barthel Index was available to be used for administration. Several translations of the instrument have been made, including both European and Asian language groups, with individual studies on the translation's reliability and validity. While formal translation studies ensure an outcome measure has minimal bias, time-constraints limited us to the use of a bilingual speaker-translated and back-translated guide to explain to our patients the domains included in the Barthel Index scoring (Appendix B). Interpretation of the tool was guided by the table (Table 1), with scores ranging from 0 to 100 indicating the level of independence of a person. In addition to the total score, attention was also given to the items that scored low to obtain a more meaningful picture of ADL limitation.[16]

Significance of the Study

Apart from vaccination, a mainstay of controlling the infection rates of SARS-CoV-2 was physical distancing imposed both at the home and community level. It was important to note the extent of functional limitations caused by COVID-19, such that rehabilitation services could be better planned to facilitate re-integration of recovered patients into the home and community, and achieve the best quality of life while avoiding transmission of disease.

This led us to our research question: Among patients admitted to the Philippine General Hospital who have recovered from a moderate to critical COVID-19 infection, what is the association between patient demographic profile and hospitalization and long-term functional outcome as measured by the Barthel Index Score at discharge, one month post-recovery, and 6 months post-recovery in a prospective cohort study?

OBJECTIVES

General Objective

The objective of this study was to determine the baseline and long-term functional outcomes of patients who developed and recovered from moderate to critical COVID-19.

Specific Objectives

1. To describe the demographic profile (age, sex, comorbidities), length of hospital stay, length of ICU stay, and rate of referral for Rehabilitation Medicine services

of moderate to critical COVID-19 confirmed patients admitted to PGH.
2. To determine any change in their participation in activities of daily living using the Barthel Index score over the course of six months post-recovery.
3. To determine the association between patient demographic profile (age, sex, comorbidities) and hospitalization (length of hospital stay, length of ICU stay, and rate of referral for rehabilitation medicine services) and their Barthel Index scores at discharge.

MATERIALS AND METHODS

This study was a descriptive prospective cohort study conducted at the University of the Philippines – Philippine General Hospital. After securing ethics approval from the university research ethics board, participant recruitment was started in September 2020, concluding by February 2021.A target sample size of 108 patients was computed using Slovin's formula based on the COVID-19 recovered population of the hospital during protocol development. Consenting adult patients aged 19 years old and above who were admitted to COVID-19-designated wards of the Philippine General Hospital and identified as COVID-19 Confirmed via rRT-PCR with moderate, severe, or critical risk status who had recovered from infection were included in the study. Pediatric (<19 years old), pregnant, COVID-19 probable or suspect, and COVID-19 confirmed patients with a mild designation were excluded from the study. The case definitions used were as reported by the hospital, based on the interim guidelines of the Department of Health and Philippine Society for Microbiology and Infectious Diseases (PSMID) in handling COVID-19 cases (Appendix C) which defines clinical recovery as resolution of symptoms with at least a negative test for SARS-CoV-2.[15]

The following data were recorded via telephone interview at the specified data collection periods—at discharge, one month post-discharge, and six months post-discharge. In the instances that the patient was unable to participate (e.g., limited ability to communicate due to illness, expired patient), consent and information were secured from the caregiver

1. Consent for participation and contact for interviews at predetermined follow-up time points for one month and six months post-discharge
2. Patient demographics during the initial interview – particularly age, sex, comorbidities, COVID-19 status (whether suspect, probable, or confirmed; whether mild, moderate, severe, or critical), whether or not admitted to the ICU and referred for in-patient rehabilitation services. Basic demographic information was augmented by the available hospital case records and census in relation to their admission for COVID-19.
3. Premorbid Barthel Index (BI) score, BI score at discharge, and at the follow-up points of 1 month and 6 months post-discharge.

Data Analysis

Data gathered from the study was analyzed using Stata®. Descriptive statistics were reported on patient demographic profile (age, sex, comorbidities) and hospitalization (length of hospital stay, ICU stay, rate of referral for Rehabilitation Medicine services), as well as the Barthel Index scores obtained from the patients. Multiple regression analysis was conducted to determine the association of these factors and the Barthel Index Score at discharge. Because of the long interval between obtaining the baseline BI score and follow-up scores, there was a high attrition rate recorded towards the latter part of the study despite anticipatory measures (prescheduled follow-up interviews). Further qualitative and quantitative data analyses were deferred due to a small sample size.

RESULTS

From September 2020 to December 2020, 513 unique patients were admitted to the COVID service wards of the Philippine General Hospital. In identifying potential patients, 135 patients were diagnosed to have COVID-19 and seven were excluded due to a diagnosis of mild infection. The COVID-19 status of the remaining 378 patients were left pending and of these selected patients, 99 expired in-hospital. A total of 63 patients (58.3% of target sample size) who recovered from moderate to critical COVID-19 were recruited to our study with a higher percentage of males (54%) vs. females (46%) with an average age of 52.4 years old. Consent from the remaining 72 patients of the 135 initially identified was not obtained due to difficulty in contacting the patient and/or caregiver from frequent changes in hospital discharge policies and transfers to home or community-based isolation facilities prior to meeting the criteria for "recovered" based on the interim PSMID guidelines.

Among the patients recruited, more recovered patients had fulfilled the criteria of moderate illness (46%), followed by severe (30.2%), and then critical illness (23.8%) with an array of comorbidities, the most common being chronic lung disease (42.1%) and diabetes (42.1%) among the COVID-19 severe population. Based on the premorbid Barthel Index score, almost all of the patients had total independence (mean BIS of 93.1) with better baseline functional scores for the COVID-19 severe population. During their admission, there was an average stay of 20.8 hospital days for all patients, with an average stay of 6.9 of these hospital days at the ICU for critically ill patients. Most of the patients (63.5%) were not referred for rehabilitation services and a higher rate of referral was observed for those with worse illness. Across all patients, BIS at discharge [61.19(33.21)] was significantly different from the pre-morbid score [93.10(21.97); $t(62) = 8.391$, $p = 0.000$] indicating a decline from slight dependence to moderate dependence in performing activities of daily living (Table 2).

Multiple linear regression was used to determine which factors from the patient demographic profile and hospitalization (length of hospital stay, length of ICU stay, and rate of referral for Rehabilitation Medicine services) significantly predicted their Barthel Index scores at discharge (Table 3). The overall regression was statistically significant (R^2 = 0.307, R^2_{adj} = 0.189, F(9, 53) = 2.61, p = 0.014) with the pre-morbid BIS significantly predicting BIS at discharge (β = 0.621, p = 0.001) while the rest of the demographic factors (age, sex, comorbidities), hospitalization and ICU stay and outcome, and referral to Rehabilitation Medicine did not.

In the course of following up these patients, a high dropout rate was observed across the population, beginning at one month post-discharge with 28.6% of the participants either lost to follow-up or have expired with the highest rate coming from the COVID-19 critical group. At six months post-discharge, dropout rates further increased, this time with the highest coming from the COVID-19 moderate illness group. By the end of the study, 57.1% of the participants were alive while among those lost to follow up, 20.6% had expired and the remaining 22.2% had an unknown status. The Barthel Index scores of the patients who had expired or were lost to follow-up were not included in the analysis and pairwise deletion was employed in further analysis of the data. Because of the novelty of the recovery trajectory for COVID-19, strategies such as mean substitution and last observation carried forward would have favored a bias towards the earlier BIS obtained in this longitudinal study.

In doing pairwise comparison of the BIS at discharge versus one month post-discharge, a significant difference (Pearson r 0.940, p<0.000) was noted for the remaining 45 patients while the difference between the BIS at one month post-discharge versus six months post-discharge was not significant (Pearson r 0.765, p = 0.446) for the remaining 38 patients at the end of the study.

Table 2. Descriptive Statistics of Study Population

		COVID-19 Confirmed		
	Overall (N=63)	Moderate (n=29, 46.0%)	Severe (n=19, 30.2%)	Critical (n=15, 23.8%)
Age[a]	53.6 (16.8)	52.0 (17.0)	55.0 (14.6)	55.0 (19.8)
<60 years old	42.2 (11.1)	42.5 (11.1)	43.4 (9.9)	40.1 (13.7)
≥60 years old	69.8 (7.6)	71.4 (6.9)	67.0 (6.3)	71.1 (9.8)
Sex[b]				
Male	54.0%	51.7%	68.4%	40.0%
Female	46.0%	48.3%	31.6%	60.0%
Comorbidities[b]				
None	4.8%	3.4%	5.3%	6.7%
Chronic lung disease	38.1%	34.5%	42.1%	40.0%
Chronic heart disease	23.8%	13.8%	31.6%	33.3%
Chronic kidney disease	22.2%	17.2%	36.8%	13.3%
Chronic liver disease	19.0%	17.2%	10.5%	33.3%
Chronic neurological conditions	22.2%	27.6%	21.1%	13.3%
Diabetes	28.6%	20.7%	42.1%	26.7%
Problems with the spleen	4.8%	10.3%	-	-
Weakened immune system such as HIV or AIDS, or medicines such as steroid tablets or chemotherapy	22.2%	24.1%	21.1%	20.0%
Total Hospital Stay*[a]	20.8 (12.4)	17.1 (13.4)	21.1 (11.3)	27.7 (8.6)
ICU Stay**[a]	6.4 (4.1)	0	5(1)	6.9 (4.7)
Referral to Rehabilitation Medicine[b]				
Yes	36.5%	20.7%	47.4%	53.3%
No	63.5%	79.3%	52.6%	46.7%
Status at last follow-up[b]				
Live	57.1%	58.6%	63.2%	46.7%
Unknown	22.2%	10.3%	26.3%	40.0%
Expired	20.6%	31.0%	10.5%	13.3%
Dropout rate[b]				
At 1 month post-discharge	28.6%	20.7%	26.3%	46.7%
At 6 months post-discharge	39.7%	65.5%	36.8%	53.3%
Pre-morbid BI score[a]	93 (22.0)	90 (26.0)	98 (7.1)	93 (25.8)
BI score at discharge[a]	61 (33.2)	62 (35.4)	66 (30.5)	53 (32.6)
BI score at 1 month post-discharge[a]	79 (33.7)	76 (38.5)	82 (32.0)	81 (22.8)
BI score at 6 months post-discharge[a]	87 (27.2)	82 (33.3)	88 (23.7)	97 (2.7)

[a]Data presented as mean (standard deviation); [b]Data presented as percentage
**Total Hospital Stay in days; **Total ICU Stay in days*

Table 3. Summary Table for Multiple Regression Analysis Results of Patient Characteristics and Barthel Index Score at Discharge

Variables	Unstandardized Coefficients				Collinearity Statistics	
	B	Standard Error	t	*p*-value	Tolerance	VIF
(Constant)	19.639	30.839	0.637	0.527		
Age	-0.202	0.231	-0.872	0.387	0.92	1.08
Sex	4.240	7.982	0.531	0.597	0.89	1.12
COVID severity	-3.300	6.745	-0.489	0.627	0.49	2.06
Comorbidities	2.587	18.382	0.141	0.889	0.93	1.08
Pre-morbid BI score	0.621	0.183	3.387	0.001*	0.73	1.37
Length of Hospital Stay	-0.585	0.370	-1.584	0.119	0.65	1.54
ICU Stay	-0.189	1.408	-0.134	0.894	0.53	1.88
Rehabilitation Medicine Referral	3.972	9.752	0.407	0.685	0.63	1.59
Status at Last Follow-up	6.635	7.016	0.946	0.349	0.66	1.51

Dependent variable: Barthel Index Score at discharge
R^2 = 0.307, R^2adj = 0.189 (N=63, p=0.014)
**significant at α = 0.05*

DISCUSSION

Majority of the patients recruited to our study were of middle age, had at least one comorbid condition, and had recovered from moderate COVID-19 illness. The study population was similar to the distribution of patients in that of the Chinese cohort as reported by Wu & McGoogan last February 2020 to describe the epidemiologic characteristics of the COVID-19 outbreak in Wuhan, China, thought to be the origin location of the novel coronavirus. Case fatality rate was noted to be higher in patients 80 years or older and in those who were classified as critically ill hence the expected recovered population to be of a younger age group with milder disease.[17] In terms of incidence, COVID-19 affected all age groups with no notable sex predilection, with a trend to progress to more severe illness in those with chronic health conditions and immunocompromised states. Among the comorbid conditions, more observations of diabetes and chronic lung disease were seen which are the top four and top eight all causes of mortality in the country, respectively.[18] Given the demographic data and hospitalization data gathered from the recruited patients, no significant factor predicted the BIS at discharge except for the pre-morbid BIS.

Overall, the premorbid BIS of patients indicated slight dependence reflecting a good baseline functional capacity that significantly declined post-COVID-19 illness. Unlike other measures, we were not able to elucidate using our selected outcome measure the factors underlying the significant decline post-illness. Several studies in other countries have looked into post-viral sequelae, lung capacity, ICU syndromes, and fatigue as post-COVID-19 sequelae.

In a small center study among patients who recovered from mild COVID-19 infection, fatigue was the most common reported post-viral sequelae as well as disordered sleep.[19,20] This is similar to findings of a UK-based area study wherein among those discharged from hospital admission for COVID-19, fatigue was also a common symptom as well as exercise tolerance problem, and prominent respiratory symptoms such as cough, breathlessness, and voice changes especially among the ICU population.[21] Based on the data of patients admitted to a hospital in Wuhan, China who were followed up for up to four weeks post-discharge, it was noted that respiratory symptoms were most prominent for the first two weeks and resolved with 13.74% of the patients reporting cough, dyspnea by the third and fourth weeks with no statistical difference between non-severe and severe patients.[22] In a study of Dutch hospitals, for those admitted to the ICU specifically for COVID-19, the main outcomes reported through validated tests were physical symptoms, fatigue, mental symptoms, depression, post-traumatic stress disorder, and cognitive symptoms even one year after admission.[23] Although not included in this study, researchers have found that COVID-19 impairs diffusion capacity and causes restrictive ventilatory defects detected through spirometry which, from a theoretical standpoint, can explain the respiratory symptoms of long COVID syndrome caused by the predilection of the disease for lung tissue causing inflammation and scarring.[24,25]

Referral to Rehabilitation Medicine services was also not shown to significantly affect the BIS at discharge. At the time of recruitment, no clear guidelines had yet been formed regarding the rehabilitation of patients with the disease but it was recognized that because of the prominence of respiratory symptoms, pulmonary rehabilitation would play an important role. For those critically ill patients, indications for rehabilitation were to prevent complications of extended immobilization such as neuromuscular complications including weakness and joint stiffness, reduced mobility, psychological problems, and even quadriparesis. However, the timing of rehabilitation intervention was tempered by the effects of the disease whereby patients were prone to desaturations and respiratory distress.[26] This translated in

our institution to a creation of a program that specifically catered to the in-patient rehabilitation needs of patients diagnosed with COVID-19 which increased the number of study participants towards the end of the recruitment period and improved the follow-up rate of patients. Termed Rehabilitation for COVID-19 Early Functional Return or RECOVER, the program allowed for a standardized evaluation method which included the Barthel Index in order to formulate a quick assessment of COVID-19 patients referred for rehabilitation services. This allowed the rehabilitation personnel and co-managing services to have a unified code for stratifying the needs of the referred patient while limiting exposure time to the patient at a time when personnel protective equipment was scarce and vaccination against the disease was not yet available.[27]

Despite anticipatory measures, there was a high dropout rate beginning at one month post-discharge and carrying over to the follow-up period at six months post-discharge. At the end of the 6-month follow-up period, almost half of the participants were lost to follow-up, either having expired or with an unknown status. For the patients who had followed up, it was recorded that their BI scores were improving across time from the initial decline from pre-morbid to post-discharge status. In a United Kingdom-based prospective cohort study done on the follow-up of patients with COVID-19 illness, in terms of participant recruitment for a face-to-face follow-up, there were a few patients who declined because they were care providers themselves, felt a follow-up was unnecessary, or could not be contacted.[28] Unlike our study population, their government healthcare network, like others, had systems in place that enabled the patient to achieve a consistent follow-up such as enrollment to health services specifically designed for COVID-19 follow-up. Multiple centers were also involved in the research study allowing for a greater population size that buffered the dropout rate observed in our study.[29,30]

Limitations of the Study

The difficulty in contacting patients post-discharge resulted in a small sample size limiting the scope of our data analysis and generalizability of the results obtained. Patients were difficult to track and to maintain communication with as can be anticipated in a longitudinal study. Furthermore, only a single tool (Barthel Index) was used to evaluate the functional outcome of our patients over the course of follow-up. In using this scale, we were able to have a tool which could be administered quickly and consistently during the initial recruitment and follow-up periods, with good reliability and validity parameters, even through self-report or telephone interview.[12-14] The Barthel Index was also incorporated into the quick assessment tool being used for our in-patient Rehabilitation Medicine services thus facilitating data gathering while admitted in the wards and providing a channel for patient recruitment.[27]

While the BI is a good quick assessment tool, its scope is general and may miss out on the nuances of each activity of daily living as can be detected by a tool like the Functional Independence Measure. As observed from those with COVID, dyspnea was a prominent factor which limited ADLs in that a patient was still able to perform the activity but was hampered by the dyspnea. Because of the scoring method, the BI has limited sensitivity[16] and might not have detected low levels of disability[30]. In addition, the BI did not take into account the psychosocial aspects of ADL independence such as pain, depression, self-neglect, and caregiver fatigue.[31]

Recommendations

The novelty of COVID-19 generated various research studies whose methodology was tempered with the need to protect the researchers due to then unknown ways to prevent acquiring the disease and mitigating its transmission. The Barthel Index was a simple validated tool that could be administered quickly thus minimizing exposure while still achieving our study outcome of the functional capacity of patients upon their return to home. Permitting a larger sample size, a retrospective cohort study approach can be done to gather a sample size large enough to facilitate analysis of the individual domains of the Barthel Index from a similar study population of patients who have recovered from a moderate to critical COVID-19 infection.

Because of the better understanding of the disease at present and measures in place such as vaccines to curb virus transmission and mitigate complications arising from the disease, there is now more allowance to spend longer time with the patient while they are in the hospital so that in-depth in-patient interviews and a complete physiatric examination can be performed. The generation of programs from rehabilitation medicine also exposes more patients who are aware of and availing of rehabilitation services for their illness. This will allow us to better explore the factors contributing to functional limitations, not just from a biomedical, but also a psychosocial perspective. Outcome measures that require more time to administer can be used to gain a deeper understanding of the scope of functional limitations caused by COVID-19, not just for activities of daily living but perhaps for the individual physiology, as well as the psychological and socioeconomic impact of the disease.

As such, cross-sectional outcome measures for psychosocial well-being may not be appropriate in an acute setting and may be better addressed by one-on-one or small-group discussions to facilitate psychological first aid by trained individuals.[32] Other tools have also been developed to capture the nuances of functional limitations such as the post-COVID-19 functional scale (PFCS), developed by researchers from a small sample retrospective observational study of patients who experienced joint or muscle pain reporting functional limitations in ADL performance.[33] This information will also be valuable in involving other fields for the care of our patients and generate more interest and available resources in terms of financing and personnel to contribute to the long-term follow-up of patients.

The initial response in containing the COVID-19 pandemic was a multisectoral approach involving higher institutions of the government. As such, in monitoring the state of the patients who had contracted this disease, the government, with its greater reach and fund of resources, should be engaged to be able to achieve the ideal follow-up care for these patients.

CONCLUSION

Among those recruited to this study, the average patient diagnosed with moderate COVID-19 was middle-aged with a chronic disease who was likely to have had total independence in activities of daily living prior. Hospital stay was longer than the previously thought infective period of 14 days with low referral rates to rehabilitation medicine during and after admission. Over the course of follow-up until 6 months, COVID-19 significantly affected the functional outcome of patients in terms of activities of daily living as measured by the Barthel Index, with a significant change in scores from pre-morbid independence to discharge and at one month post-recovery, while the difference at six months post recovery was minimal in the remaining population of recovered patients. The importance of premorbid health status was highlighted in the preliminary data gathered in this study, being the only factor among demographics and hospitalization data significant for predicting the BIS at discharge. Rate of referral to Rehabilitation Medicine was also not found to be a significant factor affecting the change in BIS during the recovery period.

Given the high dropout rate and limited sample size as the study progressed, conclusions made regarding the timeline of recovery and role of physical medicine and rehabilitation in regaining premorbid independence may have been underestimated. While more detailed scales and measures do exist, our study, using a quick assessment tool, was able to highlight the need for better follow-up and an in-depth understanding of the non-demographic factors affecting functionality and participation in activities of daily living. Moving forward, due to better understanding of COVID-19 and management, and mitigation of its complications permitting more time for study, the authors recommend future studies shift away from a rapid assessment tool such as the Barthel Index to more qualitative assessment tools. Not only does the virus have prolonged effects on the internal biophysical processes of its host but also on how that individual interacts with their environment during and post-infection.

Statement of Authorship

Both authors certified fulfillment of ICMJE authorship criteria.

Author Disclosure

Both authors declared no conflicts of interest.

Funding Source

The study was funded by the authors.

REFERENCES

1. World Health Organization, Clinical management of severe acute respiratory infection when COVID-19 is suspected (v1.2) [Internet]. 2020 [cited 2020 Apr]. Available from: https://www.who.int/publications-detail/clinical-management-of-severe-acute-respiratory-infection-when-novel-coronavirus-(ncov)-infection-is-suspected
2. Department of Health, Updates on novel coronavirus disease (COVID-19) [Internet]. 2020 [cited 2020 Apr]. Available from: https://www.doh.gov.ph/2019-nCoV.
3. Toscano G, Palmerini F, Ravaglia S, Ruiz L, Invernizzi P, Giovanna Cuzzoni M, et al. Guillain-Barré syndrome associated with SARS-CoV2. N Engl J Med. 2020 Jun 25;382(26):2574-6. doi: 10.1056/NEJMc2009191. PMID: 32302082; PMCID: PMC7182017.
4. Chan JCK. Recovery pathway of post-SARS patients. Thorax. 2005 May;60(5):361-2. doi: 10.1136/thx.2004.035972. PMID: 15860708; PMCID: PMC1758902.
5. Hui DS, Joynt GM, Wong KT, Gomersall CD, Li TS, Antonio G, et al. Impact of severe acute respiratory syndrome (SARS) on pulmonary function, functional capacity and quality of life in a cohort of survivors. Thorax. 2005 May;60(5):401–9. doi: 10.1136/thx.2004.030205. PMID: 15860716; PMCID: PMC1758905.
6. Herridge MS, Cheung AM, Tansey CM, Matte-Martyn A, Diaz-Granados N, Al-Saidi F, et al. One-year outcomes in survivors of the acute respiratory distress syndrome. N Engl J Med. 2003 Feb 20;348(8):683–93. doi: 10.1056/NEJMoa022450. PMID: 12594312.
7. Simpson R, Robinson L. Rehabilitation after critical illness in people with COVID-19 infection. Am J Phys Med Rehabil. 2020 Jun;99(6):470-4. doi: 10.1097/PHM.0000000000001443. PMID: 32282359; PMCID: PMC7253039.
8. Aylward B, Liang W. Report of the WHO-China Joint Mission on Coronavirus Disease 2019 (COVID-19) Vol. 2019, The WHO-China Joint Mission on Coronavirus Disease 2019 [Internet]. 2020 [cited 2020 Apr]. Available from: https://www.who.int/docs/default-source/coronaviruse/who-china-joint-mission-on-covid-19-final-report.pdf
9. World Health Organization, Health systems respond to COVID-19 technical guidance #2 creating surge capacity for acute and intensive care recommendations for the WHO European Region [Internet]. 2020 Apr 6 [cited 2020 Apr]. Available from: https://www.who.int/europe/publications/i/item/WHO-EURO-2020-670-40405-54163
10. Christakou A, Papadopoulos E, Patsaki E, Sidiras G, Nanas S. Functional assessment scales in a general intensive care unit. A review. Hosp Chron. 2013;8(4):164–70. doi: 10.2015/HC.V8I4.552.
11. Elliott D, Denchy L. Post-ICU Rehabilitation. In: Stevens RD, Hart N, Herridge MS, editors. Textbook of post-ICU medicine: the legacy of critical care. Oxford, United Kingdom: Oxford University Press; 2014. p. 584.
12. Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J. 1965 Feb;14:56-61. PMID: 14258950.
13. Quinn TJ, Langhorne P, Stott DJ. Barthel Index for stroke trials: development, properties, and application. Stroke. 2011 Apr;1146–51. doi: 10.1161/STROKEAHA.110.598540. PMID: 21372310.
14. Della Pietra GL, Savio K, Oddone E, Reggiani M, Monaco F, Leone MA. Validity and reliability of the Barthel Index administered by telephone. Stroke. 2011 Jul;42(7):2077–9. doi: 10.1161/STROKEAHA.111.613521. PMID: 21527755.
15. Philippine Society for Microbiology and Infectious Disease, Philippine Society for Microbiology and Infectious Disease – interim guidelines on the clinical management of adult patients (v2.1 as of 31 March 2020) [Internet]. 2020 [cited 2020 April]. Available from: https://www.psmid.org/wp-content/uploads/2020/03/PSMID-COVID-19-Interim-Guidelines-v.03262020.pdf
16. Shah S, Vanclay F, Cooper B. Improving the sensitivity of the Barthel Index for stroke rehabilitation. J Clin Epidemiol. 1989;42(8):703–9. doi: 10.1016/0895-4356(89)90065-6. PMID: 2760661.

17. Wu Z, McGoogan JM. Characteristics of and important lessons from the Coronavirus Disease 2019 (COVID-19) outbreak in China: Summary of a report of 72,314 cases from the Chinese Center for Disease Control and Prevention. JAMA. 2020 Apr 7;323(13):1239-42. doi: 10.1001/jama.2020.2648. PMID: 32091533.
18. Philippines Statistics Authority, 2022 Causes of Deaths in the Philippines [Internet]. 2022 [cited 2022 Sep]. Available from: https://psa.gov.ph/content/2022-causes-deaths-philippines-preliminary-31-march-2022
19. Halpin S, O'Connor R, Sivan M. Long COVID and chronic COVID syndromes. J Med Virol. 2021 Mar;93(3):1242-3. doi: 10.1002/jmv.26587. PMID: 33034893; PMCID: PMC7675759.
20. Islam MF, Cotler J, Jason LA. Post-viral fatigue and COVID-19: Lessons from past epidemics. Fatigue. 2020 Jun;8(2):61-9. doi: 10.1080/21641846.2020.1778227.
21. Halpin SJ, McIvor C, Whyatt G, Adams A, Harvey O, McLean L, et al. Postdischarge symptoms and rehabilitation needs in survivors of COVID-19 infection: A cross-sectional evaluation. J Med Virol. 2021 Feb;93(2):1013–22. doi: 10.1002/jmv.26368. PMID: 32729939.
22. Wang X, Xu H, Jiang H, Wang L, Lu C, Wei X, et al. Clinical Features and outcomes of discharged Coronavirus Disease 2019 patients: a prospective cohort study. QJM. 2020 Sep 1;113(9):657-65. doi: 10.1093/qjmed/hcaa178. PMID: 32442308; PMCID: PMC7313792.
23. Heesakkers H, van der Hoeven JG, Corsten S, Janssen I, Ewalds E, Simons KS, et al. Clinical outcomes among patients with 1-year survival following intensive care unit treatment for COVID-19. JAMA. 2022 Feb 8;327(6):559-65. doi: 10.1001/jama.2022.0040. PMID: 35072716; PMCID: PMC8787680.
24. Vincent KB, Kasperski SJ, Caldeira KM, Garnier-Dykstra LM, Pinchevsky GM, O'Grady KE, et al. Maintaining superior follow-up rates in a longitudinal study: experiences from the college life study. Int J Mult Res Approaches. 2012 Jan 1;6(1):4406. doi: 10.5172/mra.2012.6.1.56. PMID: 22247739; PMCID: PMC3255097.
25. Mo X, Jian W, Su Z, Chen M, Peng H, Peng P, et al. Abnormal pulmonary function in COVID-19 patients at time of hospital discharge. Eur Respir J. 2020 Jun 18;55(6): 2001217. doi: 10.1183/13993003.01217-2020. PMID: 32381497; PMCID: PMC7236826.
26. Demeco A, Marotta N, Barletta M, Pino I, Marinaro C, Petraroli A, et al. Rehabilitation of patients post-COVID-19 infection: a literature review. J Int Med Res. 2020 Aug;48(8):300060520948382. doi: 10.1177/0300060520948382. PMID: 32840156; PMCID: PMC7450453.
27. Ignacio SD, Supnet IE, Estrada TDB, Dy Ching Bing-Agsaoay DD, de Leon KP. Rehabilitation for COVID-19 early functional return (RECOVER): Ensuring delivery of inpatient rehabilitation services for patients with COVID-19 in a low resource setting. Acta Med Philipp. 2022;56(4):7-9. doi: 10.47895/amp.v56i4.4885.
28. Arnold DT, Hamilton FW, Milne A, Morley AJ, Viner J, Attwood M, et al. Patient outcomes after hospitalisation with COVID-19 and implications for follow-up: results from a prospective UK cohort. Thorax. 2021 Apr;76(4):399-401. doi: 10.1136/thoraxjnl-2020-216086. PMID: 33273026; PMCID: PMC7716340.
29. Bek LM, Berentschot JC, Hellemons ME, Huijts SM, Aerts JGJV, van Bommel J, et al. CO-FLOW: COVID-19 follow-up care paths and long-term outcomes within the Dutch health care system: study protocol of a multicenter prospective cohort study following patients 2 years after hospital discharge. BMC Health Serv Res. 2021 Aug 21;21(1):847). doi: 10.1186/s12913-021-06813-6. PMID: 34419032; PMCID: PMC8379596.
30. Katz PP. Measures of adult general functional status. Arthritis Rheum. 2003 Oct;49(5S):S15-27. doi: 10.1002/art.11415.
31. Mlinac ME, Feng MC. Assessment of activities of daily living, self-care, and independence. Arch Clin Neuropsychol. 2016 Sep;31(6):506–16. doi:10.1093/arclin/acw049. PMID: 27475282.
32. Inter-Agency Standing Committee Reference Group on Mental Health and Psychosocial Support, Addressing Mental Health and Psychosocial Aspects of COVID-19 Outbreak Version 1.5 [Internet]. 2020 [cited 2020 May 9]. Available from: https://interagencystandingcommittee.org/iasc-reference-group-mental-health-and-psychosocial-support-emergency-settings/interim-briefing
33. Du H, Fang S, Wu S, Chen X, Chen J, Zhang Y, et al. Six-month follow-up of functional status in discharged patients with coronavirus disease 2019. BMC Infect Dis. 2021 Dec 20;21(1):1271. doi: 10.1186/s12879-021-06970-3. PMID: 34930161; PMCID: PMC8686090.

APPENDICES

Appendix A. The Barthel Index

Patient Name: _____
Rater Name: _____
Date: _____
The Barthel Index Activity Score: _____

FEEDING
0 = unable
5 = needs help cutting, spreading butter, etc., or requires modified diet
10 = independent

_____

BATHING
0 = dependent
5 = independent (or in shower)

_____

GROOMING
0 = needs help with personal care
5 = independent face/hair/teeth/shaving (implements provided)

_____

DRESSING
0 = dependent
5 = needs help but can do about half unaided
10 = independent (including buttons, zips, laces, etc.)

_____

BOWELS
0 = incontinent (or needs to be given enemas)
5 = occasional accident
10 = continent

_____

BLADDER
0 = incontinent, or catheterized and unable to manage alone
5 = occasional accident
10 = continent

_____

TOILET USE
0 = dependent
5 = needs some help, but can do something alone
10 = independent (on and off, dressing, wiping)

_____

TRANSFERS (BED TO CHAIR AND BACK)
0 = unable, no sitting balance
5 = major help (one or two people, physical), can sit
10 = minor help (verbal or physical)
15 = independent

_____

MOBILITY (ON LEVEL SURFACES)
0 = immobile or <50 yards
5 = wheelchair independent, including corners, >50 yards
10 = walks with help of one person (verbal or physical) >50 yards
15 = independent (but may use any aid; for example, stick) >50 yards

_____

STAIRS
0 = unable
5 = needs help (verbal, physical, carrying aid)
10 = independent

_____

TOTAL (0–100): _____

The Barthel ADL Index: Guidelines

1. The index should be used as a record of what a patient does, not as a record of what a patient could do.
2. The main aim is to establish degree of independence from any help, physical or verbal, however minor and for whatever reason.
3. The need for supervision renders the patient not independent.
4. A patient's performance should be established using the best available evidence. Asking the patient, friends/relatives, and nurses are the usual sources, but direct observation and common sense are also important. However, direct testing is not needed.
5. Usually the patient's performance over the preceding 24-48 hours is important, but occasionally longer periods will be relevant.
6. Middle categories imply that the patient supplies over 50 per cent of the effort.
7. Use of aids to be independent is allowed.

Mahoney FI, Barthel DW. Functional evaluation: the Barthel Index. Md State Med J. 1965 Feb;14:56-61. Used with permission.

Appendix B. Filipino Interview Guide for the Barthel Index

FEEDING | *PAG-KAIN*
0 = unable | *hindi kaya nang mag-isa*
5 = needs help cutting, spreading butter, etc., or requires modified diet | *kailangan ng tulong sa pag hiwa, paglagay ng palaman, atbp., o nangangailangan ng ibang uri ng pagkain (hal. ibang* texture *– malambot, malapot, malabnaw, atbp.)*
10 = independent | *kaya nang mag-isa*

_____

BATHING | *PAG-LIGO*
0 = dependent | *kailangan ng tulong*
5 = independent (or in shower) | *kaya nang mag-isa*

_____

GROOMING | *PAG-AYOS NG SARILI*
0 = needs help with personal care | *kailangan ng tulong*
5 = independent face/hair/teeth/shaving (implements provided) | *kaya mag-hilamos ng mukha/mag-suklay/mag-sipilyo/mag-ahit nang mag-isa*

_____

DRESSING | *PAG-BIHIS*
0 = dependent | *hindi kaya nang mag-isa*
5 = needs help but can do about half unaided | *kailangan ng tulong sa ibang bagay*
10 = independent (including buttons, zips, laces, etc.) | *kaya nang mag-isa (kasama na ang pag-butones, pag-siper, pagtali ng sintas, atbp.)*

_____

BOWELS | *PAG-DUMI*
0 = incontinent (or needs to be given enemas) | *hindi kontrolado ang pag-dumi o nangangailangan ng pampadumi o labatiba*
5 = occasional accident | *nadudumi minsan sa salawal*
10 = continent | *kontrolado ang pag-dumi*

_____

BLADDER | *PAG-IHI*
0 = incontinent, or catheterized and unable to manage alone | *hindi mapigilan ang ihi, naka-sonda o kailangan ng tulong para gumamit ng sonda*
5 = occasional accident | *naiihi minsan sa salawal*
10 = continent | *kontrolado ang pag-ihi*

_____

TOILET USE | *PAGGAMIT NG PALIKURAN*
0 = dependent | *hindi kaya nang mag-isa*
5 = needs some help, but can do something alone | *kailangan ng tulong sa ibang bagay*
10 = independent (on and off, dressing, wiping) | *kaya nang mag-isa (pag-upo at pag-tayo sa kubeta, pagsuot ng salawal, pagpunas sa sarili)*

_____

TRANSFERS (BED TO CHAIR AND BACK) | *PAG-LIPAT (MULA UPUAN PAPUNTANG HIGAAN AT PABALIK)*
0 = unable, no sitting balance | *hindi kaya lumipat at umupo nang mag-isa*
5 = major help (one or two people, physical), can sit | *kailangan ng tulong para makalipat (isa o dalawang tao, alalay), kaya umupo*
10 = minor help (verbal or physical) | *kailangan ng kaunting tulong (may gumagabay, kaunting alalay)*
15 = independent | *kaya nang mag-isa*

_____

MOBILITY (ON LEVEL SURFACES) | *PAG-GALA (SA PATAG)*
0 = immobile or < 50 yards | *hindi maka-gala o nakakagala pero <50 metro*
5 = wheelchair independent, including corners, > 50 yards | *kaya gumala nang mag-isa gamit ang wheelchair (kasama na ang pag-liko), >50 metro*
10 = walks with help of one person (verbal or physical) > 50 yards | *nakakalakad kapag may gumagabay o may alalay na kasama >50 metro*
15 = independent (but may use any aid; for example, stick) > 50 yards | *nakakalakad nang mag-isa (maaaring gumamit ng baston, saklay, atbp.)*

_____

STAIRS | *PAG-AKYAT AT BABA NG HAGDAN*
0 = unable | *hindi kaya*
5 = needs help (verbal, physical, carrying aid) | *kailangan ng tulong*
10 = independent | *kaya nang mag-isa*

_____

TOTAL (0–100): _____

Appendix C. Case Definitions for COVID-19

Adapted from Philippine Society for Microbiology and Infectious Disease – interim guidelines on the clinical management of adult patients[15]

COVID-19 Suspect: Person with a. severe acute respiratory illness (SARI) with no other etiology explaining clinical presentation; b. influenza-like illness (ILI) with i. no other etiology explaining clinical presentation AND history of travel to/residence in an area with local transmission of COVID-19 during 14 days of symptom onset or ii. with contact (direct physical contact, direct care without proper PPE) to a confirmed or probable COVID-19 case during 14 days of symptom onset; or c. fever, cough, or shortness of breath or other respiratory signs and symptoms in those i. ≥60 years old ii. with comorbidity iii. with high-risk pregnancy iv. who are health workers.

COVID-19 Probable: Suspect who either has a. inconclusive COVID testing or b. underwent COVID-19 testing not in an accredited laboratory or c. COVID suspect for which testing could not be done

COVID-19 Confirmed: Laboratory-confirmed for COVID-19 in accredited laboratory +/- clinical signs and symptoms

COVID-19 Recovered/Improved (for discharge): Clinical recovery (with resolution of symptoms) after a single negative test (or if kits are in abundant supply, two consecutive negative tests 24 hours apart) for SARS-CoV-2

Clinical Signs and Symptoms: Fever, cough, sore throat, nasal congestion, headache, muscle pain or malaise; signs and symptoms of pneumonia (respiratory rate </> 30 breaths/minute, HR </>125 beats/minute, SpO_2 </> 93% on room air)

Table C1. Classification of adult patients with probable or confirmed COVID-19 infection in Philippine Society for Microbiology and Infectious Disease – interim guidelines on the clinical management of adult patients[15]

Classification	Signs and Symptoms
A	Adult (age <60 years) with no comorbid illness, and mild non-specific symptoms such as fever, cough, sore throat, nasal congestion, headache, muscle pain or malaise
B	Adult (age >60 years) or young adult with stable co-morbid illness, and pneumonia (e.g. RR <30/minute, HR <125/minute, SpO_2 >93% on room air)
C	Any adult with fever or severe acute respiratory infection, as follows: • respiratory rate >30 breaths/minute • severe respiratory distress, or SpO_2 <93% on room air
	Sepsis: life-threatening organ dysfunction caused by a dysregulated host response to suspected or proven infection, with organ dysfunction presenting as follows: • altered mental status • difficult or fast breathing • low oxygen saturation • reduced urine output • fast heart rate, weak pulse, cold extremities or low blood pressure • skin mottling, or • laboratory evidence of coagulopathy, thrombocytopenia, acidosis, high lactate or hyperbilirubinemia • Septic Shock: persisting hypotension despite volume resuscitation, requiring vasopressors to maintain MAP ≥65 mmHg and serum lactate level >2 mmol/L
D	Within 1 week of known clinical insult or new or worsening respiratory symptoms, progressing infiltrates on CXR or chest CT), with respiratory failure not fully explained by cardiac failure or fluid overload

A – mild; B – moderate; C/D – severe/high risk; critical cases – require ICU admission