

ORIGINAL ARTICLE

Implementation of Rehabilitation and Patient Outcomes During the Initial COVID-19 Pandemic

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Objectives: This study investigated the impact of the initial outbreak of coronavirus disease (COVID-19) on rehabilitation and functional outcomes of patients in Japanese hospitals.

Methods: The study subjects were hospitals belonging to Japan's National Hospital Organization that provided inpatient care for patients with coronavirus COVID-19 during March–May 2020. We specifically focused on patients who were hospitalized for acute diseases, such as stroke, hip fracture, acute myocardial infarction, congestive heart failure, or chronic obstructive pulmonary disease, and received rehabilitation during hospitalization. Data were sourced from Japanese administrative data. The primary outcome was rehabilitation provision time in the target hospitals. The secondary outcomes were patient outcomes: rehabilitation participation time, length of hospital stay, 30-day readmission rate, and improvement of activities of daily living. Interrupted time series analysis was performed to evaluate the trend of rehabilitation provision time. Patient outcomes were compared with those for 2019.

Results: The rehabilitation provision time for outpatients declined by 62% during the pandemic, while that for inpatients declined temporarily, and then increased. Compared with 2019 outcomes, rehabilitation participation time was longer and hospital stay length was shorter for stroke and hip-fracture patients, the 30-day readmission rate was increased for hip-fracture patients, and improvement of activities in daily living was less for patients with congestive heart failure who were totally dependent at admission. Other outcomes did not change.

Conclusions: The findings suggest that during the initial COVID-19 pandemic, resources for rehabilitation were quickly reallocated to inpatient care, and the impact on inpatient outcomes was minimized.

Key Words: Asia, claims data, DPC data, healthcare policy, healthcare system

INTRODUCTION

The first outbreak of coronavirus disease (COVID-19) in Japan occurred during March–May 2020. Since then, COVID-19 has remained as a prominent health and social problem. During the worldwide pandemic, the provision of healthcare has been significantly affected.¹⁾ The number of hospitalizations for various diseases has decreased in many

countries,^{2–6)} and some patient outcomes have changed during the pandemic.^{7,8)} During this period, healthcare providers and staff have faced an excessive workplace burden because of measures taken to prevent nosocomial infections, such as altering workflows, reallocating healthcare resources, and frequent use of personal protective equipment.

Special responses have also been required for the implementation of rehabilitation. This is because physical contact

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between therapists and patients and the sharing of equipment between patients occurs frequently in rehabilitation settings, which can cause cross-infection. In many countries, inpatient rehabilitation has been offered in a reduced capacity or only to patients with urgent needs, and outpatient rehabilitation programs have been suspended and shifted to telerehabilitation.⁹⁾ A group of international experts in cardiorespiratory physiotherapy published clinical recommendations for managing physiotherapy during COVID-19 in March 2020.¹⁰⁾ The recommendations included screening for physiotherapy involvement for patients with COVID-19, reallocation of healthcare resources, selection of patients eligible for rehabilitation, and intervention. This guide was immediately translated into Japanese and disseminated nationwide.

For hospitalized patients, prolonged immobility results in delayed functional recovery, extended hospitalization, and an increased risk of complication.^{11–13)} Therefore, early and intensive mobilization and adequate exercise should be implemented during hospitalization. In addition, to achieve functional recovery and desirable outcomes, rehabilitation after hospital discharge plays a crucial role.^{14–17)} During the pandemic, however, patients may have been adversely affected because the implementation of rehabilitation was restricted.

It is unclear how the COVID-19 pandemic has affected the implementation of rehabilitation and whether patients' functional outcomes have been affected. To investigate this, we surveyed the provision of rehabilitation and functional outcomes in Japanese hospitals that provided inpatient care for patients with COVID-19 during the first stage of the pandemic.

MATERIALS AND METHODS

Data Source

We used insurance claims data and Diagnosis Procedure Combination (DPC) data of the National Hospital Organization (NHO) of Japan, an organization established to manage national hospitals across 140 locations nationwide. The DPC holds Japanese administrative data, and its explicit content has been described in previous studies.¹⁸⁾ Specifically, it contains information on inpatient care, including patient profile, diagnoses, surgeries, procedures, medications, and selected hospitalization information, such as Japan Coma Scale¹⁹⁾ at admission and discharge, length of stay, discharge destination, and outcome. Diagnoses were recorded based on the International Classification of Diseases Tenth Revision (ICD-10) codes. Activities of daily living (ADL) scores

based on the Barthel Index (BI) with a 20-point scale were recorded at admission and discharge.²⁰⁾

Study Subjects

This study included data from 59 hospitals nationwide that provided inpatient care to patients with COVID-19 during March–May 2020. We focused on patients who were admitted to these hospitals because of acute diseases, such as stroke, hip fracture, acute myocardial infarction (AMI), congestive heart failure (CHF), or chronic obstructive pulmonary disease (COPD), and received rehabilitation during hospitalization. To examine the effect of the pandemic on patient outcomes, patients with the same diseases during the same period of the previous year were included as a control group.

Measurements

The primary outcome was the rehabilitation provision time in the target hospitals, which was calculated as the total rehabilitation time provided to all patients based on inpatient and outpatient claims data. To assess the time trend before the COVID-19 outbreak, we set an evaluation period from December 2019 to May 2020. The time was calculated by summing the time provided in all the subject hospitals daily and was evaluated for each inpatient and outpatient.

The secondary outcomes were patient outcomes including rehabilitation participation time per day, length of hospital stay, 30-day readmission, and improvement in ADL score during hospitalization. These were assessed using the DPC data. An inpatient can receive a rehabilitation program for up to 180 min per day. The rehabilitation participation time per day was calculated by dividing the total rehabilitation participation time during hospitalization by the number of days from the start of rehabilitation to discharge. The 30-day readmission was defined as an unplanned admission to the same hospital regardless of the reason within 30 days of discharge. For evaluation of ADL scores, patients were divided into three groups according to BI score at admission: total dependence group with 0 points, severe dependence group with 1–12 points, and moderate and slight dependence group with 13–19 points.^{21,22)} For each group, differences between the scores on admission and discharge were evaluated.

This study was approved by the institutional review board of the NHO (R2-1119002). This study used only anonymized data; therefore, informed consent was not required. However, a public notice of the study was acknowledged on the NHO website, and the opportunity to opt out was guaranteed.

Statistical Analysis

Continuous variables were expressed as means and standard errors or medians and interquartile ranges, and categorical variables were expressed as percentages. Comparison between the groups was performed using a *t*-test, Mann–Whitney U test, or χ^2 test.

Interrupted time series (ITS) analysis was performed to analyze the trend of rehabilitation provision time in the target hospitals.²³⁾ We divided the study period into three parts: (1) pre-pandemic (December 1, 2019 to March 22, 2020; the period before the explosive increase in COVID-19 cases); (2) pandemic (March 23 to May 16, 2020; the period during which the number of new COVID-19 cases per day exceeded 50 and began increasing rapidly until it fell below 50 and stopped declining); and (3) post-pandemic (May 17 to May 31, 2020). For these three periods, we estimated the daily total rehabilitation time and the level changes between two adjacent periods.

Patient outcomes were analyzed for each disease group. Rehabilitation participation time per day was averaged for each month based on the patient admission month and compared with the same month last year, referring to an event study model.²⁴⁾ We fitted a multivariable ordinary least-squares regression model to the outcome. We regressed rehabilitation participation time on indicator variables for months, a binary categorical variable for the intervention year group, and the interaction term between these two regressors.

ADL improvement was analyzed for each disease group using a difference-in-difference model. Statistical significance was set at $P < 0.05$. All statistical analyses were performed using the Stata version 14 software (StataCorp, College Station, TX, USA).

RESULTS

A total of 59 hospitals included in this study were all acute-care hospitals [median number of beds was 295 (interquartile range 140–430), including 9 hospitals with 500 or more beds]. Of these, 3 hospitals had beds for rehabilitation in the recovery phase, and 26 hospitals had beds for long-term care for intractable neural disease. Of the 59 hospitals, 5 were located in northern Japan (Hokkaido and Tohoku regions), 19 in eastern Japan (Kanto and Shin-etsu regions), 7 in the middle of Japan (Tokai and Hokuriku regions), 16 in western Japan (Kinki, Chugoku, and Shikoku regions), and 12 in southern Japan (Kyushu and Okinawa regions). Twenty-eight hospitals were located in seven major cities where the spread of COVID-19 was particularly severe in

the first outbreak and were the first to be subjected to emergency decelerations. A total of 2500 therapists including 1349 physical therapists, 811 occupational therapists, and 340 speech therapists, belonged to these hospitals. In total, 7847 patients were included in this study; 3793 patients were inpatients during the pandemic period (March–May 2020), and 4054 patients were inpatients during the same period of 2019. Patient characteristics were compared between groups of patients for each year (Table 1). When compared with 2019 data, the 2020 period showed more emergency admissions for stroke, a lower proportion of male patients with hip fractures, and a lower mean age for COPD.

The daily rehabilitation provision time in the target hospitals was evaluated for each inpatient and outpatient. The averaged data for each period are shown in Table 2. As a baseline condition, before the pandemic, the rehabilitation provision time for outpatients accounted about for 6% of the total time for inpatients and outpatients. The results of the ITS analysis for the rehabilitation provision time per day in the subject hospitals are shown in Fig. 1 and Table 3. For outpatient rehabilitation time, a decrease of approximately 10% was observed at the start of the pandemic [–24.4 h, 95% confidence interval (CI) –48.2 to –0.5 h] (Fig. 1A), which was equivalent to a decrease of 24.8 min per hospital. Moreover, during the pandemic period, a negative slope change was observed (–2.7 h per day, 95% CI –3.7 to –1.7 h). This was equivalent to an additional decrease of 2.7 min per day per hospital from the baseline trend. At the end of the pandemic period, outpatient rehabilitation time was reduced by 62% from the baseline trend. Thereafter, in the post-pandemic period, there was a positive slope change from the pandemic period (5.4 h per day, 95% CI 4.3 to 6.6 h, equivalent to 5.5 min per day per hospital). For inpatient rehabilitation, although it temporarily decreased by about 7% (–314 h, 95% CI –398 to –230 h) at the start of the pandemic (equivalent to –5.3 h per hospital), the slope positively changed in the pandemic period by 9.2 h per day from the baseline trend (equivalent to 9.4 min per day per hospital). The increasing trend continued after the pandemic, and it was higher than that in the pre-pandemic period by the end of the study period (Fig. 1B). The trend of the total rehabilitation provision time for inpatients and outpatients was similar to that for inpatients. It temporarily decreased by about 7% (–338 h, 95% CI –424 to –253 h) at the start of the pandemic (equivalent to –5.7 h per hospital) and then continued to increase throughout the pandemic and post-pandemic periods (Fig. 1C).

The rehabilitation participation time per day for the patients was also evaluated by disease group. For patients with

Table 1. Patient characteristics by patient group in March-May 2020 and 2019

Variables	Stroke		Hip fracture		AMI		CHF		COPD	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Total, n	1297	1222	1092	986	317	331	1032	1077	316	177
Age, years	76.0 (12.4)	75.8 (12.1)	81.6 (12.9)	81.8 (11.7)	71.0 (12.4)	71.7 (13.0)	82.1 (10.6)	81.6 (10.4)	77.4 (8.0)	75.0* (8.3)
Male, %	41.1	40.2	77.0	72.5*	29.0	28.4	49.3	46.2	17.7	14.1
JCS, %										
0	45.0	46.6	86.4	85.7	88.0	87.6	82.1	84.0	90.2	87.6
1	41.1	40.4	13.3	13.8	7.6	8.5	14.4	12.6	7.6	9.0
2	10.5	9.2	0.3	0.4	1.3	1.8	2.4	2.4	1.6	0.6
3	3.4	3.8	0.1	0.1	3.2	2.1	1.1	0.9	0.6	2.8
Emergency, %	71.5	78.3*	70.7	73.6	96.2	97.6	72.8	74.7	41.5	42.4
Region, %										
North	6.48	7.36	3.21	3.25	6.94	8.16	6.40	6.22	6.96	6.21
East	33.92	36.09	33.52	31.34	30.91	36.56	34.98	31.20	32.28	32.77
Middle	18.74	16.37	17.86	20.89	22.71	20.54	18.02	18.11	8.54	11.30
West	20.58	18.90	23.54	23.33	21.45	19.94	25.29	28.41	33.55	31.63
South	20.28	21.28	21.89	21.20	17.98	14.80	15.31	16.06	18.67	18.08

Data for Age given as mean (SD).

JCS, Japan Coma Scale. * Statistically significant difference, $P < 0.05$.

Table 2. Daily rehabilitation provision time during pre-pandemic, pandemic, and post-pandemic period

Period	Outpatient	Inpatient	Overall
Pre-pandemic, h	264.6 (38.1)	4368.0 (122.3)	4632.6 (123.7)
(per hospital)	4.5 (0.6)	74.0 (2.1)	78.5 (2.1)
Pandemic, h	150.6 (44.2)	4288.4 (154.4)	4439.0 (123.9)
(per hospital)	2.6 (0.7)	72.7 (2.6)	75.2 (2.1)
Post-pandemic, h	138.9 (28.2)	4625.2 (92.4)	4764.0 (113.3)
(per hospital)	2.4 (0.5)	78.4 (1.6)	80.7 (1.9)

Data given as mean (SD). Mean hours per hospital was calculated by dividing hours in the cell above by 59 target hospitals.

stroke or hip fracture, rehabilitation participation time per day was longer in April and May than in the previous year (**Fig. 2A, B**). The respective differences were 8.4 and 6.8 min per day for patients with stroke and 2.6 and 3.2 min per day for patients with hip fractures. The daily rehabilitation participation time was 6 min longer in May for patients with AMI (**Fig. 2C**) and 3.4 min longer in both March and May for patients with CHF (**Fig. 2D**). For patients with COPD, there was no statistically significant difference in any month (**Fig. 2E**).

Figure 3 shows that the length of hospital stay was significantly shorter in 2020 than that in the previous year for patients in stroke and hip fracture groups (median difference was 2 days in each group).

However, no significant difference was observed for the

AMI, CHF, or COPD groups.

Figure 4 shows little change between years for the 30-day readmission rates for the respective disease groups. However, the 30-day readmission rate for patients with hip fractures in 2020 was significantly higher than in the previous year, with a difference of 1.5 points. Specifically, the readmission rate among these patients discharged to nursing homes increased from 2.3% in 2019 to 9.3% during the pandemic ($P=0.02$). The readmission rate for other patients discharged to home or transferred to other medical facilities were 2.1% and 1.8% in 2019 and 3.5% and 2.3% in 2020 (none were significantly different). The distribution of discharge destinations remained unchanged from the previous year for all groups (**Table 4**).

There was no change in ADL score improvement years for all disease groups (**Table 4**). However, only the mean

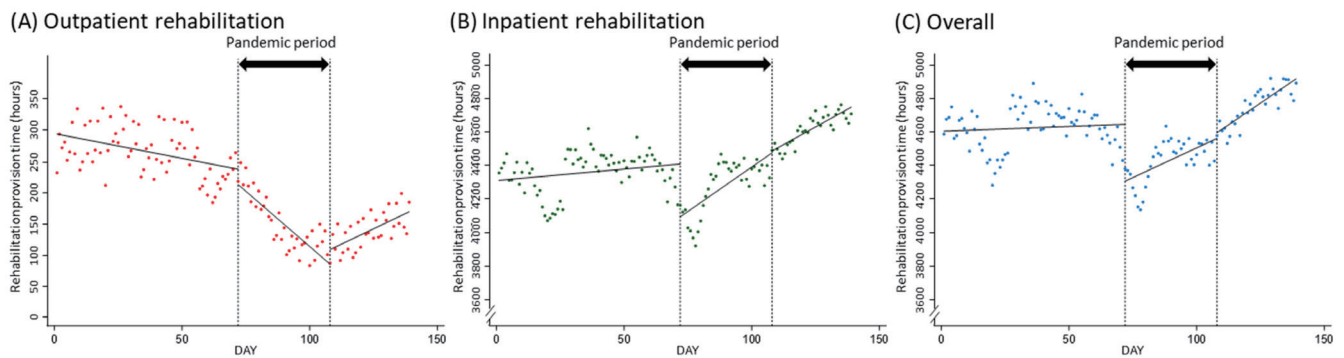


Fig. 1. The trends of daily hours of rehabilitation provided in all hospitals.

The dots in the figure show the total hours of rehabilitation performed in all hospitals for each day. (A) Outpatient rehabilitation; (B) inpatient rehabilitation; (C) inpatient and outpatient rehabilitation. Three periods were set: before, during, and after the pandemic. Subsequently, interrupted time series analysis was performed, and regression lines were fitted for each period (black lines).

Table 3. Results of interrupted time series analysis for the trend of rehabilitation provision time during December 2019 to May 2020

Variables	Outpatient rehabilitation			Inpatient rehabilitation			Overall		
	Coef.	95% CI	P value	Coef.	95% CI	P value	Coef.	95% CI	P value
Baseline trend, h/day	-0.8	(-1.1, -0.4)	<0.001	1.4	(0.2, 2.6)	0.026	0.6	(-0.6, 1.8)	0.348
Slope change, h/day									
Pandemic	-2.7	(-3.7, -1.7)	<0.001	9.2	(5.7, 12.7)	<0.001	6.5	(2.9, 10.1)	0.001
Post-pandemic	2.7	(1.5, 3.9)	<0.001	7.0	(2.9, 11.2)	0.001	9.8	(5.5, 14.0)	<0.001
Difference between pandemic and post-pandemic	5.4	(4.3, 6.6)	<0.001	-2.2	(-6.4, 2.1)	0.314	3.3	(-0.9, 7.4)	0.125
Level change, h									
At start of pandemic	-24.4	(-48.2, -0.5)	0.046	-313.9	(-398.0, -229.8)	<0.001	-338.3	(-423.7, -252.8)	<0.001
At end of pandemic	23.1	(0.4, 45.8)	0.046	11.0	(-72.3, 94.2)	0.793	34.1	(-47.2, 115.4)	0.405

The pre-pandemic period was from December 1, 2019, to March 22, 2020. The pandemic period was from March 23 to May 16, 2020. The post-pandemic period was from May 17 to May 31, 2022. Coef., coefficient.

score of total dependence group in patients with CHF was significantly less than that of the same group in the previous year, with a difference of 2.2 points (**Fig. 5**). The same trend was observed in the total dependence group for COPD, with a difference of 3.7 points, although this was not significant.

DISCUSSION

This study evaluated the impact of the initial COVID-19 pandemic outbreak on the provision of rehabilitation in 59

hospitals in Japan. The results showed that the provision time for outpatient rehabilitation showed a decreasing trend, whereas that for inpatients showed an increasing trend. In addition, for patients divided into groups based on treatment for stroke, hip fracture, AMI, CHF, or COPD, some of the patient groups showed changes in some outcomes such as ADL improvement, length of stay, and 30-day readmission. To the best of our knowledge, this is the first report of a nationwide study of rehabilitation practices and patient outcomes during the COVID-19 pandemic. Although the scale of the first out-

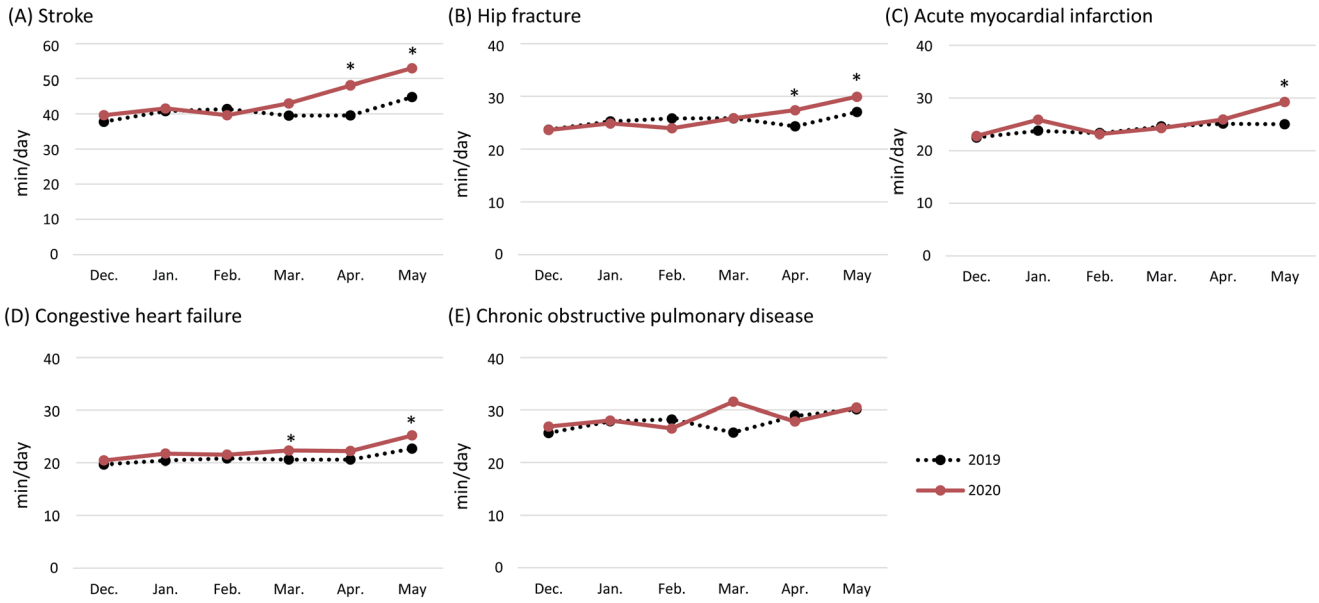


Fig. 2. Rehabilitation participation time per day by patient group.

The rehabilitation participation time per day was calculated by dividing the total time of rehabilitation participation time during hospitalization by the number of days from the start of rehabilitation to discharge.

Asterisks indicate difference for the month between years.

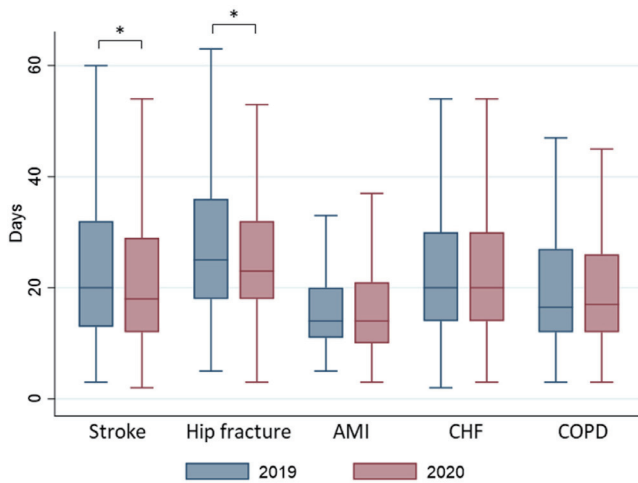


Fig. 3. Length of hospital stay during the COVID-19 pandemic and previous year by patient group.

The boxes are bordered at the 25th and 75th percentiles, with the middle line at the 50th percentile.

Asterisks indicate that hospital stays in 2020 were significantly shorter than in 2019.

break was much smaller than those of subsequent outbreaks (Supplemental Fig. S1), at that time, the characteristics of the disease itself were unknown and personal protective

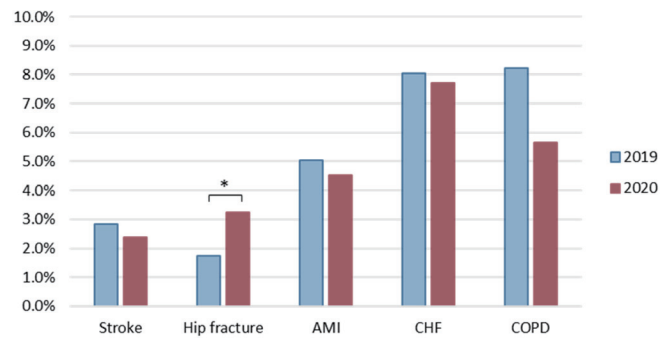


Fig. 4. Thirty-day readmission rate during the COVID-19 pandemic and previous year by patient group.

Blue bars indicate rates during March–May 2019; red bars indicate rates for the same period in 2020.

Asterisk indicates that the rate in 2020 was significantly higher than in 2019.

equipment was not readily available, causing confusion in the healthcare delivery system in hospitals. Therefore, it is necessary to clarify how the rehabilitation of non-COVID-19 patients was affected under these circumstances. Furthermore, understanding impacts on patient outcomes will provide essential knowledge for further research and valuable insights for future countermeasures against large-scale

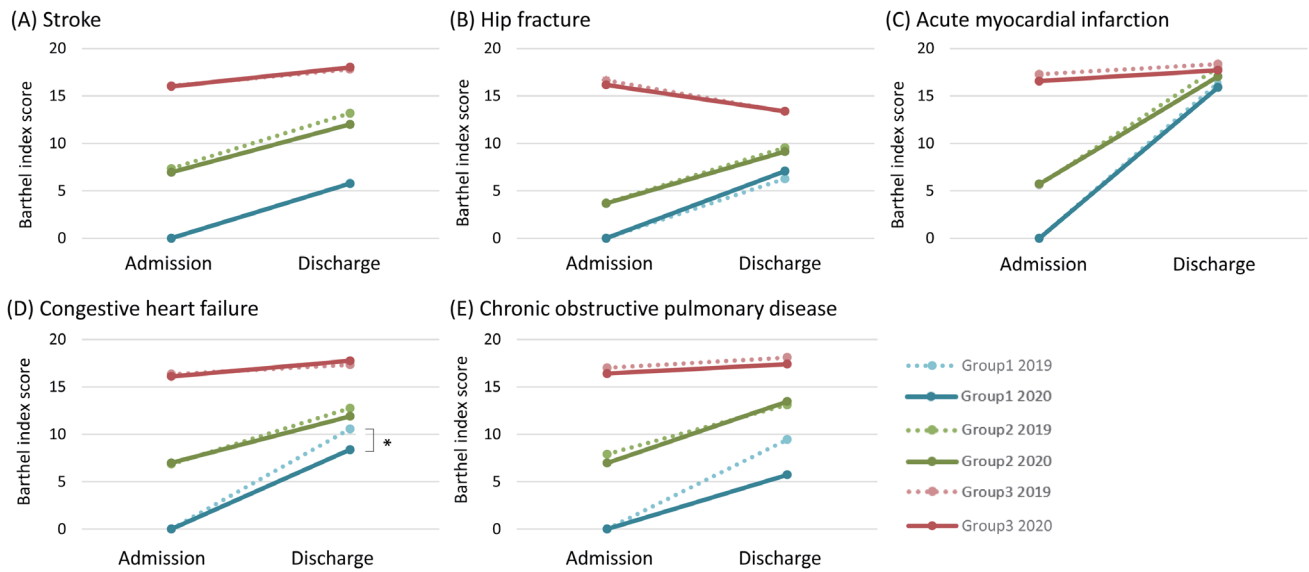


Fig. 5. Improvement in ADL scores by patient group.

The status of ADL was reported at admission and discharge based on the BI. ADL score improvement was evaluated by classifying patients into three groups based on BI at admission: Group 1, total dependence patients with a score of 0 at admission; Group 2, severe dependence patients with a score of 1–12 at admission; Group 3, moderate and slight dependence patients with a score of 13–19 at admission. The differences between the COVID-19 pandemic period (March–May 2020, solid lines) and the same period of the previous year (March–May 2019, dotted lines) were analyzed using a difference-in-differences model.

Asterisk denotes significant difference.

Table 4. Barthel Index and discharge destination by patient group in March–May 2020 and 2019.

Variables	Stroke		Hip fracture		AMI		CHF		COPD	
	2019	2020	2019	2020	2019	2020	2019	2020	2019	2020
Discharge destination, %										
Home	47.1	47.2	20.1	17.3	88.3	84.3	69.1	72.2	86.7	77.4
Hospital transfer	44.3	45.3	66.6	70.7	8.2	9.4	14.1	14.4	7.3	14.1
Nursing home	4.8	4.4	11.8	11.0	1.9	2.4	8.3	7.8	1.6	3.4
Death	3.9	3.0	1.4	0.9	1.6	3.9	8.4	5.6	4.1	5.1
Other	0.0	0.0	0.1	0.1	0.0	0.0	0.1	0.0	0.3	0.0
Barthel Index, mean (SD)										
At admission	9.44 (8.07)	9.42 (8.12)	4.30 (6.12)	4.13 (5.86)	10.48 (8.91)	9.29 (8.95)	11.31 (8.16)	11.60 (8.14)	15.62 (6.56)	14.35 (7.20)
At discharge	13.40 (8.00)	12.80 (8.03)	9.37 (7.12)	9.07 (6.83)	18.31 (4.64)	17.82 (5.17)	15.33 (6.60)	14.89 (6.96)	17.44 (5.30)	16.85 (5.72)

Barthel Index is represented on a 20-point scale.

epidemics and disasters.

Our results showed that rehabilitation for outpatients was undoubtedly limited in the first outbreak of the COVID-19 pandemic. This is consistent with recommendations made by the Japan association of rehabilitation hospitals and in-

stitutions that suggested the suspension of rehabilitation for outpatients. This implies that the hospitals and their medical staff paid attention to the recommendations and complied with them. Moreover, the nationwide declaration of a state of emergency from April 16 to May 25, 2020 restricted the

scope of social and daily life, and patients refraining from visiting hospitals to avoid the risk of infection may also have contributed to this result.²⁵⁾

In contrast, rehabilitation of inpatients showed an increasing trend, which can be attributed to the resources typically reserved for outpatient rehabilitation being temporarily shifted to rehabilitation of inpatients. This response corresponds to that of many other countries.⁹⁾ As a result, the total rehabilitation duration provided in hospitals did not change significantly. This may indicate that the rehabilitation departments of hospitals that took care of patients with COVID-19 were able to successfully reallocate resources and provide rehabilitation without loss of function even during the pandemic.

Focusing on the patient groups, the rehabilitation participation time for stroke and hip fractures increased during the pandemic period. This suggests that these patients, who especially needed early intervention for functional recovery and prevention of complications, were given priority in assigning the available resources. These groups also had shorter hospital stays than in the previous year. During this period, although the proportions of patients with COVID-19 among all inpatients were not high (about 1% in March, 3% in April, and 2% in May), a large part of the workforce was devoted to securing beds and personnel in preparation for providing medical care for patients with COVID-19. Outpatient care was suspended whenever possible, and inpatient care was also drastically restricted by postponing scheduled admissions unless it was an emergency. In addition, inpatients were encouraged to discharge from the hospital as early as possible to prevent cross-infection within the hospital. Particularly for patients with stroke or hip fracture, the Japanese medical system has established care plan coordination between acute hospitals and communities, rehabilitation hospitals, and long-term care facilities, which is reported to contribute to shortened hospital stay.^{26,27)} Our results indicate that the coordination was strongly promoted and probably worked effectively during the pandemic.

However, the 30-day readmission rate for patients with hip fractures during the pandemic was worse than that in the same period during the previous year. Given that post-discharge facility-based training improves physical function,²⁸⁾ suspension of outpatient rehabilitation and inactivity during the pandemic may have contributed to the increased readmission rate. In particular, the increase in readmission rate from the previous year for these patients discharged to nursing homes was evidently higher than that for those discharged elsewhere. Considering that a previous study re-

ported that discharge to a nursing home is a related factor of readmission,²⁹⁾ and the distribution of discharge destinations remained unchanged from the previous year, our results suggest that discharge to a nursing home was more strongly related to readmission in the pandemic situation. However, further studies are required in this area because the reason for readmission was not assessed in the current study.

In the evaluation of ADL improvement, no difference was observed between years when comparing the mean BI scores of all inpatients. However, by dividing patients into three groups based on the level of ADL dependence, it was possible to identify differences in the impact in each group. Our results showed that ADL improvement in the total dependence group of patients with CHF was less than that in the previous year. A similar trend was observed in the group of patients with COPD. Patients with these diseases often demonstrate muscle catabolism and wasting.^{30,31)} In particular, the total dependence group may have been suffering from more severe skeletal muscle dysfunction because of prolonged bed rest. Dysfunction of ADL among these patients is often caused by a decline in cardiopulmonary function, muscular endurance, and functional capacity,³²⁾ and exercise is strongly recommended for a beneficial outcome in such cases.³³⁾ However, the circumstances of the COVID-19 pandemic may have forced patients to train at the bedside, where equipment, facilities, and space are minimal, resulting in inadequate training and unsatisfactory results. However, the content or location of rehabilitation training was not observed in this study, and further detailed studies are needed. The other groups achieved ADL improvements comparable with those of the previous year, indicating that patients were not disadvantaged in this aspect during the pandemic. These results allowed us to understand which patients were more likely to be disadvantaged and require special consideration when similar situations arise in the future.

The current study has some limitations. First, we could not evaluate the impact on outpatient outcomes. Interruption of outpatient programs could adversely impact patients,^{34–36)} and further studies are needed to confirm this assumption. Subsequently, the results of the present study were based on nationwide data from multiple centers in Japan. Therefore, the validity of generalizing these results to other countries or situations is unknown. Next, we compared the patient outcomes in the COVID-19 pandemic period with those of the same period in the previous year to evaluate the impact of the pandemic. However, the patient outcomes in the previous year might not have been fully representative of the status of ordinary conditions. Lastly, the number of therapists who

were engaged in the rehabilitation of patients with COVID-19 during this period was unknown. Therapists who engaged in rehabilitation for patients with COVID-19 often did not rehabilitation for non-COVID-19 patients on the same day to prevent nosocomial infections. This protocol may have affected the level of rehabilitation available for non-COVID-19 patients. However, the degree of impact of this factor was not evaluated.

CONCLUSION

During the 3 months of the first outbreak of the COVID-19 pandemic in Japan, a reduced level of rehabilitation was provided to outpatients, as recommended by the expert association, while rehabilitation for inpatients was slightly increased. These findings suggest that in emergency situations, priority was given to ensuring the safety of patients and therapists, and resources were swiftly reallocated to inpatient care. Moreover, the impact on patient outcomes was minimized in this situation. When faced with similar public health problems in the future, the findings of this study may provide essential resources for addressing these problems. In the future, more detailed studies will be required to assess the relationship between rehabilitation practices and patient outcomes.

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CONFLICTS OF INTEREST

The authors have no conflicts of interest to declare.

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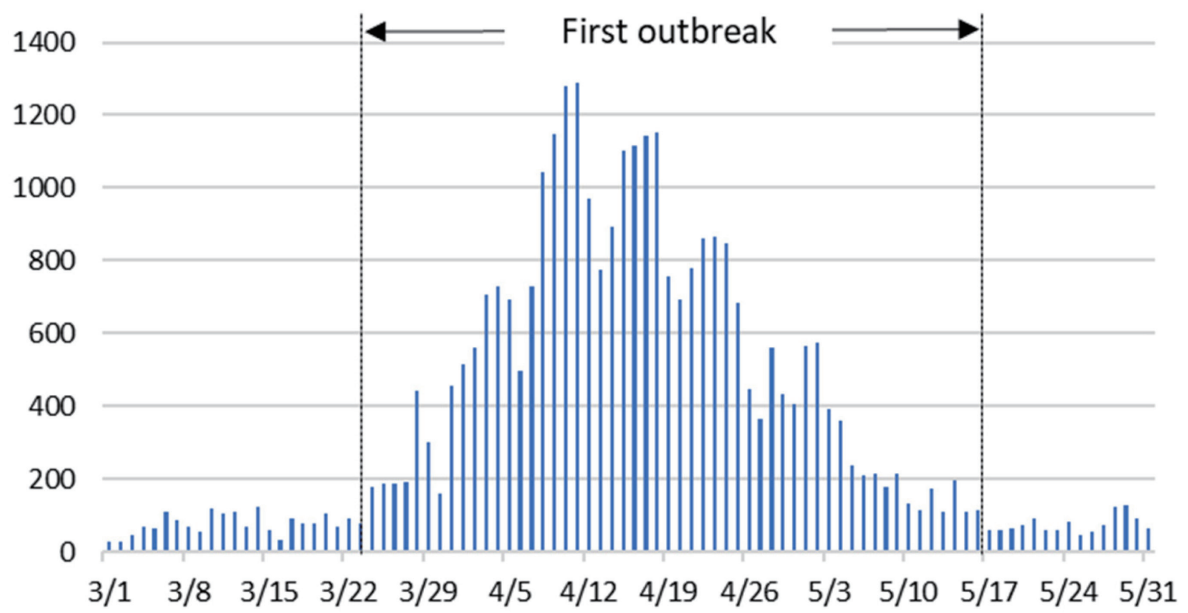


Fig. S1. Number of daily cases of COVID-19 in March–May 2020 in Japan.