Original Article

Relationship between the intensity of stroke rehabilitation and outcome: A survey conducted by the Kaifukuki Rehabilitation Ward Association in Japan (second report)

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ABSTRACT

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Objective: To verify the scientific basis for "additional remuneration for providing rehabilitation services on holidays" and "additional remuneration for enrichment of rehabilitation programs," 2 new medical remuneration systems that were introduced in 2010.

Methods: Stroke patients admitted to kaifukuki rehabilitation wards were included in this study. Questionnaire forms were mailed to 11 member facilities of the Kaifukuki Rehabilitation Ward Association in Japan, and relevant data were collected. The 11 facilities were divided into 3 groups according to the total hours spent on physical, occupational, and speech-language-hearing therapy at each facility. Rehabilitation outcomes were compared between facilities that provided ≥6 units/day of rehabilitation 7 days per week for each patient (1 unit = a 20-minute rehabilitation) (≥6 units group), those providing ≥4 and <6 units/day of rehabilitation (4–6 units group), and those providing <4 units/day of rehabilitation (<4 units group).

Results: Total scores of the motor and cognitive items of the Functional Independence Measures on admission were significantly lower in the ≥6 units group than in the other 2 groups. The number of days spent in the rehabilitation facility was significantly lower, by approximately 12 days, in the ≥6 units group than in the other groups.

Conclusion: These results revealed that facilities providing ≥6 units/day of rehabilitation even on holidays enabled patients to be discharged from the facility in significantly fewer days, despite accepting patients with more severe stroke, compared to facilities providing fewer units of rehabilitation.

Key words: kaifukuki rehabilitation ward, stroke, training time, rehabilitation outcome

Introduction

The Japanese national insurance system introduced kaifukuki rehabilitation wards in 2000; the term "kaifukuki" refers to the recovery or convalescent phase [1]. A stay in a kaifukuki rehabilitation ward is approved by the medical remuneration system in Japan when a stroke patient is hospitalized within 2 months of symptom onset, and the patient can receive up to 9 units of 20-minute rehabilitation sessions per day (i.e., up to 180 minutes/day) for 150 days after admission. This system is internationally unique in that it provides as long as 180 minutes of rehabilitation in a single day. The findings of the first investigation of kaifukuki rehabilitation wards conducted by the Kaifukuki Rehabilitation Ward Association in Japan, the association for kaifukuki rehabilitation wards throughout Japan [2,3], were noteworthy: stroke patients hospitalized in kaifukuki rehabilitation wards who had received ≥6 units/day of physical/occupational therapy showed markedly improved activities of daily living (ADL) than those shown by patients who had received <6 units/day of therapy [3].

Following the introduction of 2 new medical

remuneration systems in 2010, namely "additional remuneration for providing rehabilitation services on holidays" and "additional remuneration for enrichment of rehabilitation programs," an environment has been established for more frequent use of rehabilitation services because these new systems are applicable to facilities providing ≥6 units/day of rehabilitation 7 days a week. However, whether an increased frequency of rehabilitation treatment can in fact improve rehabilitation outcomes has not been adequately investigated. Therefore, the objective of this study was to verify the scientific basis of the aims of these newly introduced additional remuneration systems: providing ≥6 units/day of rehabilitation 7 days a week, based on the data obtained from our previous investigations.

Methods

1. Study population

This study included stroke patients admitted to and treated in kaifukuki rehabilitation wards.

2. Survey methods

Among the 21 member facilities of the Kaifukuki Rehabilitation Ward Association in Japan that previously participated in committee activities or other administrative activities, 11 facilities that were evaluable for 3 consecutive years were included in the present survey. The survey was conducted between 2006 and 2008. Questionnaire forms were mailed at the end of October in each year to all the patients discharged from the relevant facilities between August and September in the same year, and stroke patients were identified from the returned data.

The patient background data evaluated were age, sex, primary disease, number of symptom onsets (primary or recurrence), laterality of lesion (right, left, or bilateral), onset-admission interval (OAI), length of stay in facility (LOS), and discharge disposition (home, sudden change in condition (including death), or other). The discharge disposition was recorded as "home" even if the patient used home services, such as visiting care (including those discharged to group homes or care houses), and "other" if the patient was transferred to another hospital or nursing facility. Functional Independence Measures (FIM) [4] were evaluated as parameters of daily activities of living: total score of FIM motor and cognitive items, gained score of FIM motor items (total score of FIM motor items at discharge minus the score on admission), and efficiency of FIM motor items (gained score of FIM motor items divided by LOS) were calculated. The numbers of beds and facility staff (including physicians, occupational therapists, physical therapists, speech-language-hearing therapists, social workers, nurses, and care workers) at the time of the 2008 survey were also determined.

3. Analysis methods

The number of units, with 1 unit defined as 20 minutes of rehabilitation, was calculated from the data available on hours spent on rehabilitation per week. Average hours of rehabilitation were calculated for each of the 11 facilities evaluated, and rehabilitation outcomes were compared among facilities that provided each patient with ≥6 units/day of rehabilitation 7 days a week (≥6 units group), those providing ≥4 and <6 units/day of rehabilitation (4−6 units group), and those providing <4 units/day of rehabilitation (<4 units group).

One-way analysis of variance (ANOVA) was used for the statistical analysis. The Tukey-Kramer honestly significant difference (HSD) test was used for post-hoc analysis. Nominal scales were compared using the chi-square test. The average numbers of beds and facility staff at the time of the 2008 survey were compared between facilities.

Results

1. Data collected

Data were collected from 1,651 stroke patients at the 11 participating facilities. Among the 1,651 patients, 79 with incomplete data were excluded, and data from the remaining 1,572 patients were analyzed. Detailed background data for all patients are presented in Table 1.

2. Comparison of rehabilitation outcomes among the 3 treatment groups

When facilities were classified according to the total number of units of physical, occupational, and speech-language-hearing therapy given per day; there were 124 patients in 2 facilities that provided <4 units, 560 patients in 4 facilities that provided 4–6 units, and 888 patients in 5 facilities that provided ≥6 units of therapy. A significant difference in the distribution of sex was found among the 3 groups. In contrast, no significant differences were found in the distributions of diagnosis, laterality of lesion, number of symptom onsets, age, or OAI (Table 2). A significant intergroup difference was also observed in discharge disposition; slightly fewer patients were discharged to home in the <4 units group than in the other 2 groups (Table 2).

Total score of FIM motor and cognitive items on admission was significantly lower in the ≥6 units group than in the other 2 groups. Total score of FIM motor items at discharge was significantly lower in the ≥6 units group than in the 4−6 units group (Table 3). The same tendency was also observed in the total score of FIM cognitive ability items at discharge as compared to at admission (Table 3). LOS was significantly shorter in the ≥6 units group, by approximately 12 days, than in the other 2 groups (Table 3). While no significant difference was found among the 3 groups with regard to gained scores of FIM motor and

Table 1. Background data for all patients

Sex	(n)	M: 905	F: 667	
Primary disease	(n)	CH: 577	CI: 895	SAH: 100
Laterality of lesion	(n)	Rt: 721	Lt: 716	bilateral: 121
Discharge disposition	(n)	home: 996	other: 439	sudden change: 137
Number of symptom onsets	(n)	primary: 1,257	recurrence: 306	unknown: 9
Mean age	(years)	68.7 ± 12.9		
Mean OAI	(days)	39.3 ± 28.8		
Mean LOS	(days)	86.3 ± 46.3		
Admission FIM motor	(points)	46.1 ± 23.9		
Admission FIM cognitive	(points)	21.6 ± 9.5		
Units of PT per week	(units)*	18.9 ± 7.9		
Units of OT per week	(units)	17 ± 6.9		
Units of ST per week	(units)	8.9 ± 6.1		
Units of therapy per day	(units)	6 ± 2.2		

CH: cerebral hemorrhage, CI: cerebral infarction, SAH: subarachnoid hemorrhage, OAI: onset-admission interval, LOS: length of stay, FIM motor: total score of FIM motor items, FIM cognitive: total score of FIM cognitive items, PT: physical therapy, OT: occupational therapy, ST: speech-language-hearing therapy
* One unit is defined as 20 minutes of rehabilitation

Table 2. Comparison of the demographics among the 3 groups defined by the daily number of rehabilitation units provided (i.e., <4 units, 4−6 units, and ≥6 units groups)

		<4 units group n = 124 2 facilities	4−6 units group n = 560 4 facilities	≥6 units group n = 888 5 facilities	p value
Mean age	(years)	67.6 ± 12.7	68.0 ± 12.7	69.3 ± 13.0	N.S. (ANOVA)
Mean OAI	(days)	41.5 ± 26.8	40.1 ± 35.6	38.5 ± 23.9	N.S. (ANOVA)
Sex	(n)	M: 87	M: 315	M: 503	p < 0.05 (chi-square test)
		F: 37	F: 245	F: 385	
Primary disease	(n)	CH: 40	CH: 212	CH: 325	N.S. (chi-square test)
		CI: 70	CI: 318	CI: 507	
		SAH: 14	SAH: 30	SAH: 56	
Laterality of lesion	(n)	Rt: 62	Rt: 237	Rt: 422	N.S. (chi-square test)
		Lt: 56	Lt: 277	Lt: 383	
		bilateral: 6	bilateral: 38	bilateral: 77	
		unknown: 0	unknown: 8	unknown: 6	
Discharge disposition	(%)	home: 57.3	home: 65.7	home: 62.7	p < 0.05 (chi-square test)
		sudden change: 5.6	sudden change: 7.0	sudden change: 10.3	
		others: 37.1	others: 27.3	others: 27.0	
Number of symptom onsets	(n)	primary: 105	primary: 442	primary: 710	N.S. (chi-square test)
		recurrence: 19	recurrence: 110	recurrence: 177	
		unknown: 0	unknown: 8	unknown: 1	
Units of PT per week	(units)	7.6 ± 6.9	15.0 ± 4.3	22.9 ± 6.9	p < 0.0001 (ANOVA)*
Units of OT per week	(units)	6.3 ± 5.5	13.6 ± 4.0	20.6 ± 5.7	p < 0.0001 (ANOVA)*
Units of ST per week	(units)	4.9 ± 5.2	9.3 ± 5.2	9.2 ± 6.6	p < 0.0001 (ANOVA)**
Total units of therapy per day	(units)	2.0 ± 1.7	4.1 ± 1.1	6.2 ± 1.6	p < 0.0001 (ANOVA)*

OAI: onset-admission interval, CH: cerebral hemorrhage, CI: cerebral infarction, SAH: subarachnoid hemorrhage, PT: physical therapy, OT: occupational therapy, ST: speech-language-hearing therapy, N.S.: not significant
Significant difference on Tukey-Kramer HSD test   * among 3 groups
                                                      ** between <4 units and ≥4 units group, <4 units and ≥6 units group

cognitive items, efficiency of FIM motor items was significant higher in the ≥6 units group than in the <4 units group (Table 3). The rate of returning home was slightly lower in the <4 units group than in the other groups. Patients in the ≥6 units group had a slightly higher rate of sudden change in condition than those in the other groups (Table 2).

The average numbers of beds and facility staff tended to increase as the number of rehabilitation units increased, although the numbers of beds and nurses were slightly higher in the 4–6 units group than in the ≥6 units group (Table 4).

Discussion

In 2010, new remuneration systems for "additional remuneration for providing rehabilitation services on holidays" and "additional remuneration for enrichment

Table 3. Comparison of treatment outcomes among the <4 units, 4–6 units, and ≥6 rehabilitation units groups

		<4 units group n = 124 2 facilities	4−6 units group n = 560 4 facilities	≥6 units group n = 888 5 facilities	ANOVA
Mean LOS	(days)	93.4 ± 41.2	93.0 ± 50.1	81.1 ± 43.8	p < 0.0001*
Admission FIM motor	(points)	51.1 ± 25.2	48.2 ± 24.1	44.1 ± 23.4	p < 0.001 *
Discharge FIM motor	(points)	64.8 ± 25.8	64.5 ± 24.8	59.9 ± 26.3	p < 0.01 **
FIM motor gain	(points)	13.7 ± 15.3	16.3 ± 14.1	15.7 ± 13.0	N.S.
FIM motor efficiency	(points/day)	0.15 ± 0.17	0.20 ± 0.24	0.22 ± 0.21	p < 0.01 ***
Admission FIM cognitive	(points)	24.2 ± 8.8	22.4 ± 9.7	20.7 ± 9.4	p < 0.0001*
Discharge FIM cognitive	(points)	27.6 ± 7.9	25.8 ± 8.9	23.8 ± 9.3	p < 0.0001*
FIM cognitive gain	(points)	3.5 ± 4.1	3.4 ± 5.2	3.1 ± 4.0	N.S.

LOS: length of stay, N.S.: not significant, FIM motor: total score of FIM motor items, FIM motor gain: total score of FIM motor items at discharge minus that on admission, FIM motor efficiency: gained score of FIM motor items divided by LOS, FIM cognitive: total score of FIM cognitive items, FIM cognitive gain: total score of FIM cognitive items at discharge minus that on admission
Significant difference in Tukey-Kramer HSD test
   * between <4 units and ≥6 units groups, and 4−6 units and ≥6 units groups
 ** between 4−6 units and ≥6 units groups
*** between <4 units and ≥6 units groups

Table 4. Average numbers of beds and staff in the facilities of each group

		Number of beds	MD (n)	OT (n)	PT (n)	ST (n)	SW (n)	NS (n)	CW (n)
<4 units group	(2 facilities)	90	1.5	11	17.5	3	2	37.9	9.4
4−6 units group	(3 facilities)*	128.7	3.7	25.3	29.3	8.3	4	51.7	25.5
≥6 units group	(5 facilities)	119.6	5.2	32.8	37	9.2	4.2	47.6	27.7

MD: doctor of medicine, OT: occupational therapist, PT: physical therapist, ST: speech-language-hearing therapist, SW: social worker, NS: nurse, CW: care worker
* The data for only 3 of the 4 facilities

of rehabilitation programs" were introduced into kaifukuki rehabilitation wards that provide ≥6 units/ day of rehabilitation 7 days a week. However, other than general reports demonstrating the relationship between rehabilitation intensity and rehabilitation outcome [5−8], there is insufficient scientific basis for the substantial increase in medical remuneration that these new systems have brought. Therefore, the aim of the present study was to retrospectively analyze historical data to determine the appropriateness of these new medical remuneration systems.

Most previous studies on the number of rehabilitation units have compared groups of patients defined by the number of rehabilitation units performed [3, 9]. One problem with such data is that the unit numbers were not assigned randomly, but were influenced by various factors, such as the treatment strategies adopted by the attending physicians, the number of staff, and the severity of complications. Therefore, the results were affected more by bias due to other factors than by rehabilitation intensity. A previous comparison of rehabilitation intensity within a single facility did not necessarily show an improvement in rehabilitation outcomes with increasing intensity of rehabilitation

[9]. Another study demonstrated a significant improvement with increasing intensity of rehabilitation [3] by excluding severe comorbidities and all disorders other than hemiplegia, and stratifying patients by time elapsed since symptom onset; however, the excessive amount of data excluded as a result of stratification might have resulted in a substantial disparity in patient characteristics between the analyzed population and the entire population.

The present study is the first to compare rehabilitation outcomes between facilities in Japan. The types of patients admitted and the treatment strategies adopted tend to vary among kaifukuki rehabilitation wards due to regional characteristics and separateness in facility-to-facility relationships [3]. Therefore, to correct for such biases, the participation of multiple facilities is essential; therefore, the present study analyzed patient data from 11 facilities. The present study divided rehabilitation facilities into 3 groups for analysis purposes, resulting in relatively small numbers of facilities in each group and possibly an insufficient statistical power. Nevertheless, a certain trend in rehabilitation outcomes was observed.

The results showed that the ≥6 units group had

significantly lower total scores of FIM motor and cognitive items on admission, indicating that facilities providing ≥6 units/day of rehabilitation accept patients with relatively severe ADL and cognitive disorders on admission. These factors are generally associated with poor prognosis and adverse consequences [10]. However, patients in the ≥6 units group were discharged with significantly shorter LOS (by approximately 12 days) than those in the other 2 groups; in other words, these facilities allowed patients admitted with more severe stroke to be discharged within a shorter period of time. Given a home returning rate of greater than 60%, no significant difference in gained score of FIM motor items among the 3 groups, and significantly higher efficiency of FIM motor items in the ≥6 units group compared to the <4 units group, it would seem that a shorter LOS does not necessarily imply reduced rehabilitation outcomes.

Additionally, in the ≥6 units group, the rate of sudden change in condition was slightly higher than that in the other 2 groups. This may be because patients with more severe stroke were admitted to facilities providing ≥6 units/day of rehabilitation, although the involvement of other factors is also possible.

In this study, grouping was based only on the number of units of rehabilitation provided. Rehabilitation outcomes in kaifukuki rehabilitation wards are affected, not only by the number of units of rehabilitation provided, but also by many other factors, including the number of staff, ward structure, the equipment/instruments available, and cooperation with medical institutions and welfare agencies. Originally, the grouping should have been done using a comprehensive rehabilitation parameter reflecting all these factors. However, since this was difficult to do in this study, the effects were analyzed by groups based only on the number of rehabilitation units provided. However, in facilities with a higher number of units, the average number of staff tends to be higher for all professionals, except for nurses, and this might have affected the results to some extent.

Overall, the present results revealed that facilities providing ≥6 units/day of rehabilitation even on holidays allowed patients to be discharged from the facility in significantly fewer days, despite accepting patients with more severe stroke, compared to facilities providing fewer units of rehabilitation. Although further investigations are needed, the 2 systems introduced, "additional remuneration for providing rehabilitation services on holidays" and "additional remuneration for enrichment of rehabilitation programs," do appear to be producing the expected effects.

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