Since January 2020 Elsevier has created a COVID-19 resource centre with free information in English and Mandarin on the novel coronavirus COVID-19. The COVID-19 resource centre is hosted on Elsevier Connect, the company's public news and information website.

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ORIGINAL RESEARCH

Rehabilitation in Acute COVID-19 Patients: A Japanese Retrospective, Observational, Multi-Institutional Survey

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Abstract

Objective: : To investigate the changes in activities of daily living (ADLs) and the conditions of rehabilitation for acute COVID-19 patients in Japan.

Design: : Retrospective, observational survey.

Setting: : Four tertiary hospitals with intensive care units and one secondary hospital in Japan.

Participants: : COVID-19 patients (N=478) admitted to 5 hospitals

Interventions: : Not applicable.

Main Outcome Measures: : Walking ability and swallowing status were assessed using the FIM locomotion item and Food Intake Scale at admission and discharge. The physiatrists of each hospital were also surveyed regarding the factors that influenced decisions to provide rehabilitation.

Results: : Excluding patients who died, the proportion of critical patients who could walk independently at discharge was 63%, and the proportion of those who were able to take 3 meals orally at discharge was 90%. Rehabilitation was provided to 13.4% of all patients and to 58.3% of patients with critical symptoms.

Conclusions: : After COVID-19 treatment, patients, especially those with critical symptoms, still have functional disabilities related to walking and swallowing. It is possible that sufficient rehabilitation could not be provided during the period studied.

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Although vaccination against COVID-19 began in some countries in December 2020, the COVID-19 pandemic continues around the world. As of March 2021, there was an estimated 118 million people infected worldwide, with 2 million deaths reported.[1] Although the primary presentation is a respiratory infection contributing to pulmonary disease, including acute respiratory distress syndrome, COVID-19 affects other body systems and is associated with neurological,[2-4] thromboembolic,[5] and cardiovascular complications.[6,7] Furthermore, even after recovery from COVID-19, it is becoming clear that many activity limitations remain, such as respiratory impairment,[8-10] dysphagia,[11-13] low fat-free mass,[10] impaired physical function and activities of daily living (ADL),[8,10,13,14] and cognitive or mental dysfunction.[10,13]

Although guidelines and expert opinions on rehabilitation for patients with COVID-19 have been published,[15-17] there are still many unknowns, such as when and how much intervention should be performed, the possibility of secondary infection to therapists,

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and what rehabilitation interventions might be effective. There is a need to collect evidence to address these issues. In addition, because the infectious situation and outcomes,[18] genotypes of SARS-CoV-2,[19] medical systems, and rehabilitation resources differ, appropriate interventions can easily be expected to vary by country.

The first case of COVID-19 in Japan was reported on January 16, 2020.[20] The number of cases increased in late March, triggered by the influx of infected patients from overseas, and a state of emergency was declared on April 7 in 7 prefectures with urban areas. The number of infected people reached the peak of the first wave on April 11, 2020. In May, the spread of the disease began to be temporarily controlled, and the declaration of a state of emergency was lifted on May 25. With the reactivation of social activities, the number of infected people increased again in late June 2020 and reached the peak of the second wave in early August.[18,20] Since then, the number of new positive cases has been on the decline, but the effective reproduction number was still around 1 at the end of September, which caused concern about the spread of the infection nationwide. Until the beginning of April, all COVID-19 patients in Japan were hospitalized, whether they had symptoms or not. However, as the number of infected people increased, patients with no or mild symptoms were allowed to stay home. COVID-19 patients who stayed home were periodically investigated by the public health center. When a patient who stayed home worsened, the health center contacted some hospitals, and the patient was transferred to a hospital for treatment. A prior study has reported that Japanese patients with COVID-19 tended to have fewer comorbidities and lower mortality.[20]

There are case reports[12] and single-center intervention reports[21] on rehabilitation for patients with COVID-19 in Japan, but no reports have examined the changes in ADL or the conditions of rehabilitation at multiple facilities. The aim of this study was to investigate the changes in ADL and the conditions of rehabilitation for patients with acute COVID-19 in Japan.

Methods

This retrospective, observational study was conducted at 4 tertiary hospitals with intensive care units (ICUs) and 1 secondary hospital located in the metropolitan area and surrounding prefecture. All patients with confirmed COVID-19 (positive result by polymerase chain reaction testing or loop-mediated isothermal amplification testing of a nasopharyngeal sample or tracheal swab) who were admitted to 5 hospitals between January 16, 2020 (the first day COVID-19 patients were confirmed in Japan), and September 30, 2020, were recruited. Patients were excluded if they were younger than 16 years of age. No patients refused to participate in this study. The study protocol was approved by the institutional ethics review board (approval no. 20200093) and was registered in the University Hospital Medical Information Network clinical trial registry (UMIN 000043367). The study was performed in accordance with the Declaration of Helsinki.

List of abbreviations:

ADL activity of daily living
FILS Food Intake Scale
ICU intensive care unit
PPE personal protective equipment
FFR N95 filtering facepiece respirator

Patient characteristics

The following demographic characteristics and measures were collected from the patients' medical records: age, sex, severity of disease, comorbidities, length of hospital stay, and discharge destination. In addition, the patients' walking ability and swallowing status at admission and discharge were recorded.

Severity of disease and outcomes

Severity of disease was classified as mild, severe, or critical. Mild included nonpneumonia and mild pneumonia cases. Severe was characterized by dyspnea, respiratory frequency of 30 or more per minute, blood oxygen saturation of 93% or less, arterial oxygen partial pressure to fractional inspired oxygen ratio less than 300, and/or lung infiltrates greater than 50% within 24 to 48 hours. Critical cases were those with respiratory failure, septic shock, and/or multiple organ dysfunction/failure.[22] Subsequent analyses were done after classification of the patients into 3 groups: critical, severe, and mild. Discharge destination was classified as discharge home, transfer to hospital, and death.

Clinical symptoms and rehabilitation

Walking ability was assessed using the FIM locomotion item,[23,24] which has a 7-grade scale ranging from 1 point (total assistance or not testable) to 7 points (complete independence); patients with 6 or 7 points were classified as independent, and those with 1 to 5 points were classified as dependent. Swallowing status was assessed using the Food Intake Scale (FILS). FILS is a practical tool to assess the severity of dysphagia for various diseases with dysphagia. It has fair reliability and validity.[25] The patients were divided into 2 groups according to their oral intake status: a group with oral intake alone (FILS 7-10) and a group with no or partial oral intake (FILS 1-6).

The FIM locomotion score and FILS were assessed by physiatrists certified by the Japanese Association of Rehabilitation Medicine. Patients who died were excluded when checking FIM and FILS.

The mode of rehabilitation intervention was also collected and classified into 3 categories: direct (therapist directly provided rehabilitation), indirect (therapist provided guidance on rehabilitation without actually touching the patient), and none (no rehabilitation provided by therapist). If patients were provided rehabilitation, the following information was also collected: days from admission to providing rehabilitation, length of rehabilitation, and the content of rehabilitation. The content of rehabilitation was classified as respiratory rehabilitation, physical rehabilitation, and dysphagia rehabilitation.

Human and material resources for rehabilitation

The physiatrists of each hospital were surveyed on factors that influenced the decision to provide rehabilitation. The specific contents of the questionnaire were as follows. Regarding human resources, they were asked the number of therapists per 100 beds. On material resources, they were asked about the use of personal protective equipment (PPE) during

Table 1 Clinical characteristics of the study sample

Characteristics	Overall (N=456)	Critical (n=60)	Severe (n=83)	Mild (n=313)
Mean age (SD), y	52.7 (19.0)	66.8 (12.1)	60.2 (14.2)	48.0 (19.3)
Female, n (%)	172 (37.7)	9 (15.0)	27 (32.5)	136 (43.5)
Rehabilitation intervention, n (%)	61 (13.4)	35 (58.3)	14 (16.9)	12 (3.8)
Mean hospital stay (SD), days	16.1 (16.2)	32.6 (26.0)	20.0 (19.4)	11.9 (9.0)
Outcome, n (%)				
Discharge home	398 (87.3)	26 (43.3)	69 (83.1)	303 (96.8)
Transfer to hospital	35 (7.7)	15 (25.0)	10 (12.0)	10 (3.2)
Death	23 (5.0)	19 (31.7)	4 (4.8)	0 (0)
Comorbidity				
None, n (%)	134 (29.5)	6 (10.2)	19 (22.9)	109 (34.8)
No. of comorbidities, median (IQR)	1 (3)	3 (2.3)	2 (3)	1 (2)
Cardiovascular	42 (9.2)	9 (15.0)	13 (15.7)	20 (6.4)
Oncological	40 (8.8)	7 (11.9)	9 (10.8)	24 (7.7)
Chronic lung disease	62 (13.6)	14 (23.3)	13 (15.7)	35 (11.2)
Asthma	34 (7.5)	4 (6.7)	7 (8.4)	23 (7.3)
COPD/emphysema	13 (2.9)	6 (10.2)	4 (4.8)	3 (1.0)
Other	16 (3.5)	4 (6.8)	3 (3.6)	9 (2.9)
Immunocompromised	2 (0.4)	0 (0)	0 (0)	2 (0.6)
Orthopedic disease	34 (7.5)	4 (6.8)	9 (10.8)	21 (6.7)
Hypertension	102 (22.4)	26 (43.3)	30 (36.1)	46 (14.7)
Diabetes mellitus	88 (19.3)	23 (39.0)	23 (27.7)	42 (13.4)
Hyperlipidemia	69 (15.2)	16 (27.1)	22 (26.5)	31 (9.9)
CKD	18 (3.9)	5 (8.3)	8 (9.6)	5 (1.6)
Cerebrovascular disease	26 (5.7)	10 (16.9)	8 (9.6)	8 (2.6)

Abbreviations: IQR, interquartile range; CKD, chronic kidney disease; COPD, chronic obstructive pulmonary disease.

rehabilitation interventions, whether N95 filtering facepiece respirators (FFRs) were reused, and whether homemade PPE was used temporarily due to a shortage of PPE. They were also asked whether they had to temporarily postpone, suspend, or triage the provision of rehabilitation for COVID-19 patients due to a lack of human and material resources.

Results

The characteristics of the study participants are shown in table 1. A total of 478 patients were hospitalized during the study period. Of these, 22 were excluded because they were younger than 16 years old. Thus, 456 patients were analyzed; the mean age was 52.7±19.0 years, and 37.7% were women (n=172). Figure 1 shows patient exclusion criteria and the numbers and outcomes of the 3 groups.

Discharge destination and status of rehabilitation intervention

For the 60 patients with critical symptoms, the mean age was 66.8±12.1 years. The proportion of women was 15% (n=9), and 10% (n=6) had no relevant comorbidities. Of the 60 patients, 26 were discharged, 15 were transferred after their condition improved, and 19 died.

The mode of rehabilitation intervention was direct for 32 patients, indirect for 3, and none for 25. Eight of the direct intervention patients had already tested negative at the start of the intervention and were all discharged. For 2 of the indirect intervention patients, instruction and advice about physical rehabilitation were provided to direct contact health care workers, mainly nurses, and 1 was provided pamphlets in addition to verbal instruction to health care workers. Of the nonintervention patients, 2 had requests for rehabilitation by the attending physicians, but it was not possible to intervene due to infection control concerns at the time of the requests for intervention; 1 patient was discharged and 1 was transferred.

For the 83 patients with severe symptoms, the mean age was 60.2±14.2 years. The proportion of women was 32.5% (n=27), and 23% (n=19) had no relevant comorbidities. Of the 83 patients, 69 were discharged, 6 were transferred after their condition improved, and 4 died. One had a malignant syndrome during treatment of the disease and was transferred to a tertiary hospital. Three patients were transferred to other hospitals in the area to prioritize care of other critical patients requiring intensive care.

The mode of rehabilitation intervention was direct for 12 patients, indirect for 2, and none for 69. Of the patients provided direct intervention, 1 patient tested negative at the start of the intervention and was subsequently discharged. Among the indirect intervention patients, 2 were provided with pamphlets about physical and respiratory rehabilitation methods and independent training instruction.

For the 313 patients with mild symptoms, the mean age was 48.0±19.3 years. The proportion of women was 43.5% (n=136), and 35% (n=109) had no relevant comorbidities. Of the 313 patients, 303 were discharged, 9 were transferred after their condition improved, and none died. One was transferred to another hospital where his family was staying for treatment.

The mode of rehabilitation intervention was direct for 11 patients, indirect for 1, and none for 301. Of the direct intervention patients, 2 tested negative at the start of the intervention; 1 was discharged and 1 was transferred. One indirect intervention patient was provided with pamphlets and videos about physical and respiratory rehabilitation methods and independent training instruction.

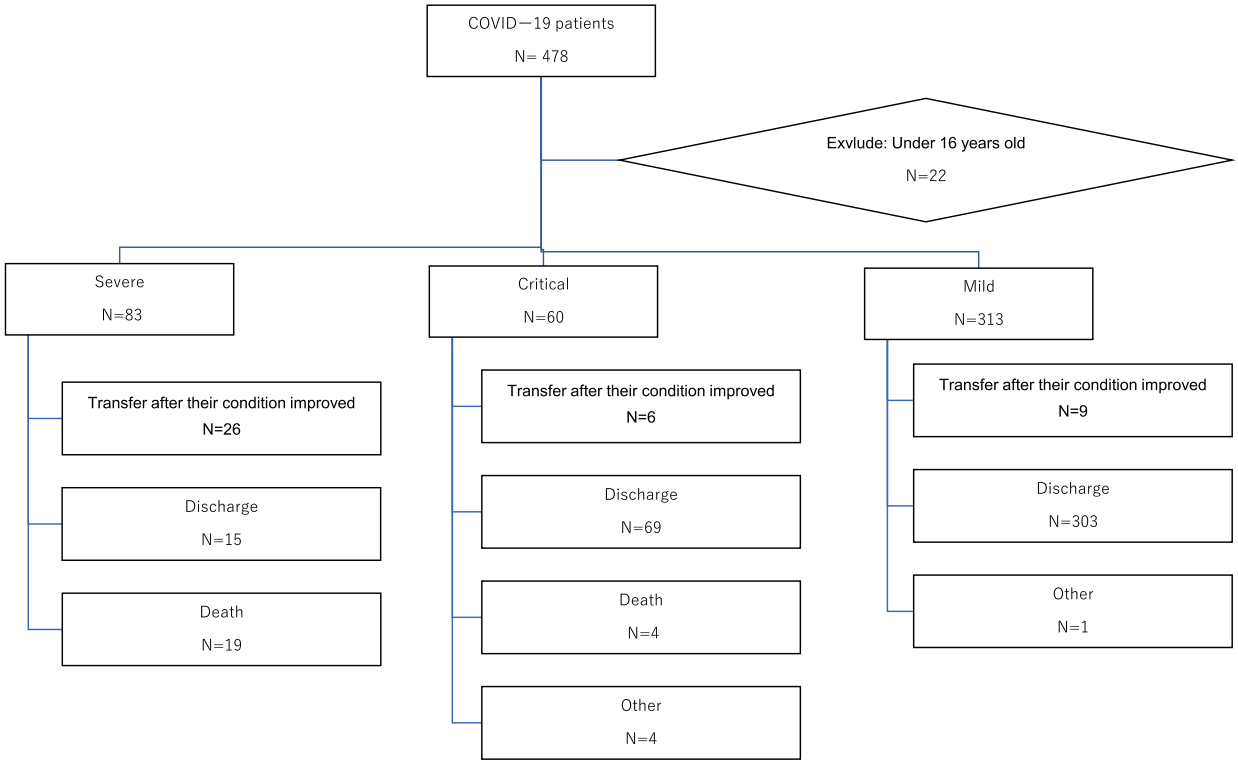

Fig. 1 Flow diagram for exclusion in this study and outcomes of the 3 groups.

Changes in walking ability and swallowing status

A total of 433 participants, excluding those who died, were studied. For walking ability, the proportion that was independent at admission was 5% (n=3) in the critical group, 61% (n=48) in the severe group, and 93% (n=289) in the mild group. At discharge, the percentage was 63% (n=26) in the critical group, 89% (n=70) in the severe group, and 94% (n=295) in the mild group. For swallowing status, the proportion of patients with oral intake alone at admission was 27% (n=11) in the critical group, 91% (n=72) in the severe group, and 98% (n=310) in the mild group. At discharge, the percentage was 90% (n=37) in the critical group, 95% (n=75) in the severe group, and 99% (n=310) in the mild group. The surviving patients' characteristics, walking ability, and swallowing status by direct and indirect rehabilitation interventions are shown in table 2.

For all severities, the group with rehabilitation intervention was older and had a longer hospital stay than the group without intervention. Days from admission to providing rehabilitation and length of rehabilitation varied widely.

Content of rehabilitation

For all 55 patients who were provided direct rehabilitation (including 32 critical, 12 severe, and 11 mild cases), physical therapists provided the rehabilitation. Ten of the patients (7 critical and 3 severe) were also treated by speech therapists. All 55 patients were provided physical rehabilitation, and 32 (25 critical, 5 severe, and 2 mild) were also provided respiratory rehabilitation.

Two severe cases were both diagnosed with COVID-19 during treatment of different diseases, but after the diagnosis was discovered, the therapist in charge was found to have a secondary infection. There were no cases of secondary infection of therapists from cases in which the patient was known to be positive at the start of the rehabilitation intervention.

Availability of human and material resources

The results of a questionnaire on availability of human and material resources are shown in table 3. In all hospitals, therapists who provided direct rehabilitation to the patients with COVID-19 were instructed in advance to reduce the risk of self-contamination. In all hospitals, therapists wore face masks and eye protection, N95 FFRs, gowns, and gloves when providing rehabilitation. N95 FFRs were disposed of each day in 2 hospitals. In the other 3 hospitals, healthcare workers reused N95 FFRs several times, referring to the Centers for Disease Control and Prevention strategy.[26] Two hospitals reported that they temporarily used handmade PPE instead of official PPE due to shortages. One of the 2 hospitals used handmade face shields for patients with COVID-19, and 1 used handmade gowns for patients who did not have COVID-19.

Four of the 5 hospitals reported that they had temporarily postponed, suspended, or triaged the provision of rehabilitation for patients with COVID-19, 2 hospitals due to lack of human resources and 3 hospitals due to lack of material resources.

Discussion

This study is the first report of a multi-institutional survey of the actual rehabilitation provided to patients with COVID-19 in Japan. In this study, the status of rehabilitation interventions in patients with COVID-19 was examined. Walking ability and swallowing status at the time of admission and discharge were also investigated. In the present study, the proportion of COVID-19 patients with severe symptoms was 13.2% (n=60). In a U.S. study of 230

Table 2 Characteristics, walking ability, and swallowing status by rehabilitation intervention

Characteristics	Critical		Severe		Mild	
	Rehabilitation	Nonrehabilitation	Rehabilitation	Nonrehabilitation	Rehabilitation	Nonrehabilitation
	n=29	n=12	n=11	n=68	n=12	n=301
Mean age (SD), y	68.2 (7.9)	54.0(10.5)	71.6(10.8)	57.5(13.5)	77.4(11.6)	46.8(18.6)
Mean hospital stay (SD), days	44.0 (30.9)	20.3(6.1)	27.0(11.6)	14.4(6.7)	33.3(22.0)	11.1(6.8)
Mean duration until rehabilitation start (SD, days	18.0 (20.4)		8.5(7.5)		20.6(17.7)	
Mean duration of rehabilitation (SD), days	27.0 (25.6)		8.9(6.0)		14.0(14.0)	
Walk independently, n (%)						
Admission	1 (3)	2 (17)	2 (18)	46 (68)	3 (25	286 (95)
Discharge	20 (69)	6 (50)	6 (55)	64 (94)	5 (42)	290 (97)
Oral intake alone, n (%)						
Admission	8 (28)	3 (25)	9 (82)	63 (93)	11 (92)	299 (99)
Discharge	26 (90)	11 (92)	8 (73)	67 (99)	11 (92)	299 (99)

patients, 27.4% required admission to the intensive care unit, and 48.3% required ventilator management.[27] Compared with the previous study, the proportion with critical symptoms was lower. It is known that the numbers of COVID-19 cases and deaths are lower in Japan than in Western countries,[28] and the overall severity of hospitalized patients is also known to be lower in Japan.[20] In the results of the present study, a similar trend can be seen.

In the present study, 50% of the surviving critical patients who were not provided rehabilitation and 32% of those who were provided rehabilitation could not walk independently at discharge. Curci et al[9] found that only 43.7% of COVID-19 patients with a history of ICU care were able to walk on admission to a rehabilitation unit. The present results support this previous study. In addition, van den Brost et al[10] reported that, even 3 months after COVID-19 treatment, 22% of patients had a 6-minute walking distance less than 80% of that predicted. Patients with severe COVID-19 were expected to have residual walking difficulty even after acute treatment. Spruit et al[29] reported the interim recommendations by experts, such as the European Respiratory Society and American Thoracic Society key opinion leaders and clinical experts from other relevant societies in the field of pulmonary rehabilitation. In that previous study, experts commented that patient-tailored early rehabilitative interventions similar to other critically ill patients should start after an assessment, including early mobilization and airway clearance. This may prevent or slow down the expected rapid deterioration in physical and emotional functioning.[29]

It appears that rehabilitation was beneficial in the critical group for walking. On the other hand, in terms of severe or mild cases, the proportion of patients who could walk independently at discharge was not higher in those with rehabilitation than in patients without rehabilitation. There could be some reasons to explain this. First, the patients' characteristics were different between those with and without rehabilitation; patients who were provided rehabilitation were older, and fewer of them could walk independently at admission in both groups. It is suggested that patients with preexisting walking disability prior to COVID-19 may be included. Second, the number of patients who received rehabilitation was extremely small. In the severe and mild groups, 11 and 12 patients, respectively, received rehabilitation and 68 and 301 did not. For these reasons, it is not possible to make a simple comparison of percentages for the effects of rehabilitation in the severe and mild groups. Regardless of not being provided rehabilitation, 94% of severe and 97% of mild patients were able to walk independently at discharge, which may indicate a relatively good prognosis if there is no significant frailty or functional impairment at admission. De Biase et al[30] reported that, to identify individuals who need rehabilitation, it is necessary to establish a screening system for rehabilitation that takes into account not only the severity of the disease, but also the degree of preexisting frailty and functional impairment. They also noted that models for rehabilitation vary from country to country due to the different health and social welfare systems and the impact of COVID-19. Further research in Japan is needed to understand how many people need rehabilitation and who they are.

In the present study, the swallowing status of patients with COVID-19 at the time of admission and discharge was investigated. The cause of dysphagia associated with COVID-19 may be due to aggravation of neuromuscular diseases and complications of cerebrovascular diseases,[31] in addition to dysphagia after ICU treatment, such as postextubation dysphagia.[31-33] However, there have been limited reports of dysphagia in COVID-19 patients. In

Table 3 Actual situation of providing rehabilitation for COVID-19 patients

Actual Situation	A	B	C	D	E
No. of beds	960	1153	560	530	713
Human resources					
No. of physical therapists (No. per 100 beds)	15 (1.6)	25 (2.2)	23 (4.1)	20 (3.8)	19 (2.7)
No. of occupational therapists (No. per 100 beds)	4 (0.4)	11 (1.0)	7 (1.3)	11 (2.1)	8 (1.1)
No. of speech therapists (No. per 100 beds)	3 (0.3)	7 (0.6)	3 (0.5)	4 (0.8)	4 (0.6)
Whether temporarily postponed, suspended, or triaged the provision of rehabilitation due to a lack of human resources	Yes	No	No	Yes	No
Specific details (therapy that needed to be suspended)	ST			OT/ST	
Material resources					
Whether N95 FFRs were reused several times	Yes	No	Yes	Yes	No
Whether all rehabilitation interventions for COVID-19 patients were provided with full PPE	Yes	Yes	Yes	Yes	Yes
Whether temporarily postponed, suspended, or triaged the provision of rehabilitation due to a lack of material resources	No	Yes	No	Yes	Yes
Whether temporarily used handmade PPE instead of official PPE due to PPE shortage	No	No	Yes	No	No
Specific details (handmade PPE)	Gown use for non-COVID-19 patients		Face shields for COVID-19 patients		
Others					
Whether there were an N95 FFR fitting test and instruction in gowning for medical staff	Yes, directly	Yes, directly	Yes, directly	Yes, directly	Yes, directly
Whether temporarily suspended the provision of rehabilitation due to concerns regarding secondary infection to medical staff	Yes	Yes	No	Yes	No

Abbreviations: OT, occupational therapy; ST, speech therapy.

the present study, 11 of 434 patients could not take nutrition only by oral intake, and 33 patients could take meals orally but had mild dysphagia (FILS 7-9). Lima et al[11] reported that approximately 30% of patients with COVID-19 had dysphagia at ICU discharge, although they had a better prognosis for dysphagia than those admitted for reasons other than COVID-19. Aoyagi et al[12] reported a case of a patient who developed severe dysphagia and repeated aspiration pneumonia after treatment for COVID-19. Further research is needed to determine which characteristics of patients lead to prolonged dysphagia.

In terms of physical rehabilitation provision, 13.4% (61 of 456 patients) were provided rehabilitation, although 6 patients were provided rehabilitation indirectly. By severity, 58.3% of patients with critical symptoms, 16.9% with severe symptoms, and 3.8% with mild symptoms were provided rehabilitation. In a US study of 230 patients with COVID-19, excluding deaths, it was reported that rehabilitation was provided to 26.5% of patients.[27] The proportion of patients provided with rehabilitation in the present study was small compared with the previous study. In fact, about half of the patients in the previous study were on ventilators, whereas 68.6% of the patients in the present study had mild disease. It is possible that the difference in the percentage of rehabilitation services provided was affected by the difference in severity.

In addition, of the surviving patients who were discharged from hospital in the present study, 11 patients remained on no or partial oral intake (FILS 1-6) and 33 patients had mild dysphagia (FILS 7-9). However, only 10 patients were provided with swallowing rehabilitation. There are 2 possible reasons why so few patients were provided swallowing rehabilitation.

The first reason is concern about the risk of secondary infection to health workers. In the present survey, 3 of the 5 hospitals reported that there was a time when it was necessary to temporarily postpone, suspend, or triage the provision of rehabilitation due to the risk of secondary infection to health care workers. The Society of Swallowing and Dysphagia of Japan proposed its position statement on dysphagia treatment considering the ongoing spread of COVID-19. According to the statement, dysphagia treatment including clinical assessments and examinations, dysphagia rehabilitation, and oral care can lead to the production of droplets and aerosols, as well as contact with viral particles. Furthermore, it states that physicians who order swallowing therapy should confirm the patient's current COVID-19 status and carefully assess the urgency of intervention.[34] The present survey period included the period with limited material resources, such as PPE, technical equipment, and drugs, as a global issue.[32] In the present survey, 3 of the 5 hospitals reported that healthcare workers had to reuse N95 FFRs several times. Two hospitals reported that they temporarily used handmade PPE instead of official PPE due to shortages; 1 hospital reported using handmade face shields for patients with COVID-19, and 1 hospital reported using handmade gowns for patients without COVID-19 instead of official gowns, which were used for patients with COVID-19. Based on this, the lack of material resources

also occurred in Japan. On the other hand, there were no secondary infections from patients who were found positive to healthcare workers who provided rehabilitation. This finding provides a useful message to medical institutions and rehabilitation staff who are concerned about the risk of secondary infection, showing that rehabilitation can be provided safely with the appropriate use of PPE.

The second reason is lack of human resources. In all 5 hospitals, there was less than 1 speech therapist per 100 beds. Furthermore, 2 hospitals reported that there was a period when they were unable to provide swallowing rehabilitation to patients with COVID-19 due to a lack of speech therapists. In 2019, the population of speech therapists in Japan was estimated to be 14.7 per 100,000,[35] which is approximately one-third of the proportion of ASHA-certified speech and language pathologists in the United States.[36] To maintain the system of providing dysphagia rehabilitation in Japan, enhancement of human resources is also an important issue.

Study limitations

The present study had several limitations. First, it was conducted at acute hospitals in an urban Japanese area. Therefore, caution is needed when generalizing the results. Second, this was a retrospective study, and the criteria and content for rehabilitation intervention were not uniform among the hospitals. Third, walking ability and swallowing status at admission may be due to the underlying illness. Fourth, respiratory function, neurological findings, or ADLs other than eating and walking were not evaluated. The relationship between this detailed information and rehabilitation should be examined in future studies. Despite these limitations, we believe that the present findings provide important information regarding the changes in ADLs and conditions of rehabilitation for patients with acute COVID-19 in Japan.

Conclusions

After COVID-19 treatment, patients, especially those with critical symptoms, continue to have functional disabilities related to walking and swallowing. During the period studied, it is possible that sufficient rehabilitation could not be provided.

Keywords

Activities of daily living; Gait; Rehabilitation

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