International Journal of Health Sciences and Research
www.ijhsr.org ISSN: 2249-9571

Original Research Article

The Effect of Nursing Factors Affected on Benefit Expenses Related Home Visit Nursing in Long Term Care Insurance by Prefecture in Japan

Kazuya Ikenishi[1*], Noriko Nakagaki[2**], Akiko Akabane[3**]

[1]Lecture, [2]Professor, [3]Assistant Professor,
[*]Faculty of Nursing, Shoin University, 9-1, Morinosato-Wakamiya, Atsugi City, Kanagawa Prefecture, Japan.
[**]School of Nursing, Aichi Kiwami Nursing College, 5-4-1, Jogan-dori, Ichinomiya city, Aichi prefecture, Japan.

Corresponding Author: Kazuya Ikenishi

Received: 14/04/2016 *Revised: 27/04/2016* *Accepted: 28/04/2016*

ABSTRACT

Background: The number of user and the amount of benefit expenses of the long-term care insurance (LTCI) continued to increase since the insurance system had been enforced on 2000.Various factors related with the increment were reported in several earlier studies. Although many studies had been executed on medical costs in Japan, it was still few studies concerning factors related with the amount of benefit expenses in LTCI.
Objective: This study aimed to clarify the magnitude of impacts that these factors affected on benefit expenses on home-visiting nurse in LTCI. Methods: Published reports by the Ministry of Internal Affairs and Communications (MIAC) and Ministry of Health, Labour and Welfare (MHLW) were used as these analyzing data. This study used the benefit expenses on home-visiting nurse of LTCI by prefecture as an output in analysis, and independent variables included regional and home-visit nursing factors. Then, multiple regression analysis conducted two times to clarify the magnitude of explanation by factors.
Results: 94 samples in terms of 47 prefectures in Japan were collected from published reports in 2005 and 2010.As a result, average length of stay and the number of user, the number of use of home-visiting nursing care per user were variables significantly. Standardized R-squared in the analysis with only regional factors was 90.7%, the one gained 98.9% in the analysis adding it to home-visit nursing factors.
Conclusion: The magnitude of explanation by regional factors was 90.7%, and the magnitude of it by adding home-visit nursing factors was 98.9%.

Keywords: home nursing, Long-Term Care Insurance, home care services, regression analysis.

INTRODUCTION

According to a report published by MHLW in Japan, the number of user and the amount of benefit expenses of LTCI continued to increase since the insurance system had been enforced on 2000.

The more LTCI is used, the more the amount of benefit expenses of it should increase mandatorily. Various factors related with the increment were reported in several earlier studies. [1,2] Nishiyama et al [1] described the proportion of aged people influenced to the amount of benefit expenses in LTCI. Moreover, Nagayoshi et al [2] showed the number of clinics per population and the numbers of persons requiring long-term care were affected to it in addition to the proportion.

Although many studies had been executed on medical costs in Japan, it was

still few studies concerning factors related with the amount of benefit expenses in LTCI.

This study was to analyze factors on regions and nursing which were found in earlier studies. [1,2] Therefore, this study aimed to clarify the magnitude of impacts that these factors affected on benefit expenses on home-visiting nurse in LTCI.

The purpose of this analysis was not to construct a model but to make clear of the magnitude of factors on home-visiting nurse. Therefore, after analyzing only variables on regional factors, variables on home-visiting nurse additionally were done.

It was thought to clarify the size of influence of home-visiting nursing factors on benefit expenses relating home-visiting nurse in long-term care through this analysis. Specifically, as analysing factors by prefecture such population and average length of stay etc, then analysing factors relating home-visiting nurse additionally, it could be thought to make clear how did these nursing factors explain benefit expenses in LTCI.

MATERIALS AND METHODS

Published reports included Population Census [3,4] (surveyed in every 5 years) by the MIAC and MHLW were used as these analyzing data. Years of used these reports were 2005 and 2010 because the last Population Census [4] by MIAC was surveyed in 2010 and the second last one [3] was done in 2005.Moreover, the usage of LTCI since 2005 was considered as enough popular because LTCI was enforced on 2000. Accordingly the Population Census in the same year 2000 did not use in this study.

Data used in this study were showed by prefecture and categorized into two types: regional variables and home-visiting nursing variables. Specifically, the former were population, proportion of aged 65 or over and average length of stay, and the latter were the number of persons requiring long-term care/ needed support, the number of users of home-visit nursing care, the number of use of home-visit nursing care per user and the number of nursing personnel.

Variables: This study used the benefit expenses on home-visiting nurse of LTCI by prefecture [5,6] as an output in analysis. The benefit expenses in long-term care referred to a total sum of money which was added the usage fee (10% of the service cost) of services by users and the rest of the service cost (90%) spent by municipalities, prefectures and national government as the insurer of LTCI and insurance premiums. [7] The benefit expenses on home-visiting nurse in LTCI were used as a dependent variable in this study.

The proportion of aged 65 or over referred to the one in each 47 prefectures in Japan, was used data from Census by MIAC. The Census was a complete and nationwide survey performed in every 5 years, and its subject was all people and household resided in Japan. [3,4] Therefore, this survey was the most credible survey on population dynamics in Japan. Average length of stay was computed values by prefecture and average values of inpatient days in hospitals had more 20 beds. These data were used the Hospital Report published by MHLW in 2005 and 2010. [8,9] Factors related home-visiting nurse contained the number of persons requiring long-term care/ needed support, the number of users of home-visit nursing care, the number of use of home-visit nursing care per user and the number of nursing personnel. The person requiring long-term care/ needed support referred to a certified person was available to use services of LTCI. [7] They were roughly divided into primary insured persons and secondary insured persons. The former were old people aged 65 or over and didn't required the presence of disease. The latter were people aged from 40 to 64 as well as required any diagnosis of 16 diseases designate by MHLW. [7]

These insured persons applied for use services of LTCI to a certification of long-term care need by municipalities. As a result, if they were approved any levels of

long-term care need (requiring support 1 and 2, requiring long-term care1 to 5), they could use any services of LTCI included home-visiting nurse care, home-visiting bathing care and outpatient day long-term care and so on. The certification of long-term care need had 7 levels. The slightest degree one was the requiring support 1 which defined as required the fewest amount of care evaluated in time and the severest degree one was the requiring long-term care 5 which defined as required the most numerous amount of care. The more severe the degree of long-term care need is, the more amounts of LTCI services are available to use for small fees (10% of the service cost). [7] The number of persons requiring long-term care/ needed support referred to a total number of certificated person (monthly prevalence) by prefecture. The users of home-visit nursing care referred to a person received the service of it using LTCI. [10,11] Home-visiting nurse was used through public medical insurance other than LTCI. However, the benefit expenses of it on public medical insurance did not subsume under benefit expenses in this study so as to focus on the benefit expenses on LTCI. Accordingly, it was thought that this analysis made it clear how large the magnitude of influencing by factors concerning home-visiting nurse on benefit expenses of home-visiting nurse increasing rapidly since 2000 LTCI enforced on.

The number of use of home-visit nursing care per user was to the number of use of home-visiting nurse in a month per user through LTCI. [10,11] The number of nursing personnel referred to the number of nurse staff engaged in home-visiting nursing care in a month by prefecture. [10,11] The home-visiting nursing personnel consisted of public health nurse, midwife, nurse and assistant nurse by law enacted. The actual number of nursing personnel was a sum of full-time staff and part-time one.

Some people may think it odd that while adopting the dependent variable as benefit expenses of home-visiting nurse, independent variables included the number of nurse personnel worked in it. In first place, benefit expenses of LTCI was to accrue when people requiring long-term care/ needed support received long-term care benefits. Therefore, the emergence of such benefits expenses was said to results which home-visiting nurses did not cause such expenses but people certificated of long-term care need consumed any services through LTCI. Hence, inputting the number of nurse personnel as independent variable in this analysis might be unlikely to be appropriate so as to explain the amount of benefit expenses of home-visiting nurse in LTCI. On the other hand, it was not necessary that independent variables included the number of home-visiting nurse if the number of visiting nurses was never in short for the demand with people requiring long-term care/ needed support. Nevertheless, a shortage of visiting nurses was currently at issue in Japan. [12,13] Therefore, the existence of them will make it reveal the demand on home-visiting nursing services with people requiring long-term care/ needed support. Consequently, if the shortage arises at any area, they couldn't use home-visiting nurse service sufficiently. However, if not, they could use such a service to result in incurring benefits expenses in LTCI.As taking the relevance into account, the number of nursing personnel was put into this analysis as explanatory variables.

Analysis Methods: At first, using Spearman's rank correlation coefficient with significance level of 5%, statistically significant variables related with benefits expenses on home-visiting nursing were found. Then these significant variables were analyzed in multiple regression analysis with benefits expenses on home-visiting nursing as dependent variable. The multiple regression analysis conducted two times. The first one analyzed with only regional factors as explanatory variable. Subsequently, significant variables resulting in the first analysis as well as 4 variables on home-visit nursing were analyzed.

Such an analysis method conducting multiple regression twice with the same dependent variable should have a multiple testing. In an analysis result, namely, it's to be in danger of arising type 1 error regarding wrong independent variables as statistically significant ones. Nevertheless, because the purpose of this study was to clarify how much gained the degree of explanation after adding factors of home-visit nursing to regional factors, a model development and specifying some factors related with benefits expenses were without a scope of the purpose. Therefore, as considering no effect of the multiple testing on a result in this study, twice conducted multiple regression analysis.

Using the adjusted R-squared in multiple regression method, the presence or absence of additional amount of explanation was evaluated when adding factors of home-visiting nursing. The degree of certainty with the adjusted R-squared was assessed by the goodness-of-fit:Durbin-Watson ratio (D-W ratio), Variance Inflation Factor (VIF). The level of significance was set at $p < 0.05$. Data were analysed using SAS university edition.

RESULTS

94 samples in terms of 47 prefectures in Japan were collected from published reports by MIAC and MHLW in 2005 and 2010. Descriptive statistics were showed in Table1.

First, using Spearman's rank correlation coefficient, the relationship between benefit expenses of home-visiting nurse with independent variables (Table2). All independent variables were found to be related with benefit expenses statistically significant. The proportions of aged 65 or over, the average the length of stay, and the number of home-visit nursing care per user were a negative correlation with benefit expenses. Intuitively, as the proportion of aged 65 or over and the number of use of home-visit nursing care per user were likely to be a positive correlation. However, it showed a negative one with them.

Table1: Descriptive statistics (n=94)

Variables*	Median	Minimum	Maximum
Benefits expenses of home-visit nursing care in Long-term care insurance (Yen in millions)	1611.5	424.0	16585.0
Population	1729710.5	588667.0	13159388.0
Proportion of aged 65 or over (%)	23.7	16.1	29.6
Average length of stay (days/month)	35.1	24.9	55.4
The number of persons requiring Long-term care/needed support	72266.5	26339.0	444486.0
The number of user of home-visit nursing care†	3782.0	552.0	37121.0
The number of use of home-visit nursing care per user†	6.0	4.5	7.7
The number of nursing personnel‡	442.0	86.0	3207.0

* These variables were measured by prefecture in Japan, † These number were in Long-term care insurance not Health care insurance system, ‡ The nursing personnel consisted of public health nurse and midwife, nurse, assistant nurse.

Table.2 The result of univariate statistics* (n=94)

Variables†	Correlation coefficient	p-value
Population	0.9110	<0.0001
Proportion of aged 65 or over	- 0.4517	<0.0001
The number of persons requiring Long-term care/needed support	0.9173	<0.0001
Average length of stay	-0.4904	<0.0001
The number of user of home-visit nursing care‡	0.9874	0.0007
The number of use of home-visit nursing care per user‡	-0.3442	<0.0001
The number of nursing personnel§	0.9732	<0.0001

* The Spearman's rank correlation coefficient were used in clarifying relationships interested variables with benefits expenses of home-vist nursing care in Long-term care insurance., † These variables were measured by prefecture in Japan, ‡ These number were in Long-term care insurance not Health care insurance system., §The nursing personnel consisted of public health nurse and midwife, nurse, assistant nurse.

Second, multiple regression analysis was conducted twice. At first of it, only region factors were input, then, at second of it, in addition to statistically significant variables (region factors) resulting of first of it, factors of home-visit nursing were analyzed.

In result of the analysis, all of 3 region factors were found to be statistically significant (Table3). Regression coefficients of population (0.9993) and proportion of aged 65 or over (0.1567) indicated a positive (p<0.0001, both). Increasing of these variables was significantly related with gain of the amount of benefit expenses. On the other hand, a regression coefficient of average length of stay showed a negative (-0.0786, p=0.0258).

Table3. The result of multiple regression analysiswith regional factors (n=94)

Variables	Standardized coeffiecient	p-value	VIF
Population	0.9993	<0.0001	1.5981
Proportion of aged 65 or over	0.1567	<0.0001	1.4670
Average length of stay	-0.0786	0.0258	1.2019

Then, 3 these regional factors as well as factors of home- visiting nursing were input into the multivariate analysis (Table4).

Table4. The result of multiple regression analysis with regional and home-visit nursing factors (n=94)

Variables	Standardized coeffiecient	p-value	VIF
Average length of stay	-0.0261	0.0410	1.3334
The number of user of home-visit nursing care*	1.0107	<0.0001	1.4571
The number of use of home-visit nursing care per user*	0.0611	<0.0001	1.2482

*These numbers were in Long-term care insurance not Health care insurance system.

As a result, average length of stay was related with the dependent variables significantly, however, population and proportion of aged 65 or over were not. The regression coefficients of average length of stay was a negative (-0.0261, p=0.0410). Among factors of home- visiting nursing, the number of user and the number of use of home- visiting nursing care per user were variables significantly concerned with benefit expenses. Moreover, both were positive regression coefficients (1.0107, p<0.0001: 0.0611, p<0.0001 respectively). As compared a result of the first analysis with the second one (Table5), although a standardized R-squared in the analysis with only regional factors (the first analysis) was 90.7%, the one gained 98.9% in the analysis adding it to home-visit nursing factors (the second analysis). In terms of D-W ratio, the former had 1.366 and the latter did 2.141. Consequently, the latter was indicated higher value of goodness of fit than the former. Moreover, VIF in both models provided low possibility of multicollinearity because these values were less than 2.0.

Table5. R-squared and goodness of fit on models

Independent variables	Standard izedR-squared (%)	D-W ratio*	VIF
Only regional factors	90.70	1.366	1.2019 - 1.5981
Added home-visit nursing factors	98.90	2.141	1.2482 - 1.4571

*Durbin-Watsonratio

DISCUSSION

This study aimed to clarify how much the magnitude of explanation (standardized R-squared) with regional factors and home-visit nursing factors on benefit expenses of home-visiting nurse in LTCI. As a result, although 90.7% of standardized R-squared in the analysis with only regional factors showed, one in the other analysis with home-visit nursing factors additionally went up to 98.9% were found.

For the sake of a well-substantiated explanation with respect to an amount of benefit expenses of home-visiting nurse, results in this analysis were considered to provide a necessity of adding home-visit nursing factors as well as regional factors in an analysis according to the gain of standardized R-squared value. Moreover, the result of 90.7% explanation about a variance of the benefit expense through the analysis included just regional factors such as population variable considered to make it confirm that a difficulty of avoiding an increasing of benefit expenses in LTCI as it continued to rise the proportion of elderly in

the total population in Japan in near future. [14]

Then, discuss variables representing different signs of coefficient between univariate analysis with multivariate one. Although the proportion of aged 65 or over had a negative correlation coefficient (0.4517) in Spearman's rank correlation coefficient (Table2), it did a positive regression coefficient (0.1567) in multiple regression analysis (Table3). This discrepancy was thought to bring out by a cause of adjusting confounding factors using multivariate analysis. Specifically, the amount of benefit expense might decrease as proportion of aged people rised in some prefectures. Supposing proportion of aged people is high and total population is small at some prefectures, a relatively small number of elderly populations is considered to bring about low amount of benefit expenses in the prefecture. In fact, the elderly population and the proportion of aged 65 or over varied on by prefecture. Therefore, the proportion of elderly people was considered to be a negative correlate with benefit expenses. Moreover, the result of the second multiple regression analysis represented not the proportion of aged 65 or over but the number of user of home-visit nursing care as a significantly variable. This result is regarded reasonable because the dependent variable was benefit expenses of home-visiting nurse. That is, it concludes that not the size of proportion of aged people but the number of user itself was related determinately with benefit expenses of home-visiting nurse.

Likewise, a number of uses of home-visiting nursing per user were found to be related significantly with a gain of benefit expenses. Consequently, it considers that more use of home- visiting nursing by one user demonstrated increasing of benefit expenses of home-visiting nurse naturally. Then, examine average length of stay. As a result of analysis the data by prefecture in 2005 and 2010, the average length of stay displayed a negative regression coefficient (-0.0261,p=0.0410), namely, this result is to considered to suggest that the longer people stay in the hospital, the smaller an amount of benefit expenses incurs in the area. However, further studies are needed in order to inspect this result. Because the hospitalization period continues to be diminished, and patients completed an acute-phase treatment are to be induced administratively to return to their home as soon as possible in Japan. [14] It goes without saying that the purpose of medical policy is obviously to restrain the increment of medical care expenditure while providing appropriate and high quality the medical services.

Nevertheless, the result of this study set forth an implication that a reducement of average length of stay did not diminish the cost of home-visit nursing but increase. It considers that validating a certainty of this result so that providing a worthwhile suggestion for the medical policy in near the future. Therefore, further studies are needed for it.

CONCLUSIONS

1. The magnitude of explanation by regional factors on benefit expenses of home-visiting nurse in LTCI was 90.7%.
2. The magnitude of explanation by regional factors as well as home-visit nursing factors on benefit expenses of home-visiting nurse in LTCI was 98.9%.

REFERENCES

1. Nishiyama Tomohiro, Matsuda Shinya. Analysis on factors related with increasing benefit expenses in Fukuoka prefecture. Journal of health and welfare statistics.2007; 54(8):40-47.
2. Nagayoshi Ruriko, Miyaji Fumiko,et al. The influencing factors on the elderly medical expenses among municipalities/ Okinawa prefecture in three years after the federal insurance for the elderly care has started. Journal of Okinawa Prefectural College of Nursing. 10, 2009; 71-78.
3. Ministry of Internal Affairs and Communications. 2005 Population Census. 2005.http://www.e-

stat.go.jp/SG1/estat/GL02100104.do?tocd=00200521. (accessed2016.3.26).
4. Ministry of Internal Affairs and Communications.2010 Population Census. 2010. http://www.e-stat.go.jp/SG1/estat/GL02100104.do?tocd=00200521. (accessed2016.3.26).
5. Ministry of Health, Labour and Welfare. 2005. Survey of Long-term Care Benefit Expenditures. 2005. http://www.mhlw.go.jp/toukei/list/45-1.html. (accessed2016. 3.26).
6. Ministry of Health, Labour and Welfare. 2010 Survey of Long-term Care Benefit Expenditures. 2010. http://www.mhlw.go.jp/toukei/list/45-1.html.(accessed2016.3.26).
7. Ministry of Health, Labour and Welfare. 2013. Health and Welfare Services for the Elderly. http://www.mhlw.go.jp/english/wp/wp-hw6/dl/10e.pdf. (accessed2016.3.26).
8. Ministry of Health, Labour and Welfare. 2005Hospital Report. 2005. http://www.mhlw.go.jp/toukei/list/80-1.html. (Accessed 2016.3.26).
9. Ministry of Health, Labour and Welfare. 2010 Hospital Report. 2010. http://www.mhlw.go.jp/toukei/list/80-1.html. (accessed2016.3.26).
10. Ministry of Health, Labour and Welfare. Survey of Institutions and Establishments for Long-term Care. 2005.http://www.mhlw.go.jp/toukei/list/24-22-2.html.(accessed2016.3.26).
11. Ministry of Health, Labour and Welfare. Survey of Institutions and Establishments for Long-term Care. 2010.http://www.mhlw.go.jp/toukei/list/24-22-2.html. (accessed2016.3.26).
12. Ministry of Health, Labour and Welfare.The 6th Projection of Estimated Supply and Demand for Nursing Personnel. 2009.http://www.mhlw.go.jp/english/wp/wp-hw4/dl/health_and_medical_services/P47.pdf. (accessed2016.3.26).
13. Keiko Sekiguchi.Causes of Nurse Shortages and Necessity of New Nursing. Bulletin of graduate studies /Hosei University. 2013.http://repo.lib.hosei.ac.jp/bitstream/10114/7850/1/12_grad_70_sekiguchi.pdf. (accessed2016.3.26).
14. Ministry of Health, Labour and Welfare. Annual Health, Labour and Welfare Report 2013-2014: Health and Welfare Services for the Elderly. http://www.mhlw.go.jp/english/wp/wp-hw8/index.html. 2015 (accessed 2016.3.26).

How to cite this article: Ikenishi K, Nakagaki N, Akabane A. The effect of nursing factors affected on benefit expenses related home visit nursing in long term care insurance by prefecture in Japan. Int J Health Sci Res. 2016; 6(5):207-213.

****