

*Original Article***Efforts and effects of additional medical coverage to maintain or improve activities of daily living in an acute cardiovascular internal medicine ward**

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**ABSTRACT**

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**Purpose:** This study investigated the effects of additional medical coverage to maintain or improve ADLs on the length of hospital stay and level of ADLs.

**Methods:** This retrospective study included patients who were admitted to the cardiovascular internal medicine ward and were referred to the rehabilitation (rehab) department. Patients who were referred to the rehab department within one year after the implementation of additional medical coverage to maintain or improve ADLs were categorized as the added-coverage ADLs group, and those who were referred to the rehab department within one year before the implementation were categorized as the control group. The evaluation items included age, number of days before initiation of rehab, duration of rehab intervention, length of hospital stay, and Functional Independence Measure (FIM) score at discharge.

**Results:** While the added-coverage ADLs group had 147 patients (women, 101; mean age, 82 ± 10 years), the control group had 102 patients (women, 54; mean

age, 82±10 years). In the added-coverage ADLs group, we found a significant decline in the number of days before initiation of rehab, duration of rehab intervention, and length of hospital stay; however, we found no difference in the FIM score at discharge between the two groups.

**Conclusions:** The implementation of additional medical coverage to maintain or improve ADLs allowed early initiation of rehab intervention and decreased the duration of rehab intervention and the length of hospital stay while maintaining the level of ADLs at discharge.

**Key words:** acute rehabilitation, additional medical coverage to maintain or improve ADLs, length of hospital stay

**Introduction**

When patients with cardiovascular disease are in an acute care hospital, their treatment is prioritized and physical activity is often restricted. As a result, their physical function and level of activities of daily living (ADLs) easily decline secondary to prolonged bed rest, and their hospital stay tends to be extended, especially in older patients. In fiscal year 2014, the treatment cost for cardiovascular diseases was the highest among medical care expenditures, accounting for 20.1%, and was as high as 5,889.2 billion yen [1].

Lately, the proportion of older patients with heart failure has increased significantly among patients with cardiovascular disease [2]. According to a survey conducted by the Japanese Circulation Society, the number of Japanese inpatients with heart failure in 2012 was approximately 210,000, which is estimated to increase to 1.3 million by 2030 [3]. Conversely, the mean length of hospital stay for patients with heart failure declined from 33.4 days in 2004–2005 to 30 days in 2007–2011 [4, 5]. Shortening the mean length

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of hospital stay is one of the primary objectives of the Ministry of Health, Labour and Welfare's plan for reducing healthcare costs for implementing appropriate and efficient provision of medical services [6, 7]. Hence, it is anticipated that the length of stay for patients with heart failure in an acute care hospital will decline further in the future, whereas the number of patients with heart failure will increase. Thus, rehabilitation (rehab) for inpatients with heart failure requires quality improvement through the implementation of early-stage intervention and enhancement of intervention programs. Older patients with heart failure often undergo repeated acute exacerbation during the disease course [8], which quickly leads to reduced physical function and level of ADLs through repeated hospitalization. Therefore, it is essential for them to prevent a decline in ADLs through rehab intervention in the early stage of their hospital course and improve comprehensive hospital management such as through a holistic approach by an interdisciplinary team.

In fiscal year 2014, additional medical coverage to maintain or improve ADLs was introduced in the revision of reimbursements of medical fees, allowing preventive rehab intervention immediately after admission in an acute care ward to facilitate early discharge and prevent disuse syndrome. The conditions required for receiving this additional coverage are as follows: (a) the proportion of patients with declined ADL level as evaluated by the Barthel Index at discharge or transfer compared to that at admission should be less than 3% and (b) the proportion of inpatients who have hospital-acquired pressure sores should be less than 1.5% [9]. The fundamental policies for additional medical coverage to maintain or improve ADLs are as follows: (1) to prevent a decline in ADLs during hospital stay and to facilitate early discharge for patients who are not indicated for disease-specific rehab and (2) to enhance interdisciplinary safety management, prevent disuse syndrome and pressure sores, and share information with patients and their families. Although early identification of patients who require rehab intervention is possible by the traditional system of assigning therapists to a medical ward, rehab intervention by therapists is initiated only after an attending physician issues a rehab order. In contrast, under additional medical coverage to maintain or improve the ADLs system, therapists may evaluate and intervene at an early stage after admission, which is arguably effective, especially for reducing the length of hospital stay.

This study investigated the effects of additional medical coverage to maintain or improve ADLs on the length of hospital stay and level of ADLs at discharge.

## Methods

### 1. Study design and subjects

In this single-center case registry retrospective

study, we included patients who were admitted to the cardiovascular internal medicine ward in our hospital from July 2014, when the additional medical coverage to maintain or improve ADLs system was implemented in the ward, to June 2015. Among the participants, those who required emergency hospitalization, except for hospitalization for tests, and those who were referred to the rehab department from the cardiovascular department were included in the added-coverage ADLs group. However, those who were independent prior to admission and had not been referred to the rehab department were recognized as patients for whom rehabilitation had not been prescribed (Figure 1). Patients who died during hospitalization and those who were transferred to another department for treatment of comorbid conditions were excluded from this study. In the control group, we included patients who were referred to the rehab department from the cardiovascular department and had undergone physical therapy and/or occupational therapy from April 2013 to March 2014 before the implementation of additional medical coverage to maintain or improve ADLs. This study was approved by the Fujita Health University Ethical Review Board for Epidemiological and Clinical Studies (Approval number: 15-259).

### 2. Efforts for the added-coverage ADLs group

Efforts for the added-coverage ADLs group included the identification of newly admitted patients and the evaluation of their disease status. Also included was expediting the rehab orders from attending physicians to minimize the period of bed rest for patients able to undergo rehab intervention to facilitate early initiation of rehab after admission and smooth transition to a rehab program. By participating in ward case conferences, we promoted close communication with the nursing staff on the ward and shared information about the ADL ability level of the patients on the ward. In the control group, rehab intervention was initiated only after an attending physician ordered rehab intervention; thus, the rehab department did not directly deal with patients until the order was issued. Furthermore, the ward case conferences were limited to patients in a rehab program. The rehab

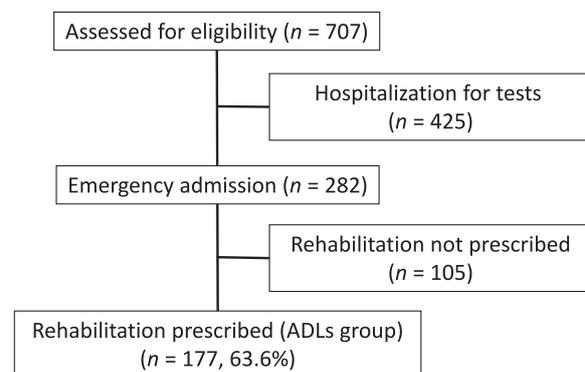


Figure 1. Patient flow.

intervention was completed at discharge.

### 3. Study parameters

In both groups, age, gender, body mass index (BMI), severity of heart failure [N-terminal pro-brain natriuretic peptide (NT-proBNP)], heart function [left ventricular ejection fraction (LVEF)], etiology, length of hospital stay, days before rehab initiation, duration of rehab intervention, Functional Independence Measure (FIM), and total units of rehab provided during the subject period were investigated based on medical records.

### 4. Data analysis

We conducted statistical analyses to compare the added-coverage ADLs group with the control group using the unpaired *t*-test for age, BMI, NT-proBNP, LVEF, length of hospital stay, number of days before rehab initiation, and duration of rehab intervention, and the  $\chi^2$  test for etiology and gender. SPSS version 21.0 (SPSS, Tokyo, Japan) was used for the analyses, and  $p < 0.05$  was considered statistically significant.

## Results

Among the 750 patients who were admitted to the cardiovascular internal medicine ward during the study

period, 43 were excluded due to death (8) or transfer to another department (35). Among the remaining 707 patients, 425 were scheduled admissions for medical tests and 282 were emergency admissions. Among these 282 patients, 177 (women, 121; mean age,  $82.4 \pm 9.6$  years) who were referred to rehab were defined as the added-coverage ADLs group (Figure 1; Table 1). The remaining 102 patients were assigned as the control group (women, 59; mean age,  $81.4 \pm 10.6$  years). We observed no significant differences in age, gender, BMI, LVEF, NT-proBNP, or etiology between the two groups. Among the 282 emergency admissions, three (1.06%) demonstrated a decline in the Barthel Index, the causes of which were cerebral infarction in two and septic shock in one. In comparison to the control group, the added-coverage ADLs group had a significantly shorter time before the initiation of rehab (11.7 and 3.7 days, respectively), duration of rehab intervention (30.1 and 23.4 days, respectively), and length of hospital stay (41.8 and 26.1 days, respectively; Table 2). However, no difference was observed in the FIM score at discharge between the two groups. The mean units of rehab provided per day were calculated by the total units of rehab divided by the number of patients, and was almost the same between the two groups (1.68 units in the added-coverage ADLs group and 1.63 units in the control group).

**Table 1.** Patient characteristics.

	ADLs group ( <i>n</i> = 177)	Control group ( <i>n</i> = 102)	<i>p</i>
Age (yo)	82.4 ± 9.6	81.4 ± 10.6	0.565
Gender M/F	56/121	43/59	0.132
BMI	21.3 ± 2.3	20.7 ± 2.9	0.445
LVEF (%)	56.3 ± 16.3	48.2 ± 18.2	0.198
NT-proBNP (pg/dl)	6717 ± 8205	5231 ± 6678	0.458
Etiology ( <i>n</i> )			
Ischemic heart disease	21	14	0.231
Heart failure	93	51	
Aortic disease	7	3	
Arrhythmia	14	10	
Others	42	24	

Data is expressed as average ± standard deviation.

Abbr.: BMI, body-mass index; LVEF, left ventricular ejection fraction; NT-proBNP, N-terminal pro-brain natriuretic peptide.

**Table 2.** Comparison between ADLs group and control group.

	ADLs group ( <i>n</i> =177)	Control group ( <i>n</i> =102)	<i>P</i>
Number of days before initiation of rehabilitation	3.7 ± 2.0	11.7 ± 6.9	<0.001
Length of hospital stay (days)	26.1 ± 12.6	41.8 ± 17.1	<0.001
Duration of rehabilitation intervention (days)	20.3 ± 10.4	25.0 ± 15.1	0.012
FIM score at discharge (points)	95.2 ± 2.0	93.1 ± 6.9	0.578

Data is expressed as average ± standard deviation.

## Discussion

This study demonstrated that the implementation of additional medical coverage to maintain or improve ADLs could prevent a decline in ADLs among inpatients, as well as decrease the number of days before initiation of rehab, duration of rehab provided, and length of hospital stay. The practice corresponding to the additional medical coverage to maintain or improve the ADLs system was effective in maintaining the level of ADLs and reducing the length of hospital stay, which had been two challenges for acute care hospitals providing care for older patients. This indicates that the system can promote efficient provision of medical care.

### • Effects of assigning therapists to a ward

In Japan, assigning therapists to a medical ward had been in practice before the introduction of additional medical coverage to maintain or improve ADLs. Previous studies investigating the effects of assigning therapists to a ward reported a reduction in the number of days before initiation of rehab, duration of rehab provided, and length of hospital stay; improvement in the level of ADLs at discharge; and increase in the rate of returning home [10, 11]. In addition, qualitative and practical improvements were identified, such as improvement in communication with attending physicians and nurses, ward staff's understanding about the rehab program, and patients' ADL ability level on a medical ward [10], although these are not quantified outcomes. Furthermore, assignment of therapists to an intensive care unit was reportedly effective in reducing the number of days before initiation of sitting square and reducing the incidence rate of delirium [12]. Furthermore, the results of the present study revealed that the number of days before initiation of rehab, duration of rehab provided, and length of hospital stay decreased, whereas the level of FIM at discharge was maintained after the implementation of additional medical coverage to maintain or improve ADLs, which indicates that the required outcomes were attained with a shorter length of hospital stay. This study supports the findings of previous studies. The underlying factors of this desirable outcome may be attributed to the prevention of a decline in ADLs at the initiation of rehab intervention through assigning therapists to a ward and early initiation of rehab intervention.

### • Mean length of hospital stay

In this study, the mean length of hospital stay in the added-coverage ADLs group was 26.1 days (median, 21 days). The mean length of hospital stay in the Japanese Cardiac Registry of Heart Failure in Cardiology (JCARE-CARD), a multi-center registry study with 164 facilities participating nationwide, was 33.9 days (median, 16 days) [13] and that in the ATTEND (acute decompensated heart failure syndromes) registry was 31 days (median,

21 days) [14]. Based on these reports, the length of hospital stay for emergency admissions in our cardiovascular internal medicine ward is nearly the same as the national average. However, while the mean age of subjects in JCARE-CARD was 70.7 years and that in the ATTEND registry was 73.0 years, the mean age of our subjects was 82.4 years. Our study group population was approximately 10 years older than the subject group populations in the previous studies. Given this age difference, the results of this study indicate that a reduction in the length of hospital stay among older patients with heart failure was attained. This suggests the effectiveness of the early rehab intervention on the length of hospital stay for older patients with heart failure, the proportion of which is anticipated to increase rapidly in the future in Japan. Behind this effectiveness, an excessive decline in the level of ADLs was possibly prevented by controlling unnecessary bed rest in the acute phase among older patients.

### • Features and benefits of additional medical coverage for ADLs

In the conventional system of assigning therapists to a medical ward, physical and occupational therapy intervention is provided if ordered by an attending physician or a physiatrist. The feature of additional medical coverage to maintain or improve ADLs is that direct preventive intervention by therapists becomes available in the early stage of hospitalization. The reduction in the number of days before initiation of rehab intervention, duration of rehab provided, and length of hospital stay was possibly attained by selecting patients with a high risk of declining ADLs by identifying the disease status and ADL ability of patients at an early stage after admission and connecting these patients to disease-specific rehab programs without delay. The outcome assessment for additional medical coverage to maintain or improve ADLs includes the ratio of the decline in the level of ADLs to a benchmark of less than 3%. The decline rate of ADLs in our study was 1.06%, which is below the benchmark, indicating the effectiveness in the prevention of decline in the level of ADLs. The reduction in the level of ADLs among three patients in this study was attributed to the onset of comorbidities, such as stroke; the cause of decline was not iatrogenic, such as bed rest. Therefore, we believe that the system of additional medical coverage to maintain or improve ADLs is, to a certain degree, effective in preventing a decline in the level of ADLs.

### • Limitations of this study

This study's control group was a historical control group, and data was retrospectively obtained from medical records. Therefore, it was challenging to present the selection method for the control group and the details of the data, including the number of units of rehab provided to each patient. Nevertheless, only a small number of studies have reported on the effects of

additional medical coverage to maintain or improve ADLs; therefore, our study provides meaningful data.

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