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Original Article

Effect of adaptations to the living environment on ADL abilities and self-perception of performance/satisfaction—Based on experience from post-discharge home visits—

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ABSTRACT

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Objective: We evaluated the change in post-discharge ability in activities of daily living (ADL) and self-perception of performance/satisfaction in patients who were hospitalized at the restoration phase rehabilitation ward and for whom pre-discharge home visits were conducted.

Methods: The study included 10 patients, for whom post-discharge home visits were conducted approximately 3 months after discharge. In the post-discharge home visit, we ascertained the places where adaptations to the living environment were made before patients were discharged. ADL abilities were assessed by the Functional Independence Measure (FIM) while occupational performance and satisfaction with performance were evaluated by the Canadian Occupational Performance Measure (COPM).

Results: The patients tended to perceive ADL that were carried out in a well-adapted living environment as important occupations. A comparison made between pre- and post-discharge home visits showed improvement in mean score from 5.5 to 7.3 for performance and from 5.3 to 7.4 for satisfaction, both presenting significant differences, maintaining ADL by and large.

Conclusion: It was suggested that when implementing hospital-to-home discharge, it is vital to focus on the in-home flow of activity, means for going out, and toilet and bathroom environment, and that adaptations to the living environment have a beneficial effect on self-perception of performance/satisfaction for the occupations selected by patients.

Key words: adaptations to the living environment, pre-discharge home visits, post-discharge home visits, FIM, COPM

Introduction

Factors contributing to decreased functions in older adults include aging, presence of chronic diseases, and falls [1–3], which suggests that implementation of adaptations to the living environment is vital for seniors to continue to live safely at home while maintaining ADL abilities. The Long-Term Care Insurance System in effect since 2000 encompasses the cost for home modifications and rental/purchase of assistive devices for insurance coverage, thereby increasing initiatives for modifying the home environment. In present-day Japan, the population certified as Persons Requiring Long-Term Care reached 6.18 million [4], which is projected to continue increasing in the future. Accordingly, people who are in rehabilitation-related professions are important, as specialists in assessing patients' mobility and ADL abilities, and whether they are sufficiently capable of giving guidance to help provide supportive living spaces.

As a part of discharge support, pre-discharge home assessment visits (hereinafter "pre-discharge home visits") are often conducted for patients who are hospitalized in restoration phase rehabilitation wards. The Kaifukuki (meaning "restoration phase") Rehabilitation Ward Association has reported that 98.0% of these wards (among those that gave a valid answer) were undertaking pre-discharge home visits in fiscal 2013 [5]. It has been reported that home modifications made after pre-discharge home visits

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drew high satisfaction [6], and that pre-discharge home visits were associated with a decreased risk of falls in patients after discharge [7]. Thus, there is a likelihood that pre-discharge home visits brings a change in patients' post-discharge life.

Previous post-discharge follow-up investigations include reports produced from questionnaires mailed to patients [8, 9]. Although post-discharge counseling home visits to grasp patients' post-discharge life have been incorporated into the medical fee system since fiscal 2016, very few hospitals are conducting post-discharge visits; hence there have been no reports on patients' own perception of changes between pre- and post-discharge.

The purpose of this study was to ascertain the state of the adapted living environment by conducting post-discharge home visits, and to evaluate the change in ADL abilities and self-perception of performance/satisfaction between pre- and post-discharge settings as a result of the home modifications, in patients for whom adaptations to the living environment were made following the pre-discharge home visits. Adaptations to the living environment referred to in the present study are the implementation of home modifications to the patient's home premises and the introduction of assistive devices intended to enhance the patient's independence, decrease the amount of ADL caregiving, and alleviate the burden of family caregivers.

Study Subjects

The study included 10 patients who were discharged from the restoration phase rehabilitation ward in the author's hospital to their home from April 2015 to October 2015 and for whom pre-discharge home visits were conducted while they were hospitalized. The 10 patients were 6 males and 4 females with an average age of 68.6±9.7 years (53−80 years). Five patients had cerebrovascular disease and 5 patients had orthopedic disease. Inclusion criteria were patients with the ability to communicate and having no severe cognitive dysfunction. Severe cognitive dysfunction was defined as a Mini-Mental State Examination (MMSE) score of 10 or lower according to the Dementia Treatment Guidelines (2002) established by the Joint Committee of the Japanese Society of Neurology.

For ethical considerations, subjects and their families were given sufficient explanation about the objectives of the study both orally and in writing in advance and their written agreement was obtained. The study was carried out under the approval of the Ethics Committee of the author's hospital (No. 803-3).

Methods

1. Actions taken toward post-discharge home visits

The attending physician for the patient, a therapist in charge of the patient, a care manager, a home renovator, etc., participated in the pre-discharge home visit. In-home mobility was checked and a home modification plan based on the patient's physical abilities was designed through interprofessional alliance.

Prior to discharge, the patients underwent assessment using the MMSE, Canadian Occupational Performance Measure (COPM) [10], and Functional Independence Measure (FIM). The COPM was used to identify occupations/activities meaningful for the patient when envisioning, before discharge, post-discharge life at home, and to investigate the change in activities perceived by individual patients. The COPM is an individualized measure to assess a patient's self-perception of occupational performance problems. It is carried out by interview and can be used for any patient from whom information can be gathered by interview. The COPM process is as follows: (i) identifying occupations that each patient perceives as important, (ii) deciding the priority (confined to the top five most important occupations), (iii) assessing performance and satisfaction, and (iv) reassessing performance and satisfaction. Importance, performance, and satisfaction are rated using a 10-point scale, where 10 indicates very important, very good performance and high satisfaction, while 1 indicates not important at all, poor performance and low satisfaction. For performance and satisfaction, the mean performance score and mean satisfaction score were calculated for each patient. Table 1 shows an example of a patient's scores. In the COPM, a change in the mean score for performance and satisfaction of 2 or more points is considered clinically significant [11]. The occupations are grouped into "self-care," "productivity," and "leisure." We mostly focused on the category of self-care, which is commonly used for assessment before and after occupational therapy, and we performed the assessment centering on ADL and instrumental activities of daily living (IADL) of greater importance envisioning life after discharge.

Post-discharge home visits were conducted approximately 3 months after discharge, in which two therapists who were in charge of the restoration phase rehabilitation ward in the author's hospital visited the patients' homes. To minimize bias in the assessment of patients, the two therapists who conducted the post-discharge home visits consisted of one therapist who had attended the pre-discharge home visits and one who had not. In the post-discharge home visits, places where home modifications were actually made were ascertained and patient mobility was confirmed under the adapted living environment. Additionally, reassessment was performed using COPM and FIM to examine the change along a time course.

2. Method of analysis

The COPM and FIM scores were analyzed by paired *t*-test to compare the data from the pre- and

Table 1. Example of COPM.

Selected occupations	Importance	Performance		Satisfaction	
		Pre-discharge	Post-discharge	Pre-discharge	Post-discharge
Climb/descend the riser in the entrance hall safely without support	10	6	8	4	8
Bathe in the bathtub every day	8	3	7	2	7
Walk inside the home without a cane	8	5	5	3	6
Climb/descend stairs using a grab bar	6	7	5	5	5
Get up from the floor or futon without falling	6	5	6	3	5
Mean score		5.2	6.2	3.4	6.2

post-discharge visits. The statistically significant level was set at less than 5% and statistical analyses were performed using IBM SPSS Statistics.

Results

1. State of adaptations to the living environment

Places where adaptations were ascertained during post-discharge home visits are shown in Figure 1. The place most commonly modified was the toilet (8 patients), followed by the entrance area (including outdoor space, 7), bedroom (7), and bathroom (6). The 4 patients who did not have bathroom adaptations were provided with bathing services at adult day centers while all other patients who bathed at home had modifications to the bathroom facilities. Details of the housing modifications are shown in Table 2.

2. Breakdown of occupational problems

The COPM results identified a total of 50 problem items in ADL/IADL that were perceived as important by the patients themselves. Among these items, 10 related to dressing, eating, contents of IADL, etc. were excluded because they had no association with the adaptations to the living environment that were made at this time. Among the 40 remaining items, 13 (32.5%) were related to transferring (such as safely climbing/descending the riser in the entrance hall using a grab bar), 10 (25%) were related to toileting in the toilet (such as standing stably by the toilet using a grab bar), 7 (17.5%) to bathing (such as getting in the bathtub unassisted), and 10 (25%) to other occupations (transfer motion, rising, and hygiene). Details of the COPM assessment are shown in Table 3.

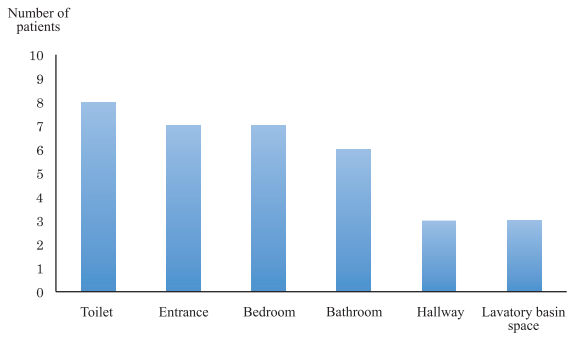

Figure 1. Places where adaptations were made to the living environment.

3. Comparison of scores between pre- and post-discharge home visits

Table 4 presents demographic information about patients and the change after discharge. On an individual patient basis, changes of 2 or more points were found in 5 patients in performance scores and 6 patients in satisfaction scores. The results showed 9 patients presenting maintenance/improvement including increases falling short of 2 or more points, whereas 1 patient presented a decline. Mean scores among the 10 patients for performance/satisfaction and FIM were compared between pre- and post-discharge home visits. For performance, the mean score increased by 1.8 points from 5.5 to 7.3 (95% confidence interval: 0.4–3.1, $p = 0.015$) and for satisfaction, the mean score rose by 2.1 points from 5.3 to 7.4 (95% confidence interval: 0.6–3.6, $p = 0.011$), both showing significant differences (Figure 2). Additionally, regarding the 10 items related to dressing, eating, contents of IADL, etc. that were excluded from the analysis of the present study, the mean scores for performance and satisfaction showed improvement from 3.0 to 3.6 ($p = 0.69$) and from 2.8 to 4.4 ($p = 0.10$), respectively, but yielded no significant differences. Mean scores for FIM showed no significant differences either in motor function or in cognitive function (Figure 3).

Discussion

It was found that adaptations to the living environment were made mostly to the toilet, entrance, bedroom, or bathroom, which is approximately consistent with the tendency indicated in previous studies of home modifications [8, 9, 12]. Additionally,

Table 2. Details of adaptations to the living environment.

Places adapted	Details of modification	Number of cases	Assistive devices introduced	Number of cases
Toilet	Install a grab bar	2	Portable toilet	3
	Eliminate a rise	1	Grab bar	3
			Toilet seat riser	1
			Urinal	1
Entrance area	Level the ground surface	2	Electric lift	3
	Install a grab bar	2	Ramp	2
			Grab bar	1
Bedroom			Clinical bed	7
			Grab bar	1
Bathroom	Install a grab bar	4	Shower chair/wheeled shower chair	2
			Bath board	1
			Duckboard	1
Hallway	Install a grab bar	1		
	Eliminate a rise	1		
	Remove walls to ensure wheelchair accessibility	1		

Table 3. Details of COPM assessment.

	Occupations assessed by COPM	Number of items
Transferring	Get in/out of the house	5
	Use a wheelchair without support	4
	Walk without falling	2
	Transfer inside the home without support	2
Toileting	Perform toileting activities without support	4
	Keep a stable standing position using a grab bar	3
	Pull down underwear without support	1
	Perform semi-sitting easily	1
	Excrete using a common toilet (instead of a portable toilet)	1
Bathing	Get in the bathtub safely	4
	Get in/out of the bathroom without any problems	1
	Take a bath, or at least a shower, without support	1
	Soak in a bath up to the shoulders	1
Others	Transfer motion	5
	Rising motion	4
	Perform personal grooming at the lavatory	1
Excluded occupations	Cook meals	2
	Clean and tidy up	2
	Eat rice using chopsticks	1
	Change clothes every day	1
	Put on/off shoes safely	1
	Brush teeth and wash hands in a stable position	1
	Go up to the second floor using stairs	1
	Transfer in the supermarket by walking	1

40 out of the 50 occupational problems perceived as important by each patient in the COPM were associated with adaptations to the living environment, with transferring being the most common problem followed by toileting activities, and bathing.

It has been previously reported that individuals who have a transferring range extending beyond their home had a better quality of life (QOL) [13], and that independence in toileting activities was closely related to the hospital-to-home discharge rate [14, 15]. In addition, bathing transfer and body wiping are considered to be a challenge in attaining independence

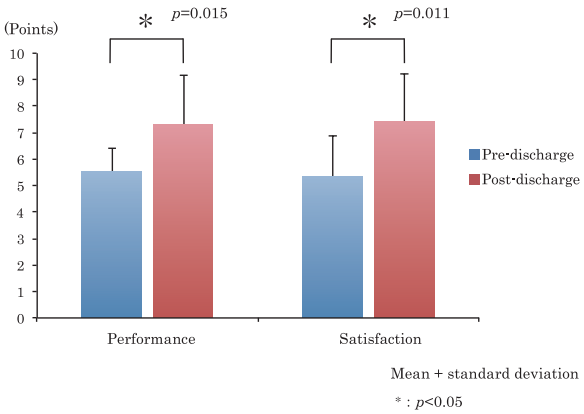

Figure 2. Comparison of satisfaction and performance scores.

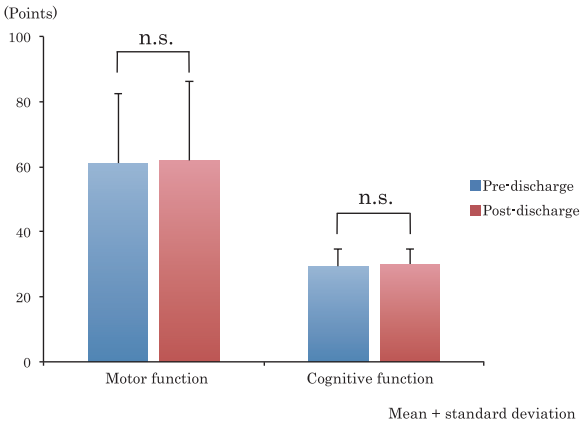

Figure 3. Comparison by FIM.

Table 4. Demographic information about patients and changes in COPM and FIM.

ID	Sex	Age	Disease	Major symptom	MMSE	Performance score Pre-/post-discharge	Satisfaction score Pre-/post-discharge	FIM otal Pre-/post-discharge
1	F	72	Right thalamus hemorrhage	Left hemiplegia	27	6.0/6.0	4.3/6.7**	81/71
2	M	76	Right cerebellar infarction	Ataxia in right upper/lower limbs	26	5.2/6.2	3.4/6.2**	106/112
3	M	63	Fracture in right femoral neck	Muscle weakness in lower limbs	30	7.0/8.0	8.6/8.0	99/99
4	M	79	Compression fracture	Low back pain, right hemiplegia	21	5.0/3.8	5.0/3.8	53/56
5	M	60	Ossification of yellow ligament	Sensory disturbance in lower limbs	30	6.0/8.5**	4.5/7.5**	119/123
6	M	53	Right distal femur fracture	Muscle weakness in lower limbs	23	3.8/7.8**	5.5/8.8**	87/98
7	F	73	Cerebral infarction in right MCA	Left hemiplegia	26	5.6/5.6	5.6/6.0	59/57
8	F	74	Gonarthrosis in both knees	Limited knee joint range of motion	29	6.3/9.0**	3.7/9.0**	122/122
9	M	56	Right putamen hemorrhage	Left hemiplegia	30	5.7/10.0**	6.0/10.0**	115/120
10	F	80	Cerebral infarction in right MCA	Left hemiplegia	27	4.6/8.2**	6.8/8.2	64/60

COPM, Canadian Occupational Performance Measure; FIM, Functional Independence Measure; MCA, middle cerebral artery; MMSE, Mini-Mental State Examination.
**: Change of 2 or more points.

[16]. As human beings lead their life, transferring and toileting are two of the most frequently performed activities of daily living, significantly affecting the sense of shame and self-esteem. Additionally, with regard to bathing, it involves many procedures requiring applied movements in the standing position, thereby posing the highest risk of falls. Taking into account the findings described above, when allowing patients to discharge to home, it is important to focus on the in-home flow of activity, means for going out and the environment of toileting and bathing facilities, as well as to consider repeated practice and movement methods in an environment envisioning the home environment.

Previous COPM studies have produced many reports showing that the use of COPM led to changes in ADL abilities and performance/satisfaction [17–22], which indicates the usefulness of COPM in assessing the effects of rehabilitation therapy. Various reports comparing ADL abilities between pre- and post-discharge settings have been published [23–26] including one showing that the 1-month post-discharge ADL of patients from the restoration phase rehabilitation ward were prone to start deteriorating mainly in self-care occupations [27].

In the present study, significant differences were found between pre- and post-discharge in the mean scores for performance and satisfaction. On an individual patient basis, changes of 2 or more points were found in 50% of all patients for performance scores and 60% for satisfaction scores. The one patient who presented a post-discharge decline was in a state requiring support in overall ADL when the post-discharge home visit was conducted. Therefore, it is likely that the difficulties the patient was actually experiencing in daily activities led to the decreased self-assessment of performance/satisfaction. With respect to ADL abilities, even though patients' ADL are prone to start deteriorating immediately after discharge as referred to in a previous report [27], ADL of the patients in the present study were found to be largely maintained during a period of 3 months after discharge, when patients are susceptible to environmental changes.

In addition to the living environment, the use of caregiving services such as home visit rehabilitation as well as the relationship with cognitive function [28] are factors that may also affect performance, satisfaction, and ADL abilities after discharge. In fact, 2 of the 10 patients were provided with home visit rehabilitation service and 2 patients had mild cognitive impairment (MCI). However, in these patients, the home visit rehabilitation program was limited (relaxation for one patient, and mainly toileting activities for the other), and no major decline in cognitive function as severe as impairing daily activities was observed. Therefore, it is likely that the effects of these factors on performance/satisfaction and ADL abilities were limited.

Thus, it was suggested that adaptations to the living environment give beneficial effects to self-perceived occupational performance/satisfaction in the patients' chosen activities, and that the adaptations are an effective method of ensuring maintenance of ADL. Since the occupational performance and self-perception of patients are highly affected by whether or not their living environment is accessible and supportive, it is vital that rehabilitation-related professions take a proactive role in enhancing adaptations to the living environment to help ensure that a supportive home environment is ready by the time patients are discharged. As an approach to accomplish this, pre-discharge home visits are a useful method while continued follow-up after discharge and introduction of home visit rehabilitation are also helpful.

The present study has some limitations. First, the number of patients evaluated was small. As only 10 patients participated in the study, it is necessary to increase the number of subjects in the future. Secondly, comparing the results of the present study with the findings of existing research papers is difficult because COPM is normally used to assess the effects of occupational therapy, whereas the present study used it to make a comparison between the scores before and after adaptations to the living environment. Additionally, with regard to performance/satisfaction, the importance of individual occupations was not taken into account. Thirdly, because it is difficult to assess ADL in the in-home living environment in patients who are hospitalized, the assessment of pre-discharge ADL was inevitably an assessment of in-hospital ADL; hence, the difference in the environment needs to be noted. Thus, to evaluate the results of the present study, the factors described above need to be taken into consideration.

In the future, we intend to increase the number of subjects and proceed with the efforts initiated in the present study, comparing and examining ADL abilities and self-perceived performance/satisfaction before and after the implementation of adaptations to the living environment, in order to improve the reliability/validity of the self-perceived assessment and design an evaluation method taking into account individual uniqueness and importance. We also intend to listen to the patients' own wishes as well as needs and the level of caregiving burden of their families to help provide a living space that is supportive and accessible not only for the patients but also for their families.

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