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Characteristics of Older Patients at the Start of Medical and Long-Term Care at the Place of Discharge After Acute Care Who Needed Continuous Medical Care: Analysis of a Nationwide Administrative Database in Japan

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Japan has the largest aged population globally, and the number of older people requiring medical and long-term care is increasing yearly. Therefore, providing older people with appropriate medical and long-term care in their living setting is essential. This study will clarify the characteristics of older patients who started medical and long-term care in their place of living following acute inpatient treatment, focusing on the differences between their homes and nursing homes. The analysis was conducted using Japan's nationwide administrative database. We collected discharge records of patients aged 65 and older who received acute inpatient treatment. Those who started medical and long-term care at home or admission a nursing home at the time of discharge were selected and categorized into the home group and the nursing home group. Patient characteristics were shown by group, and factors determining group differences were estimated using univariate and multivariate logistic regression analysis. We selected 89,705 people in the home group and 92,969 in the nursing home group. The home group had a significantly higher rate of cancer, while the nursing home group had a significantly higher age, long-term care need level, and dementia. It became clear that the home group was highly dependent on medical care, and the nursing home group was highly reliant on long-term care. Furthermore, the age group of those admissions to nursing homes varied by sex. These results are expected to provide basic information useful in practice for medical professionals, care workers, and policymakers.

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Introduction

Japan has the world's most-aged population (Yamada and Arai 2020). The percentage of people aged 65 and over in Japan has reached a record high of 29.1%, the highest rate in the world (Ministry of Internal Affairs and Communications 2023).

With this dramatic population aging, the number of older people requiring long-term care in Japan is increasing yearly (Ministry of Health, Labour and Welfare 2021). Therefore, providing appropriate medical and long-term care to the older is essential. When older people start receiving medical and long-term care services (e.g., home visits by doctors, nursing care services by caregivers provided at home or nursing home, etc.) at their homes, nursing homes, or other places where they reside, it is often triggered by admission to and discharge from hospitals (Sendai City 2023). This is because, after acute inpatient treatment at a hospital, the patient's physical condition and the hopes of the patient and family are considered when deciding where to receive medical and long-term care at home or a nursing home. However, the patient's condition characteristics, such as attributes, disease, and long-term care need level, remain unknown when the patient starts

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receiving medical and long-term care services at each living place.

Regarding previous studies in this research field, while we have seen reports on the primary diseases covered by home medical care (Schildmeijer et al. 2018), there are few reports on the characteristics of older patients when they begin medical and long-term care at home or in a nursing home. Previous Japanese studies comparing home and nursing homes as the place of post-discharge recuperation include patients discharged after stroke and observational studies involving patients discharged from convalescent beds after acute treatment (Otori and Fukushima 2019; Iwasa et al. 2024). These disease-specific and non-acute hospitalization studies have provided valuable insights into this research area. However, the number of previous studies is small, and no large-scale studies have analyzed patients after acute inpatient treatment, covering a comprehensive range of diseases.

It is essential to explore the considerations and issues related to extending the period of care in the respective place of living and reaching the end of life by identifying patient attributes and patient conditions when starting medical and long-term care at home or nursing home post-discharge from hospital following acute inpatient treatment (Ikeda and Tsuboya 2021; Lee and Lee 2022; Shen et al. 2022).

Based on the above, this study will clarify the characteristics of older patients who started medical and long-term care in their place of discharge after acute hospitalization and who needed continuous medical, focusing on the differences between their homes and nursing homes.

Materials and Methods

Data source

We used the Diagnosis Procedure Combination (DPC) database, a nationwide administrative claim and discharge abstract database in Japan, with over 1,000 participating hospitals (Ministry of Health, Labour and Welfare 2022a). This data covers a wide range of acute inpatient care in Japan and is representative. This DPC database has been used in many clinical epidemiology studies (Tarasawa et al. 2020; Fujimori et al. 2021a,b, 2023; Mizuta et al. 2022; Akaishi et al. 2023) including many studies targeting the older (Tomioka et al. 2020; Shibata et al. 2023; Yokoyama et al. 2023).

The database contains data on age, sex, most resource-consuming diagnoses, comorbidities at admission, in-hospital complications (coded by the International Classification of Diseases, 10th Revision [ICD-10]), hospitalization days, medical treatment, medications, and discharge status. The level of long-term care needs under the long-term care insurance system is also recorded (Ministry of Health, Labour and Welfare 2022b).

The present study was approved by the Institutional Review Board of the Graduate School of Medicine, The University of Tohoku (No. 2021-1-1082). The need for informed consent was waived because of the anonymous and retrospective nature of the study.

Patient selection

Using this database, we collected hospitalization records of patients from April 1, 2020 to March 31, 2022.

The inclusion criteria for the current analysis were as follows:

(i) Patients who did not receive home medical care before hospitalization and were admitted from home (In this study, home medical care refers to medical care provided by a visiting physician in the patient's home or nursing home). (ii) Patients who started home medical care at home or nursing home after discharge. (iii) Patients with no duplicates of the same condition in (i) and (ii). (iv) 65 years old or older.

The exclusion criteria were as follows:

(i) Death at discharge; and (ii) Level of long-term care needs unknown or pending.

Finally, the eligible patients were classified into discharged to home group and discharged nursing home group (Fig. 1).

Statistical analysis

The collected data is as follows. Age, sex, long-term care need level, most resource-consuming diagnosis, presence or absence of dementia, Charlson Comorbidity Index (CCI) (Charlson et al. 1987), and hospitalization days. Japan's long-term care need level is set on seven levels: requiring support 1 and 2 and requiring long-term care 1 to 5. Requiring long-term care 5 is the highest level of dependence. Most resource-consuming diagnoses were classified according to the major categories presented in the ICD-10 chapter. To assess the severity of chronic comorbid conditions, we used the CCI, the most widely used index of comorbidity, which has been validated in various studies (Tarasawa et al. 2020; Fujimori et al. 2021a,b, 2023). The analysis first classified the place of living post-discharge into the home group and the nursing home group and compared these groups to show the characteristics of the patients. Next, univariate and multivariate logistic regression analysis evaluated factors related to differences between home and nursing home groups. The logistic regression analysis's objective variable is "admission to a nursing home," a higher odds ratio indicates a tendency to be admitted to a nursing home.

Furthermore, we conducted two additional types of multivariate logistic regression analyses stratifying the eligible patients by sex and age (65-74 years old and 75 years old or older) to determine the extent to which the characteristics of older patients differed by sex and age. Finally, we conducted a cross-tabulation by sex and age group to examine the influencing factors that show the differences between the home and nursing home groups. This verified the results of the multivariate logistic regression analysis in detail.

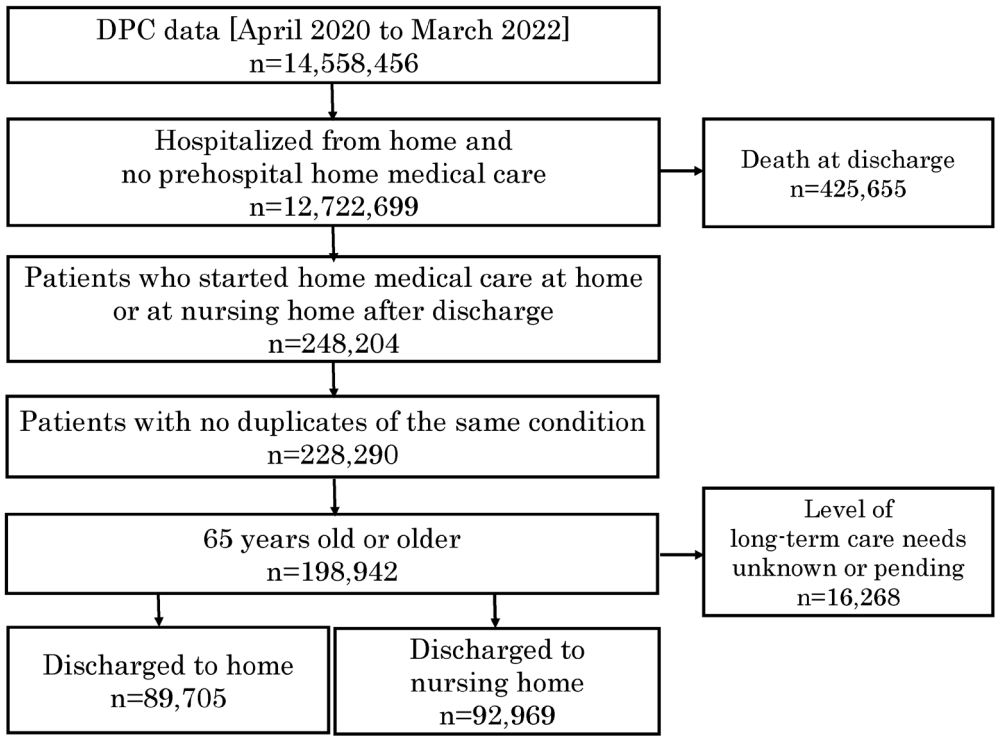

Fig. 1. Patient selection.
We extracted 248,204 patients who started home medical care at home or nursing home after discharge from the Diagnosis Procedure Combination data in Japan. After selecting patients who did not duplicate the same conditions, the study patients were restricted to those aged 65 years or older. Those excluded from this study were patients whose long-term care needs were unknown or pending (n = 16,268). After data extraction, patients were categorized into those discharged to home (n = 89,705) and those discharged to nursing homes (n = 92,969). DPC, Diagnosis Procedure Combination.

We determined the number and percentage of qualitative variables regarding data aggregation, and a chi-square test was performed. Furthermore, we determined the mean value and standard deviation for quantitative variables, and Welch's t-test was performed. Regarding the implementation of logistic regression analysis, as a consideration for collinearity, if a correlation of 0.7 or more was observed between independent variables, one was excluded from the study (Miyazaki et al. 2023).

The statistical hypothesis test was two-sided; a significant difference was determined when the p-value was less than 0.05. The software used was IBM SPSS Statistics for Windows, version 29.0 (IBM Corp., Armonk, NY, USA).

Results

The number of eligible patients was 182,674, of which 89,705 were in the home group and 92,969 in the nursing home group (Fig. 1).

Table 1 shows patient characteristics by home and nursing home groups. The home group had significantly higher rates of males, cancer, and CCI. The nursing home group was considerably older, had significantly higher rates of females, had a higher long-term care need level, external causes such as injury and dementia, and had substantially longer hospitalization days.

Table 2 shows all eligible patients' univariate and multivariate logistic regression analysis results. Univariate logistic regression analysis showed that the tendency toward the home group was associated with males, cancer, higher CCI, lower long-term care need level, and lower dementia. On the other hand, the trends toward the nursing home group were higher age, higher long-term care need level, external causes such as injury, and higher dementia. Regarding multivariate logistic regression analysis, none of the independent variables showed a correlation greater than 0.7 among the independent variables. The analysis results showed the same trends as univariate logistic regression analysis. In particular, age, long-term care needs level, and dementia showed high odds ratios (odds ratio and p-value: 3.165; $p < 0.001$ for 95 years or older, 2.985; $p < 0.001$ for requiring long-term care 4, and 2.193; $p < 0.001$ for dementia).

Table 3 shows the results of the multivariate logistic regression analysis stratified by sex. In this analysis, male and female results were consistent with the overall trends shown in Table 2.

Table 4 shows the multivariate logistic regression analysis results stratified by age group 65-74 and 75 or older. In this analysis, males in the 65-74 age group tended to be in the nursing home group (odds ratio and p-value: 1.235; $p < 0.001$). On the other hand, females in the 75 or older age group tended to be in the nursing home group

Table 1. Patient characteristics by home and nursing home groups.

	Home n = 89,705 n	%	Nursing home n = 92,969 n	%	p-value
Age (years)	80.1 ± 8.1		85.5 ± 7.3		p < 0.001***
Age classification					
65-74	25,479	28.4%	8,603	9.3%	p < 0.001***
75-84	36,092	40.2%	28,287	30.4%	p < 0.001***
85-94	25,061	27.9%	47,775	51.4%	p < 0.001***
≥ 95	3,073	3.4%	8,304	8.9%	p < 0.001***
Sex					
Male	47,562	53.0%	34,287	36.9%	p < 0.001***
Female	42,143	47.0%	58,682	63.1%	
Level of Long-term care need					
None	46,680	52.0%	22,497	24.2%	p < 0.001***
Requiring support 1	5,309	5.9%	4,099	4.4%	p < 0.001***
Requiring support 2	6,299	7.0%	5,561	6.0%	p < 0.001***
Requiring long-term care 1	8,765	9.8%	15,506	16.7%	p<0.001***
Requiring long-term care 2	9,182	10.2%	15,489	16.7%	p < 0.001***
Requiring long-term care 3	5,787	6.5%	13,448	14.5%	p < 0.001***
Requiring long-term care 4	4,670	5.2%	10,948	11.8%	p < 0.001***
Requiring long-term care 5 (most dependent)	3,013	3.4%	5,421	5.8%	p < 0.001***
Most resource-consuming diagnosis					
Cancer	28,797	32.1%	6,397	6.9%	p < 0.001***
Cardiovascular disease	13,731	15.3%	18,325	19.7%	p < 0.001***
Respiratory disease	10,005	11.2%	11,135	12.0%	p < 0.001***
External causes such as injury	7,199	8.0%	21,426	23.0%	p < 0.001***
Digestive diseases	7,665	8.5%	7,597	8.2%	p = 0.004**
Renal urinary tract disease	5,481	6.1%	7,609	8.2%	p < 0.001***
Others	16,827	18.8%	20,480	22.0%	p < 0.001***
Dementia	8,296	9.2%	24,198	26.0%	p < 0.001***
Charlson Comorbidity Index score (points)	1.9 ± 2.1		1.3 ± 1.4		p < 0.001***
Charlson Comorbidity Index					
0	29,180	32.5%	31,857	34.3%	p < 0.001***
1	21,799	24.3%	30,556	32.9%	p < 0.001***
2	15,512	17.3%	17,201	18.5%	p < 0.001***
≥ 3	23,214	25.9%	13,355	14.4%	p < 0.001***
Hospitalization days (days)	31.0 ± 32.0		48.0 ± 54.4		p < 0.001***

Eligible patients were divided into two groups: home group and nursing home group. Values are presented as mean ± standard deviation or Numbers and percentages.
*p < 0.05, **p < 0.01, ***p < 0.001, derived from the Welch's t-test or Chi-square test.

(odds ratio and p-value: 0.720; p < 0.001). The trends in age leading to the nursing home group differed by sex. The results for the other items were consistent with the overall trends shown in Table 2.

Table 5 shows a cross-tabulation by sex and age group of the long-term care need level and those having dementia, which were considered influential factors in determining the difference between the home and nursing home groups. The validity of selecting the degree of long-term care needs level and having dementia as influencing factors was demonstrated by the high odds ratio in Table 2. The results show that males were more likely than females in the 65-74 age group to have both the long-term care needs level and with dementia. On the other hand, females were more likely than males in the 75 and older age group to have both the long-term care need level and dementia.

Discussion

This study used Japanese DPC data to determine the characteristics of older patients who started receiving medical and long-term care services at their place of living following acute inpatient treatment. The characteristics of the

Table 2. Univariate and multivariate logistic regression analysis for all eligible patients.

	Univariate logistic regression analysis				Multivariate logistic regression analysis			
	Odds ratio	95% confidence interval		p-value	Odds ratio	95% confidence interval		p-value
		Lower	Upper			Lower	Upper	
Age classification								
65-74	Reference				Reference			
75-84	2.321	2.255	2.389	p < 0.001***	1.653	1.602	1.707	p < 0.001***
85-94	5.646	5.485	5.811	p < 0.001***	2.901	2.809	2.997	p < 0.001***
≥ 95	8.003	7.628	8.397	p < 0.001***	3.165	3.004	3.335	p < 0.001***
Sex								
Female	Reference				Reference			
Male	0.518	0.508	0.527	p < 0.001***	0.828	0.810	0.846	p < 0.001***
Level of Long-term care need								
None	Reference				Reference			
Requiring support 1	1.602	1.533	1.674	p < 0.001***	1.104	1.053	1.158	p < 0.001***
Requiring support 2	1.832	1.761	1.905	p < 0.001***	1.200	1.149	1.253	p < 0.001***
Requiring long-term care 1	3.671	3.560	3.785	p < 0.001***	2.188	2.115	2.264	p < 0.001***
Requiring long-term care 2	3.500	3.396	3.608	p < 0.001***	2.064	1.996	2.135	p < 0.001***
Requiring long-term care 3	4.822	4.657	4.992	p < 0.001***	2.745	2.642	2.852	p < 0.001***
Requiring long-term care 4	4.864	4.684	5.052	p < 0.001***	2.985	2.865	3.111	p < 0.001***
Requiring long-term care 5 (most dependent)	3.733	3.561	3.914	p < 0.001***	2.353	2.236	2.477	p < 0.001***
Most resource-consuming diagnosis								
Cancer	0.156	0.152	0.161	p < 0.001***	0.281	0.271	0.292	p < 0.001***
Cardiovascular disease	1.358	1.326	1.392	p < 0.001***	1.093	1.058	1.129	p < 0.001***
Respiratory disease	1.084	1.053	1.115	p < 0.001***	0.790	0.761	0.820	p < 0.001***
External causes such as injury	3.432	3.336	3.532	p < 0.001***	1.889	1.822	1.958	p < 0.001***
Digestive diseases	0.952	0.921	0.985	p = 0.004**	0.781	0.750	0.814	p < 0.001***
Renal urinary tract disease	1.370	1.321	1.420	p < 0.001***	0.957	0.916	0.999	p = 0.046*
Dementia	3.453	3.361	3.547	p < 0.001***	2.193	2.126	2.262	p < 0.001***
Charlson Comorbidity Index								
0	Reference				Reference			
1	1.284	1.254	1.315	p < 0.001***	0.923	0.898	0.948	p < 0.001***
2	1.016	0.989	1.043	p = 0.256	0.745	0.722	0.769	p < 0.001***
≥ 3	0.527	0.513	0.541	p < 0.001***	0.580	0.562	0.599	p < 0.001***

Objective variable: Nursing home (1.0).
*p < 0.05, **p < 0.01, ***p < 0.001.

Table 3. Multivariate logistic regression analysis stratified by sex.

	Male				Female			
	Odds ratio	95% confidence interval		p-value	Odds ratio	95% confidence interval		p-value
		Lower	Upper			Lower	Upper	
Age classification								
65-74	Reference				Reference			
75-84	1.328	1.273	1.386	p < 0.001***	2.204	2.099	2.313	p < 0.001***
85-94	2.280	2.181	2.384	p < 0.001***	3.875	3.693	4.066	p < 0.001***
≥ 95	3.233	2.938	3.558	p < 0.001***	3.813	3.567	4.075	p < 0.001***
Level of Long-term care need								
None	Reference				Reference			
Support 1	1.310	1.219	1.407	p < 0.001***	0.950	0.891	1.013	p = 0.118
Support 2	1.286	1.201	1.378	p < 0.001***	1.112	1.051	1.175	p < 0.001***
Care 1	2.332	2.215	2.455	p < 0.001***	2.044	1.953	2.139	p < 0.001***
Care 2	2.209	2.100	2.324	p < 0.001***	1.919	1.834	2.008	p < 0.001***
Care 3	3.054	2.885	3.234	p < 0.001***	2.481	2.357	2.612	p < 0.001***
Care 4	3.409	3.202	3.631	p < 0.001***	2.654	2.513	2.803	p < 0.001***
Care 5 (most dependent)	2.582	2.384	2.797	p < 0.001***	2.152	2.013	2.302	p < 0.001***
Most resource-consuming diagnosis								
Cancer	0.259	0.246	0.273	p < 0.001***	0.303	0.288	0.319	p < 0.001***
Cardiovascular disease	1.049	0.999	1.102	p = 0.055	1.116	1.068	1.166	p < 0.001***
Respiratory disease	0.724	0.688	0.762	p < 0.001***	0.865	0.819	0.914	p < 0.001***
External causes such as injury	1.870	1.758	1.990	p < 0.001***	1.914	1.831	2.001	p < 0.001***
Digestive diseases	0.712	0.669	0.757	p < 0.001***	0.836	0.791	0.883	p < 0.001***
Renal urinary tract disease	0.838	0.784	0.895	p < 0.001***	1.063	1.002	1.127	p = 0.042*
Dementia	2.368	2.256	2.486	p < 0.001***	2.068	1.986	2.154	p < 0.001***
Charlson Comorbidity Index								
0	Reference				Reference			
1	0.925	0.887	0.965	p < 0.001***	0.925	0.892	0.960	p < 0.001***
2	0.743	0.709	0.778	p < 0.001***	0.754	0.722	0.787	p < 0.001***
≥ 3	0.591	0.565	0.618	p < 0.001***	0.572	0.546	0.598	p < 0.001***

Objective variable: Nursing home (1.0).
*p < 0.05, ** p < 0.01, ***p < 0.001.

Table 4. Multivariate logistic regression analysis stratified by age group.

	65-74				75 or older			
	Odds ratio	95% confidence interval		p-value	Odds ratio	95% confidence interval		p-value
		Lower	Upper			Lower	Upper	
Sex								
Female	Reference				Reference			
Male	1.235	1.168	1.306	p < 0.001***	0.720	0.703	0.737	p < 0.001***
Level of Long-term care need								
None	Reference				Reference			
Support 1	1.286	1.104	1.498	p = 0.001***	1.155	1.098	1.214	p < 0.001***
Support 2	1.432	1.248	1.643	p < 0.001***	1.263	1.207	1.322	p < 0.001***
Care 1	2.798	2.535	3.089	p < 0.001***	2.294	2.213	2.378	p < 0.001***
Care 2	2.457	2.234	2.703	p < 0.001***	2.187	2.111	2.267	p < 0.001***
Care 3	3.495	3.146	3.882	p < 0.001***	2.876	2.762	2.995	p < 0.001***
Care 4	3.978	3.571	4.431	p < 0.001***	3.061	2.929	3.199	p < 0.001***
Care 5 (most dependent)	3.120	2.755	3.532	p < 0.001***	2.334	2.208	2.468	p < 0.001***
Most resource-consuming diagnosis								
Cancer	0.282	0.259	0.306	p < 0.001***	0.277	0.266	0.288	p < 0.001***
Cardiovascular disease	1.422	1.311	1.542	p < 0.001***	1.108	1.070	1.148	p < 0.001***
Respiratory disease	0.718	0.648	0.794	p < 0.001***	0.848	0.815	0.883	p < 0.001***
External causes such as injury	1.817	1.643	2.009	p < 0.001***	2.013	1.937	2.092	p < 0.001***
Digestive diseases	0.753	0.678	0.835	p < 0.001***	0.821	0.785	0.858	p < 0.001***
Renal urinary tract disease	1.101	0.982	1.235	p = 0.100	0.982	0.937	1.029	p = 0.447
Dementia	3.411	3.057	3.807	p < 0.001***	2.215	2.145	2.288	p < 0.001***
Charlson Comorbidity Index								
0	Reference				Reference			
1	1.012	0.943	1.085	p = 0.744	0.890	0.864	0.917	p < 0.001***
2	0.740	0.682	0.803	p < 0.001***	0.726	0.701	0.751	p < 0.001***
≥ 3	0.585	0.542	0.632	p < 0.001***	0.556	0.537	0.576	p < 0.001***

Objective variable: Nursing home (1.0).
*p < 0.05, **p < 0.01, ***p < 0.001.

Table 5. Cross-tabulation by sex and age group of the level of care needed and the presence of dementia.

		65-74 years old		75-84 years old		85-94 years old		95 years old or older	
		n	%	n	%	n	%	n	%
Level of Long-term care need									
Requiring support 1	Male	600	55.8%	1,557	44.7%	1,856	42.0%	149	34.3%
	Female	475	44.2%	1,925	55.3%	2,561	58.0%	285	65.7%
Requiring support 2	Male	695	53.8%	1,749	42.5%	1,885	32.8%	214	30.3%
	Female	598	46.2%	2,362	57.5%	3,864	67.2%	493	69.7%
Requiring long-term care 1	Male	1,248	55.7%	3,404	43.7%	4,222	33.9%	444	24.8%
	Female	993	44.3%	4,377	56.3%	8,238	66.1%	1,345	75.2%
Requiring long-term care 2	Male	1,444	59.2%	3,586	46.7%	4,094	33.2%	498	22.4%
	Female	997	40.8%	4,099	53.3%	8,231	66.8%	1,722	77.6%
Requiring long-term care 3	Male	1,075	58.2%	2,753	47.1%	3,143	33.2%	446	21.4%
	Female	773	41.8%	3,092	52.9%	6,312	66.8%	1,641	78.6%
Requiring long-term care 4	Male	986	57.3%	2,241	46.2%	2,299	31.1%	274	16.7%
	Female	736	42.7%	2,611	53.8%	5,102	68.9%	1,369	83.3%
Requiring long-term care 5 (most dependent)	Male	666	53.4%	1,273	44.8%	1,051	29.4%	111	14.5%
	Female	581	46.6%	1,570	55.2%	2,528	70.6%	654	85.5%
Dementia	Male	957	53.6%	4,083	41.2%	5,509	30.9%	595	20.0%
	Female	830	46.4%	5,828	58.8%	12,319	69.1%	2,373	80.0%

older were conducted by comparing the post-discharge place of living, consisting of a home and a nursing home. This study included the advantage of using large data sets from all over Japan to clarify the actual situation of the older concerning the initiation of medical and long-term care.

We found significant differences in sex, age, long-term care need level, diseases, and hospitalization days between the groups who received post-discharge medical care services initiated at home and those who received care at a nursing home.

To the best of our knowledge, these results are the first study to use large-scale data from across Japan. As such, the results show universal trends in initiating medical and long-term care services for older Japanese people in their respective living settings. We obtained these results by examining a large dataset representative of acute inpatient treatment in Japan. These new findings are expected to contribute to geriatrics and provide valuable insights and value to the issues of medical and long-term care delivery in other countries with aging populations like Japan.

Patients in the home group had significantly higher cancer and CCI and lower long-term care needs levels and dementia. On the other hand, patients in the nursing home group had substantially higher ages, long-term care needs levels, and dementia and had longer hospitalization days. These results showed similar trends in multivariate logistic regression analysis stratified by sex, indicating that these are universal characteristics regardless of sex. These results provide meaningful insight for those providing medical and long-term care.

Because the home group had a higher CCI, an indicator of short-term mortality risk, it is thought that there are more cases in which patients require medical care rather than long-term care. It is believed that care must be taken as this high level of dependence on medical care may lead to sudden changes in symptoms during treatment at home. Furthermore, it is thought that some cancer patients whose disease is progressing may hope to remain in their familiar homes until the last days of their lives. The high level of activity of doctors who provide home visits has been cited as a factor that increases the likelihood of cancer patient's death at home (Tarasawa et al. 2023). Therefore, it is essential for doctors who make home visits to respond appropriately to sudden changes in patients' medical conditions recuperating at home and to support patients in continuing to receive care at home until the last days of their lives. The home group was also less likely than the nursing home group to require long-term care or dementia. To prevent the need for long-term care and dementia as much as possible, Japan provides a wide range of information to the public about preventive care and new drugs for Alzheimer's disease and conveys their importance (Ministry of Health, Labour and Welfare 2024a,c). In the future, it is essential to promote further activities to prevent long-term care and control dementia.

Because the nursing home group requires a high long-term care need level and has a high rate of dementia, it is thought that they are more dependent on long-term care than on medical care. As Japan's population ages and the number of people needing care increases, the number of people requesting admission to nursing homes will increase significantly. In this study, the hospitalization days in the nursing home group were substantially longer than those in the home group. It has been reported that patients admitted to a nursing home at discharge require a longer hospital stay for adjustment than patients discharged home (Otori and Fukushia 2019). This trend was the same in this study, which used large-scale data. It was considered necessary for medical professionals to provide information and support early on to patients who hope to be admitted to a nursing home and to make efforts to realize their hopes smoothly.

Interestingly, multivariate logistic regression analysis stratified by age group (65-74 years old and 75 years old or older) showed that males in the 65-74 age group and females in the 75- older group tended to be the nursing home group. To verify this, the long-term care level and the presence or absence of dementia, considered influential factors determining the difference between the home and nursing home groups, were tabulated by sex and age (Table 5). As a result, in the 65-74 age group, males were more likely to need long-term care and have dementia than females. On the other hand, in the 75-year-old or older group, females were more likely to need long-term care and have dementia than males. Based on these results, it is thought that the peak of the need for long-term care and the onset of dementia in males is earlier than in females, and this characteristic is reflected in these results. Additionally, public information from the government supports the fact that males tend to be more likely to need long-term care at a relatively younger age (Ministry of Health, Labour and Welfare 2022c). Focusing on dementia, Japan's Basic Act on Dementia to Promote an Inclusive Society took effect in 2024, making dementia support increasingly important (Ministry of Health, Labour and Welfare 2024b). In light of the new findings of this study, it was deemed necessary to consider how to optimize dementia support by taking into account "the age and sex combination". With this in mind, further research is needed based on the results of this study to determine the factors that lead elderly patients to extend the care period in their respective places at home or in nursing homes and to spend their last days in their preferred place of living.

Although this study has significant findings, several limitations exist. First, confirming the patient's hopes is essential when deciding on a place to live post-discharge. In addition, information regarding the presence of family members to support the patient's life and the assets required for institutionalization is essential. However, this information was not available from the current DPC data. We hope this information will be included in the DPC data in the

future and will be available for analysis.

In summary, this study clarified the characteristics of older patients who started medical and long-term care in their place of living following acute inpatient treatment based on the differences between their home and nursing home. As a result, the home group was characterized by a higher level of medical care dependence due to a higher rate of cancer and CCI. In comparison, the nursing home group was characterized by a higher level of dependence due to long-term care due to a high rate of long-term care needs level and dementia. Furthermore, the age group of those admissions to nursing homes varied by sex, with more males aged 65-74 and more females aged 75 or older. These results are expected to provide basic information useful in practice for medical professionals, care workers, and policymakers.

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Conflict of Interest

The authors declare no conflict of interest.

References

Akaishi, T., Tarasawa, K., Fushimi, K., Hamada, H., Saito, M., Kobayashi, N., Kikuchi, S., Tomita, H., Ishii, T., Fujimori, K. & Yaegashi, N. (2023) Risk Factors Associated With Peripartum Suicide Attempts in Japan. *JAMA Netw. Open*, **6**, e2250661.

Charlson, M.E., Pompei, P., Ales, K.L. & MacKenzie, C.R. (1987) A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J. Chronic Dis.*, **40**, 373-383.

Fujimori, K., Tarasawa, K. & Fushimi, K. (2023) Cost-effectiveness of polymyxin B hemoperfusion for septic shock: an observational study using a Japanese nationwide administrative database. *J. Anesth. Analg. Crit. Care*, **3**, 4.

Fujimori, K., Tarasawa, K. & Fushimi, K. (2021a) Effectiveness of polymyxin B hemoperfusion for sepsis depends on the baseline SOFA score: a nationwide observational study. *Ann. Intensive Care*, **11**, 141.

Fujimori, K., Tarasawa, K. & Fushimi, K. (2021b) Effects of Polymyxin B Hemoperfusion on Septic Shock Patients Requiring Noradrenaline: Analysis of a Nationwide Administrative Database in Japan. *Blood Purif.*, **50**, 560-565.

Ikeda, T. & Tsuboya, T. (2021) Place of Death and Density of Homecare Resources: A Nationwide Study in Japan. *Ann. Geriatr. Med. Res.*, **25**, 25-32.

Iwasa, S., Uchiyama, Y., Tauchi, Y., Koyama, T. & Domen, K. (2024) Impact of functional independence and sociodemographic factors on post-stroke discharge destination in a super-aged rural community in Japan. *J. Rural Med.*, **19**, 33-39.

Lee, E.J. & Lee, N.R. (2022) Factors associated with place of death for terminal cancer patients who wished to die at home. *Medicine* (*Baltimore*), **101**, e30756.

Ministry of Health, Labour and Welfare (2021) Overview of long-term care insurance system. https://www.mhlw.go.jp/content/000801559.pdf [*Accessed*: April 4, 2024].

Ministry of Health, Labour and Welfare (2022a) Health, Labor and Welfare Scientific Research Results Database. https://mhlw-grants.niph.go.jp/project/161225 [*Accessed*: Jannuary 24, 2024].

Ministry of Health, Labour and Welfare (2022b) Implementation of explanatory materials for "Survey on impact assessment of DPC introduction". https://www.mhlw.go.jp/content/12404000/000923138.pdf [*Accessed*: April 22, 2024].

Ministry of Health, Labour and Welfare (2022c) Long-term care situation. https://www.mhlw.go.jp/toukei/saikin/hw/k-tyosa/k-tyosa22/dl/05.pdf [*Accessed*: April 26, 2024].

Ministry of Health, Labour and Welfare (2024a) About new therapeutic drugs for Alzheimer's disease. https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/0000089508_00004.html [*Accessed*: May 1, 2024].

Ministry of Health, Labour and Welfare (2024b) Outline of The Dementia Basic Act to Promote an Inclusive Society. https://www.mhlw.go.jp/content/001212852.pdf [*Accessed*: September 9, 2024].

Ministry of Health, Labour and Welfare (2024c) Prevention for long-term care. https://www.mhlw.go.jp/stf/seisakunitsuite/bunya/hukushi_kaigo/kaigo_koureisha/yobou/index.html [*Accessed*: May 1, 2024].

Ministry of Internal Affairs and Communications (2023) Older people in Japan from the viewpoint of statistics. https://www.stat.go.jp/data/topics/pdf/topi138_summary.pdf [*Accessed*: April 4, 2024].

Miyazaki, D., Tarasawa, K., Fushimi, K. & Fujimori, K. (2023) Risk Factors with 30-Day Readmission and the Impact of Length of Hospital Stay on It in Patients with Heart Failure: A Retrospective Observational Study Using a Japanese National Database. *Tohoku J. Exp. Med.*, **259**, 151-162.

Mizuta, M., Tarasawa, K., Fushimi, K. & Fujimori, K. (2022) Effect of Postoperative Pain Management after Robot-Assisted Radical Prostatectomy: A Study on Reducing Hospital Length of Stay and Medical Costs Using Japanese Nationwide Database. *Tohoku J. Exp. Med.*, **259**, 27-35.

Otori, K. & Fukushima, K. (2019) Discharge destination of patients admitted to community comprehensive care wards and related factors. *The Journal of Japan Society for Health Care Management*, **20**, 14-18 (in Japanese).

Schildmeijer, K.G.I., Unbeck, M., Ekstedt, M., Lindblad, M. & Nilsson, L. (2018) Adverse events in patients in home healthcare: a retrospective record review using trigger tool methodology. *BMJ Open*, **8**, e019267.

Sendai City (2023) Survey report on the state of medical care in Sendai City. https://www.city.sendai.jp/iryosesaku/documents/saisyuhoukokusyo.pdf [*Accessed:* April 22, 2024].

Shen, E., Rozema, E.J., Haupt, E.C., Henry, M., Scholle, S.H., Wang, S.E., Lynn, J., Mularski, R.A., Nguyen, H.Q. & Grp, H.R. (2022) Assessing the concurrent validity of days alive and at home metric. *J. Am. Geriatr. Society*, **70**, 2630-2637.

Shibata, T., Shinjo, D., Takahashi, J. & Fushimi, K. (2023) Pandemic-resilient target setting in colorectal cancer screening for vulnerable older population. *Cancer Med.*, **12**, 619-630.

Tarasawa, K., Fujimori, K. & Fushimi, K. (2020) Recombinant Human Soluble Thrombomodulin Contributes to a Reduction In-Hospital Mortality of Acute Cholangitis with Disseminated Intravascular Coagulation: A Propensity Score Analyses of a Japanese Nationwide Database. *Tohoku J. Exp. Med.*, **252**, 53-61.

Tarasawa, K., Fujimori, K., Ogata, T. & Chiba, H. (2023) Associations of Death at Home with Medical Resources and Medical Activities in Cancer Patients: A Nationwide Study Using Japanese National Database. *Ann. Geriatr. Med. Res.*, **27**, 91-98.

Tomioka, S., Rosenberg, M., Fushimi, K. & Matsuda, S. (2020) An analysis of equity in treatment of hip fractures for older patients with dementia in acute care hospitals: observational study using nationwide hospital claims data in Japan. *BMC Health Serv. Res.*, **20**, 830.

Yamada, M. & Arai, H. (2020) Long-Term Care System in Japan. *Ann. Geriatr. Med. Res.*, **24**, 174-180.

Yokoyama, A., Jo, T., Sakamoto, Y., Urushiyama, H., Tamiya, H., Tanaka, G., Kumazawa, R., Matsui, H., Fushimi, K., Yasunaga, H. & Nagase, T. (2023) Effectiveness and safety of the co-administration of Yokukan-San (Japanese herbal medicine) with antipsychotics in hospitalized older patients with pneumonia. *Geriatr. Gerontol. Int.*, **23**, 849-854.