



Original Article

Correlates of improvement in the care need levels of older adults with disabilities: a two-year follow-up study

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Abstract. [Purpose] This study examined the effect of motor functioning, cognitive functioning, and activities of daily living on improvements in care need levels of older adults requiring low-level care at baseline in Japan's Long-Term Care Insurance system. We aimed to link our findings to a proposal for effective measures toward improving care need levels. [Participants and Methods] This retrospective cohort study included 11,585 individuals aged 65 years and above who received personal care and used day-care services continuously for two or more years starting from the baseline assessment. Participants showing an improvement in their care need level from baseline to two years were included in the improved group, and those who maintained or declined from the baseline level were included in the maintained/deteriorated group. [Results] The mental status questionnaire and sub-scores for the Functional Independence Measure, including those for self-care, continence, and social cognition, were significantly correlated with improvements in care need levels. [Conclusion] Conducting a detailed evaluation of these factors is important for gauging the progress of the care need levels of older adults. In addition, it is important for physiotherapists to provide non-rehabilitation professionals with advice and guidance on their assessment methods and remedies.

Key words: Older adults with disability, Improvement in the care need levels, Japan's Long-Term Care Insurance System

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INTRODUCTION

The global rate of aging has increased from 5.1% in 1950 to 8.3% in 2015 and it is expected to increase to 18.1% by 2060, indicating that aging will progress rapidly in the latter half of this century¹⁾. Japan reached its highest level of aging in 2005 and is expected to reach 30.3% in 2030. This trend is also associated with increased national healthcare costs. Since 2014, the national healthcare costs for adults aged 75 years and older accounted for 35.6% of the total expenditure for an elderly individual²⁾. Furthermore, with aging comes a steady, irreversible decline in mental and physical health, as well as in life functions.

The Long-Term Care Insurance (LTCI) system was started in April 2000 to provide financial support for healthcare to older adults, as part of the social insurance mechanism³⁾. Individuals who are 65 years or older in age are required to submit an application to their municipality, receive authorization based on their nursing-care requirement, and then, a care service plan is created depending on the degree of care required by them. Older adults can receive in-home care services or facility-based services based on their requirement. The cost of this LTCI has been increasing yearly, burgeoning from 3.6 trillion yen in 2000 to 10.4 trillion yen in 2016, which places pressure on public finances. Thus, there is an emphasis on preventative care for older adults, preventing the exacerbation of existing conditions, and improving the level of care in various countries

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worldwide, particularly in countries with rapidly aging populations.

There are several studies investigating factors related to the occurrence of long-term care, such as physical function being a predictor of certification for long-term care⁴⁻⁷⁾ and cognitive impairment as a predictor of dysfunction⁸⁻¹²⁾; however, research in this area has not yet described the factors that affect improvement in long-term care and improvement measures that can be taken.

Many studies have focused on factors related to the new occurrence of long-term care, but there are no studies that describe factors that affect improvement from the state of long-term care and improvement measures.

For information about factors related to the new generation of care, although many studies have been accumulated, I do not see studies that discuss the factors affecting and improvement measures to improve from the need of nursing care state.

In the current study, we examine physical functions, cognitive functions, and activities of daily living (ADL) that affect improvement in the care need level of older adults requiring low-level care at baseline, in Japan's Long-term Care Insurance system, with the aim of linking our findings to a proposal for effective measures to work toward improving care need levels.

PARTICIPANTS AND METHODS

This study was conducted in Japan, comprising 11,585 individuals aged 65 years and above, who received personal care and used day-care services continuously for two or more years starting from the baseline assessment (age 82.0 ± 6.5 years, males=3,822, females=7,763). The study included individuals enrolled in the Tsukui Ordered Useful Care for Health (TOUCH) program. To enroll in the TOUCH program, an individual had to be aged 65 years or older and be certified as an individual needing support or care under the Japanese public LTCI system. Detailed information regarding this program has been provided in a previous study¹³⁾. In brief, TOUCH sites (241 day-care centers) are located throughout Japan and they provide comprehensive, facility-based day-care services (e.g., bathing, lunch, physical and cognitive recreational activities, and physical exercise). Most TOUCH clients have some form of physical disability and frailty, which is defined as the presence of weakness, low physical activity, and/or slow gait speed, in accordance with the widely accepted definition of frailty¹³⁾. The breakdown of the care need level was as follows: 16% for support need level two, 54% for care need level one, and 30% for care need level two. The inclusion criteria were as follows: individuals with no apparent dementia who passed all the examinations, individuals who continuously used day-care services for the following two years, and individuals whose care need level could be traced. Cognitive function was evaluated using the mental status questionnaire (MSQ)^{14, 15)}, and any potential subjects with 9 or 10 incorrect answers were excluded from the study. The participants were divided into two groups. Participants who showed an improvement in their care need level from the baseline over a period of two years were included in the improved group, while participants who maintained the baseline or experienced a deterioration in the care need level were included in the maintained/deteriorated group. At the time of the survey, the maximum length of care need level was two years, so we thought that a survey period of less than two years from the baseline would create a bias. Therefore, the survey period is set to two years in this study.

The Ethics Committee of the Tokyo Metropolitan Institute of Gerontology approved the study protocol. Written informed consent was obtained from the participants or their representative family members.

The assessments were conducted by well-trained staff who had qualifications in nursing, physiotherapy, occupational therapy, or other similar fields. Prior to the commencement of the study, the staff received training on the correct protocols for administering all assessment measures.

The assessment included several physical tests. Upper and lower limb muscle functions were assessed using the grip strength (GS) and chair stand test (CST), respectively¹⁶⁾. GS was measured in kilograms for the participant's dominant hand using a Smedley-type handheld dynamometer (GRIP-D; Takei Ltd, Niigata, Japan). The CST required the participants to sit down and stand up five times using a chair without an armrest. The score showed the time taken by the participant to complete the task in seconds. Participants were asked to exert their maximum effort in the GS and CST.

Gait function was assessed using a 6-meter walking time test conducted at a comfortable pace (comfortable walking speed [CWS]) and using the timed up-and-go (TUG) test¹⁷⁾. The CWS was measured in seconds using a stopwatch. Participants were asked to walk on a flat and straight surface at their CWS. Two markers were used to indicate the start and end of the path, and a 2 m and over approach was allowed before reaching the marker at the beginning so that participants could walk at a comfortable pace within the required time. They were instructed to continue walking past the end of the path further for 2 m and over to ensure that their walking pace was consistent throughout the task.

The TUG test involved rising from a chair, walking for 3m, turning around, walking back to the chair, and sitting down¹⁶⁾. The TUG test is one of the most frequently used tests for balance and gait and is often used to assess fall risk in older individuals¹⁸⁾. The time taken to complete the TUG test was measured in seconds, at each participant's usual pace. Both walking tests were measured once, and if the participants normally used a walking aid when at home, it was used during the tests as well.

The MSQ was administered among individuals enrolled in the TOUCH program to measure cognitive function as it can serve as a potential confounding variable in the association between performance-based physical assessments and functional dependence¹⁴⁾. Individuals with three or more errors on the MSQ were considered to have cognitive impairment^{14, 15)}.

The Functional Independence Measure (FIM) was used to evaluate ADL, and the scores were calculated for the main components: self-care, bladder/bowel control, transfer, movement, communication, and social cognition^{19, 20)}. Staff employed at

each of the day-care facilities performed these measurements and assessments after receiving training from a physiotherapist. In case of a lack of clarity in the FIM scores, the scores were assigned after discussion with other care staff.

We conducted univariate analyses using a t-test and χ^2 test to compare the differences for each variable between the two groups. Multiple logistic regression analysis was conducted between motor function, cognitive function, and FIM binary classification as independent variables where a significant correlation was observed, and the improved group and maintained/deteriorated group were used as the dependent variables (model 1). In addition, multiple logistic regression analysis adjusted for all motor functions, major items related to FIM, age, and gender was also performed (model 2).

Statistical software SPSS 22.0 for Windows was used for all statistical processing, and the level of significance was less than 5%. The study protocol was developed in accordance with the Helsinki Declaration and Personal Information Protection Law. Prior to study participation, written informed consent was obtained from all participants.

RESULTS

The baseline characteristics of the participants are shown in Table 1. There were 1,298 participants in the improved group (males=374, females=924, 81.6 ± 6.6 years), and 10,287 participants in the maintained/deteriorated group (males=3,448, females=6,839, 82.1 ± 6.4 years). There were no significant differences between the groups in any of the measurements of motor function. The improved group showed higher MSQ scores ($p<0.001$) and FIM scores in self-care ($p<0.001$), bladder/bowel control ($p<0.001$), communication ($p<0.001$), and social cognition ($p<0.001$) compared to the maintained/deteriorated group.

With respect to the multiple logistic regression analysis (Table 2), MSQ (odds ratio [OR] 2.45, 95% confidence interval (CI) 2.15–2.80, $p<0.01$), self-care (OR 1.21, 95% CI 1.04–1.41, $p<0.05$), continence (OR 1.28, 95% CI 1.01–1.61, $p<0.05$), and social cognition (OR 1.35, 95% CI 1.15–1.58, $p<0.01$) were significantly correlated with improvement in care need levels. These results remained substantially unchanged after controlling for age, gender, cognitive impairment, and other

Table 1. Participant attributes, measurement results and univariate analyses

	All participants (n=11,585)	Improved group (n=1,298)	Maintained/ deteriorated group (n=10,287)	p value
Age (years)	81.9 ± 6.5	81.6 ± 6.5	82.1 ± 6.4	0.091
Gender				
Males, n (%)	3,822 (33.0)	374 (28.8)	3,448 (33.5)**	$p<0.001$
Females, n (%)	7,763 (67.0)	924 (71.2)	6,839 (66.5)**	$p<0.001$
Care level in LTCI, n (%)				
Support need level 2	1,849 (16.0)	251 (19.3)	1,598 (15.5)**	$p<0.001$
Care need level 1	6,260 (54.0)	350 (27.0)	5,910 (57.5)**	$p<0.001$
Care need level 2	3,476 (30.0)	697 (53.7)	2,779 (27.0)**	$p<0.001$
GS (kg)	17.1 ± 7.3	17.2 ± 6.8	17.1 ± 6.9	0.519
Motor function				
CST-5 (s)	14.0 ± 6.6	13.9 ± 6.1	14.1 ± 6.8	0.100
The one-leg standing (s)	7.3 ± 10.5	7.6 ± 13.9	7.0 ± 12.4	0.195
CWS (m/s)	0.6 ± 0.3	0.6 ± 0.3	0.6 ± 0.3	0.088
TUG (s)	16.3 ± 9.2	16.3 ± 8.8	16.3 ± 9.3	0.804
MSQ	3.5 ± 2.7	2.2 ± 2.2	$3.7 \pm 2.7^{**}$	$p<0.001$
FIM (points)				
Self-care	37.9 ± 6.4	38.8 ± 5.8	$37.8 \pm 6.5^{**}$	$p<0.001$
Bladder/bowel control	13.0 ± 2.2	13.2 ± 2.0	$12.9 \pm 2.3^{**}$	$p<0.001$
Transfer	18.4 ± 3.3	18.5 ± 3.0	18.4 ± 3.3	0.073
Movement	11.5 ± 2.6	11.5 ± 2.4	11.5 ± 2.6	0.485
Communication	12.1 ± 2.7	12.7 ± 2.3	$12.0 \pm 2.7^{**}$	$p<0.001$
Social cognition	17.1 ± 6.9	18.1 ± 3.9	$16.6 \pm 4.5^{**}$	$p<0.001$

Age, motor function, and FIM: Mean \pm standard deviation.

* $p<0.05$, ** $p<0.01$.

Gender, Care level: χ^2 test.

Age, GS, CWS, FIM: t-test.

CST-5, The one-leg standing, TUG: Mann-Whitney U test.

LTCI: long-term care insurance; GS: grip strength; CST: chair stand test; CWS: comfortable walking speed; TUG: timed up-and-go test; MSQ: mental status questionnaire; FIM: Functional Independence Measure.

Table 2. Factors that affect improvement in care need levels

	Model 1		Model 2	
	OR	95% CI	OR	95% CI
MSQ	2.45**	2.15–2.80	2.44**	2.13–2.79
Selfcare	1.21*	1.04–1.41	1.20*	1.01–1.33
Bladder/bowel control	1.28*	1.01–1.61	1.25*	1.01–1.58
Communication	1.08	0.89–1.30	1.07	0.88–1.29
Social cognition	1.35**	1.15–1.58	1.34**	1.14–1.58

Model 1: crude ORs.

Model 2: adjusted for age, gender, and care level in the LTCI, motor function, and FIM score.

MSQ: mental status questionnaire.

physical performance tests. In model 2, MSQ (OR 2.44, 95% CI 2.13–2.79, $p<0.01$), self-care (OR 1.20, 95% CI 1.01–1.33, $p<0.05$), continence (OR 1.25, 95% CI 1.01–1.58, $p<0.05$), and social cognition (OR 1.34, 95% CI 1.14–1.58, $p<0.01$) were significantly correlated with improvements in the care need level.

DISCUSSION

The results of this study show that there is a relationship between improvement in the care need level and baseline assessments of cognition and ADL scores related to self-care, continence, and social cognition in older adults with disabilities. Yokoi et al. reported that disorders related to cognitive functioning caused the participants' scores on motor-related items in the FIM to decline, indicating that participants with moderate dementia were able to independently eat and transfer, but none were able to independently groom, bathe, and change their clothes (top and bottom)²¹. Reisberg et al. reported that participants with moderate to severe disorders related to cognitive functioning had impaired ability in changing clothes, bathing, and using toilet facilities, and suffered urinary incontinence and fecal incontinence²². Yamada et al. reported that even among ADL, motor functions such as “walking”, “getting out of bed”, “standing up”, and “standing on one leg”, were items that did not require an individual's cognitive functioning abilities²³. However, reports show that when cognitive functioning in an individual is reduced, tasks such as “putting on and taking off trousers”, “putting on and taking off jackets”, “brushing hair”, and “oral hygiene” require higher levels of observation and assistance²³. Thus, previous studies suggest that disorders related to cognitive functioning and self-care are closely related to bladder/bowel control.

This study measured cognitive functions, self-care, and bladder and bowel control and their association with improvements in the care need level of disabled older adults. Social cognition abilities related to cognitive functioning may also affect ADL and care need levels. In the FIM, the component of social cognition comprises three items related to problem solving, social interactions, and memory^{18, 19}. In case a person has low problem-solving abilities, they may be unable to perform ADL even if they have high levels of physical functioning. Reports show that having a low problem-solving ability inhibits improvement in the care need level and it is also related to medication management and self-care ability²⁴.

In the FIM, the social interaction component evaluates a person's ability to “interact appropriately with people around them without causing trouble for strangers”, and incorporates the skills related to compromising and participating in groups in a community living setting^{19, 20}. Studies show that older adults who engage more in social interaction have higher levels of cognitive functioning than those who do not interact as much socially^{25–29}. Moreover, having a large social network and socializing with friends and family has a positive effect on cognitive functioning, and it reportedly has a preventive effect on dementia^{28, 30}. Reduced social participation increases the risk of developing dementia³¹. This information demonstrates that the ability to socially interact is closely related to opportunities for social participation and cognitive function, and it is considered to be a factor that affects improvement in the care need level.

In FIM, the memory component measures three aspects, namely, “implementing requests”, “recognizing people who are encountered often”, and “remembering daily routines^{19, 20}”. Items related to cognitive functioning in the nurse-care requirement authorization survey are divided into “understanding daily routine”, “remembering the date of birth and age”, “immediate recall”, “own name”, “understanding seasons”, and “understanding locations”, which suggests that “daily routine” and “immediate recall” are related to the FIM memory items. “Daily routine” and “immediate recall” require an individual to memorize, retain, and recall details that are constantly changing. These items are more difficult to retain than one's name and date of birth, so “daily routine” and “immediate recall” are considered to be memory abilities that would have a major impact on care need level.

The above information suggests that cognitive function, self-care ability, bladder/bowel control, and social cognition have a stronger effect than motor function on the improvement of care need levels in older adults who require low-level care. Therefore, conducting a detailed evaluation of these factors is important to gauge the progress of their care need levels. The number of rehabilitation professionals working in day-care services (those examined in this study) is smaller, as

compared to the number of individuals working in medical institutions and in-home rehabilitation services. Thus, with such a small number of rehabilitation professionals, it is important that they provide—to professionals other than rehabilitation professionals—advice and guidance related to the methods for assessing cognitive function, self-care, and bladder/bowel control and the respective measures for improving the same, thereby striving to improve care need levels through indirect intervention.

One of the limitations of our study is that the performance tests used were limited. In our sample, motor function at baseline was not associated with improvement in the care need level of older adults who required low-level care. Therefore, further investigation using various tests to predict functional decline in older individuals is recommended. Another limitation is that non-ambulatory participants were excluded from our study as several frail older individuals using healthcare services might be unable to walk because of multiple diseases or geriatric syndromes. We acknowledge that the study findings may not be applicable to this group.

This study provides preliminary evidence that clinical tests of cognitive function, self-care ability, bladder/bowel control, and social cognition may be able to predict the risk of functional decline in older individuals. Further investigation is required in this area, and future research could include intervention studies to prevent functional decline in this population.

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Conflict of interest

None.

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