

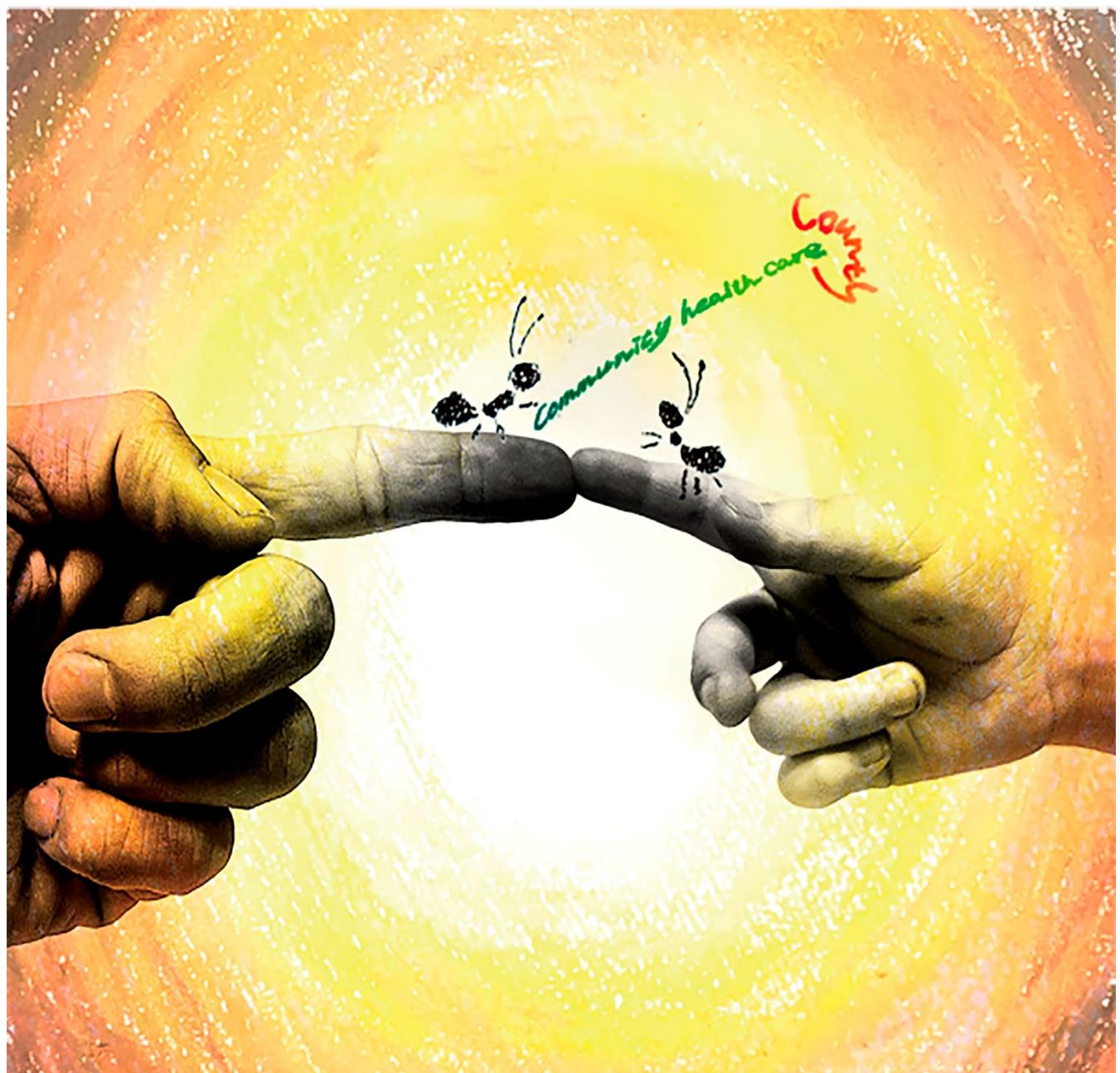
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ORIGINAL ARTICLE

## Factors that Affect the Estimated Revenue of Kantaki Services: Multifunctional in-home Long-term Care in Japan

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### ABSTRACT

**Objectives:** In order to cope with a rapidly aging national population, the Japanese government promotes the use of a comprehensive community care system known as Kantaki, which was established in 2012. Aimed at older populations, Kantaki offers a variety of services, including home-visit nursing care, day care, and overnight care. This study clarified the factors that affect the estimated revenue of Kantaki services through a secondary analysis of detailed information released by the Ministry of Health, Labour and Welfare (MHLW). Our goal was to provide information that may facilitate the stable management of Kantaki operations across Japan.

**Methods:** We conducted a secondary analysis of official statistics data and detailed information released by the MHLW in April 2020. As such, we calculated the estimated revenue for Kantaki services. We then conducted a logistic regression analysis with estimated revenue set as the dependent variable in order to assess the magnitude of each influencing factor.

**Results:** A total of 594 multifunctional in-home long-term care services were established. Of these, 506 met the requirements for Kantaki set in this study's analysis. The logistic regression analysis showed that items with large odds ratios included tube feeding (2.59), enhanced working conditions for care workers (I) (2.58), and colostomy/ileostomy care (1.76).

**Conclusion:** To achieve stable management practices for Kantaki, it is important to handle at-home medical needs through the use of skilled care workers, who must be properly trained and ensured stable employment.

< Key words >

long-term care, community health care, estimated revenue, facility management, profitability

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## I. Background

The 2019 White Paper on the Aging Society<sup>1)</sup> reported that 35.58% of the Japanese population was aged 65 years or older as of October 1, 2018, thus comprising 28.1% of the total national population. This is the highest such proportion in the world. In the context of an aging society, the increasing demand for long-term care services previously resulted in the establishment of the Japanese long-term care insurance system in the year 2000. The Long-Term Care Insurance Law provides nursing care services to individuals aged 65 years or older with long-term care needs according to their specific level of need (certified into five levels based on their condition) at a cost of 10% of the total cost. To further cope with a rapidly aging population, the Japanese government implemented a 2012 amendment to the Long-Term Care Insurance Law, which clearly states that a comprehensive community care system should be promoted through several subsystems, including multifunctional in-home care services. Here, the primary aim is to provide seamless service provisions.

These multimodal services are run through businesses, in which a single office provides a variety of unique services. For example, provisions include a combination of home health services, home care services, short-stay services, and day care services in order to meet different client needs to remain in the community. These businesses have been referred to as Kantaki services since 2015. In theory, there is a high need for Kantaki services, as they can support individuals who are highly dependent on medical care and who may thus require comprehensive life support.

There were 479 Kantaki businesses in Japan as of December 2018. However, this only covered around 13% of all municipalities, thus showing limited availability<sup>2,3)</sup>. This lack of widespread coverage is primarily due to the difficulty associated with achieving stable management practices for Kantaki services. There are two main reasons for this. First, it is difficult for small-scale businesses to secure the human resources needed to provide complex services; second, it is difficult to secure a sufficient number of service users<sup>4)</sup>. As a result, it has been revealed that many Kantaki are operating at a loss<sup>4)</sup>. Despite these concerns, there is a lack of scholarly research on the factors that influence Kantaki profitability. The Ministry of Health, Labour and Welfare (MHLW) publishes data related to Kantaki operations on its public website<sup>5)</sup>, and will also release more detailed information upon request.

Therefore, the purpose of this study was to investigate the factors that affect the stability of Kantaki operations, and in particular, to use the data related to income to calculate the revenue of Kantaki services and to estimate the factors that affect it.

## II. Objectives

This study clarified the factors related to estimated service revenue through a secondary analysis of detailed information on Kantaki operations released by the MHLW. In this regard, our goal was to provide information that could facilitate the stable management of Kantaki operations across Japan.

## III. Methods

### 1. Research design

Secondary analysis (descriptive correlation study) using data released by the MHLW.

### 2. Implementation period

April 2020

### 3. Data collection

As of the end of March 2020, we obtained public information on all Kantaki services managed by the MLHW, then created a database.

### 4 . Data contents

#### 1) User information

Number of users based on the Care Needs Levels (CNL), number of users by gender

#### 2) Estimated revenue

To estimate actual revenue for Kantaki services, we defined and calculated basic revenue using the allowance of CNLs among users, number of users, and regionally adjusted unit price as the estimated revenue<sup>6)</sup>. Specifically, estimated revenue was calculated as follows:

$$\{(\text{¥}12,341 \times \text{number of users at CNL1}) + (\text{¥}17,268 \times \text{number of users at CNL2}) + (\text{¥}24,274 \times \text{number of users at CNL3}) + (\text{¥}27,531 \times \text{number of users at CNL4}) + (\text{¥}31,141 \times \text{number of users at CNL5})\} \times \text{regionally adjusted unit price}$$

The regionally adjusted unit price is set by the government to reflect the wage levels of private sector workers in municipalities, ranging from 10-11.4 to yen/unit<sup>7)</sup>. In addition to estimated revenue, additional allowances are given for special conditions, such as provisions involving specialized skilled nursing care (e.g., dementia care, terminal care, etc.) and enhanced working conditions for care workers. The latter of these refers to a system of improvement that offers relevant career paths and enhanced working

environments. For example, salaries must be systematically raised based on experience and/or qualification; there must also be an appraisal process occurring on regular bases, in which documentation is available to all care workers. Payments are reduced in cases the additional allowance requirements are not fully met.

### **3) Facility characteristics**

Duration of continuous operation, utilization status (average age of users, capacity of day care services, capacity of overnight services, establishment type, managerial occupation)

### **4) Employee characteristics**

Number of full-time equivalent nursing staff, number of full-time equivalent care workers, number of full-time care workers with certifications (e.g., national certification for care workers, completion of initial training), number of employees based on years of experience, number of staff on night shifts, and on-call nighttime staff.

### **5) Information on service provisions**

Whether medical care is available (13 total items, such as indwelling bladder catheter care, home oxygen therapy), whether additional allowances for special conditions are obtained.

## **5. Analysis method**

To clarify the factors related to estimated revenue for Kantaki services, we divided them into high estimated revenue and low estimated revenue groups; these groups were compared based on their characteristics, including the employee characteristics and service provision status. Among these characteristics, the number of consecutive months and utilization status were compared between groups using the Mann-Whitney U test. After cross-tabulation, we conducted  $\chi^2$  tests to compare three establishment types (for-profit corporations, medical corporations, and social welfare corporations)  $\times$  the two estimated revenue groups and two managerial credentials (nurse or care worker)  $\times$  the two estimated revenue groups. We then examined the magnitude of each factor's influence on estimated revenue using a logistic regression analysis with estimated revenue set as the dependent variable (high revenue group: 1, low revenue group: 0); variables shown as significant via the single regression analysis were entered stepwise as independent variables. To avoid collinearity, we confirmed that the correlation coefficients with estimated revenue were less than 0.7; the correlation coefficients between the independent variables were also less than 0.7. We used the IBM SPSS ver26 software to conduct all such analyses (significance probability was set to 5%).

## IV. Results

A total of 594 multifunctional in-home long-term care services had been established by the end of March 2020. Of those, 13 did not meet the requirements for Kantaki services, and were thus excluded from this analysis. As our examination was focused on the stability of Kantaki operations, another 75 were eliminated because they had been in operation for less than two years. Ultimately, a total of 506 Kantaki services were subjected to the analysis.

### 1. User information (Table 1)

The means and standard deviations for the registered capacity and actual number of users were  $26.7 \pm 4.5$  and  $20.7 \pm 6.0$ , respectively. The system contained a maximum number of 29 registered users, while the average user age was  $83.7 \pm 5.0$  years, and the average numbers of male and female users were  $6.7 \pm 3.2$  and  $14.0 \pm 4.9$ , respectively. Users were aggregated based on their CNLs, in decreasing order of need;  $3.6 \pm 2.8$  were deemed CNL1,  $4.4 \pm 2.6$  were CNL2,  $4.1 \pm 2.3$  were CNL3,  $4.2 \pm 2.5$  were CNL4, and  $4.4 \pm 3.4$  were CNL5.

### 2. Estimated revenue and business characteristics (Table 2)

The means and standard deviations of estimated revenue for the entire Kantaki was  $4,982,837.8 \pm 1,615,919.1$  yen/month, with a mean continuous business duration of 48.8 months (range of 15-92). Duration was significantly longer in the high revenue group. In terms of establishment type, 252 (49.8%) were for-profit corporations, while 114 (22.5%) were medical corporations, and 91 (18.0%) were social welfare corporations. In terms of managerial occupations, 220 (43.5%) were nurses and 249 (49.2%) were certified care workers; more nurses were managers in the high revenue group.

### 3. Employee information (Table 3)

The mean number of full-time equivalent nursing staff was  $4.4 \pm 2.5$ , while the mean number of full-time equivalent care workers was  $9.03 \pm 3.1$ . In both cases, the number of employees was significantly higher in the high revenue group. In terms of the number of employees based on years of experience, the largest number of care workers had between one and three years of experience, with  $2.0 \pm 2.4$  full-time employees and  $1.6 \pm 2.6$  part-time employees. The largest number of nursing staff had more than 10 years of experience ( $1.4 \pm 2.0$  full-time and  $1.0 \pm 2.1$  part-time). Both groups had more care workers than nursing staff; however, the high revenue group had significantly more care workers at most experience levels. There was also a significant tendency for the high revenue group to have more certified full-time care workers.

**4. Service provision information for receiving additional allowances (Table 4)**

An average of  $7.8 \pm 3.9$  of the 13 total care procedures were performed. The most frequently performed procedures were indwelling bladder catheter care (433, 85.6%) and tube feeding (407, 80.4%), while the less frequently performed procedures were ventilator care (132, 26.1%) and home self-peritoneal dialysis (141, 27.9%). Among the 13 procedures, there were no significant intergroup differences in the three items of home central venous nutrition, ventilator care, and self-peritoneal dialysis. Special conditions that provide additional allowances were reported for 12. Regarding the Kantaki that handled these, the following numbers were obtained: dementia care I (464, 91.7%), dementia care II (441, 87.2%), strengthened service provision system III (20, 4.0%), and enhanced working conditions for care workers III (21, 4.2%).

**5. Logistic regression analysis with estimated revenue set as the dependent variable (Table 5)**

The logistic regression analysis with estimated revenue set as the dependent variable revealed three items with large odds ratios, including tube feeding (2.59), enhanced working conditions for care workers (I) (2.58), and colostomy/ileostomy care (1.76).

<Table 1> User information in Kantaki (n=506)

	Mean	SD
Number of users	20.7	6.0
Number of users at CNL1	3.6	2.8
Number of users at CNL2	4.4	2.6
Number of users at CNL3	4.1	2.3
Number of users at CNL4	4.2	2.5
Number of users at CNL5	4.4	3.4
Men	6.7	3.2
Women	14.0	4.9

(persons)

&lt;Table 2&gt; The estimated revenue and characteristics of Kantaki

	All n=506		High n=253		Low n=253		<i>p</i>
	Means	SD	Means	SD	Means	SD	
<b>Estimated revenue</b> (1,000 yen)	4982	1615	6263	878	3702	1081	—
<b>Duration of continuous operation</b> (month)	48.8	22.2	51.2	21.8	46.5	22.3	.017*
<b>Utilization status</b>							
Average age of users (age)	83.7	5.0	84.0	3.0	83.5	6.4	.770*
Capacity of day care service (persons)	15.6	3.0	16.5	2.9	17.3	2.5	.000*
Capacity of overnight service (persons)	7.5	1.8	7.5	1.8	7.6	1.7	.411*
	n	%	n	%	n	%	<i>p</i>
<b>Establishment type</b>							
For-profit corporation	252	49.8	127	50.2	125	49.4	
Medical Corporation	114	22.5	56	22.1	58	22.9	.936†
Social welfare corporation	91	18.0	44	17.4	47	18.6	
NPO	17	3.4	9	3.6	8	3.2	
Incorporated associations and foundations	15	3.0	8	3.2	7	2.8	
Co-op	11	2.2	8	3.2	3	1.2	
Other corporations	3	0.6	0	0.0	3	1.2	
Others	3	0.6	1	0.4	2	0.8	
<b>Managerial occupation</b>							
Registered Nurse	220	43.5	121	47.8	99	39.1	
Certified care worker	249	49.2	116	45.8	133	52.6	.079†
Others	37	7.3	16	6.3	21	8.3	

※:Mann-Whitney U test, †:χ<sup>2</sup> test

<Table 3> Employee characteristics

	All n=506		High n=253		Low n=253		<i>p</i>
	Means	SD	Means	SD	Means	SD	
<b>Nurse</b>							
Number of full-time equivalent nursing staff	4.4	2.5	4.8	2.9	4.0	2.0	.001
Number of employees by years of experience							
1 year							
full-time	0.6	1.0	0.6	1.0	0.6	1.0	.691
part-time	0.6	1.3	0.5	1.0	0.6	1.4	.226
1-3 years							
full-time	0.9	1.5	1.0	1.5	0.9	1.6	.259
part-time	0.8	1.5	0.9	1.5	0.8	1.4	.592
3-5 years							
full-time	0.5	1.1	0.6	1.3	0.4	0.8	.478
part-time	0.4	0.8	0.4	0.9	0.3	0.7	.334
5-10 years							
full-time	0.5	1.0	0.5	1.1	0.4	0.9	.160
part-time	0.4	1.0	0.4	1.0	0.4	0.9	.193
over 10 years							
full-time	1.4	2.0	1.6	2.3	1.1	1.8	.091
part-time	1.0	2.1	1.2	2.4	0.9	1.7	.609
<b>Care worker</b>							
Number of full-time equivalent care workers	9.0	3.1	10.4	2.8	7.6	2.8	.000
Number of employees by years of experience							
1 year							
full-time	1.1	1.6	1.2	1.6	1.1	1.6	.370
part-time	1.1	1.7	1.1	1.7	1.1	1.8	.491
1-3 years							
full-time	2.0	2.4	2.2	2.6	1.7	2.1	.043
part-time	1.6	2.6	1.7	2.6	1.4	2.6	.108
3-5 years							
full-time	1.3	1.7	1.6	1.8	1.0	1.4	.000
part-time	0.9	1.4	1.0	1.5	0.7	1.3	.019
5-10 years							
full-time	1.4	1.8	1.6	1.9	1.2	1.6	.036
part-time	0.8	1.4	0.9	1.5	0.6	1.2	.008
over 10 years							
full-time	1.4	1.9	1.7	2.2	1.1	1.6	.002
part-time	0.6	1.5	0.8	1.8	0.5	1.1	.126
Number of care workers with national certification	3.9	2.8	4.7	2.9	3.2	2.4	.000
Number of care workers with completion of the initial training	1.3	1.6	1.4	1.7	1.2	1.6	.332
Number of staff on night shifts	4.3	3.5	4.8	3.9	3.8	3.0	.009
Number of staff on call at night	2.1	2.7	2.3	3.0	2.0	2.5	.527

(persons) Mann-Whitney U test

<Table 4> Information on service provision

	All n=506		High n=253		Low n=253		<i>p</i>
	n	%	n	%	n	%	
<b>Medical care</b>							
Indwelling bladder catheter care	433	85.6	234	92.5	199	78.7	.000
Home oxygen therapy	410	81.0	220	87.0	190	75.1	.001
Tube feeding	407	80.4	226	89.3	181	71.5	.000
Suction	394	77.9	208	82.2	186	73.5	.024
Intravenous infusion/injection	392	77.5	205	81.0	187	73.9	.070
Colostomy/ileostomy care	351	69.4	197	77.9	154	60.9	.000
Pain management using narcotics	302	59.7	166	65.6	136	53.8	.009
Renal and bladder transplantation care	282	55.7	153	60.5	129	51.0	.039
Home central venous feeding	263	52.0	151	59.7	112	44.3	.001
Artificial bladder care	220	43.5	121	47.8	99	39.1	.060
Tracheal care	212	41.9	118	46.6	94	37.2	.038
Peritoneal dialysis	141	27.9	72	28.5	69	27.3	.843
Ventilator care	132	26.1	71	28.1	61	24.1	.362
<b>Item receives additional allowance</b>							
Dementia care (I)	464	91.7	238	94.1	226	89.3	.075
Dementia care (II)	441	87.2	228	90.1	213	84.2	.062
Attending hospital discharge conference	286	56.5	153	60.5	133	52.6	.088
Emergency home visit by nurse	423	83.6	230	90.9	193	76.3	.000
Enhanced special management (I)	380	75.1	211	83.4	169	66.8	.000
Enhanced special management (II)	366	72.3	204	80.6	162	64.0	.000
Terminal care	333	65.8	183	72.3	150	59.3	.003
Strengthed service provision system (II)	66	13.0	33	13.0	33	13.0	1.00
Strengthed service provision system (III)	20	4.0	13	5.1	7	2.8	.254
Enhanced working condition(I)	419	82.8	229	90.5	190	75.1	.000
Enhanced working condition (II)	40	7.9	19	7.5	21	8.3	.869
Enhanced working condition (III)	21	4.2	6	2.4	15	5.9	.072

$\chi^2$  test

&lt;Table 5&gt; Results of logistic regression analysis

Variables	Odds	95% Confidence interval		p
Enhanced working condition( I )	2.58	1.39	—	.003
Tube feeding	2.57	1.42	—	.002
Colostomy/ileostomy care	1.80	1.11	—	.018
Number of full-time equivalent care workers	1.38	1.27	—	.000
Capacity of day care service	1.20	1.09	—	.000
Number of full-time equivalent nursing staff	1.12	1.02	—	.017

## V. Discussion

This study examined the factors that affected estimated revenue for Kantaki services by conducting a secondary analysis of national data. Based on this, we offer the following suggestions to stabilize Kantaki operations and promote utilization:

### 1. Characteristics of Kantaki Management

The results of this study were compared with the 2017 Kantaki report<sup>4)</sup> to discuss the characteristics of the Kantaki Management. The fact that the group with the high revenue group had a longer operating period (Table2) was consistent with the previous reports<sup>4)</sup> that a certain period of time is needed to convert to profitability. It was suggested that setting up a system to provide financial support after the opening would be effective for Kantaki management.

The mean values of the capacity of daycare service and capacity of overnight service were similar to those in the previous reports<sup>4)</sup>. Only the former remained as a significant variable for estimated revenue in the regression analysis (Table5), which was a new finding in this study. The reason for this might be the daycare service including medical services which contribute to a comprehensive community care system<sup>8)</sup>. On the other hand, organizational structures such as establishment body and managerial occupation did not have any effect on the revenue.

### 2. Improve the ability to meet medical needs

This study revealed that the provision of medical care improved the estimated revenue (Table 4).

Results showed that Kantaki users were a mixture of elderly persons with wide ranging differences in independence (Table1). In addition, indwelling bladder catheter care, home oxygen therapy, and tube feeding were performed in more than 80% of Kantaki services, while more than 90% provided additional services for dementia, thus indicating that Kantaki services are currently responding to a variety of home care needs(Table4).

Further, the regression analysis showed that tube feeding and colostomy/ileostomy care had particularly notable impacts on estimated revenue(Table5). In this regard, a 2011 survey showed that 10% of those utilizing home care nursing received tube feeding; among these individuals, 90% with gastrostomy were bedridden, which may increase the associated workload<sup>9)</sup>. A survey conducted by the Japan Ostomate Association<sup>10)</sup> also reported that 61.3% of ostomates were over 70 years of age, while 19.6% were over 80 years of age. Finally, a 2011 report on the level of care required by ostomates showed that the percentage of ostomates requiring care was higher than the percentage of the total population requiring care, even when adjusted for age<sup>11)</sup>. Advances in perioperative management have made it possible to introduce stomas at older ages; however, due to shorter hospital stays, there has also been an increase in the number of patients treated at home without sufficient knowledge and skills of procedures and self-care, thereby resulting in a wide range of stoma problems reported by home care nurses<sup>12)</sup>.

### **3. Retain care work personnel**

In this study, it was a new finding that in addition to providing medical care, management systems such as enhanced special management and enhanced working condition were significantly associated with the estimated revenue (Table4).

Regarding the areas of additional allowance, only enhanced working conditions for care workers (I) was related to estimated revenue; given the high odds ratio, this was one of the factors with the greatest impacts(Table5). This additional allowance provides incentives for Kantaki management to ensure career paths and better working environments for care workers, including improved training and retention.

In addition, the odds ratio was higher for the number of full-time equivalent care workers than that for the number of full-time equivalent nursing staff, which impacted estimated revenue(Table5). In terms of employee characteristics, there were more care workers than nursing staff(Table3). Further, the high revenue group tended to have more care workers(Table3). This suggests that increased workloads resulting from increased user numbers and CNL levels were met by increasing the number of care workers. A previous study by Fukui<sup>13)</sup> examined the factors influencing the profitability of visiting nurse agencies in Japan, thus finding that both the number of care workers ( $\geq 5$ ) and number of nurses ( $\geq 5$ ) were significant variables. Although employee availability is often important for profitability among visiting nurse agencies and Kantaki, the number of care workers had a stronger impact on estimated revenue than nursing staff when specifically looking at Kantaki. However, when looking at the number of staff based on years of experience, many nurses working at Kantaki services had more than 10 years of experience, while most care workers had between one and three years of experience(Table3). This indicates that many care workers had less experience than the nursing staff. While the overall turnover rate for care workers has not changed from the 15.4% found in 2019, more than 60% of those who leave the workforce have been with

their respective companies for fewer than three years<sup>14)</sup>. The reports<sup>14)</sup> have also shown that educational opportunities and training must be strengthened for staff who have remained with their companies for fewer than three years. As estimates show there will be a shortage of 377,000 care workers by 2025<sup>15)</sup>, it is highly important for Kantaki to develop and retain experienced care workers, which will also increase their estimated revenue.

#### **4. Study limitations**

While this study used data that were obtained through the MHLW, data entry was conducted by personnel at each Kantaki, which limits reliability. In addition, the revenue used as the dependent variable was only an approximation, not an analysis of actual revenue and expenditures. Future studies should therefore investigate the break-even point of each Kantaki in order to obtain more specific suggestions for Kantaki management; that is, suggestions that are based on actual conditions.

## **VI. Conclusion**

A secondary analysis of data from all Kantaki in Japan revealed the factors that influenced their estimated revenue.

Factors that significantly affected estimated income included tube feeding, enhanced working conditions for care workers, and colostomy/ileostomy care. To achieve stable management practices, Kantaki services must be able to respond to a variety of home care medical needs. In this regard, it is highly important to train and retain skilled care workers.

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## CONTENTS

### ORIGINAL ARTICLES

---

Structure of Nutrition Improvement Approaches for Care-dependent Older People and Related Challenges in Community-based Integrated Care

Yuko FUJIO et al. p.1

Rapid E-mail Response to First-Contact E-mails Increases Consultation Continuation Rates for Suicide Prevention

Asumi TAKAHASHI et al. p.19

Factors that Affect the Estimated Revenue of Kantaki Services:  
Multifunctional in-home Long-term Care in Japan

Rika WATANABE et al. p.34

The Verification of Reliability and Validity of Shimonoseki City University Lecturer Evaluation Scale (SLES)

Minji KIM et al. p.48

### SHORT PAPER

---

Expected Characteristics for New Home-Visiting Nurses According to Experienced Nurses

Akiko AKIYAMA et al. p.61