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Outcomes of Long-term Care Insurance Services in Japan: Evidence from National Long-term Care Insurance Claim Data

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List of Abbreviations/Acronyms

ASEAN	Association of Southeast Asian Nations
CI	confidence interval
JICA	Japan International Cooperation Agency
LPN	licensed practical nurse
LTC	long-term care
LTCI	long-term care insurance
PT	physical therapist
RN	registered nurse

Chapter 1

Introduction

As the country with the most aged population structure in the world, Japan has been required to modify its social system and improve its long-term care provision system, which mainly depends on long-term care insurance (LTCI) as the social compulsory insurance system. As the proportion of older people increases, demands for higher quality and more efficient long-term care are also growing. The increasing cost of long-term care is imposing a financial burden on those insured by the LTCI and taxpayers in Japan, so maintenance and improvement of the conditions of LTCI beneficiaries are being encouraged to reduce the cost of long-term care services as much as possible.

Asia is one of the most rapidly ageing regions in the world. Some Association of Southeast Asian Nations (ASEAN) Member States are also in the process of rapid population ageing and are required to establish their own long-term care provision systems. Japan's long-term care system has been used as a reference model in other countries. For example, in 2013, Thailand initiated a project for long-term care service development for the frail, elderly, and other vulnerable people in an effort to emulate Japan's system. According to the Japan International Cooperation Agency (JICA), the effects of Thailand's long-term care services model expanded from Thailand to other countries, such as Malaysia and Viet Nam (Japan International Cooperation Agency, 2017). Thus, it seems timely to review the lessons that can be drawn from the Japanese experience regarding the effects of long-term care insurance services.

Previous research regarding the evaluation of long-term care services in Japan has mainly focused on their structural (equipment/personnel allocation, etc.) and procedural characteristics (provision of care). Nonetheless, while outcome assessment is necessary for measuring the effects of long-term care services on the physical conditions of the beneficiaries, research focusing on outcome assessments (evaluation of the changes in the physical conditions of the beneficiaries) has not been fully addressed (Ito, 2012).

To ensure continuous improvement in the quality of long-term care and to explain how Japan's long-term care services contribute to maintaining and improving the conditions of the long-term care service beneficiaries, it is necessary to clarify the structures and processes that contribute to such improvements and share the evidence with the ASEAN Member States.

For older people, functional status is strongly linked to service needs, care cost, and institutionalisation (Palese et al., 2016). Functional status has been used as a core measure informing the quality of long-term care (Rosen et al., 1999) and, therefore, extensive knowledge of the factors associated with functional status is fundamental for the planning of health services. A decline in functional status, as measured by an individual's loss of independence over a period

of time, is considered to be one of the most meaningful outcomes for quality assessment in long-term care (Rosen et al., 1999). However, in Japan, one of the most generally used assessments of functional status is the care-need level, because all beneficiaries of long-term care insurance services are required to have care-need level certificates. Care-need levels are assessed using a nationally standardised questionnaire, which includes questions on the current physical and mental status. Recently, a good correlation between activities of daily living and the care-need level was reported by Matsuda et al. (2019).

Through its universal long-term care insurance system, Japan retains all information on beneficiaries' long-term care insurance claims. Moreover, long-term care claims ensure that care-need level information is up to date, making it easier to observe functional changes over time.

Therefore, this report aims to investigate the predictors of care-need level change by focusing on the users of long-term care facility services, adult day service users, and day care users by applying national-level long-term care claims data.

This study was approved by the ethical committee of the University of Tsukuba. (NO.1325)

Chapter 2

Japan's Long-term Care System and an Overview of this Study

Japan has the oldest population structure in the world, with a share of 28.1% of older people (defined in this paper as people aged 65 years or older) in 2018, and this rate is expected to increase continuously, at least in the coming several decades. In 2000, Japan implemented a public long-term care insurance programme to meet the challenges of its rapid population ageing and ensure its citizens can access and receive long-term care services equitably (Ministry of Health, Labour and Welfare of Japan, 2002). Since then, all citizens aged 65 years or older are eligible to receive LTCI services based strictly on the results of the care-need level assessment. The benefits include care prevention services and long-term care services. The eligibility of the above-mentioned services differs according to the care-need level.

Care-need level assessment

To get a care-need level certification, citizens must submit an application for a care-need assessment to their municipality. A trained local government official visits the home to evaluate the citizen's long-term care needs using a nationally standardised questionnaire on their current physical and mental status (73 items) and the use of medical procedures (12 items). The estimated time for care is calculated according to the results of the survey and classified into seven categories (Tsutsui and Muramatsu, 2005). Care-support levels 1 and 2 are intended to provide nursing care prevention services, and care-need levels 1 to 5 are eligible to use long-term care services. Long-term care services are classified into three categories: in-home services, facility services, and community-based services.

The certificate is available for a maximum of 2 years (1 year in principle) for persons who renew the certificates, and a maximum of 1 year (6 months in principle) for new LTCI users. However, reassessment of the care-need level is available whenever the person experiences functional changes, even in a short period, such as 1 month.

Additional payments

In the fee schedule of Japan's LTCI, the payments to the long-term care (LTC) service providers can be categorised into two types: basic payment and additional payment. The government created the system of additional payment to let LTC providers provide enhanced desirable care, aimed at slowing down the deterioration speed of the care-need level of the beneficiaries. Under this mechanism, to increase their profits, LTC providers are expected to strengthen services by satisfying the requirements to receive the additional payment. The fee schedule of the LTCI has two types of additional payment: items to appraise the initiatives of the LTC service providers,

and items that appraise the special care to individual clients. The former type of additional payment can be reimbursed for all services provided at certain LTC providers if they meet the requirements of the designated LTCI fee items, mainly to strengthen the management systems; while the additional payment for individual care services will be reimbursed when users are provided with special care according to the services users' needs.

Since the establishment of the LTCI in 2000, the government has every three years revised the contents of the additional payments according to the total amount of the care needs. However, there has been limited investigation into the impact of additional-payment-related services on users' outcomes.

Therefore, the focus of this study is to examine the association of additional payments with the care-need level change. We analysed this association separately for the clients of four categories defined by the LTCI. The following Chapter 3 shows the results of analysis targeting long-term care health facilities, Chapter 4 shows the results for long-term care welfare facilities, Chapter 5 for day services, and Chapter 6 for day care rehabilitation. The definition of each category given by Japan's LTCI is also described in each chapter.

Chapter 3

Predictors of Care-need Level Deterioration in Long-term Care Health Facilities

Long-term care health facilities

A long-term care health facility is a category of LTC-providing institution that is defined by the Long-Term Care Insurance Act. It is designed as an intermediary facility between a hospital and a home or nursing home, and a facility to improve the physical function of the clients, so they are required to be equipped with professional rehabilitation and nursing care providers. The goal of long-term care health facilities is to 'improve the user's function to enable them to go back home' (Japan Association of Geriatric Health Services Facilities, 2015).

Methods

Study population and design

A time-to-event analysis was conducted using a national retrospective cohort. Data were obtained from national long-term care insurance claims and the Survey of Institutions and Establishments for Long-term Care. People who were admitted to long-term care health facilities during fiscal year 2014 were included. The residents included in this analysis had to be 65 years old or more with a care-need level from 1 to 4 (Figure 1).

Outcome

We set the deterioration of the care-need level as the primary outcome. Residents were followed for up to 24 months from admission. The care-need level deterioration time was calculated as the number of months from the beginning of observation, which is the time of admission into the facilities. Only the time from admission to the first care-need level (for example, the time of the change of the care-need level from 1 to 2 or 2 to 4) deterioration was identified.

Independent variable

Additional payments

The LTCI fee items of the LTCI for additional payments appraising individuals' special care and facility initiatives were included to explore the association with care-need level deterioration. **Table 1** presents the items of additional payments and the relevant requirements that were included in the analysis of this study.

Facility characteristics

The facility type (conventional care[1] versus unit care[2]), location (metropolitan city[3] or not) (Jin et al., 2018), and years in business were included. The staffing levels were measured as the number of staff in different specialities and were allocated per 100 users. The proportion of registered nurses (RNs)[4] amongst total nurses (i.e. the sum of the number of registered nurses and certified assistant nurses[5]) and registered dietitians amongst total dietitians (i.e. the sum of the number of registered dietitians[6] and dietitians[7]) were included.

Covariates of resident characteristics

Age, sex, and the care-need level were measured as control variables. These factors have been proved to have an effect on the outcome of functional status (Castle and Ferguson, 2010; Burge, von Gunten, and Berchtold, 2013; Jin et al., 2018) in previous studies.

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[1] Conventional care refers to care for residents in facilities that contains mostly shared rooms and several private rooms.

[2] Unit care refers care to a small number of residents (less than 10) as one living unit. Care staff are assigned to each unit and provide person-centred care. Residential layouts are designed to be all private rooms with a shared living space.

[3] Metropolitan cities: We defined this as cities with a population of more than 500,000 or located in the Tokyo metropolitan area. Besides the Tokyo metropolitan area, this includes the following cities: Sapporo, Sendai, Utsunomiya, Saitama, Chiba, Kawasaki, Yokohama, Sagamihara, Niigata, Shizuoka, Hamamatsu, Nagoya, Kyoto, Osaka, Sakai, Kobe, Okayama, Hiroshima, Matsuyama, Kitakyushu, Fukuoka, Kumamoto, and Kagoshima.

[4] A registered nurse is a nurse who has passed the nursing national examination and provides medical care or medical assistance to patients.

[5] A certified assistant nurse is a nurse who has a license issued by the governor of a prefecture and provides medical care or medical assistance to patients under the direct supervision of doctors and registered nurses.

[6] A registered dietitian is a nutrition expert who has a license issued by the Ministry of Health, Labour and Welfare. The work performed is nutrition education required to get medical treatment for the sick or wounded and nutrition education required to maintain and promote health, which requires a high level of professional knowledge and technique according to clients' physical and nutritional conditions and food service management.

[7] A dietitian is a nutrition expert who has a license issued by the governor of a prefecture. The work performed is nutrition education for clients.

Statistical analysis

Initially, a descriptive analysis was conducted to review the distribution of the outcomes and independent variables. A competing risk [8] regression model was used for the analysis. Deterioration of the care-need level was regarded as a primary outcome of interest. Leaving home, transfer to another facility, hospitalisation, and death were considered as competing events. Subdistribution hazard ratios (SHRs) and the associated 95% confidence intervals (Cis) were reported. The level of statistical significance was checked at 0.05 (two-tailed). All statistical analyses were conducted using Stata version 15.

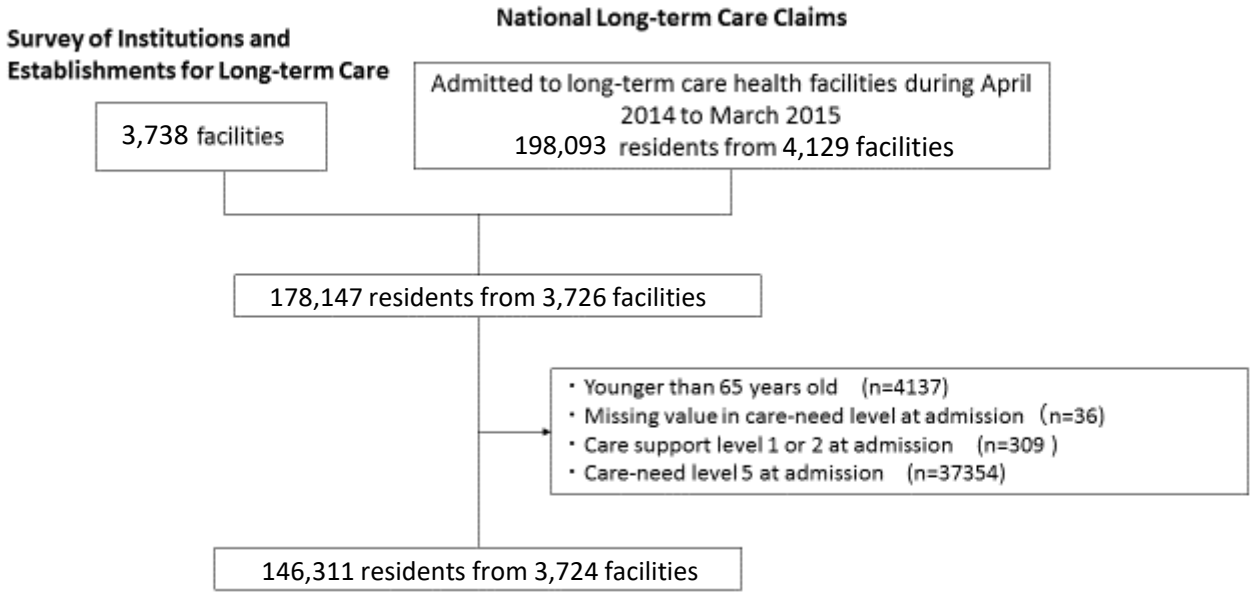
[8] Competing risk occurs when subjects can experience one or more events or outcomes which 'compete' with the outcome of interest. In those cases, the competing risk hinders the observation of the event of interest or modifies the chance that the event occurs. In such cases, a cumulative incidence function is proposed to solve this particular issue by estimating the marginal probability of a certain event as a function of its cause-specific probability and overall survival probability (Noordzij et al., 2013).

Table 1. Items and Requirements for Additional Payments in Long-term Care Health Facilities

Items	Requirements determined by the Ministry of Health, Labour and Welfare of Japan
Additional payments for individuals' special care	
Short-term intensive rehabilitation programme	Provide intensive rehabilitation by physical therapists based on doctors' instructions within three months of admission.
Intensive rehabilitation programme for dementia	Provide intensive rehabilitation by physical therapists based on doctors' instructions within three months of admission for residents with dementia
Instructions for pre-post admission	Visit the home and creation of a detailed care plan regarding goals, such as resuming home life, within 30 days before admission or within 7 days after admission.
Therapeutic meals	Provide the following therapeutic meals based on dietitians' instructions: diabetic diet, kidney disease diet, liver disease diet, stomach ulcer diet, anaemic diet, pancreatic disease diet, hypercholesterolemia diet, and gout diet.
Emergency care and treatment	Provide medication, injections, and medical treatment for residents who require emergency treatment.
Medical treatment for a specified disease	Provide medication, examination, injections, and treatment for residents who have specific diseases, such as pneumonia, urinary tract infections, and herpes zoster.
Oral feeding support	Create a plan for clients under tube feeding to promote oral intake in cooperation with multiple relevant professionals and implement the plan by registered dietitians.
Dementia care	Provide special services to residents with dementia.
Oral hygiene management	Provide oral care at least four times a month in facilities that are eligible for an 'oral hygiene management system', which is one of the facility-initiative based items for additional payment (see below).
Additional payments for facility initiatives	
Support for resuming home life	The following requirements will be calculated using a certain formula: (i) home-life resumption rate, (ii) bed turnover rate, (iii) proportion giving instructions pre-post admission, (iv) proportion giving instructions before and after leaving, etc.
Sufficient night-shift staff	Having nursing staff or care workers at night of more than a 20:1 resident-to-staff ratio.
Sufficient nursing care	Having one care worker or nurse for every four residents, especially in facilities with high medical needs.
Oral hygiene management system	Dentists or dental hygienists give technical suggestions to nursing care staff about oral cavity care more than once a month.
Strengthening of the services provision system	The proportion of certified care workers amongst care workers is more than 50%.
Nutrition management	A full-time registered dietitian to create and manage nutrition plans for malnourished residents.
Improvements in working conditions	Implementation of detailed plans regarding the improvement of working conditions for care workers.

Source: Abe (2015) (translated by the authors).

Figure 1. Flow Diagram of the Participant Selection Process (long-term care health facilities)



Source: Compiled from Japan's LTCI claims by the authors.

Results

As described in the previous section, the endpoints of this competing risk model were care-need deterioration, leaving home, hospitalisation or death, and transfer to another facility. **Table 2** gives the characteristics of the residents by the endpoints of this study. Amongst the total residents enrolled in this study, 32,754 (22.4%) residents reached the endpoints for care-need level deterioration, 33,940 (23.2%) were discharged to go home, 36,144 (24.7%) were hospitalised or died, and 23,375 (16.0%) were transferred to other facilities. The rate of the residents ending with care-need-level deterioration increased with age, and females had a relatively higher rate than males. Additionally, the rate of care-need deterioration decreased with a higher baseline care-need level.

Table 3 shows the distribution of additional payments for facility initiatives and facility characteristics. The majority of the facilities provided conventional care. The mean of the proportion of private rooms was 26.4%, and most (86.4%) of facilities provided 24-hour care systems.

In the multivariable analysis, a higher age, being female, and a lower care-need level were associated with deterioration in the care-need level. Subsequently, residents who were required to make additional payments regarding the LTCI items of 'specific emergency care and treatment', 'medical expense for specified disease', 'dementia care', and 'oral feeding support' were more likely to end up with care-need level deterioration. In contrast, residents who were provided with the LTCI services of 'special care of short-term intensive rehabilitation', 'intensive rehabilitation for dementia', 'instructions pre-post admission', and 'therapeutic meals' were associated with lower care-need level deterioration.

At the facility level, a higher proportion of registered nurses amongst the nursing staff, a higher proportion of certified care workers amongst the care workers, and a larger number of physical therapists (PTs) per 100 residents were associated with a lower likelihood of care-need level deterioration. Facility initiatives, which are defined by the LTCI as 'support for resuming home life', 'sufficient night-shift staff', 'nutrition management', 'oral hygiene management system', 'strengthening of the services provision system', and 'improvements in working conditions' were associated with less deterioration in the care-need level (**Table 4**).

Discussion

The uniqueness of the study is that the factors related to less deterioration in the care-need level were analysed using national-level long-term care claims, with data on all beneficiaries of the LTCI in Japan. Amongst the LTCI fee items categorised as individuals' special care, the following items were associated with less deterioration in the care-need level: short-term intensive rehabilitation, short-term intensive rehabilitation for dementia, home visits for guidance pre-post admission, and therapeutic meals. Amongst the fee items of the facility initiatives, support for resuming home life, sufficient night-shift staff, nutrition management, and strengthening of the services provision system were negatively associated with the care-need level deterioration.

We also analysed the relationships between staffing levels and care-need level deterioration, and we found that a higher percentage of RNs amongst the total number of nurses and a higher number of PTs per 100 residents were negatively related with care-need level deterioration.

Residents whose LTCI claims had payment requests for 'special care of short-term intensive rehabilitation' and 'intensive rehabilitation for dementia' were less likely to deteriorate in their care-need level. A systematic review reported that rehabilitation specifically designed for geriatric patients had the potential to improve outcomes related to function (Bachmann et al., 2010). Recently, an interventional study on the effect of intensive rehabilitation programmes for dementia in long-term care health facilities was conducted. The results showed that the intervention group had a significantly higher Hasegawa dementia rating scale-revised score[9] and a lower Dementia Behaviour Disturbance scale score compared with the control group.

Residents whose LTCI claims included the cost for instructions pre-post admission to their facility had less deterioration in their care-need level. The fee schedule of the LTCI says that instructions must include detailed care plans regarding the improvement of daily functions or the expected functional status when they would leave the facility. Therefore, it may be more effective to have goals and detailed care plans that focus on functional status.

Residents provided with therapeutic meals were less likely to experience care-need level deterioration. There are relatively broad kinds of therapeutic meals, including diabetic, kidney disease, liver disease, stomach ulcer, anaemic, pancreatic disease, hypercholesterolemia, and gout diets. The effects of specific diet therapy on individuals' functional status have been well documented (Lieber, 2003; Evert et al., 2014; Rysz et al., 2017). However, due to the lack of information regarding diseases, this study is unable to identify whether therapeutic meals have an effect on the prevention of the deterioration of the care-need level.

Residents who were provided with the following special care items were more likely to experience care-need level deterioration: emergency care and treatment, medical treatment for specified diseases, oral hygiene management, oral feeding support, and dementia care. The explanation behind this positive association could be that these care items were provided to residents who had more complicated chronic conditions that were related to a higher risk in the deterioration of their physical conditions. Hence, high-risk residents are more likely to deteriorate in their care-need level.

Amongst the items of additional payment for facility initiatives, the 'support for resuming home life' had the strongest association with less care-need level deterioration. Facilities can be approved to receive reimbursement of this LTCI-fee item if they meet the requirements regulated by the LTCI using an index. This index consists of several factors, including the rate of residents that leave to go home (i.e. those who are discharged and go home) and the bed turnover rate. Thus, we can interpret the result that facilities with a higher rate of residents that leave to go

[9] The revised Hasegawa's dementia scale is a test to measure cognitive function comprising nine simple questions with a maximum score of 30.

home (i.e. those who are discharged to go home) may provide more services focusing on residents' functional performance.

Residents in the facilities that are approved to receive the additional payment item of 'sufficient night-shift staff' were less likely to deteriorate in their care-need level. This finding is consistent with a previous study reporting that night shifts were meaningful because they helped to established closer relationships between the nursing staff and residents (Gustafsson et al. 2009).

Facilities that were reimbursed for the additional payments of 'nutrition management' were less likely to have residents whose care-need level deteriorated. One of the requirements of this fee item is assigning full-time dietitians. Considering the outcome of an earlier study that showed that full-time dietitians had a higher score for evidence-based knowledge than part-time dietitians (Byham-Gray et al., 2005), the finding can be interpreted that the knowledge of the full-time dietitians contributes to the prevention of the deterioration of the care-need level.

The residents of facilities that satisfied the requirements of 'oral hygiene management systems' were less likely to deteriorate in their care-need level. Previous studies showed that oral care helped residents to maintain or improve their oral health and function, and a better oral condition contributed to the intake of better nutrition and eventually the improvement of general health. (Naito et al., 2010). The significant effects of oral care on the prevention of pneumonia in nursing homes have also been well documented in earlier studies (Yoneyama et al., 2002).

Satisfying the requirement of 'strengthening of the services provision system' was also negatively associated with care-need level deterioration. One of the most important requirements of this additional payment item is the proportion of certified care workers amongst care workers, which should be more than 60%. Certified care workers require a national qualification and are considered to be experts in the area of long-term care. They are required to have a higher level of professional knowledge and technique regarding the support and care of the daily living of people who need care: both older people and disabled people（The Japan Association of Certified Care Workers, 2007). It is plausible for higher-qualified care workers to enhance the quality of care.

A higher proportion of RNs amongst the nursing staff was associated with lower care-need level deterioration. Our result is consistent with the findings of a previous study (Jin et al., 2018). A possible explanation is that RNs serve as leaders and role models in the supervision of licensed practical nurses, and this contributes to the improvement of the quality of the provided care.

A higher number of PTs was also considered to be a factor in preventing deterioration in the care-need level. The impact of physical therapy on residents' outcomes in nursing homes has been well documented in previous studies (Chiodo et al., 1992) Another study indicated that with increased PT and occupational therapist services, residents experienced less decline in their physical, psychosocial, and cognitive status (Przybylski et al., 1996).

Table 2. Participants' Characteristics and Additional Payments for Individuals' Special Care by Outcome Status in Long-term Care Health Facilities

C	Deteriorated (=32,754)		Discharge home (n=33,940)		Hospitalised/Died (n=36,144)		Transferred to other facility (n=23,375)		End of observation (n=20,098)		Total (n=146,311)	
	n	%	n	%	n	%	n	%	n	%	n	%
Age (years)												
65–74	2,514	19.4	3,700	28.6	2,560	19.8	2,155	16.6	2,021	15.6	12,950	100
75–84	11,220	21.6	12,971	25.0	11,977	23.1	8,516	16.4	7,217	13.9	51,901	100
85–94	16,419	23.0	15,547	21.8	18,343	25.7	11,371	15.9	9,662	13.5	71,342	100
≥95	2,601	25.7	1,722	17.0	3,264	32.3	1,333	13.2	1,198	11.8	10,118	100
Sex												
Male	9,016	19.4	11,091	23.8	14,870	32.0	6,688	14.4	4,849	10.4	46,514	100
Female	23,738	23.8	22,849	22.9	21,274	21.3	16,687	16.7	15,249	15.3	99,797	100
Care-need level												
1	8,580	37.6	6,143	26.9	3,497	15.3	2,627	11.5	1,995	8.7	22,842	100
2	10,679	30.3	9,404	26.6	6,911	19.6	3,909	11.1	4,393	12.4	35,296	100
3	8,963	21.4	9,382	22.4	10,630	25.3	7,055	16.8	5,939	14.2	41,969	100
4	4,532	9.8	9,011	19.5	15,106	32.7	9,784	21.2	7,771	16.8	46,204	100
Additional payments for individuals' special care												
Short-term intensive rehabilitation	24,219	21.5	29,529	26.2	26,785	23.8	17,870	15.9	14,165	12.6	112,568	100

Short-term intensive rehabilitation for dementia	7,447	21.4	9,539	27.4	7,774	22.4	5,946	17.1	4,047	11.6	34,753	100
Instructions for pre-post admission	2,076	17.8	5,508	47.2	1,944	16.7	1,337	11.5	806	6.9	11,671	100
Oral feeding support	4,272	35.4	1,762	14.6	3,085	25.5	1,200	9.9	1,756	14.5	12,075	100
Oral hygiene management	3,581	24.6	3,567	24.5	3,044	20.9	2,344	16.1	2,018	13.9	14,554	100
Therapeutic meals	10,111	21.4	10,801	22.9	12,838	27.2	6,993	14.8	6,464	13.7	47,207	100
Dementia care	6,192	29.4	3,004	14.3	5,452	25.9	3,554	16.9	2,850	13.5	21,052	100
Emergency treatment	1,579	25.5	456	7.4	3,398	55.0	263	4.3	485	7.8	6,181	100
Medical expense for specified disease	7,805	31.9	2,942	12.0	7,563	30.9	2,281	9.3	3,855	15.8	24,446	100

Note: The denominators of the percentage of each item are the total numbers of residents who belong to the specific demographic group, e.g. in the row for 'Age 65–74', the denominator is 12,950.
Source: Compiled from Japan's LTCI claims by the authors.

Table 3. Additional Payments for Facility Initiatives and Baseline Characteristics of Long-term Care Health Facilities (n=3,724)

		n	%
Additional payments for facility initiatives			
	Nutrition management	3,514	94.4
	Assignment for night shift	3,266	87.7
	Improvements in working conditions	2,857	76.7
	Strengthening services provision system	2,427	65.17
	Oral hygiene management system	2,117	56.85
	Support for returning home	1,371	36.82
	Maintenance of the medical treatment system	77	2.07
Facility characteristics			
Facility type	Conventional	3,345	89.82
	Unit	379	10.18
Location	Central city of metropolitan area	735	19.74
Capacity	<100 beds	1,847	49.6
	>=100 beds	1,877	50.4
	24-hour nursing care	3,216	86.36
		Mean	SD
Years in business		14.44	6.86
Staffing level	Doctors per 100 users	1.53	2.25
	Dentists per 100 users	0.02	0.82
	Registered nurses per 100 users	6.79	10.13
	LPNs per 100 users	7.17	12.88
	RN/(RN + LPN) (%)	48.53	24.39
	Caregivers per 100 users	38.73	57.78
	Certified care workers/caregivers	0.62	0.22
	Physical therapists per 100 users	2.36	4.74
	Occupational therapists per 100 users	1.71	2.82
	Speech therapists per 100 users	0.30	1.08
	Dietitians per 100 users	0.37	1.19
	Registered dietitians per 100 users	1.47	2.62
	Registered dietitians/dietitians (%)	85.68	30.19

LPN = licensed practical nurse, RN = registered nurse.
Note: Part-time employee hours were converted to the numbers equivalent to full-time staff using the calculation method designated by the LTCI fee schedule.
Source: Compiled from Japan's LTCI claims by the authors.

Table 4. Multivariable Competing-risk Cox Proportional Hazards Regression Analysis for Care-need Level Deterioration in Long-term Care Health Facilities

	Subdistribution hazard ratio	95% confidence interval		P-value
Individual level				
Additional payment for individuals' special care				
Short-term intensive rehabilitation	0.92	0.89	0.94	<0.001
Short-term intensive rehabilitation for dementia	0.92	0.89	0.94	<0.001
Instructions for pre-post admission	0.81	0.77	0.85	<0.001
Therapeutic meals	0.92	0.90	0.95	<0.001
Oral feeding support	2.04	1.98	2.11	<0.001
Oral hygiene management	1.15	1.11	1.19	<0.001
Dementia care	1.50	1.46	1.55	<0.001
Emergency treatment	1.12	1.07	1.18	<0.001
Medical expense for specified disease	1.80	1.75	1.85	<0.001
Facility level				
Additional payments for facility initiatives				
Support for returning home	0.85	0.83	0.87	<0.001
Assignment for night shift	0.93	0.90	0.97	<0.001
Nutrition management	0.90	0.84	0.97	0.005
Oral hygiene management system	0.93	0.90	0.95	<0.001
Strengthening services provision system	0.95	0.92	0.98	0.002
Improvements in working conditions	0.98	0.95	1.01	0.121
Maintenance of medical treatment system	1.28	1.16	1.41	<0.001
Facility characteristics				
Service type				
Unit (ref.: conventional)	1.00	0.96	1.04	0.995
Central city of metropolitan area (ref.: no)	1.02	0.99	1.05	0.149
Years in business	1.00	1.00	1.00	0.613
Staffing level				
Doctors per 100 users	1.01	1.00	1.02	0.058
RN/(RN + LPN)	0.998	0.997	0.998	<0.001
Certified care workers per 100 users	0.89	0.83	0.96	0.003
Physical therapy staff per 100 users	0.99	0.98	1.00	0.002
Registered dietitians/dietitians	1.00	1.00	1.00	0.367

LPN = licensed practical nurse, RN = registered nurse.
Note: Estimates additionally adjusted for age, sex, and care-need level.
Source: Compiled from Japan's LTCI claims by the authors.

Chapter 4

Predictors of Care-need Level Deterioration in Long-term Care Welfare Facilities

Long-term care welfare facilities

A long-term care welfare facility is a category of residential institution providing life services such as assistance with eating, bathing, dressing, and medication management. Compared to a long-term care health facility, which is designed as an intermediary facility between an acute-care hospital and the home, a long-term care welfare facility is not an institution for temporary accommodation but a permanent residential facility for older people as it focuses on life-long support and a social environment until the end of life. The LTCI regulates the eligibility of the residents of long-term care welfare facilities, and only older people who have higher needs for care (equal or higher than care-need level 3 after 2015) can be the residents in these facilities.

Methods

A time-to-event analysis was conducted using a national retrospective cohort. Data were obtained from national long-term care insurance claims and the Surveys of Institutions and Establishments for Long-term Care. People who started to stay in a long-term care welfare facility during the 2014 fiscal year were included. We included residents who were 65 years old or more and with a care-need-level certification from 1 to 4 (Figure 2).

Outcome

The primary outcome was the deterioration of the care-need level. Residents were followed for up to 24 months from admission. The time from admission into the facilities until the care-need-level deterioration was calculated in months. Only the time to the first care-need level deterioration was identified.

Independent variables

Additional payments

The additional payment fee items of the LTCI for appraising individuals' special care and facility initiatives were included to explore the association with care-need level deterioration. **Table 5** presents additional payment items and the relevant requirements in the long-term care welfare facilities.

Facility characteristics

Facility type (conventional care versus unit care), location (central city of a metropolitan area or not), and years in business were included. The staffing levels were measured as the number of staff in different specialties allocated per 100 residents, the proportion of RNs amongst all nurses, and the proportion of registered dietitians amongst all dietitians.

Covariates of resident characteristics

The age, sex, and care-need level of the baseline were measured as the control variables. These variables have been reported to have an effect on the outcome of the care-need level (Castle and Ferguson, 2010; Burge, Gunten, and Berchtold, 2013; Jin et al., 2018) in previous studies.

Statistical analysis

First, a descriptive analysis was conducted to review the distribution of the outcomes and the independent variables. A competing risk regression model was used for the analysis. Deterioration of the care-need level was treated as a primary outcome of interest and hospitalised and death as competing events. Due to the lack of information about the reasons for discharging residents from facilities, we regarded all residents who left the facilities as hospitalised or dead because , the main reasons for leaving long-term care welfare facilities were death (63.7%) and hospitalisation (28.9%) (Ministry of Health, Labour and Welfare of Japan, 2014). Subdistribution hazard ratios and the associated 95% confidence intervals were reported.

Table 5. Items and Requirements for Additional Payments in Long-term Care Welfare Facilities

Items	Requirements determined by the Ministry of Health, Labour and Welfare of Japan
Additional payment for individuals' special care	
Individual functional training	Provide functional training through a full-time functional training instructor according to the individual functional training plan.
Oral feeding support	Create plans for clients under tube feeding to promote oral intake in cooperation with multiple relevant professionals and implement the plans through registered dietitians.
Therapeutic meals	Provide the following therapeutic meals based on dietitians' instruction: diabetic diet, kidney disease diet, liver disease diet, stomach ulcer diet, anaemic diet, pancreatic disease diet, hypercholesterolemia diet, and gout diet.
Professional care for dementia	Provide care by staff who have completed specialised training related to dementia care in facilities where more than half of the residents have severe dementia.
Oral hygiene management	Provide oral care at least four times a month in facilities that are eligible for an 'oral hygiene management system', which is one of the facility-initiative based items for additional payment (see below).
Additional payment for facility initiatives	
Arrangement of full-time physician	Arrange for at least one full-time medical doctor.
Sufficient night-shift staffing	Arrange for more care workers or nurses at night than in night-shift staffing standards.
Nursing care system	Arrange for at least one full-time nurse.
Psychiatric care guidance	For facilities with more than 30% dementia residents, a psychiatrist provides consultation services and care guidance to the residents with dementia more than twice a month.
Nutrition management	A full-time registered dietitian creates and manages nutrition plans for residents individually.
Oral hygiene management system	Dentists or dental hygienists who follow a dentist's instructions give technical suggestions to nursing care staff about oral cavity care more than once a month.
Strengthening services provision system I	The proportion of certified care workers amongst care workers is more than 50%.
Improvement of working conditions	Implement a detailed plan regarding the improvement of working conditions for care workers.

Source: Abe (2015) (translated by the authors).

Results

The endpoints of 38.6% of the residents enrolled in this study were care-need level deterioration, while 26.6% were hospitalised or died. Table 6 provides the descriptive statistics for the resident characteristics and outcomes.

Table 7 presents the distribution of the facility characteristics. Conventional facilities accounted for 66.2%, and 18.0% of the facilities were located in the central city of a metropolitan area. Most facilities took initiatives to get additional payments for the nursing system (95.2%), improvements in working conditions (88.8%), the nutrition management system (88.6%), and night shift arrangement (85.7%). Only 2.6% arranged for full-time medical doctors.

Table 8 shows the results of the competing risk regression. Female residents and those with a lower care-need level at the baseline were more likely to experience care-need level deterioration. Residents whose LTCI claims had 'oral feeding support' and 'oral hygiene management' were associated with earlier deterioration of the care-need level. Residents who were provided with therapeutic meals were likely to have slower deterioration of the care-need level.

At the facility level, residents who were accommodated in facilities which succeeded in achieving additional payments for the LTCI items of 'arrangement of full-time medical doctor', 'sufficient night-shift staffing', 'nutrition management', 'oral hygiene management system', and 'improvements in working conditions' were less likely to end with a deterioration of the care-need level. Facilities that provided unit-type services located in a central city of a metropolitan area and with a larger bed capacity were negatively associated with care-need level deterioration. A higher proportion of registered nurses amongst nurses and a larger number of occupational therapists per 100 users were associated with less deterioration.

Discussion

This study clarified that several facility initiatives and special care services for additional payments had an association with residents' care-need level deterioration.

Residents provided with therapeutic meals were less likely to deteriorate in their care-need level. There are relatively broad kinds of therapeutic meals, and the effects of specific diet therapy on individuals' functional status have been well documented (Lieber, 2003; Evert et al., 2014; Rysz et al., 2017). However, due to the lack of information regarding the conditions of the LTC beneficiaries, this study is unable to identify whether therapeutic meals have an effect on specific diseases. Residents whose LTCI claims showed they used special care for oral feeding support or oral hygiene management were more likely to deteriorate in their care-need level. A possible explanation is that the services were provided to patients who had difficulties in oral intake or had conditions that required oral care not only for the improvement of oral function but also for the prevention of pneumonia. Thus, residents with greater medical needs because of more severe chronic conditions were more likely to experience deterioration in their care-need level. Future studies that adjust for residents' clinical conditions are needed to clarify the effect.

Residents in facilities that arranged full-time medical doctors were less likely to deteriorate in their care-need level. In long-term care welfare facilities, one visiting physician is a minimum requirement, and most facilities only allocated a visiting physician. Earlier research has reported that a full-time physician might be more aware of the residents' medical history and laboratory results than a part-time physician (Takezako et al., 2007). Long-term care welfare facilities provide end-of-life care, and the care-need level is closely linked to the dignity of the institutionalised older people. This result can suggest that full-time physicians affiliated with long-term care welfare facilities will be in great demand.

Residents in facilities providing unit-type services were less likely to deteriorate in their care-need level than those with conventional types of services. One possible explanation is the higher quality of unit-type care than the conventional type. Conventional care is mainly provided in a shared room setting. In contrast, unit care is supposed to provide more person-centred care. One living unit accommodates a small number of residents (less than 10), and most facilities provide private room settings. A previous study reported the greater effect of person-centred care on keeping physical activity levels (Pirhonen et al., 2017). On the other hand, a previous study also reported that the relationship between unit-type care and lower care-need level deterioration may have been caused by economic status because unit-type services are more expensive and such facilities accommodate more residents who have a higher socioeconomic status (Jin et al., 2018). As is well known to all, a higher social economic status is related with better functional status in older people (Berkman et al., 2014).

Residents in facilities located in a central city of a metropolitan area were less likely to deteriorate in their care-need level. According to one study from the United States, rural facilities were less likely to provide mental health services and lacked accreditations or special care programmes (Kang, Meng, and Miller, 2011). A similar relation may be found in Japan because

shortages of medical staff are more serious in rural areas. Future studies are needed to identify the factors that might lead to disparities in long-term care between urban and rural areas.

Residents in large facilities (i.e. those having more than 60 beds) were less likely to result in care-need level deterioration. This association is well documented in hospital settings. It has been reported that staff in larger hospitals have greater experience and higher technical skill levels than those in small hospitals (Hentschker and Mennicken, 2018). The practice-makes-perfect theory may also be applied in nursing home settings.

Residents in facilities with higher proportions of RNs amongst the nursing staff were less likely to deteriorate in their care-need level. Our result is consistent with a previous study, and the possible explanation is that RNs serve as leaders and role models in the supervision of licensed practical nurses (Jin et al., 2018) and this improves the quality of services in the facilities.

Table 6. Participants' Characteristics and Additional Payments for Individuals' Special Care by Outcome Status in Long-term Care Welfare Facilities

	Deteriorated n=36,222		Died/hospitalised n=27,614		End of observation n=40,070		Total N=103,906	
	n	%	n	%	n	%		
Age group								
65–74	2,355	32.9	1,489	20.8	3,311	46.3	7,155	100
75–84	11,347	35.4	7,291	22.8	13,402	41.8	32,040	100
85–94	18,903	34.9	15,102	27.9	20,176	37.2	54,181	100
≥95	3,617	34.3	3,732	35.4	3,181	30.2	10,530	100
Sex								
Male	8,377	31.7	9,496	35.9	8,545	32.3	26,418	100
Female	27,845	35.9	18,118	23.4	31,525	40.7	77,488	100
Care-need level								
1	2,225	61.8	498	13.8	878	24.4	3,601	100
2	6,015	51.6	1,883	16.2	3,754	32.2	11,652	100
3	15,821	41.6	8,227	21.6	13,992	36.8	38,040	100
4	12,161	24.0	17,006	33.6	21,446	42.4	50,613	100
Additional payments for individuals' special care								
Oral feeding support	3,070	49.4	1,153	18.6	1,992	32.1	6,215	100
Therapeutic meals	4,294	34.1	3,404	27.1	4,877	38.8	12,575	100
Individual functional training	20,266	35.6	14,045	24.6	22,673	39.8	56,984	100
Oral hygiene management	2,703	36.8	1,696	23.1	2,944	40.1	7,343	100

Note: The denominators of the percentage of each item are the total number of residents who belong to a specific demographic group, i.e. in the row for 'Age 65–74', the denominator is 7,155.
Source: Compiled from Japan's LTCI claims by the authors.

Table 7. Additional Payments for Facility Initiatives and Baseline Characteristics of Long-term Care Welfare Facilities (n=6,638)

		n	%
Additional payments for facility initiatives			
	Nursing system	6,316	95.2
	Improvements in working conditions	5,893	88.8
	Nutrition management system	5,883	88.6
	Night shift arrangement	5,688	85.7
	Oral hygiene management system	3,792	57.1
	Psychiatric medical training	1,911	28.8
	Strengthening services provision system	794	12.0
	Arrangement of full-time medical doctor	172	2.6
Facility characteristics			
Facility type	Traditional	4,392	66.2
	Unit	2,246	33.8
Location	Central city of metropolitan area	1,198	18.0
Capacity	<100 beds	3,027	45.6
	>=100 beds	3,611	54.4
		Mean	SD
Years in business		16.25	13.0
Staffing level	Doctors per 100 users	0.32	0.3
	Dentists per 100 users	0.02	0.1
	Registered nurses per 100 users	3.15	2.1
	LPNs per 100 users	2.70	2.1
	RN/(RN + LPN)	0.54	0.3
	Caregivers per 100 users	45.70	13.1
	Certified care workers/caregivers	0.55	0.2
	Physical therapists per 100 users	0.16	0.4
	Occupational therapists per 100 users	0.11	0.4
	Speech therapists per 100 users	0.02	0.1
	Dietitians per 100 users	0.39	0.9
	Registered dietitians per 100 users	1.31	0.9
	Registered dietitians/dietitians	0.83	0.3

LPN = license practical nurse, RN = registered nurse.

Note: Part-time employee hours were converted to the numbers equivalent to full-time staff using the calculation method designated by the LTCI fee schedule.

Source: Compiled from Japan's LTCI claims by the authors.

Table 8. Multivariable Competing-risk Cox Proportional Hazards Regression Analysis for Care-need Level Deterioration in Long-term Care Welfare Facilities

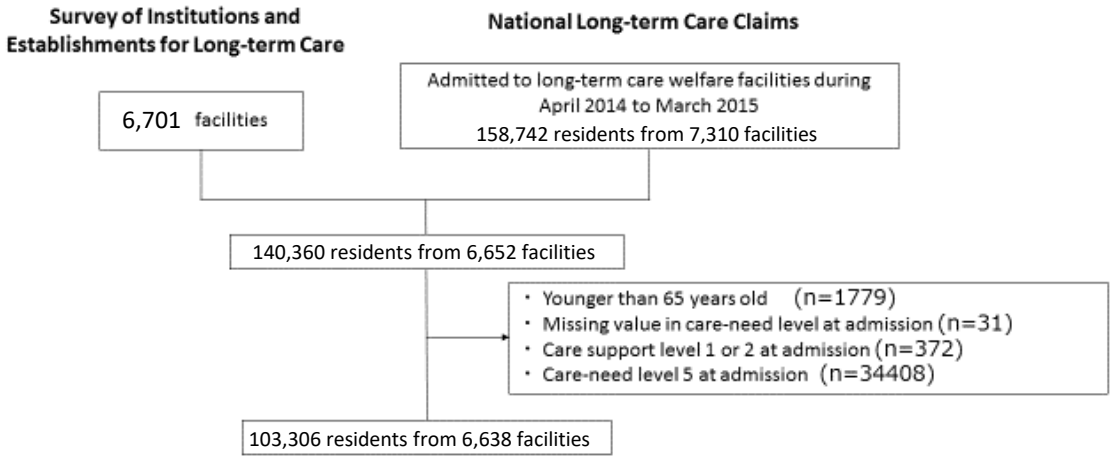
	Subdistribution hazard ratio	95% CI		P-value
Individual level				
Additional payments for individuals' special care				
Therapeutic meals	0.96	0.93	0.99	0.017
Individual functional training	0.95	0.92	0.98	0.003
Oral feeding support	1.84	1.77	1.91	<0.001
Oral hygiene management	1.09	1.06	1.11	<0.001
Professional care for dementia	1.05	1.01	1.09	0.020
Facility level				
Additional payments for facility initiatives				
Full-time physician assignment	0.92	0.87	0.98	0.007
Night-shift assignments	0.99	0.96	1.03	0.669
Nutrition management	0.96	0.92	1.00	0.072
Oral hygiene management system	0.98	0.96	1.00	0.058
Improvements in working conditions	0.98	0.94	1.01	0.201
Facility characteristics				
Service type				
Unit (ref.: traditional)	0.91	0.89	0.94	<0.001
Central city of metropolitan area (ref.: not)	0.95	0.92	0.97	<0.001
Capacity >=60 beds (ref.: <60 beds)	0.94	0.92	0.96	<0.001
Staffing level				
RN/(RN + LPN)	0.93	0.90	0.97	<0.001
Number of occupational therapists per 100 users	0.96	0.94	0.99	0.011
Registered dietitians/dietitians	0.97	0.93	1.01	0.140

LPN = licensed practical nurse, RN = registered nurse.

Note: Estimates additionally adjusted for age, sex, and care-need level.

Source: Compiled from Japan's LTCI claims by the authors.

Figure 2. Flow Diagram of the Participant Selection Process (long-term care welfare facilities)



Source: Compiled from Japan's LTCI claims by the authors.

Chapter 5

Predictors of Care-need Level Deterioration in Day Services

Day services in Japan

In Japan's LTCI, 'day service' is one of the home-based services, but it is differentiated from 'day care rehabilitation'. Both 'day service' and 'day care rehabilitation' are designed for older people who still live at home and can regularly come to the service facilities. The major difference between them is the requirement of a medical prescription issued by a medical doctor. 'Day service' clients are not required to get a prescription before using the services. We will discuss 'day care rehabilitation' in the next chapter.

The aim of the day service is to maintain or improve people's function of living in their homes (Ministry of Health, Labour and Welfare of Japan, 2017b). The clients receive nursing care such as bathing, toileting, and physical exercise there, but these facilities are not designed to provide sleepover services. Basically, day service facilities provide a means of transport to pick up and drop off users from their homes to each facility. The service is expected to encourage the clients to go out of their homes, keep social connectedness, and avoid feelings of isolation.

Methods

Data sources

This study used data from the national long-term care insurance claims database from 1 April 2012 to 31 May 2015, and the Survey of Institutions and Establishments for Long-term Care from 2013 to 2015 (Ministry of Health, Labour, and Welfare of Japan, 2016). We linked these two databases by unique identifiers of facilities.

We further used data on death records from the Vital Statistics Survey (The Ministry of Health, Labour, and Welfare of Japan, 2018) to link to the claims data using identifiers: gender, birth date, death date (date of becoming ineligible for an LTCI beneficiary in the claims data), and municipalities.

Study population

We included participants aged 65 years or older who had a care-need level from 1 to 5 and started to use day services for at least three consecutive months between 1 October 2012 and 31 May 2015.

We excluded (1) participants with care-support levels 1 to 2 and care-need level 5 at the month of starting the service use; (2) those who concomitantly used day care rehabilitation for three months; (3) those who concomitantly used more than two day service facilities; (4) those who deteriorated in their care-need level within three months.

Outcome

The primary outcome was the time to the first deterioration in the care-need level.

Independent variables

We selected several LTCI items for additional payments as the key independent variables. If the LTCI claims enrolled in the study requested the payment of those selected items in the same month as or within three months after the day service use, we took such cases in this analysis as cases provided with the designated services. **Table 9** displays the items and requirements of the additional payments in day services we used in the study. We excluded the items about caring for people with early-onset dementia and those living in mountainous regions. The item of 'strengthening services provision system' consists of two categories, and service providers can claim reimbursement for either of these two categories.

As described in the previous chapters, 'additional payment' in Japan's LTCI fee schedule has two categories. One consists of items to appraise the special care provided due to clients' needs and the other appraises the service providers' initiatives regarding the management system.

We used individual-specific and provider-specific variables to adjust the characteristics of the clients and providers in the multivariate analysis. The individual-level variables were age, sex, the care-need level at the time of enrolment, and other LTC services used within six months before the use of the day service. The provider-level variables were the type of service provider (profit versus non-profit), location (central city of a metropolitan area or not), and scale of the facility (small, medium, or large).

Statistical analysis

We first carried out a descriptive analysis of the participants' characteristics and additional payments by outcome status.

We examined the association between additional payments for day services and the first deterioration in the care-need level using a multivariable competing-risk Cox proportional hazards model. The occurrence of death was treated as a competing risk with the first deterioration in the care-need level, and the end of observation was defined as the date 24 months after the study entry. Cluster-robust standard errors were used to account for within-facility correlations.

The level of statistical significance was checked at 0.05 (two-tailed). All statistical analyses were conducted using Stata version 15.

Results

Figure 3 shows a flow diagram of the participant selection process. We identified 904,936 participants who had a care-need level from 1 to 5 and started to use day services for at least three consecutive months. Amongst these participants, 788,194 participants at 40,082 facilities were included in this study.

Table 10 summarises the participants' characteristics and additional payments by outcome status. During the maximum 24-month follow-up period, 341,351 (43.3%) participants had points of deterioration in their care-need level before any other events took place, 71,831 (9.1%) ended with death, 375,012 (47.6%) were lost to follow-up or ended observation without care-need level deterioration or death. The mean (standard deviation) number of days to the first deterioration in care-need level, death, and becoming lost to follow-up or having ended the observation without another event were 299.4 (188.2), 299.8 (206.9), and 711.1 (99.0) days, respectively. **Table 11** shows the results of the multivariable competing-risk Cox proportional hazards regression model for the first deterioration in the care-need level. The additional payments of individual functional training 1, individual functional training 2, and strengthening system to provide services 2 were significantly associated with lower hazards for the deterioration in care-need level. In contrast, the additional payments of bathing care and functional assessment and intervention for oral cavities were significantly associated with higher hazards for the deterioration in care-need level.

Discussion

This nationwide study examined the effect of special care of clients' needs and LTC-providers' initiatives, which were appraised as additional payments by the LTCI system, on the first deterioration in the care-need level. The results can be interpreted that assigning full-time functional training instructors and providers' initiatives and where the percentage of care workers who have worked more than three years is 30% or more were significantly associated with lower hazard for the first deterioration in the care-need level.

The participants who received functional training from full-time trainers to increase their motivation for living or to improve their functional abilities were associated with a lower hazard for the deterioration in the care-need level compared with those who did not receive such training. Generally, the type of functional impairments of older people in the community varies. Thus, individual training may be more effective for the prevention of deterioration in the care-need level than training with uniform content for day services.

With regard to the provider initiatives, the management system where the proportion of workers who had worked more than three years was 30% or more was significantly associated with lower hazard for the deterioration in the care-need level. A large amount of experience for the care of older participants may be associated with a better quality of care in day services.

In contrast, participants who received special care for bathing or functional assessment and intervention for oral cavities were associated with a higher hazard for deterioration in the care-need level. This association may be interpreted based on the fact that participants who received such care had a lower functional ability compared with those who did not receive the care. Bathing care was more likely to be provided for participants who required assistance with other daily living tasks as well as bathing. Similarly, the special oral cavity care function can only be provided for participants whose oral cavity function is impaired. Such impaired oral function is caused by severe chronic conditions in many cases, so it is likely to be associated with deterioration of the care-need level.

Table 9. Items and Requirements for Additional Payments for Day Services

Items	Requirements determined by the Ministry of Health, Labour and Welfare of Japan
Additional payments for individuals' special care	
Individual functional training 1	Assign at least one full-time functional training instructor (physical therapist, occupational therapist, nurse, etc.) throughout the hours of service-provision and provide functional training based on the plans individually created by the multi-professional team.
Individual functional training 2	Assign at least one full-time functional training instructor (physical therapist, occupational therapist, nurse, etc.) to be engaged in functional training and to provide functional training based on the plans individually created by the multi-professional team.
Functional assessment and intervention for oral cavities	Provide instructions for mouth cleaning and eating for patients who are at risk of decreasing oral cavity functions.
Nutritional assessment and intervention	Provide nutritional assessment and intervention for participants who are at risk of undernutrition.
Bathing care	Provide bathing care.
Additional payments for provider initiatives	
Improvement of working conditions	Implement a detailed plan regarding the improvement of working conditions for care workers.
Strengthening services provision system 1	Certified care workers account for 40% of all care workers.
Strengthening services provision system 2	Workers who have worked more than three years account for 30% of all staff.

Source: Abe (2015) (translated by the authors).

Table 10. Participants' Characteristics and Additional Payments by Outcome Status for Day Services

Variables	Deterioration in care-need level n = 341,351 (%)	Death n = 71,831 (%)	Lost to follow-up or end of observation n = 375,012 (%)	Total N= 788,194(%)
Age (years)				
65–74	35,063 (38.08)	6,125 (6.65)	50,883 (55.26)	92,071 (100)
75–84	139,325 (42.16)	25,636 (7.76)	165,530 (50.09)	330,491 (100)
85–94	152,105 (45.27)	35,112 (10.45)	148,795 (44.28)	336,012 (100)
≥95	14,858 (50.16)	4,958 (16.74)	9,804 (33.1)	29,620 (100)
Male	119,332 (44.26)	35,186 (13.05)	115,073 (42.68)	269,591 (100)
Care-need level				
1	209,016 (51.03)	23,007 (5.62)	177,554 (43.35)	409,577 (100)
2	86,945 41.92)	19,576 (9.44)	100,867 (48.64)	207,388 (100)
3	33,171 (32.25)	14,675 (14.27)	54,994 (53.48)	102,840 (100)
4	12,219 (17.87)	14,573 (21.31)	41,597 (60.82)	68,389 (100)
Additional payments for individuals' special care				
Individual functional training 1	53,641 (42.02)	10,988 (8.61)	63,037 (49.38)	127,666 (100)
Individual functional training 2	73,105 (40.53)	14,497 (8.04)	92,791 (51.44)	180,393 (100)
Bathing care	270,111 (44.95)	60,435 (10.06)	270,325 (44.99)	600,871 (100)
Nutritional assessment and intervention	119 (45.77)	22 (8.46)	119 (45.77)	260 (100)
Functional assessment and intervention for oral cavities	8,874 (43.79)	1,778 (8.77)	9,615 (47.44)	20,267 (100)
Additional payments for provider initiatives				
Strengthening services provision system 1	80,210 (44.31)	17,053 (9.42)	83,755 (46.27)	181,018 (100)
Strengthening services provision system 2	105,775 (43.8)	22,907 (9.49)	112,788 (46.71)	241,470 (100)
Improvement of working conditions 1	3,936 (44.29)	885 (9.96)	4066 (45.75)	8,887 (100)
Improvement of working conditions 2	3,130 (42.49)	715 (9.71)	3,521 (47.8)	7,366 (100)
Improvement of working conditions 3	286,504 (43.47)	60,600 (9.2)	311,915 (47.33)	659,019 (100)

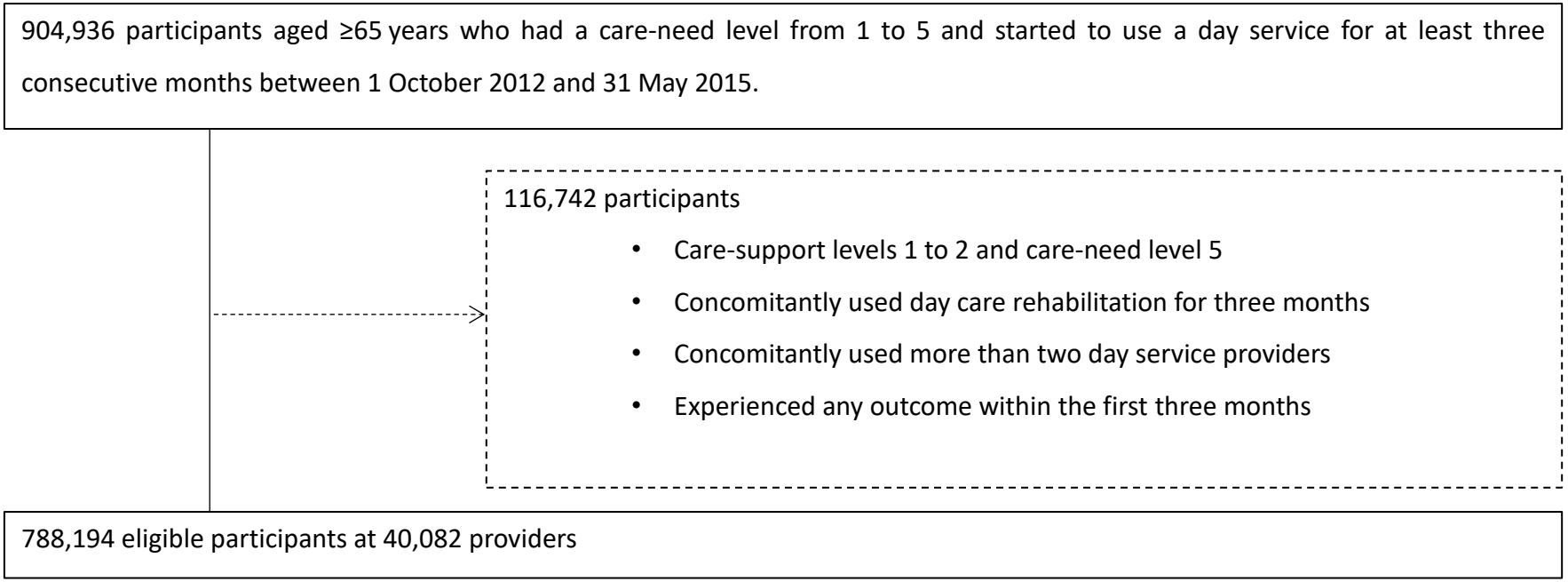
Note: The denominators of the percentage of each item are the total number of service users who belong to a specific demographic group, i.e. in the row 'Age 65–74', the denominator is 92,071.
Source: Compiled from Japan's LTCI claims by the authors.

Table 11. Multivariable Competing-risk Cox Proportional Hazards Regression Analysis for Care-need Level Deterioration in Day Services

Factor	Subdistribution hazard ratio (95% confidence interval)	P-value
Additional payments for individuals' special care		
Individual functional training 1	0.936 (0.927 to 0.945)	<.001
Individual functional training 2	0.920 (0.912 to 0.928)	<.001
Bathing care	1.426 (1.414 to 1.439)	<.001
Nutritional assessment and intervention	1.206 (0.999 to 1.457)	0.05
Functional assessment and intervention for oral cavities	1.056 (1.034 to 1.079)	<.001
Additional payments for provider initiatives		
Strengthening services provision system 1	0.992 (0.983 to 1.001)	0.09
Strengthening services provision system 2	0.972 (0.963 to 0.981)	<.001
Improvement of working conditions 1	1.008 (0.975 to 1.041)	0.65
Improvement of working conditions 2	0.966 (0.931 to 1.001)	0.06
Improvement of working conditions 3	1.000 (0.99 to 1.01)	0.98

Note: The estimates were adjusted for patient and provider-level characteristics. The occurrence of death was defined as a competing risk with the first deterioration in the care-need level.
Source: Compiled from Japan's LTCI claims by the authors.

Figure 3. Flow Diagram of the Participant Selection Process (day services)



Source: Compiled from Japan's LTCI claims by the authors.

Chapter 6

Predictors of Care-need Level Deterioration in Day Care Rehabilitation

Day care rehabilitation in Japan

In Japan's LTCI, day care rehabilitation is defined as a service for LTC beneficiaries who still live at home, aimed at functional recovery training and the training of activities for daily living (Ministry of Health, Labour and Welfare of Japan, 2017a). This service is provided by specialised staff, such as physical therapists or occupational therapists. The services are provided at long-term care health facilities, medical clinics, and hospitals etc. where the clients commute to receive the services.

Methods

Data sources

This study used data from the national long-term care insurance claims database from 1 April 2012 to 31 May 2015, and the Survey of Institutions and Establishments for Long-term Care from 2013 to 2015 (Ministry of Health, Labour and Welfare of Japan, 2016). We linked these two databases by using unique identifiers of the facilities.

We further used data on death records from the Vital Statistics Survey to link to the claims data using identifiers: gender, birth date, death date (date of becoming ineligible as an LTCI beneficiary in the claims data), and the municipality of residence.

Study population

We included participants aged 65 years or older who had a care-need level from 1 to 5 and started to use day care rehabilitation for at least three consecutive months between 1 October 2012 and 31 May 2015.

We excluded (1) participants with care-support levels 1 to 2 and care-need level 5 in the initial month of day care rehabilitation use; (2) those who concomitantly used day services for three months; (3) those who concomitantly used more than two day care rehabilitation facilities; (4) those who first deteriorated in their care-need level within three months; (5) those who did not receive individual rehabilitation services; and (6) those who needed medical care such as mechanical ventilation or enteral nutrition.

Outcome

The primary outcome was the time to the first deterioration in the care-need level.

Independent variables

We used the LTCI service items categorised as additional payments as the key independent variables of this analysis. Amongst such items in the fee schedule of the LTCI, we excluded the following items from this analysis: 'caring for people with early-onset dementia', 'caring for those living in mountainous regions', and 'intensive staffing of rehabilitation therapists for short-time users'. If the LTCI claims used in this study requested the payment of service items included in this analysis in the same month as or within three months after day care rehabilitation use, we took such cases in this analysis as those provided with the designated services. **Table 12** shows the items and requirements for the additional payments in day care rehabilitation used in the study.

We used individual-level and provider-level variables to adjust the characteristics of the participants and providers. The individual-level variables were age, sex, care-need level at the baseline, and other LTC services used within the six months before the use of the day care rehabilitation. The provider-level variables were facility type (hospital versus long-term care health facility), management agency (profit versus non-profit), location (central city of a metropolitan area or not), and the scale of the facility (small, medium, or large).

Statistical analysis

We first made a descriptive analysis of the participants' characteristics and additional payments by outcome status.

We examined the association between additional payments in day care rehabilitation and the first deterioration in the care-need level using a multivariable competing-risk Cox proportional hazards model. The occurrence of death was treated as a competing risk with the first deterioration in the care-need level, and the end of observation was defined as the date 24 months after the study entry. Cluster-robust standard errors were used to account for within-facility correlations.

The level of statistical significance was checked at 0.05 (two-tailed). All statistical analyses were conducted using Stata version 15.

Results

Figure 4 shows a flow diagram of the participant selection process. We identified 315,446 participants who had a care-need level from 1 to 5 and started to use day care rehabilitation for at least three consecutive months. Amongst these participants, 209,384 patients at 6,564 providers were eligible for this study.

Table 13 summarises participants' characteristics and additional payments by the outcomes. During the maximum 24-month follow-up period, 77,532 (37.0%) participants had points of

deterioration in their care-need level, 18,478 (8.8%) ended with death, 113,374 (54.1%) were lost to follow-up or ended observation without event. The mean (standard deviation) number of days to the first deterioration in the care-need level, death, and becoming lost to follow-up or ending observation without event were 302.2 (191.2), 320.7 (206.8), and 714.6 (89.1) days, respectively.

Table 14 shows the results of the multivariable competing-risk Cox proportional hazards regression model for the deterioration in the care-need level.

The additional payments for short and intensive rehabilitation and home visiting were significantly associated with lower hazards for the deterioration in the care-need level. In contrast, additional payments for dementia care, bathing care, and functional assessment and intervention for oral cavities were significantly associated with higher hazards for the deterioration in the care-need level.

Discussion

This nationwide study examined the effect of special care responding to clients' need and providers' initiatives to improve the quality of day care rehabilitation on the deterioration in the care-need level. The results show that the special care of intensive rehabilitation within three months after being discharged home from a hospital, or the date of certification of the care-need level or home visiting by rehabilitation staff to create rehabilitation planning, were significantly associated with a lower hazard for the deterioration in the care-need level.

Participants who received intensive rehabilitation within three months after being discharged home, or the date of certification of their care-need level, were associated with a lower hazard for deterioration in the care-need level compared with those who did not receive it. In the early phases of care transition, older people are generally vulnerable to declines in their daily living activities. Intensive rehabilitation may be effective to prevent these declines amongst older people.

Participants who received home visiting for rehabilitation planning were associated with a lower hazard for deterioration in the care-need level compared with those who did not receive it. Because the tendency for the home environment to hinder participants' activities varies, individualised rehabilitation programmes for home visiting by rehabilitation staff may be effective in maintaining or improving their activities.

In contrast, the LTCI claims for the items of 'short and intensive dementia care and rehabilitation', 'bathing care', and 'functional assessment and intervention for oral cavities' were associated with higher hazards for deterioration in the care-need level. This association may be interpreted based on the fact that participants who received such care had lower functional abilities compared with those who did not receive the care. Bathing care was more likely to be provided for participants who required assistance with bathing and other tasks for daily living. The special oral cavity function care was also more likely to be provided for participants who had risk factors for lower oral cavity functions and other tasks for daily living.

Table 12. Items and Requirements for Additional Payments in Day Care Rehabilitation

Items	Requirements determined by the Ministry of Health, Labour and Welfare of Japan
Additional payments for individuals' special care	
Short and intensive rehabilitation	Provide individual rehabilitation within three months after being discharged home from hospital or the date of certification of the care-need level.
Short and intensive dementia care and rehabilitation	Provide individual rehabilitation for clients with dementia within three months after being discharged home from hospital or the starting date of the day care rehabilitation services.
Functional assessment and intervention for oral cavities	Provide instructions for mouth cleaning and eating for clients who are at risk of decreased oral cavity functions.
Nutritional assessment and intervention	Provide nutritional assessment and intervention for clients who are at risk of undernutrition.
Bathing care	Provide bathing care.
Home visit to create a rehabilitation plan	Home visit by rehabilitation staff to create a rehabilitation plan.
Additional payments for provider initiatives	
Improvement of working conditions	Implement a detailed plan regarding the improvement of working conditions for care workers.
Strengthening services provision system 1	Certified care workers account for 60% of all care workers.
Strengthening services provision system 2	Workers who have worked for more than three years account for 30% of all staff.

Source: Abe (2015) (translated by the authors).

Table 13. Participants' Characteristics and Additional Payments by Outcome Status for Day Care Rehabilitation

Variables	Deterioration in care-need level n = 77,532 (%)	Death n = 18,478 (%)	Lost to follow-up or end of observation n = 113,374 (%)	Total N = 209,384 (%)
Age (years)				
65–74	11,663 (32.77)	2,083 (5.85)	21,846 (61.38)	35,592 (100)
75–84	33,876 (36.45)	7,550 (8.12)	51,513 (55.43)	92,939 (100)
85–94	29,784 (39.28)	8,034 (10.6)	38,007 (50.12)	75,825 (100)
≥95	2,209 43.93)	811 (16.13)	2,008 (39.94)	5,028 (100)
Male	11,663 (32.77)	2,083 (5.85)	21,846 (61.38)	35,592 (100)
Care-need level				
1	41,983 (48.42)	4,825 (5.56)	39,899 (46.02)	86,707 (100)
2	21,691 (36.78)	4,996 (8.47)	32,291 (54.75)	58,978 (100)
3	9,997 (27.13)	4,284 (11.63)	22,570 (61.25)	36,851 (100)
4	3,861 (14.38)	4,373 (16.29)	18,614 (69.33)	26,848 (100)
Additional payments for individuals' special care				
Short and intensive rehabilitation	23,413 (30.81)	7,007 (9.22)	45,572 (59.97)	75,992 (100)
Nutritional assessment and intervention	212 (38.97)	57 (10.48)	275 (50.55)	544 (100)
Functional assessment and intervention for oral cavities	2,280 (39.04)	586 (10.03)	2,974 (50.92)	5,840 (100)
Short and intensive dementia care and rehabilitation	1,385 (43.07)	255 (7.93)	1,576 (49)	3,216 (100)
Bathing care	57,806 (37.8)	14,821 (9.69)	80,319 (52.51)	152,946 (100)
Home visiting to create rehabilitation plan	30,764 (36.31)	7,513 (8.87)	46,454 (54.83)	84,731 (100)
Additional payments for provider initiatives				
Strengthening services provision system 1	16,150 (37.69)	3,830 (8.94)	22,872 (53.37)	42,852 (100)
Strengthening services provision system s 2	52,229 (36.86)	12,665 (8.94)	76,818 (54.21)	141,712 (100)
Improvement of working conditions 1	974 (37.62)	228 (8.81)	1,387 (53.57)	2,589 (100)
Improvement of working conditions 2	1,418 (35.82)	385 (9.72)	2,156 (54.46)	3,959 (100)
Improvement of working conditions 3	62,728 (37.1)	15,154 (8.96)	91,199 (53.94)	169,081 (100)

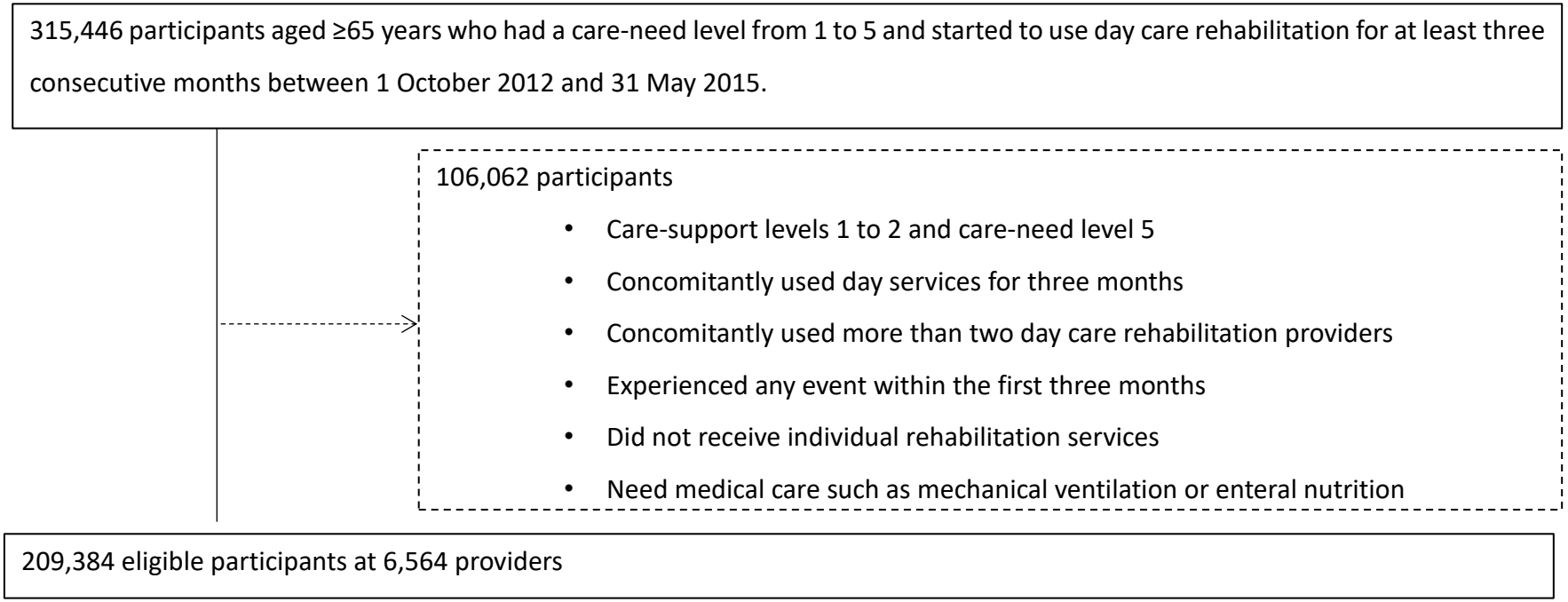
Note: The denominators of the percentage of each item are the total number of service users who belong to a specific demographic group, i.e. in the row 'Age 65–74', the denominator is 35,592.
Source: Compiled from Japan's LTCI claims by the authors.

Table 14. Multivariable Competing-risk Cox Proportional Hazards Regression Analysis for Care-need Level Deterioration in Day Care Rehabilitation

Factor	Subdistribution hazard ratio (95% confidence interval)	P-value
Additional payments for individuals' special care		
Short and intensive rehabilitation	0.863 (0.849 to 0.877)	<.001
Nutritional assessment and intervention	1.047 (0.914 to 1.2)	0.51
Functional assessment and intervention for oral cavities	1.103 (1.057 to 1.15)	<.001
Short and intensive dementia care and rehabilitation	1.149 (1.089 to 1.212)	<.001
Bathing care	1.353 (1.33 to 1.376)	<.001
Home visiting to create rehabilitation plan	0.982 (0.967 to 0.996)	.01
Additional payments for provider initiatives		
Strengthening services provision system 1	1.025 (0.999 to 1.052)	0.06
Strengthening services provision system 2	0.997 (0.974 to 1.02)	0.77
Improvement of working conditions 1	1.007 (0.944 to 1.075)	0.82
Improvement of working conditions 2	0.973 (0.921 to 1.028)	0.32
Improvement of working conditions 3	1.015 (0.994 to 1.036)	0.16

Note: The estimates were adjusted for patient and provider-level characteristics. The occurrence of death was defined as a competing risk with the first deterioration in the care-need level.
Source: Compiled from Japan's LTCI claims by the authors.

Figure 4. Flow Diagram of the Participant Selection Process (day care rehabilitation)



Source: Compiled from Japan's LTCI claims by the authors.

Chapter 7

Summary

The world is in the process of ageing at an unprecedented pace. In ASEAN, the speed of population ageing varies, but the urgent development of long-term care provision systems is required to meet the demand in some ASEAN Member States. Along with rapidly ageing populations, the increasing needs of long-term care and the relevant welfare policies have become a key challenge. Japan, the country with the most aged population structure in the world, introduced a social LTCI system in 2000 that requires all residents in Japan to be the members if they are 40 years old or more. Although Japan's LTC system may not be directly applied to other countries since the socio-economic status and cultural backgrounds differ across countries, Japan's long-term care policy and its impact on residents' outcomes can be a good reference when dealing with problems regarding long-term care.

Owing to its universal coverage for long-term care and well-established payment computing system, Japan is a unique country with national-level long-term care claims data. Additionally, all long-term care beneficiaries are required to satisfy criteria for their care-need levels, which is assessed using a nationally standardised questionnaire strictly based on their current physical and mental status. Therefore, taking advantage of the abovementioned generalisability and by applying the care-need level as an indicator of functional status, it is easy to capture functional change at the national level.

In this study, we used nationwide long-term care claims data to examine the effects of individuals' special care and facility/provider initiatives on the prevention of care-need level deterioration in two kinds of LTC institutional services and two kinds of LTC home-based care services: long-term care health facility services, long-term care welfare facility services, day services, and day care rehabilitation. **Table** 15 shows the main results of this study and presents the additional payment items that are negatively associated with deterioration in the care-need level

In all care settings (both LTC institutional services and home-based care services), individual rehabilitation or functional training were associated with reduced risk of care-need-level deterioration of the LTCI beneficiaries. Because of the variety in the need for independent living, individual rehabilitation and training seem to be effective for the maintenance or improvement of the care-need level in almost all LTC settings. Further research to examine the effects of the specified content of such services on changes in the care-need level in both LTC institutional services and home-based care is needed.

Besides rehabilitation, the predictors of care-need level deterioration also depended on the facility functions (welfare-based versus medical-based care). In more detail, long-term care welfare facilities and day services usually support older people with chronic conditions rather than conditions requiring high medical needs. Therefore, these facilities generally focus on living

support, well-being, and environments.

Our study showed that residents who were provided with unit-type services in long-term care welfare facilities had better outcomes than their counterparts. This can be interpreted that unit-type services are more likely to slow down deterioration in the care-need level because such services can respond to the needs and demands of individual clients more quickly and effectively than conventional-type care.

Day-service providers that have more care staff who have been working at the same place for more years are likely to succeed in reducing the risk of the care-need level deterioration their service clients. Through working at the same day-service provider for a longer time, staff may have a better understanding of the specific needs of clients. Looking at the results of our analyses on the effect of unit-type services in LTC welfare facilities and the staffing of care workers who have longer experience at the same day-service providers, we can conclude that the provision of care services combined with service users' specific needs may be effective for reducing the risk of deterioration in the care-need level in such settings.

On the other hand, long-term care health facilities are usually a good option for older people with higher medical needs or unstable physical conditions because they focus more on care provided by nurses. Thus, being equipped with nutrition management system, oral hygiene management systems, and having sufficient night-shift staff may prevent care-need level deterioration.

We acknowledge several limitations of the study. Due to the lack of information on participants' medical conditions in the LTCI claims, we could not rule out the effect of natural recovery from acute conditions on changes in the care-need level. In this analysis, we did not link the LTCI claims data with the data on medical insurance claims, through which information on the medical conditions can be retrieved. Unfortunately, linked data between the LTC claims and medical claims are unavailable at the national level, mainly because insurance systems are separated between medical and LTC insurance, and the databases of these insurance systems do not contain common identification information that can link the claims of the two insurance systems at the individual beneficiary level (i.e. the insurance number is different). The Japanese government is making a determined effort to link medical and LTC claims at the national level so that data for research use can be provided in the future. Although we adjusted the analyses for potential confounding factors, for example the baseline care-need level, which was associated with functional ability, other potential confounders like the medical conditions of the LTCI beneficiaries which could not be found in the LTCI claims were not included in our models. We would like to encourage the readers of this report to be cautious when interpreting the results as causal relationships.

In conclusion, our results showed that several forms of individual special care, especially rehabilitation and facility/provider initiatives focusing on the perspectives of the service users, were effective in reducing the risk of deterioration in the care-need level. These findings could provide good guidance for establishing high-quality services.

Table 15. Additional Payment Items in the LTCI Fee Schedule that are Negatively Associated with Deterioration in the Care-need Level

	Long-term care facility services		Home-based care services	
	Long-term care health facilities	**Long-term care welfare facilities**	**Day care rehabilitation**	**Day service**
Additional payment for individuals' special care	・Short-term intensive rehabilitation* ・Short-term intensive rehabilitation for dementia* ・Instructions for pre-post admission ・Therapeutic meals	・Therapeutic meals	・Short and intensive rehabilitation* ・Home visiting to create rehabilitation plans	・Individual functional training or rehabilitation
Additional payment for facility/provider initiative	・Support for resuming home life ・Sufficient night-shift staff ・Nutrition management ・Oral hygiene management system ・Strengthening of the services provision system (certified care workers account for more than 50%)	・Full-time physician assigned		・Workers who have worked for more than three years account for 30% of all staff
Facility characteristics	・RN/(RN + LPN) ・Physical therapists per 100 users	・Unit type ・Central city of metropolitan area ・Large facility (>=60 beds) ・RN/(RN + certified assistant nurses) ・Number of occupational therapists per 100 users	-	-

LPN = licensed practical nurse, RN = registered nurse.

* Services are required to be provided within three months after being discharged home or the date of certification of the care-need level.

Source: Classified by the authors based on the outcomes of this study.

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