

ORIGINAL RESEARCH

Effects of Early Postdischarge Rehabilitation Services on Care Needs—Level Deterioration in Older Adults With Functional Impairment: A Propensity Score—Matched Study



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Abstract

Objective: To examine the effects of early postdischarge rehabilitation on care needs—level deterioration in older Japanese patients.

Design: Propensity score—matched retrospective cohort study.

Setting: A secondary data analysis was conducted using medical and long-term care insurance claims data from a suburban city in Japan.

Participants: We analyzed patients (N=2746) aged 65 years or older who were discharged from hospital to home between April 2012 and March 2014 and had care needs certification indicating functional impairment.

Interventions: The provision of early rehabilitation services by rehabilitation therapists within 1 month of discharge. Propensity score matching was used to control for differences in characteristics between patients with and without early rehabilitation services.

Main Outcome Measures: Any deterioration in care needs level during the 12-month period after discharge. Cox proportional hazards analyses were conducted to identify the association between the exposure and outcome variables after matching.

Results: Among 2746 patients, 573 (20.9%) used early rehabilitation services. Care needs—level deterioration occurred in 508 patients (incidence: 18.3 per 1000 person-months), of which 76 used early rehabilitation services (12.3 per 1000 person-months) and 432 did not use early rehabilitation services (20.0 per 1000 person-months). One-to-one propensity score matching produced 566 matched pairs that adjusted for the differences in all covariables. In these matched pairs, the hazard of care needs—level deterioration was significantly lower among patients who used early rehabilitation services (hazard ratio=0.712, 95% CI, 0.529-0.958). A Kaplan-Meier survival analysis showed similar results (log-rank: $P=.023$).

Conclusions: Early rehabilitation services provided by rehabilitation therapists after hospital discharge appeared effective in preventing care needs—level deterioration, and involving rehabilitation therapists in transitional care may aid the optimization of health care for older Japanese adults with functional impairment.

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Many older adults with functional impairment will require some degree of long-term care (LTC) to assist with activities of daily living (ADL).¹ Moreover, older adults using LTC services may experience further physical and/or cognitive decline, thereby leading to an increased need for care.² In 2000, Japan implemented a public LTC insurance (LTCI) system that, among other objectives, aims to support the maintenance of functional independence in older adults with physical and/or cognitive impairments.^{2,3} Under this system, certified care needs levels are assigned to enrollees based on their impairments, with higher levels granting access to a wider range of services (eg, home care services, day care services, rental/purchase of assistive devices) and greater subsidies. Accordingly, deterioration in care needs levels can serve as a possible indicator of the effectiveness and quality of LTC services among older adults in Japan. Previous studies have used care needs–level deterioration as an outcome measure,^{4–9} and its prevention may help to alleviate the heavy clinical and economic burdens imposed on patients, providers, and payers.^{9,10}

Under the LTCI system, all individuals aged 40 years or older are required to pay LTCI premiums, and those aged 65 years or older (or aged 40–64 years with an age-related disease such as cancer) can receive care needs certification for LTCI services if they qualify. Individuals who receive care needs certification are entitled to use rehabilitation services under the LTCI system or public medical care insurance system immediately after being discharged from the hospital. Rehabilitation services for older adults are designed to facilitate the management of personal ADL without external assistance or to minimize its need through the use of adaptive techniques and equipment.¹¹ Because of these overlapping aims, the provision of appropriate and effective rehabilitation services may represent a valuable strategy for preventing care needs–level deterioration among older adults with functional impairment.

Older adults with functional impairment or chronic diseases are particularly vulnerable to deterioration during transitions in care setting, such as being discharged from hospital to home.^{12–14} Multi-disciplinary approaches that incorporate rehabilitation services and continuity of care practices are therefore especially important during these transitions. However, few studies have explored the effects of early rehabilitation services, provided by rehabilitation therapists, on transitional care quality among older adults with functional impairment. Understanding the effects of early rehabilitation services during care transitions on patients' health conditions could inform the development of care plans by care managers and the improvement of health policies by policymakers.

Several studies from the United States have shown that rehabilitation services provided by physical therapists and/or occupational therapists can improve functional status in older adults with

physical or cognitive impairment.^{15–17} Moreover, other studies have also documented the effects of rehabilitation services on physical function among older adults residing in LTC facilities after acute care.^{18–20} A Japanese study reported that older adults using adult day care services with rehabilitation had a lower risk of functional deterioration than those using similar services without rehabilitation.⁸ Although these studies showed the effects of rehabilitation services on functional status in older adults with impairments, little is known about the effects of these services provided during the brief period of transitional care. To optimize the provision of LTCI services during care transitions (such as from hospital to home), it is important to first ascertain the effects of rehabilitation services provided soon after discharge on care needs–level deterioration. For example, Falvey et al described the important role of physical therapists during care transitions in assessing and addressing functional deficits in older adults.¹⁴ We hypothesized that rehabilitation services provided immediately after discharge would have a preventive effect on care needs –level deterioration among older patients with functional impairment. This study aimed to examine the effects of early rehabilitation services provided within 1 month of hospital discharge on care needs–level deterioration for a period of 12 months among older adults with LTCI care needs certification in a Japanese city.

Methods

Study design and setting

This retrospective cohort study was conducted using a large-scale, anonymized database comprising 2 insurance claims data sets (medical claims and LTCI claims) and 2 administrative datasets (LTCI care needs certification and LTCI premium levels). The study area was the suburban city of Kashiwa in Chiba prefecture, which is located east of Tokyo, Japan. The population, spread over an area of 114.74 km², consisted of 405,099 residents in 2012; of these, 21.3% were 65 years or older.²¹

The medical claims data included claims for medical goods and services covered under the National Health Insurance and Latter-Stage Elderly Health Insurance systems. In Japan, employed individuals and their dependents are covered by employment-based insurance, whereas the self-employed and retired population 75 years or older are covered by National Health Insurance. As of April 2021, approximately 76% of Kashiwa city residents aged 65–74 years were enrolled in National Health Insurance.^{22,23} Because citizens and long-term residents are mandated to enroll in the Latter-Stage Elderly Health Insurance system on their 75th birthday, our data set included data from almost all Kashiwa city residents 75 years or older. The medical claims data included patient-level sociodemographic characteristics, treatments, use of medical facilities, prescribed drugs, and diagnoses made during clinical encounters. Diagnoses were recorded using *International Classification of Diseases, Tenth Revision* codes. The LTCI claims data included the monthly expenditures and quantity of LTC services used by each enrollee. In this study, we analyzed medical claims data and LTCI claims data from April 2012 to March 2015.

List of abbreviations:

ADL	activities of daily living
HR	hazard ratio
LOS	length of stay
LTC	long-term care
LTCI	long-term care insurance
PS	propensity score

Care needs certifications are broadly categorized into 2 care support levels (care support levels 1-2, indicative of the need for preventive care) and 5 care needs levels (care needs levels 1-5, indicative of the need for LTC), with higher levels signifying greater functional impairment. Each enrollee's care needs level is determined by computer-based assessments and a panel of specialists appointed by the local government.² Data on care needs certification for LTCI services were used to indicate functional status. Next, all citizens and long-term residents 40 years or older are required to pay LTCI premiums, the amount of which is dependent on each person's annual household income. Therefore, data on LTCI premium levels were analyzed as an indicator of household income.

Study sample

For this study, we focused on patients who were admitted to and discharged from any hospital within the study area between April 1, 2012, and March 31, 2014. Each patient's first hospitalization episode during this period was designated their index admission. Patients with LTCI care needs certifications in the month of discharge were identified and included in the analysis. The following were excluded: patients younger than 65 years; patients who had died, moved out of the study area, were admitted to an LTC facility, or were readmitted to a hospital within 1 month of discharge; patients who were receiving public welfare because of their lack of LTCI data; patients with missing data on LTCI premium levels or physical/cognitive function; and patients certified with care-needs level 5 because they could not experience any further care needs-level deterioration.

Exposure variable

We defined the use of early rehabilitation services as those services provided within 1 month of the discharge month under Japan's health insurance and LTCI systems. The 1-month cutoff point was used because this was the shortest possible duration that can be analyzed with the LTCI claims data, which are provided in a monthly format. The health insurance system covers hospital-based outpatient rehabilitation services, whereas the LTCI system covers rehabilitation services provided at adult day care service centers or at home. These rehabilitation services are administered by rehabilitation therapists (including physical therapists, occupational therapists, and speech-language pathologists) in 20-minute units in accordance with prescriptions from physicians. Postdischarge rehabilitation services aim to promote recovery and maintain physical and cognitive function in each patient across their lifespan. During rehabilitation services provided soon after discharge, therapists can monitor their patients' physical and cognitive function, educate patients on the necessary safety equipment for home (such as those for fall prevention) and implement training to prolong functional independence in ADL.¹⁴

Outcome measure

The outcome measure was the occurrence of care needs-level deterioration during the 12-month period after hospital discharge. We identified each patient's certified care needs level at the discharge month and tracked any changes for 12 months after discharge. Changes in care need levels were calculated by subtracting the recorded level during the discharge month from the recorded level during a subsequent month in which a change

was observed. Patients with a change value >0 were considered to have experienced "deterioration."⁴ We recorded the month in which any deterioration occurred.

Covariables

We collected information on the following baseline characteristics: patient sex, age group, household income, care needs level, physical function, cognitive function, chronic diseases, length of stay (LOS), and use of rehabilitation services during the index admission. We selected these variables because they have been identified as confounders in prior studies on rehabilitation services or care needs-level deterioration,^{4,24} and they were available in our database. To ensure patient anonymity, age was categorized into the following groups of 5-year intervals: 67-76, 77-81, 82-86, 87-91, and ≥ 92 years. Household income was ascertained from each enrollee's LTCI premium level, which ranged from level 1 (persons receiving public assistance) to level 16 (persons who are taxed individually with a total annual income ≥ 10 million yen). For our analysis, patients with level 4 (persons who are not taxed individually but have family members paying taxes within the same household) or higher were designated as having middle/high income, and patients with level 3 or lower were designated as having low income.^{24,25} Care needs levels were divided into 5 categories from the lowest ("requiring support," comprising both care support levels 1 and 2) to the most severe (care needs level 4).

Physical and cognitive function in relation to ADL were assessed using nationally standardized methods set by the Japanese Ministry of Health, Labour, and Welfare.^{24,26} Physical function was assessed using the "degree of independent daily living for older persons with disabilities" scale and cognitive function was assessed using the "degree of independent daily living for older persons with dementia" scale.^{24,26} Physical function was divided into 3 categories: "independent" (independent or level J: patient is able to go out independently), "mild impairment" (level A: patient requires assistance when going out), and "moderate/severe impairment" (level B: patient requires assistance indoors and sometimes for sitting up, or level C: patient is bedridden). Similarly, cognitive function was divided into 3 categories: "independent" (independent or rank I: patient is able to live independently), "mild impairment" (rank II: patient can generally live independently under observation despite some symptoms, behaviors, and/or communication problems that affect ADL), and "moderate/severe impairment" (rank III: patient requires assistance in ADL, or rank IV/M: patient requires comprehensive assistance in ADL). We included the following 4 chronic diseases, which represent the main causes of LTCI care needs certification²⁷: cerebrovascular disease, joint disorders, coronary heart disease, and Parkinson disease. These 4 diseases were identified using previously described methods.^{24,28} Also, we calculated the LOS and the use/nonuse of rehabilitation services for each patient during the index admission. LOS was divided into 3 categories (LOS: <9 , 9-27, and ≥ 28 days) based on the tertile values determined from the final sample for analyses before propensity score (PS) matching.

Statistical analysis

We used PS matching to compare outcomes between patients with and without early rehabilitation services. The PS was the probability that a patient would receive early rehabilitation services within 1 month of the discharge month conditional on covariables

measured at baseline,²⁹ and it was estimated with a logistic regression model with the use/nonuse of rehabilitation services as the dependent variable and all covariables as independent variables. The C-statistic was calculated to evaluate the model's goodness of fit (a C-statistic of 0.5 indicates no predictive ability beyond random chance, whereas a C-statistic of 1.0 indicates perfect predictive power). A previous study reported that a C-statistic of 0.67 was acceptable for a PS model's goodness of fit if the model includes variables that affect an outcome.³⁰ Other studies recommend that covariate balance between the 2 study groups should be assessed using standardized differences after matching to evaluate the confounding adjustment of a PS model.^{31,32} While there is no clear consensus on the minimum value of the absolute standardized difference that would specify an acceptable match, we used an absolute standardized difference >0.1 to indicate a significant imbalance in a covariate in accordance with several previous studies.³³⁻³⁵ One-to-one PS matching was performed without replacement using a caliper width set at 20% of the SD.

We then conducted Cox proportional hazards analyses before and after PS matching to estimate the effects of early rehabilitation services on care needs-level deterioration. The proportional hazards assumption was tested using Schoenfeld residuals before and after PS matching. Patients who had died or moved out of the study area during the follow-up period were censored, and the hazard ratios (HRs) and 95% CIs were calculated. We generated Kaplan-Meier survival curves of the PS-matched cohort to

describe the occurrence of care needs-level deterioration in patients with and without rehabilitation services. As a supplementary analysis, the same analyses were repeated following 1-to-2 PS matching instead of 1-to-1 PS matching. PS matching, absolute standardized difference calculations, and the Schoenfeld residual test were performed using Stata version 16.0.^a All other analyses were conducted using SPSS version 25.0.^b

Ethical considerations

The study protocol was approved by the Ethics Committee of the Tokyo Metropolitan Geriatric Hospital and Institute of Gerontology. The study was conducted in accordance with the Japanese government's Ethical Guidelines for Medical and Health Research Involving Human Subjects.

Results

Figure 1 shows the flowchart of patient selection. We first identified 16106 candidate patients who had been admitted to and discharged from a hospital during the study period. We excluded 10,377 patients without any LTCI care needs certification in the month of hospital discharge and 115 patients younger than 65 years. We then excluded 1540 patients who had died, 45 patients who had moved out of the study area, 808 patients who had been admitted to a long-term care facility, or 106 patients who had been readmitted within one month after discharge. We then excluded 19 patients receiving public welfare, 21 patients with missing data on LTCI premium levels, 26 patients with missing data on physical/cognitive function, or 303 patients certified with care-needs level 5. The final sample for analysis consisted of 2746 patients, 573 of whom received early rehabilitation services and 2173 of whom did not. After PS matching, 7 patients were unmatched in the early rehabilitation services group and 1607 patients were unmatched in the without early rehabilitation services group. The final PS-matched cohort consisted of 566 patients in each group.

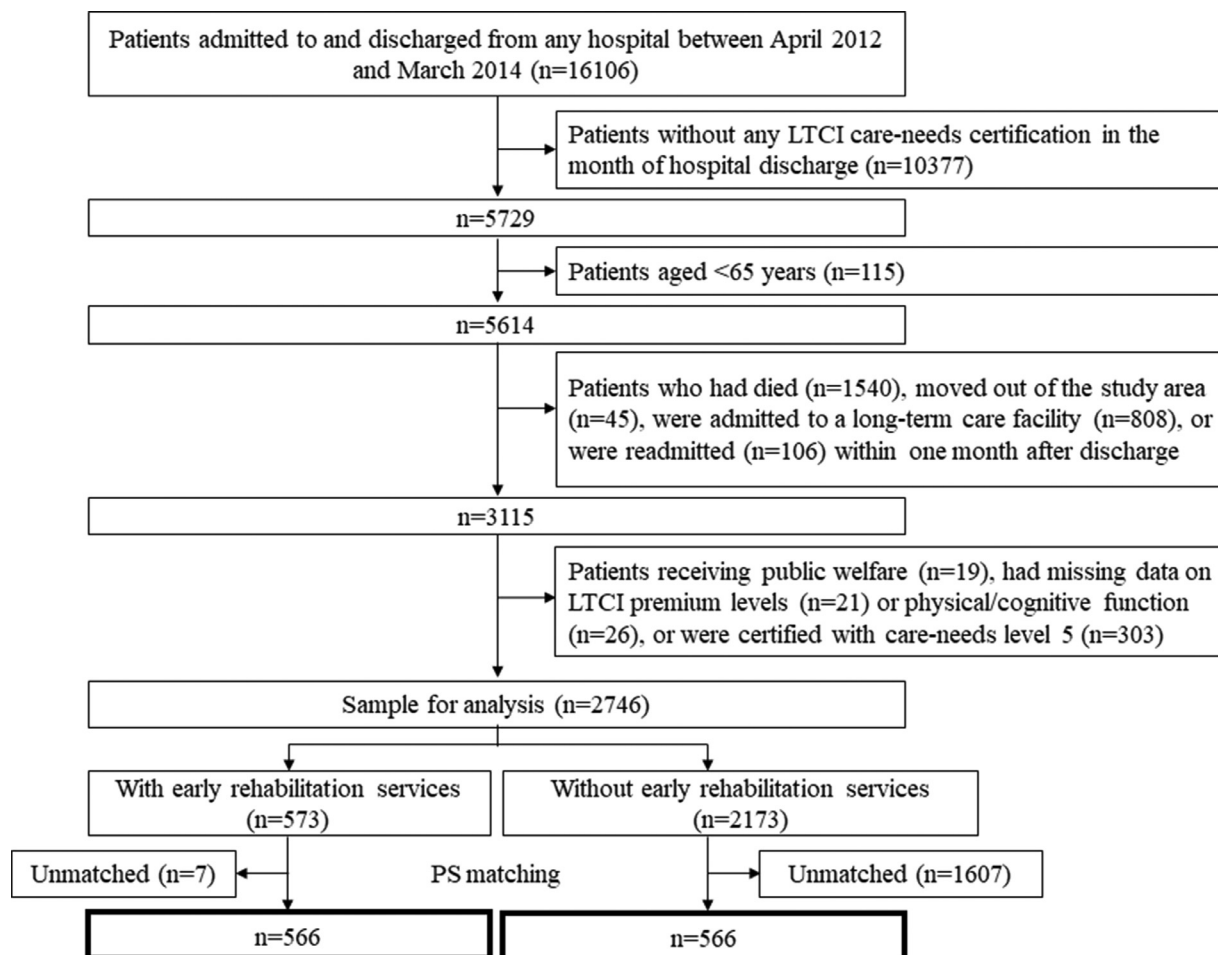


Fig 1 Flowchart of patient selection. Early rehabilitation services refer to those received within 1 month of hospital discharge.

admitted to an LTCI facility, and 106 patients who were readmitted within 1 month of discharge. Finally, we excluded 19 patients who were receiving public welfare, 47 patients with missing data on LTCI premium levels or cognitive function, and 303 patients certified with care needs level 5. The final sample for analyses comprised 2746 patients before PS matching. Among these, 573 patients had received early rehabilitation services within 1 month of discharge (20.9%). After 1-to-1 PS matching, we obtained 2 groups (with and without early rehabilitation services) of 566 matched pairs. The C-statistic of the PS model was 0.681 (95% CI, 0.657-0.705).

Table 1 compares the baseline characteristics of patients with and without early rehabilitation services. Before PS matching, patients with early rehabilitation services tended to be younger with higher household income, lower care needs levels, more severe physical impairment, milder cognitive impairment, and longer LOS than patients without early rehabilitation services. In

addition, patients with early rehabilitation services were more likely to have used rehabilitation services during the index admission, and they had higher prevalences of cerebrovascular disease, joint disorders, and Parkinson disease. After 1-to-1 PS matching, the absolute standardized differences between both groups were within the margin of 0.1 for all covariables. In the supplementary analysis, several covariates had absolute standardized differences >0.1 after 1-to-2 PS matching, which indicated imbalances (Supplemental Table S1, available online only at <http://www.archives-pmr.org/>).

Table 2 shows the incidences of care needs–level deterioration during the 12-month period after hospital discharge in patients with and without early rehabilitation services. A total of 508 patients experienced care needs–level deterioration (18.3 per 1000 person-months); among these, 76 patients had used early rehabilitation services (12.3 per 1000 person-months) and 432 patients had not used early rehabilitation services (20.0 per 1000 person-months).

Table 1 Comparisons of characteristics between patients with and without early rehabilitation services

Characteristic		All Patients (N=2746)			PS-Matched Patients (n=1132)		
		With Early Rehabilitation Services(n=573)	Without Early Rehabilitation Services(n=2173)	ASD	With Early Rehabilitation Services(n=566)	Without Early Rehabilitation Services (n=566)	ASD
Sex	Men	42.1	39.3	0.057	42.4	39.4	0.061
	Women	57.9	60.7		57.6	60.6	
Age groups (y)	67-76	17.6	9.6	0.236	16.8	15.2	0.043
	77-81	17.6	16.5	0.031	17.8	17.3	0.014
	82-86	27.4	25.9	0.035	27.7	28.8	0.024
	87-91	19.9	27.7	0.184	20.0	21.9	0.048
	≥92	17.5	20.4	0.075	17.7	16.8	0.023
Household income	Middle/high	69.5	62.6	0.145	69.3	67.7	0.034
	Low	30.5	37.4		30.7	32.3	
Care-needs level	Requiring support	16.2	26.7	0.257	16.4	16.3	0.005
	Level 1	22.5	23.3	0.018	22.8	21.7	0.025
	Level 2	30.0	21.9	0.187	29.9	29.5	0.008
	Level 3	17.3	14.4	0.079	16.8	18.2	0.037
	Level 4	14.0	13.8	0.006	14.1	14.3	0.005
Physical function	Independent	13.4	21.4	0.212	13.6	13.8	0.005
	Mild impairment	42.9	42.9	0.000	43.1	41.3	0.036
	Moderate/severe impairment	43.6	35.6	0.164	43.3	44.9	0.032
Cognitive function	Independent	60.6	55.4	0.105	60.6	61.5	0.018
	Mild impairment	25.0	25.7	0.017	24.9	25.6	0.016
	Moderate/severe impairment	14.5	19.0	0.120	14.5	12.9	0.046
Cerebrovascular disease	Yes	27.4	17.8	0.231	27.0	25.4	0.036
Joint disorders	Yes	19.7	10.1	0.273	19.3	21.7	0.061
Coronary heart disease	Yes	9.4	8.6	0.030	9.5	8.5	0.037
Parkinson disease	Yes	4.4	1.6	0.165	3.9	3.2	0.038
Rehabilitation service use during the index admission	Yes	13.6	5.4	0.283	12.7	11.8	0.027
Length of hospital stay during the index admission (d)	<9	28.3	33.3	0.109	28.6	29.0	0.008
	9-27	31.9	35.8	0.083	32.2	30.9	0.027
	≥28	39.8	30.8	0.188	39.2	40.1	0.018

NOTE. Values are presented as column percentages. Early rehabilitation services refer to those received within 1 month of hospital discharge. Abbreviation: ASD, absolute standardized difference.

Table 2 Care needs—level deterioration during the 12-month period after hospital discharge between patients with and without early rehabilitation services

Early Rehabilitation Services	PS-Matched Patients (n=1132)				
	n*	n†	PM	Incidence‡	HR (95% CI)
No	566	102	5723	17.8	Reference
Yes	566	76	6077	12.5	0.712 (0.529-0.958)
Total	1132	178	11800	15.1	-

NOTE. Early rehabilitation services refer to those received within 1 month of hospital discharge.

Abbreviation: PM, person-months.

* No. of patients.

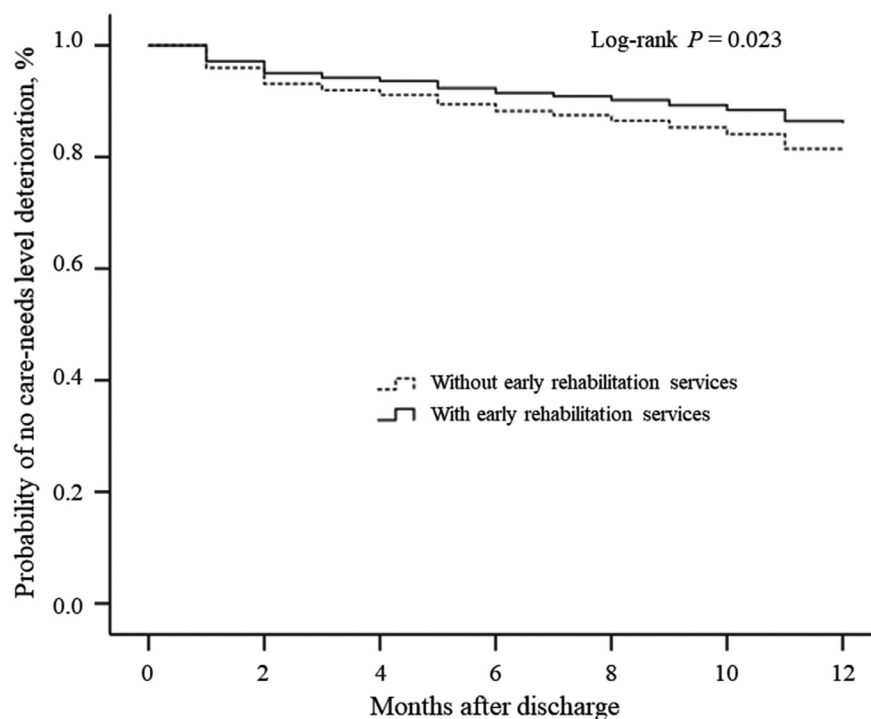
† No. of care needs—level deterioration occurrences.

‡ Incidence of care needs—level deterioration per 1000 person-months.

The Schoenfeld residual test showed no evidence to reject the proportional hazards assumption for early rehabilitation services with the occurrence of care needs—level deterioration (prematched: $P=.414$, postmatched: $P=.091$). Regardless of PS matching, the occurrence of care needs—level deterioration was significantly lower in patients who had used early rehabilitation services than those who had not (prematched: HR, 0.621; 95% CI, 0.486-0.792; postmatched: HR, 0.712; 95% CI, 0.529-0.958). The Kaplan-Meier curves for overall occurrence of care needs—level deterioration during the 12-month period after hospital discharge showed similar results (log-rank $P=.023$) (fig 2). After 1-to-2 PS matching, the occurrence of care needs—level deterioration was significantly lower in patients who had used early rehabilitation services than those who had not (HR, 0.639; 95% CI, 0.483-0.844).

Discussion

This retrospective PS-matched study examined the effects of early rehabilitation services after discharge on care needs—level deterioration among older patients with LTCI care needs certification in Japan. Our analysis showed that the hazard of care needs—level deterioration among patients with early rehabilitation services was approximately 0.7 times that of patients without early rehabilitation services. This study offers new insight into the important role of early rehabilitation services provided by rehabilitation therapists in preventing care needs—level deterioration among older Japanese adults with functional impairment. Our findings suggest that the targeted enhancement of such services during transitional care can contribute to the maintenance of functional capacity in



No. at risk

With early rehabilitation services	566	546	521	510	495	473	462
Without early rehabilitation services	566	547	501	470	453	441	408

Fig 2 Kaplan-Meier curves for overall occurrence of care needs—level deterioration during the 12-month period after hospital discharge between patients with and without early rehabilitation services. Early rehabilitation services refer to those received within 1 month of hospital discharge.

older adults, thereby preserving their health, independence, and quality of life for longer periods of time.

Our observation that patients with early rehabilitation services had a lower risk of care needs–level deterioration was consistent with those of previous studies about the effects of rehabilitation on the functional status of older adults.^{8,15–20} One such study reported that an intervention involving multiple components such as home modifications and strength training helped to improve basic and instrumental ADL in older adults.¹⁶ Falvey et al indicated that physical therapists can contribute to optimizing the care transition process for older adults, but their research group also reported that physical therapists do not routinely communicate with therapists in other care settings or follow-up with patients during transitional care.^{14,36} Studies have also noted that multidisciplinary care involving rehabilitation therapists is important for improving outcomes in long-stay residents of nursing homes.^{20,37} Rehabilitation services provided by rehabilitation therapists may therefore help to prevent further physical and/or cognitive decline among older adults with functional impairment. A recent systematic review also concluded that rehabilitation services can improve independence in older patients residing in LTC facilities, albeit with relatively small effects.¹⁸ Deterioration in care needs–levels can impose heavy clinical and economic burdens on patients, providers, and payers, and our observation that such deterioration is relatively common in older adults with care needs certification corroborates the results of other Japanese studies.^{4,5,8} This underscores a need to examine strategies not only for improving functional status in older adults, but also preventing further functional decline. Although rehabilitation therapists are not frequently involved in transitional care,^{14,36} early rehabilitation services provided by rehabilitation therapists may represent a useful approach for optimizing health care in older adults with functional impairment.

Studies from the United States have identified the crucial role of rehabilitation therapists in transitional care because of their contributions to home modifications, assessing and monitoring patients' physical and cognitive function, and educating patients on the necessary safety equipment after being discharged to home.^{14,38} Our present study showed that the provision of rehabilitation services immediately after discharge may be effective in preventing the worsening of functional status among older Japanese adults. This finding adds to the evidence that the inclusion of rehabilitation therapists in transitional care is a key component of higher care quality for older adults with functional impairment. Although our study focused on care needs–level deterioration as the outcome, further research is needed to identify the effects of early rehabilitation on early unplanned readmissions as a major outcome of transitional care.

Study limitations

This study has several limitations. First, our database did not include information on disease burden, exact household income, and the presence/absence of coresiding family members. Although these factors could directly affect the need for early rehabilitation services and care needs–level deterioration, we were unable to control for their effects. Second, we could not identify the use of rehabilitation services within shorter durations (eg, 10 days) after discharge because the LTCI claims data are provided in a monthly format. Future studies are needed to examine the effects of earlier rehabilitation services to optimize transitional care. Finally, our study was conducted using the residents of 1 suburban Japanese

city, which may limit its applicability to other locations in Japan. Similarly, our findings may not be directly generalizable to other countries because of inherent differences in health care systems.

Conclusions

The early provision of rehabilitation services by rehabilitation therapists soon after hospital discharge appears effective in preventing care needs–level deterioration in older patients with functional impairment in Japan. Our findings suggest that the increased involvement of rehabilitation therapists in transitional care through care planning and health policies may represent an important step in optimizing health care for older Japanese adults with functional impairment.

Suppliers

- Stata version 16.0; StataCorp, College Station, TX.
- SPSS version 25.0; IBM, Armonk, NY.

Keywords

Big data; Health services; Long-term care; Rehabilitation; Transitional care

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Supplementary Table 1 Comparisons of characteristics between patients with and without early rehabilitation services after one-to-two propensity score matching

Characteristics	PS-Matched Patients (n=1294)		ASD	
	With Early Rehabilitation Services (n=572)	Without Early Rehabilitation Services (n=722)		
Sex	Men	42.1	38.9	.065
	Women	57.9	61.1	
Age groups (years)	67–76	17.5	13.3	.116
	77–81	17.7	17.2	.013
	82–86	27.4	28.1	.015
	87–91	19.9	22.9	.071
	≥92	17.5	18.6	.028
Household income	Middle/high	69.4	66.6	.060
	Low	30.6	33.4	
Care-needs level	Requiring support	16.3	17.0	.021
	Level 1	22.6	24.1	.037
	Level 2	29.9	27.0	.064
	Level 3	17.3	17.5	.004
	Level 4	14.0	14.4	.012
Physical function	Independent	13.5	13.9	.011
	Mild impairment	43.0	43.1	.001
	Moderate/severe impairment	43.5	43.1	.009
Cognitive function	Independent	60.7	58.6	.042
	Mild impairment	25.0	27.6	.058
	Moderate/severe impairment	14.3	13.9	.014
Cerebrovascular disease	Yes	27.3	22.9	.102
Joint disorders	Yes	19.6	16.9	.069
Coronary heart disease	Yes	9.4	8.3	.040
Parkinson's disease	Yes	4.4	2.4	.112
Rehabilitation service use during the index admission	Yes	13.5	9.0	.141
Length of hospital stay during the index admission (days)	<9	28.3	29.6	.029
	9–27	32.0	32.8	.018
	≥28	39.7	37.5	.044

Values are presented as column percentages.

Early rehabilitation services refer to those received within one month of hospital discharge.

Abbreviations: PS, propensity score; ASD, absolute standardized difference.