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A comparative analysis of treatment costs for home-based care and hospital-based care in enteral nutrition patients: A retrospective analysis of claims data

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ABSTRACT

Objective: To explore the differences in mean treatment costs between home-based care and hospital-based care in enteral nutrition patients in Japan.
Methods: Using claims data from September 2013 to August 2014, we analyzed patients with recorded reimbursements for enteral nutrition at home or in a hospital. Treatment costs were compared using a panel data analysis with an individual fixed effects model that adjusted for the number of comorbidities and fiscal year. Costs were compared for all patients, as well as for specific diseases (pneumonia, sequelae of cerebrovascular disease, and dementia).
Results: The study sample comprised 7,783 patients with a cumulative total of 33,751 person-months of data. The mean patient age was 84.4 years for home-based care, 83.7 years for hospital-based care. The panel data analysis found that the cost estimates for hospital-based care were consistently higher than those for home-based care; the difference in adjusted treatment costs were $4,894 for all patients, $5,315 for pneumonia patients, $4,481 for sequelae of cerebrovascular disease patients, and $4,519 for dementia patients (all $P < 0.001$). Hospital-based care was still more expensive even when long-term care services were included in home-based care treatment cost estimates.
Conclusion: Home-based care was consistently and substantially cheaper than hospital-based care in enteral nutrition patients in Japan.

1. Introduction

Japan's Ministry of Health, Labour and Welfare (MHLW) is working toward the nationwide implementation of community-based integrated care systems by 2025, when the baby boomer generation will be aged 75 years or older. These efforts have resulted in an increasing demand for home-based care throughout Japan. According to a patient survey conducted in 2014, the estimated number of outpatients receiving home-based care was relatively stable until 2005 (approximately 64,800 patients), but started to rise quickly thereafter (approximately 156,400 patients in 2014) [1]. This indicates that Japan is experiencing a progressive transition from hospital-based care to home-based care.

Previous studies that comparatively analyzed hospital-based care and home-based care in Japan have generally focused on differences in survival time and the quality of care. In an analysis of cancer patients, Hamano et al. found that patients who died at home had a similar or longer survival time than those who died in a hospital [2]. Miyashita et al. surveyed bereaved family members of cancer patients, and reported that patients were more likely to receive higher quality palliative care at home than in a hospital [3]. While these studies examined the importance of home-based care from a clinical perspective, few studies have compared treatment costs (i.e., monetary costs) based on the location of care. Kato et al. conducted a comparative analysis of home-based and hospital-based palliative care in terminally ill cancer patients from an economic perspective [4]. That study found that treatment costs were lower in patients who received home-based care than those who received hospital-based care [4]. However, that analysis had focused on specific types of healthcare institutions, and larger-scale studies of the

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treatment costs associated with these two types of care are needed to inform policy formulation in Japan.

In this study, we used administrative claims data to examine the differences in mean treatment costs between home-based care and hospital-based care without limiting the subjects to cancer patients or patients that had died during the study period. As we aimed to examine patients with similar clinical conditions in home-based and hospital-based care, this economic analysis focused on individuals who had received enteral nutrition in each group.

2. Methods

2.1. Study subjects

This study was conducted using claims data obtained from the Tokyo Metropolitan Association of Medical Care for Senior Citizens. The study period was from September 2013 to August 2014. Japan's claims data comprise data from medical expense invoices submitted by providers to insurers for the purpose of reimbursement. These data have numerous research applications due to the inclusion of detailed information on patient characteristics (e.g., age, sex, major diagnoses, and comorbidities), medical treatments, resource consumption, as well as the day-to-day use of pharmaceuticals and medical devices. The claims data used in this study were collected and managed by the Tokyo Metropolitan Association of Medical Care for Senior Citizens, which anonymized the data before providing them for research.

Patients with records of reimbursements for enteral nutrition during home-based care or hospital-based care were identified using Japan-specific reimbursement codes and/or procedural codes. Specifically, the inclusion criteria for patients receiving home-based enteral nutrition were (1) patients with reimbursement claims for "instruction and management fees for home-based enteral nutrition" (reimbursement code: C105); (2) patients with reimbursement claims for "instruction and management fees for bedridden patients" (C109) and "disposable surgical or enteral feeding catheters for bedridden patients" (C300_005), and had been administered enteral nutrient solution as outpatients; (3) patients with reimbursement claims for "replacing enteral feeding catheters" (J043-4), "gastrostomy" (K664), "disposable surgical or enteral feeding catheters for bedridden patients" (C300_005), or "nasal feeding"(J120) followed by "gastrostomy closure" (K665) or "gastrostomy removal" (K665_2), and had also been prescribed enteral nutrient solution as outpatients in between the former and latter procedures; or (4) patients who had previously undergone "gastrostomy closure" (K665) or "gastrostomy removal" (K665_2), and had been prescribed enteral nutrient solution as outpatients.

The inclusion criteria for patients receiving hospital-based enteral nutrition were (1) patients with reimbursement claims for "nasal feeding"(J120); (2) patients with reimbursement claims for "fees for instruction in replacing enteral feeding catheters" (J043-4) or "gastrostomy" (K664) followed by "gastrostomy closure" (K665) or "gastrostomy removal" (K665_2), and had also received "meals during hospitalization" and "recuperative care during hospitalization" in between the former and latter procedures, or if they had been prescribed enteral nutrient solution.

Our study subjects included patients who received either home-based care or hospital-based care during the study period, as well as patients who received both types of care during the study period.

2.2. Calculation of treatment costs

The treatment cost items available in our claims data included charges for hospitalization, medical management, home medical care, medical examinations, diagnostic imaging, medications, injections, rehabilitation services, specialized psychiatric treatment, medical procedures, surgery and blood transfusions, anesthesia, radiation therapy, pathological diagnoses, dietary therapy, outpatient drug dispensing, and special treatment materials. Dietary therapy costs were only included in hospital-based treatment costs. In addition, the treatment costs in this study included both the out-of-pocket payments from patients and the National Health Insurance payments. The percentage of out-of-pocket payments in Japan is standardized at 10% to 30% depending on age and income, irrespective of whether care is provided in the home or at a hospital.

Home-based treatment costs were calculated as the monthly non-hospital healthcare costs and dispensing costs during the months where a patient received enteral nutrition outside of a hospital. Hospital-based treatment costs were calculated as the monthly healthcare costs incurred during admission in the months where a patient received enteral nutrition within a hospital. However, months with surgical procedures (surgery or blood transfusions) for both home-based and hospital-based care were excluded from analysis due to their disproportionate influence on treatment costs. Surgical procedures could be excluded from both types of care because these are not limited to operations performed in inpatients, but also include simple procedures performed in an outpatient setting.

Costs were converted from Japanese yen to US dollars using the purchasing power parity rate from 2017 ($1 = 99.6 yen).

2.3. Disease-specific comparisons

Treatment costs were compared between all patients in the home-based and hospital-based care groups. However, as this study aimed to control for the patients' clinical conditions, we also conducted subgroup comparisons of the following diseases: pneumonia, sequelae of cerebrovascular disease, and dementia.

Sequelae of cerebrovascular disease and dementia were selected for inclusion because patients with these conditions are likely to require enteral nutrition. Pneumonia was selected as patients receiving home-based enteral nutrition are likely to require hospitalization if they develop this condition. International Classification of Diseases, 10th revision codes were used to identify these diseases in both types of care, and claims data were analyzed for the months with records of the relevant diagnoses. Pneumonia was identified as pneumonitis due to inhalation of food and vomit (J69.0) or viral or bacterial pneumonia (J12–J18). Sequelae of cerebrovascular disease were identified using the I69 code. Dementia was identified as dementia in Alzheimer's disease (F00, including G300, G301, G308, and G309), vascular dementia (F01), dementia in other diseases classified elsewhere (F02, including B220, E756, G10, G20, G310, and G318), or unspecified dementia (F03).

2.4. Healthcare institution category-specific inpatient costs

Healthcare institutions in Japan are classified into general wards, recuperation wards, tuberculosis wards, psychiatric wards, specialized hospitals, advanced treatment hospitals, care facilities for persons with disabilities, and clinics with beds. In addition, hospital wards other than recuperation wards and clinics with beds are further classified according to their nurse-to-patient ratios (using ratios of 1:7, 1:10, 1:13, and 1:15).

As the basic admission fees vary among the different types of institution, we calculated the healthcare institution category-specific inpatient costs for months where a patient incurred only inpatient costs at a single institution. We analyzed the following healthcare institution categories: (1) hospital wards with a nurse-to-patient ratio of 1:7 or 1:10 (including general wards, general wards in advanced treatment hospitals, and specialized hospitals); (2) hospital wards with a nurse-to-patient ratio of 1:13 or 1:15

(including general wards and specialized hospitals); (3) recuperation wards; (4) psychiatric wards (including general psychiatric wards and psychiatric wards in advanced treatment hospitals regardless of nurse-to-patient ratio); and (5) other wards.

2.5. Statistical analysis

The monthly treatment costs for each subject were analyzed for months with home-based care only, and months with hospital-based care only. Patient comorbidities were included in analysis using the Elixhauser comorbidity index [5].

2.5.1. Comparisons of unadjusted treatment costs

Simple comparisons of unadjusted treatment costs were first conducted between months with home-based care only and months with hospital-based care only. The mean values, standard deviations, and median values for treatment costs were calculated and compared between home-based care and hospital-based care.

As the exclusion of months with surgical procedures may be insufficient to account for variations in acute care costs, we also calculated and compared the unadjusted treatment costs for each healthcare institution category. We considered that patients admitted to hospital wards with a nurse-to-patient ratio of 1:13 or 1:15, recuperation wards, and psychiatric wards would receive a level of non-acute care that is comparable to that of patients receiving home-based care.

2.5.2. Panel data analysis using an individual fixed effects model

In order to reduce individual effects, we conducted a monthly panel data analysis where the dependent variable was treatment costs (focused on months with hospital-based care only), and the independent variables were the number of comorbidities and fiscal year. Based on the results of the Hausman test ($P < 0.001$), we elected to use an individual fixed effects model for analysis. This type of analysis may be able to minimize or remove individual effects of time-invariant characteristics that could bias the predictors. The model used in this study can be expressed as the following equation:

$$\mathrm{TreatmentCost}_{i,t} = \alpha + \beta \mathrm{Caretype}_{i,t} + \gamma \mathrm{Comorbidities}_{i,t} + \delta \mathrm{Fiscalyear}_{i,t} + \nu_i + \upsilon_{i,t}$$

where Treatment $\mathrm{Cost}_{i,t}$ refers to the treatment costs for patient i in month t, Care type indicates whether the month was for hospital-based care only or home-based care only (focused on months with hospital-based care only), Comorbidities refers to the number of comorbidities in the patient, Fiscal year refers to the month's fiscal year, ν_i refers to the time-invariant patient factors (fixed effects), and $\upsilon_{i,t}$ is the error term.

2.5.3. Propensity score-matched analysis

We performed a propensity score-matched analysis between months with home-based care only and months with hospital-based care only to adjust for possible differences in patient characteristics. To calculate the propensity score, we conducted a logistic regression analysis where the dependent variable was the use of home-based care, and the independent variables were age, sex, and the number of comorbidities.

2.5.4. Comparisons that account for long-term care insurance–associated costs

Patients who use home-based care trend to also require other long-term care (LTC) services. To incorporate these LTC costs in our analysis, we obtained mean monthly cost data from the "Per-patient treatment costs for LTC service users according to month, age group, service type, and care needs level" statistical table in the MHLW's Survey of LTC Benefit Expenditures [6,7].For this study, we focused on patients aged 75 years or older with "Care Needs Level 5", which signifies the highest level of LTC needs and is usually associated with the highest costs. For each month during the study period, the mean patient-level LTC costs were calculated for all services, as well as for in-home services, community-based services, and facility-based services. These LTC costs were then compared with the estimates from the panel data analysis, and also with the calculated differences in mean treatment costs between hospital-based care and home-based care for each healthcare institution category.

All statistical analyses were conducted using Stata version 14.2 (STATA Corp., College Station, TX). P values below 0.05 were considered statistically significant.

3. Results

3.1. Study subjects

The characteristics of the study subjects (all patients and disease groups) are summarized in Table 1. In addition, the characteristics were also examined for months with home-based care only, months with hospital-based care only, and months with both home-based and hospital-based care. The study sample comprised 7,738 patients with a cumulative total of 33,751 person-months of data (57.7% from months with home-based care only, and 42.3% from months with hospital-based care only). We excluded 297 person-months of home-based care and 3,889 person-months of hospital-based care due to the use of surgical procedures during those months.

Men accounted for approximately 32.6% of patients who received home-based care only and 44.2% of patients who received hospital-based care only. The mean age of patients who received home-based care only and hospital-based care only was 84.4 years and 83.7 years, respectively. The mean number of comorbidities per patient was 3.4 in months with home-based care only and 4.3 in months with hospital-based care only. Table 1 also shows the mean analytical period per person (in months) for home-based care only, hospital-based care only, and both home-based and hospital-based care.

3.2. Comparisons of unadjusted treatment costs

Table 2 presents the unadjusted monthly treatment costs for home-based care and hospital-based care. Treatment costs for hospital-based care were consistently higher than those for home-based care; the differences in unadjusted treatment costs were $5,103 for all patients, $5,235 for pneumonia patients, $4,759 for sequelae of cerebrovascular disease patients, and $4,642 for dementia patients. The mean treatment costs of the excluded subjects were $1,798 for home-based care and $11,681 for hospital-based care.

The hospital-based costs according to healthcare institution category are shown in Table 3. When compared with patients using home-based care and assuming similar clinical conditions, hospital-based costs were higher in the various healthcare institution categories. The results indicated an additional $4,420 in hospital wards with a nurse-to-patient ratio of 1:13 or 1:15 (including general wards and specialized hospitals), $4,273 in recuperation wards, and $3,197 in psychiatric wards.

3.3. Panel data analysis using an individual fixed effects model

The estimates from the fixed effects model are presented in Table 4. As with the unadjusted treatment costs, the adjusted cost estimates for hospital-based care were consistently higher than

Table 1
Subject characteristics.

	Overall (No disease classifications)	Pneumonia	Sequelae of cerebrovascular disease	Dementia
Number of subjects (n)				
Overall, n	7,783	4,918	2,651	3,990
Home-based care only, n (%)	2,169 (27.9)	762 (15.5)	831 (31.3)	1,213 (30.4)
Hospital-based care only, n (%)	4,451 (57.2)	3,409 (69.3)	1,358 (51.2)	2,101 (52.7)
Both home-based and hospital-based care, n (%)	1,163 (14.9)	747 (15.2)	462 (17.4)	676 (16.9)
Total cumulative number of person-months				
Overall, n	33,751	10,978	10,614	16,756
Home-based care only, n (%)	19,477 (57.7)	2,842 (25.9)	6,526 (61.5)	10,325 (61.6)
Hospital-based care only, n (%)	14,274 (42.3)	8,136 (74.1)	4,088 (38.5)	6,431 (38.4)
Age, years				
Home-based care only, mean [SD]	84.4 [6.7]	84.4 [6.7]	84.1 [6.7]	84.9 [6.3]
Hospital-based care only, mean [SD]	83.7 [6.0]	83.9 [6.0]	83.4 [5.8]	84.1 [5.9]
Number of men				
Home-based care only, n (%)	6,351 (32.6)	1,205 (42.4)	2,287 (35.0)	2,686 (26.0)
Hospital-based care only, n (%)	6,304 (44.2)	4,138 (50.9)	1,974 (48.3)	2,656 (41.3)
Number of comorbidities per person				
Home-based care only, mean [SD]	3.4 [1.9]	4.0 [2.1]	3.6 [1.9]	3.5 [2.0]
Hospital-based care only, mean [SD]	4.3 [2.3]	4.5 [2.3]	4.4 [2.2]	4.4 [2.3]
Analytical period per person, months				
Patients who received either home-based care or hospital-based care				
Home-based care only, mean [SD]	6.9 [3.8]	2.6 [2.5]	6.2 [3.9]	6.6 [3.8]
Hospital-based care only, mean [SD]	2.8 [2.5]	2.1 [1.6]	2.6 [2.4]	2.7 [2.4]
Patients who received both home-based care and hospital-based care				
Home-based care only, mean [SD]	3.9 [2.6]	2.0 [1.5]	3.8 [2.7]	3.8 [2.6]
Hospital-based care only, mean [SD]	1.9 [1.3]	1.6 [1.1]	1.7 [1.1]	1.7 [1.1]

Abbreviation: SD, standard deviation.

Table 2
Comparisons of unadjusted treatment costs (USD) for home-based and hospital-based care.

	Home-based care treatment costs		Hospital-based care treatment costs		Mean difference[a]
	Mean [SD]	Median [IQR]	Mean [SD]	Median [IQR]	
Overall	1,408 [838]	1,296 [891-1,741]	6,511 [2,942]	6,308 [4,636-8,149]	5,103
Pneumonia	1,690 [1,011]	1,532 [1,061-2,063]	6,925 [2,963]	6,723 [5,166-8,483]	5,235
Sequelae of cerebrovascular disease	1,448 [775]	1,360 [953-1,793]	6,207 [2,708]	6,139 [4,503-7,827]	4,759
Dementia	1,416 [768]	1,309 [924-1,759]	6,058 [2,662]	5,968 [4,254-7,637]	4,642

Abbreviation: SD, standard deviation; IQR, inter-quartile range.
[a] Mean difference in treatment costs between home-based and hospital-based care.

Table 3
Healthcare institution category-specific hospital-based care treatment costs.

	1:7 or 1:10 wards[a]	1:13 or 1:15 wards[a]	Recuperation wards	Psychiatric wards	Others wards
Total cumulative number of person-months, n (%)					
Overall	5,976 (42.1)	2,523 (17.8)	1,870 (13.2)	959 (6.8)	2,874 (20.2)
Pneumonia	4,032 (48.8)	1,646 (19.9)	755 (9.1)	407 (4.9)	1,419 (17.2)
Sequelae of cerebrovascular disease	1,594 (38.7)	845 (20.5)	589 (14.3)	203 (4.9)	891 (21.6)
Dementia	2,439 (37.5)	1,168 (18.0)	952 (14.6)	751 (11.5)	1,195 (18.4)
Number of hospital-based treatment days/month, mean [SD]					
Overall	25.7 [8.5]	26.1 [8.5]	29.5 [4.5]	29.8 [3.6]	28.5 [6.1]
Pneumonia	26.0 [8.0]	26.7 [7.6]	29.2 [4.9]	29.5 [4.2]	28.2 [6.2]
Sequelae of cerebrovascular disease	25.4 [8.7]	25.9 [8.7]	29.5 [4.6]	29.5 [4.4]	28.5 [6.2]
Dementia	24.8 [9.0]	26.0 [8.4]	29.4 [4.8]	29.7 [3.9]	27.9 [6.7]
Hospital-based care treatment costs in USD, mean [SD]					
Overall	7,205 [3,137]	5,828 [2,543]	5,681 [1,690]	4,605 [1,547]	7,060 [2,710]
Pneumonia	7,433 [3,099]	6,241 [2,525]	6,022 [1,789]	5,309 [1,847]	7,521 [2,659]
Sequelae of cerebrovascular disease	6,825 [2,787]	5,824 [2,454]	5,797 [1,814]	4,645 [1,570]	6,687 [2,641]
Dementia	6,804 [2,883]	5,694 [2,394]	5,647 [1,704]	4,601 [1,469]	6,680 [2,512]
Mean difference with home-based care in USD					
Overall	5,797	4,420	4,273	3,197	5,652

[a] Ratios refer to nurse-to-patient ratios.

Table 4
Estimates of differences in adjusted treatment costs (USD) from the panel data analysis using an individual fixed effects model.

	Difference in treatment costs between home-based and hospital-based care	P value
Overall, cost difference (95% CI)	−4,894 (−4,975, −4,813)	< 0.001
Pneumonia, cost difference (95% CI)	−5,315 (−5,545, −5,085)	< 0.001
Sequelae of cerebrovascular disease, cost difference (95% CI)	−4,481 (−4,629, −4,332)	< 0.001
Dementia, cost difference (95% CI)	−4,519 (−4,629, −4,409)	< 0.001

Abbreviation: CI, confidence interval.

those for home-based care; the difference in adjusted treatment costs were estimated to be $4,894 for all patients, $5,315 for pneumonia patients, $4,481 for sequelae of cerebrovascular disease patients, and $4,519 for dementia patients (all $P < 0.001$).

3.4. Propensity score-matched analysis

The estimates from the propensity score-matched analysis are presented in Table 5. The post-matching standardized differences for age, sex, and the number of comorbidities were less than 0.1, indicating that the matching was able to account for variations in these characteristics. The differences in post-matching treatment costs were estimated to be $4,853 for all patients, $5,151 for pneumonia patients, $4,647 for sequelae of cerebrovascular disease patients, and $4,382 for dementia patients (all $P < 0.001$).

3.5. Comparisons that account for long-term care insurance–associated costs

The mean monthly patient-level LTC costs calculated from the MHLW's Survey of LTC Benefit Expenditures were $2,947 for all services, $2,185 for in-home services, $2,664 for community-based services, and $3,207 for facility-based services. These monthly LTC costs were generally lower than the cost difference between home-based and hospital-based care from our panel data analysis.

We also calculated the mean treatment cost differences between hospital-based care and home-based care for each healthcare institution category (Table 3), and compared these differences with the mean monthly patient-level LTC costs for all services and for facility-based services. The results showed that home-based care was cheaper than hospital-based care by $1,473 (all services) and $1,213 (facility-based services) for hospital wards with a nurse-to-patient ratio of 1:13 or 1:15; by $1,326 (all services) and $1,066 (facility-based services) for recuperation wards; and by $249 (all services) and -$10 (facility-based services) for psychiatric wards.

4. Discussion

In this study, we used administrative claims data from 7,738 older adults residing in Tokyo, Japan to examine the differences in treatment costs between home-based care and hospital-based care. Using an individual fixed effects model, we found that home-based care was consistently and substantially cheaper than hospital-based care by $4,481–$5,315. A propensity score-matched analysis supported these estimates as home-based care was again found to be cheaper than hospital-based care by $4,382–$5,151 after adjusting for patient characteristics. In addition, home-based care was cheaper than hospital-based care for all healthcare institution categories when comparing unadjusted treatment costs.

Our cost estimates did not include costs for LTC, which is used by a large proportion of older persons. To account for this shortcoming, we calculated and added the national mean LTC costs for home-based care patients with Care Needs Level 5. By comparing treatment costs based on LTC insurance–associated costs, it is possible to compare expenses for treatments and rehabilitation services that are covered by this type of insurance. Even after including these treatment costs, home-based care was still cheaper than hospital-based care by approximately $2,156 for all patients and $1,896 for facility-based services. In addition, when comparing the mean monthly patient-level LTC costs with the mean treatment cost differences between home-based care and hospital-based care for each healthcare institution category, treatment costs for home-based care that included mean LTC costs were still lower than those for hospital-based care with the exception of psychiatric wards.

When comparing treatment costs, some cost items may be included either only in home-based care or hospital-based care. We considered the following two items: First, nutrient solutions for enteral feeding can be charged either as medical supplies (enteral nutrients) or food (high-density liquid diet) when calculating hospital-based treatment costs. However, nutrient solutions are only charged as medical supplies for home-based care, as these patients are required to pay for food at their own expense. Accordingly, nutrient solutions are only reflected as fees for medicinal supplies for home-based care patients. As a result, we focused on patients with data that included nutrient solutions as medicinal

Table 5
Estimates from the propensity score-matched analysis.

	Overall (No disease classifications)	Pneumonia	Sequelae of cerebrovascular disease	Dementia
Number of matched subjects	27,374	9,082	8,707	13,634
Standardized differences				
Age				
Pre-matching	0.14	0.18	0.15	0.16
Post-matching	−0.01	0.00	0.03	−0.01
Sex				
Pre-matching	0.28	0.25	0.31	0.39
Post-matching	−0.01	−0.03	0.01	−0.01
Number of comorbidities per person				
Pre-matching	−0.41	−0.25	−0.37	−0.37
Post-matching	−0.01	−0.03	0.01	−0.01
Difference in treatment costs between home-based and hospital-based care in USD (95% confidence interval)	−4,853 (-4,910, -4,797)	−5,151 (-5,238, -5,064)	−4,647 (-4,760, -4,533)	−4,382 (-4,458, -4,306)
P value	<0.001	<0.001	<0.001	<0.001

supplies in order to minimize the impact of differential pricing on our comparisons. Second, as dietary therapy costs are included only in hospital-based costs, we compared these with the national mean LTC costs for facility-based services.

In Japan, Kato et al. previously compared the treatment costs of home-based and hospital-based palliative care in terminally ill cancer patients, and reported that home-based care (including the highest monthly LTC costs) was approximately $7,500 cheaper than hospital-based care despite similar treatment durations [4]. While that study and our present study used different analytical approaches that make direct comparisons difficult, both studies indicate that home-based treatment costs are lower than hospital-based treatment costs(even when LTC-associated costs are included). Kinjo et al. have also reported that for patients in their final 30 days of life, home-based care was more expensive than hospital-based care in the short term ($\leq$10 days), but cheaper in the long term ($\geq$30 days) [8]. Similarly, studies from South Africa and the US have reported that home-based care tends to be cheaper than hospital-based care [9–11].

This study has four limitations. First, the study was focused on enteral nutrition patients. As a result, our findings may not be representative of all home-based care patients. However, our subjects were also aged 75 years or older, which account for approximately 77.7% of all outpatients receiving home-based care [1]. The age aspect of our inclusion criteria is therefore unlikely to have a major impact on the generalizability of our findings. Also, this study was conducted using claims data obtained from the Tokyo Metropolitan Association of Medical Care for Senior Citizens. According to population estimates from 2014, approximately 8.2% of men and 12.7% of women residing in Tokyo are aged 75 years or older [12]. Throughout Japan, this age group accounts for approximately 9.7% of men and 14.7% of women [12]. Therefore, our sample may be fairly representative of enteral nutrition patients aged 75 years or older in the Japanese population. Second, there were limitations in ensuring similar patient conditions for both home-based and hospital-based care. As our analysis was conducted using claims data, we were unable to include clinical factors such as disease stage, condition, and severity. In addition, family structure and the exact duration of home-based care could not be ascertained, and we were unable to consider the possible effects of home-based care on family caregiver burden. Therefore, this study may not accurately represent home-based care conditions. Third, LTC costs for home-based care were calculated using reported treatment costs from the MHLW's Survey of LTC Benefit Expenditures, which may not reflect the state of individual patients. Finally, the mean costs for the excluded months were higher for hospital-based care than for home-based care, which may have introduced bias into the estimates. However, as hospital-based care is expected to be more expensive than home-based care, we aimed to match the patient conditions between home-based and hospital-based care by limiting the analysis to enteral nutrition patients. We also conducted subgroup analyses of pneumonia patients, sequelae of cerebrovascular disease patients, and dementia patients to facilitate more appropriate comparisons. Furthermore, hospital-based care was analyzed for various healthcare institution categories.

5. Conclusion

Even when LTC-associated costs are included in analysis, home-based care is generally cheaper than hospital-based care for enteral nutrition patients in Japan. Although the decision to shift from hospital-based care to home-based care cannot be based solely on cost considerations, these estimates provide a financial perspective to inform the decision-making process.

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Conflict of interest statement

None.

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