Physician visits and activities of daily living among middle-aged and elderly Japanese adults[1]

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Abstract

Existing studies show some association between medical and long-term care expenditure among those who received care, but decisions on medical care utilization in relation to long-term care needs have not been examined yet. This study empirically examined the relationship between the number of physician or outpatient visits and two measures of physical functioning, the activities of daily living (ADLs) and physical mobility, strength, and fine motor skills (MSFMS), among the middle-aged and elderly adults in Japan, using panel data from the Japanese Study of Aging and Retirement (JSTAR). Our analysis showed that individuals who reported limitations in at least one dimension in the MSFMS visited 0.4 times more often than those who did not, whereas there was no statistically significant difference in the out-of-pocket payment per visit between the two groups. The total payment per month was hence greater among individuals that reported limitations in the MSFMS, which was likely to be driven by the increased number of visits rather than the difference in payment for treatment they received upon visit. We did not find statistically significant association between medical care utilization and ADLs.

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1. Introduction

Recent discussion on the efficient use of healthcare resources focuses on the role of formal long-term care. After the introduction of the long-term care insurance system in Japan, long-term care utilization among the elderly has increased (Kan 2010) and a study found that an increase in the supply of long-term care facilities successfully reduced the number of inpatient days among the elderly population (Hanaoka & Suzuki 2007). To understand how individuals use medical care services is the essential step for further discussion on the efficient use of healthcare resources in the aging population. Previous studies using administrative data analyzed the relationship between medical and long-term care utilization among those who used services (Sugawara et al. 2005; Suzuki et al. 2011). What is unknown is how the elderly who dwell in the community make decisions on utilization of medical care services in relation with the need of long-term care. In this study, we explored how individuals who dwell in the community utilize medical care services in relation to limitations in their physical functioning. In contrast to the previous studies, our analysis focuses on the general population that include those with and without medical care utilization to understand how physical functioning is related to an individual's choice in medical care utilization.

2. Data and Methods

2.1 Data

We used the first and second waves of the Japanese Study of Aging and Retirement Survey (JSTAR, hereafter) in 2007 and 2009, respectively, conducted by the Research Institute of Economy, Trade and Industry (RIETI) in collaboration with Hitotsubashi University and the University of Tokyo. JSTAR collects micro-level longitudinal data on various aspects of living of middle-aged and elderly adults, including economic, social, and health information. The survey is designed to retain the compatibility with a few international surveys including the Health and Retirement Study (HRS) in the United States, the Survey of Health, Aging and Retirement in Europe (SHARE) in continental

Europe, and the English Longitudinal Study of Aging (ELSA) in the United Kingdom.

The survey universe is not a national representative sampling, but rather the survey collected individuals who reside in designated municipalities. In the first wave, data was collected in the following five municipalities: Adachi Ward, Kanazawa City, Shirakawa-cho, Sendai City, and Takigawa-cho. In 2009, Tosu City and Naha City were added to the five municipalities, resulting in seven municipalities in total. The residence of respondents could not be identified in the dataset used for our analysis for confidentiality reasons. Respondents were aged between 50 and 75 years at the time of the first survey.

2.2 Variables

To understand the relationship between medical care utilization and the individual's level of physical functioning, we used three measures of medical care use as dependent variables and two measures of the level of physical functioning as the main explanatory variable.

Dependent variables

We used the following three measures of medical care utilization: 1) number of physician or outpatient visits per month ("number of visits"); 2) out-of-pocket payment for care and prescribed medicine per visit ("payment per visit"); and 3) total out-of-pocket payment for care and prescribed medicine per month ("total payment per month"). The first measure describes the individual's decisions on if they visit physician or outpatient services, indicating the individual's choice. The second measure describes treatment or care individuals obtained upon their visit, which rather reflects the physician's choice on behalf of his/her patients. The total medical care expenditure is determined by both factors.

We constructed the three measures from survey questionnaires as follows. For 1) "number

of visits" was constructed from the response to the question that asks, "How often do you visit the clinic or hospital that you visit regularly once or more per month?" For 2) "payment per visit" was constructed from the response to the question that asks, "How much do you usually pay for services and prescribe medicine at a clinic or hospital that you visit regularly once or more per month?" We then obtained 3) "total payment per month" by multiplying 1) and 2).

Figures 1 and 2 show the distribution of the number of visits and payment per visit among those who visited. The majority of respondents reported a visit once or less in a month. Approximately 60% of the respondents reported no visits per month, and 28% of the respondents reported visiting once per month. There are a few individuals who reported 20 visits or above per month, indicating the burden of medical care falls disproportionately in the population. Among those who reported at least one visit per month, more than half of the respondents paid 5,000 yen or less per visit. As the payment distribution is skewed to the left, we transformed the variable into its logged variable in our analysis.

Dependent variables: Limitations in physical functioning

We used the following two variables as measures of physical functioning. First, we used a binary to indicate if respondents reported difficulties in any of the six activities in the top panel of Table 1 ("ADLs index" hereafter). The six activities correspond to measures of physical functioning well-known as "Activities of Daily Living (ADLs)", developed by Katz et al. (Katz et al.). Performance of ADLs evaluates a functional status of an individual particularly for the elderly and for the disabled. Second, we used a binary to indicate if respondents reported difficulties in any of the nine activities related to mobility, strength, fine and motor skills ("MSFMS index" hereafter). The second set of activities is more related to physical aspects of individuals than the ADLs and evaluated overall physical functioning. In the two-year pooled data, the proportion of individuals

who reported limited activities is approximately 5% measured by the ADLs index and 18% measured by the MSFMS index (Table 2).

[Table 2 here]

Control variables

In our regressions, we added various variables as dependent variables, including age, age squared, sex, existence of spouse, perceived health status, diagnosis of a disease within the past year, indicator of the residence of the child who lives nearest, and limitations in the physical functioning of the respondent's spouse. For perceived health status, we included five binaries to indicate "very good", "good", "bad", "very bad", and no response with "fair" being a reference category. In addition to age, we also added a binary to take unity if an individual was aged 70 years or older to control for the reduction in the rate of out-of-pocket payment under the current healthcare system in Japan.

In the two-year pooled data, the mean age was 64 years old, and approximately half of the respondents were male. 80% of the respondents had a spouse. 68% of the respondents received a diagnosis of any disease in the past year, and the mean of the five-scale perceived health status was 2.75. 75% of the respondents had a primary care or family doctor.

2.3. Empirical strategies

First, to understand the relationship between medical care utilization and physical functioning, we used a linear model and Tobit model with two-year panel data. Specifically, when the number of visits per month was used as the dependent variable, we assumed a linear model using all individuals including those who reported no visits per month and applied a simple OLS and fixed effect approach. When payment per visit was used as the dependent variable, we assumed a linear model

using data from individuals who reported at least one visit per month and applied a simple OLS and fixed effect approach. When the total monthly payment was used as the dependent variable, we used the Tobit model for our analysis using all observations. For fixed effect estimation, we restricted our sample to those from the five municipalities that participated in the survey in Wave 1.

Second, to examine how the reduction in copayment at age 70 affects the relationship between medical care utilization and physical functioning, we added the two interaction terms between the two binaries of physical function measures, ADLs index and MSFMS index, and the dummy to indicate if an individual was 70 years old or above ("elderly dummy"). Using this specification, we intended to test the hypothesis that individuals tend to increase medical care utilization when out-of-pocket payment decreased for the same level of limitations in physical functioning. We applied the same estimation method as the main regression analysis for the second part of the regression.

3. Results

3.1 Number of physician visits and physical functioning

Table 3 shows regression results on the relationship between the number of visits and physical functioning from pooled OLS and fixed effect estimation. There was a positive association between the number of visits per month and the MSFMS index, indicating that individuals with limitations in daily activities tended to use medical care services more often than those without. The fixed effect estimation showed that the difference in the magnitude between those with and without limitations in physical functioning was 0.4 visits per month. By contrast, we did not find an association between the number of visits and the ADLs index.

When controlling for unobserved heterogeneity using fixed effect estimation, the magnitude of the observed association between the number of visits and the MSFMS index

decreased, suggesting that the unobserved heterogeneity mediated the observed association between the aforementioned two variables. Such heterogeneity, for example, could be an individual's emotional or psychological factors. One possible scenario to explain the mediation is that those who are pessimistic about their health condition may tend to provide an underscore on their physical functioning and at the same time may visit hospitals or clinics more often than those who are not.

[Table 3 here]

Next, let us focus on the coefficient estimates on control variables. We found that having a primary care or family doctor and disease diagnosis within the past year both increase the number of visits. Perceived health status was significantly associated with the number of physician visits in the pooled OLS analyses in various levels whereas the significance disappeared when the fixed effect estimation was applied, and the only exception showed that individuals that reported a "bad" health condition visited more often than those who reported "fair" with the magnitude of the difference being 0.53. Interestingly, age was not a significant predictor of the number of visits.

3.2 Out-of-pocket payment per visit and physical functioning

Table 4 shows regression results on the relationship between out-of-pocket payment per visit and physical functioning using pooled OLS and fixed effect estimation. In contrast to the previous results, we did not find any statistically significant relationship in either measure of physical functioning. Although physical functioning was associated with the number of physician visits, the intensity and contents of treatment measured by out-of-pocket payment per visit did not differ between those with and without challenges in daily activities.

[Table 4 here]

Next, let us look at coefficient estimates of other control variables. Age and the squared age were associated positively and negatively with payment per visit, indicating that out-of-pocket

payment increases but that marginal increases decrease with age. We found a similar result as in Section 3.1 regarding the comparison between the two estimation methods on the coefficient of perceived health status. Pooled OLS demonstrated that most of the indicators of perceived health status were associated with out-of-pocket payment per visit whereas fixed effect estimates did not, suggesting that the association attributed to between-individual variations rather than within-individual variations. The binary to indicate individuals aged 70 or more showed a negative coefficient, reflecting the reduction in out-of-pocket payment for the age group under the healthcare system in Japan.

3.3 Out-of-pocket payment per visit and physical functioning

The results in Tables 3 and 4 indicated that individuals who reported limitations in some type of physical functioning tended to visit physicians more often than those who did not whereas out-of-pocket payment per visit did not differ. In this subsection, we analyzed how these two effects affected the total amount of out-of-pocket payment per month using the Tobit model. Table 5 indicated that individuals who reported any problem in mobility, strength, fine and motor skills paid more than those who did not, and the magnitude of the difference was 69%. The greater monthly payment among those who reported the problem(s) is most likely to arise from greater frequency in visits rather than the unit payment per visit considering the results in the previous two subsections.

It is important to notice, however, that unobserved heterogeneity was not controlled for in these regressions as the model did not allow us to use the fixed effect estimation. It is possible that the coefficient estimates may be subject to a similar upward bias as we observed in the analyses in Sections 3.1 and 3.2. Other estimates of coefficient, such as the indicators of perceived health status, may be subject to upward bias for the same reason as well.

[Table 5 here]

3.4 The effect of changes in copayment rate on medical care utilization

Under the current healthcare system in Japan, the copayment rate decreased from 30% of the total amount to 10% once individuals became 70 years old. To understand how the reduction in copayment rate affects an individual's medical care utilization in particular in relation to physical functioning, we next added the following two interaction terms in the regressions; interaction terms between the dummy to indicate 70 years old or above ("elderly dummy") and the MSFMS index; and the elderly dummy and the ADL index. Table 6 shows the results. The columns showed the OLS, fixed effect estimation, and the estimation of the Tobit model, respectively.

The number of visits was positively associated with the MSFMS index, consistent to the earlier result in Section 3.1. The coefficient estimate of the interaction term between the elderly dummy and the MSFMS index was negative, indicating that the positive association between the number of visits and the MSFMS index decreased once individuals became 70 years old. The coefficient estimate of the elderly dummy is positive, suggesting that the number of visits increased after 70 years old. These results suggest that the increase in the number of visits after 70 years old occurred for reasons that were not attributable to limitations in physical functioning.

The only variable that affected out-of-pocket payment per visit was the elderly dummy. Total payment per month was positively associated with the elderly dummy but we did not find any significant relationship between the two interaction terms and the dependent variable.

[Table 6 here]

4. Conclusions

We examined the relationship between medical care utilization and physical functioning among middle and elderly adults in Japan using data from the first and second waves of Japan Study of

Aging and Retirement (JSAR). We summarize our findings as follows.

First, we found that those who reported difficulties in any of the activities related to mobility, strength, fine and motor skills were likely to visit a hospital or clinic more often than those who did not. The association, however, was reduced when unobserved heterogeneity was controlled for using fixed effect estimation, indicating that at least a part of the association attributed to between-individual variations. The change in copayment rate at the age of 70 also affected the relationship, decreasing the magnitude of the association for those aged 70 years or older. This is likely to indicate that the reduction in copayment rate did not significantly increase medical care utilization associated with problems regarding physical functioning.

Second, the association was statistically significant when one of the indexes, MSFMS index, was used for the analysis and we did not find any statistically significant association when physical functioning were measured by the ADLs index.

Third, we found that those who reported difficulties in the MSFMS paid more than those who did not for medical expenditure per month, and this increase attributed to the number of visits rather than to greater payment per visit. It is important to notice, however, that in the analysis, the Tobit model was estimated with pooled data without controlling for unobserved heterogeneity and the magnitude and the statistical significance may be subject to change when additional explanatory variables were added to the model.

Further analyses will be necessary to identify causal effect of physical functioning on medical care utilization to understand the mechanism behind the relationship. Upcoming data of the Japanese Study of Aging and Retirement Survey will help us to understand how individuals make decisions on medical care utilization.

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Table 1. Definitions of limitations in physical functioning

ADLs	1	Dressing (putting shoes or socks on and off)
	2	Moving in the room
	3	Bathing and showering
	4	Eating
	5	Lying down and getting up on the bed
	6	Toilet hygiene
MSFMs	7	Walking 100 meters or more
	8	Sitting for 2 hours or more
	9	Getting up from the chair after sitting long time
	10	Using stairs without using the slope
	11	squatting down
	12	Raising arms to the level higher than sholders
	13	Moving chair or sofa in the room
	14	Carrying and moving boxes 5 kilograms or more
	15	Picking up small stuff

Table 2. Descriptive Statistics

	N	Mean	Std.Dev.	Min	Max
Number of visits per month	8893	0.77	1.94	0	28
Out-of-pocket payment per visit (JPY)	4135	7579	233275	0	15000000
Total OOP payment per month (JPY)	3481	14678	508735	0	30000000
ADLs index	7852	0.05	0.21	0	1
MSFM index	7852	0.18	0.38	0	1
Age	8891	64.23	7.14	50	79
Sex	8899	0.50	0.50	0	1
Having Spouse (yes=1)	7815	0.80	0.40	0	1
ADLs index of spouse	6064	0.03	0.16	0	1
MSFM index of spouse	6038	0.10	0.29	0	1
Index of distance from the nearest child	7022	2.33	1.48	1	6
Any diagnosis during the past year (yes=1)	8772	0.68	0.47	0	1
Perceived health status (5-scale)	7132	2.75	0.73	1	5
Having a family doctor (yes=1)	7744	0.73	0.44	0	1

Table 3. Association between the number of physician or outpatient visit and physical functioning

	Pooled OLS	Fixed Effect
Age	−0.1165	−0.323
	[0.1231]	[0.2954]
Age squared age	0.001	0.0024
	[0.0010]	[0.0023]
Sex	−0.0951	
	[0.0530]*	
Wave 2 cities (2009=1)	−0.1495	
	[0.0904]*	
ADLs index	0.1362	0.102
	[0.2288]	[0.3834]
MSFM index	0.572	0.4015
	[0.1291]***	[0.1995]**
Spouse's ADLs index	0.2999	−0.3352
	[0.3060]	[0.3495]
Spouse's MSFM index	0.0135	0.254
	[0.1463]	[0.2097]
Index of distance from the nearest child	−0.0129	−0.2012
	[0.0181]	[0.1322]
Any diagnosis during the past year (yes=1)	0.3069	
	[0.0574]***	
Having a family doctor (yes=1)	0.5092	0.4513
	[0.0522]***	[0.1539]***
Perceived health status (very good)	−0.1724	−0.0422
	[0.0795]**	[0.2069]
Perceived health status (good)	−0.0565	−0.0099
	[0.0540]	[0.0830]
Perceived health status (bad)	0.6926	0.526
	[0.1669]***	[0.2522]**
Perceived health status (very bad)	0.263	0.5251
	[0.5278]	[0.7835]
Perceived health status (non-response)	−0.0733	−0.2393
	[0.1648]	[0.1653]
Elderly dummy	0.0886	0.2873
	[0.1560]	[0.2026]
Year dummy	0.0534	
	[0.0541]	
Constant	3.7136	11.5174
	[3.7213]	[9.4684]
N	5098	5098

Table 4. Association between out-of-pocket payment per visit and physical functioning

	Pooled OLS	Fixed Effect
Age	0.1894	0.3754
	[0.0592]***	[0.1861]**
Age squared age	−0.0014	−0.0024
	[0.0005]***	[0.0014]*
Sex	0.1065	
	[0.0337]***	
Wave 2 cities (2009=1)	0.1096	
	[0.0563]*	
ADLs index	0.0182	0.1329
	[0.0936]	[0.1314]
MSFM index	0.0827	−0.0833
	[0.0521]	[0.0821]
Spouse's ADLs index	−0.1215	0.1962
	[0.1254]	[0.3083]
Spouse's MSFM index	−0.1477	0.0814
	[0.0629]**	[0.1067]
Index of distance from the nearest child	−0.0116	0.066
	[0.0118]	[0.0463]
Any diagnosis during the past year (yes=1)	0.2206	
	[0.0474]***	
Having a family doctor (yes=1)	0.3201	−0.0604
	[0.0795]***	[0.2063]
Perceived health status (very good)	−0.1645	−0.0991
	[0.0959]*	[0.1775]
Perceived health status (good)	−0.1026	0.0459
	[0.0396]***	[0.0495]
Perceived health status (bad)	0.2938	0.0582
	[0.0669]***	[0.0996]
Perceived health status (very bad)	0.9134	0.5528
	[0.2159]***	[0.4603]
Perceived health status (non-response)	0.0732	0.1351
	[0.1515]	[0.1772]
Elderly dummy	−0.7186	−0.6246
	[0.0800]***	[0.1125]***
Year dummy	−0.1206	
	[0.0368]***	
Constant	1.3065	−6.2441
	[1.8148]	[6.0194]
N	2679	2679

Table 5. Association between total payment per month and physical functioning

Age	0.2973
	[0.3930]
Age squared age	−0.0018
	[0.0032]
Sex	−0.469
	[0.2261]**
Wave 2 cities (2009=1)	1.5898
	[0.3554]***
ADLs index	−1.6392
	[0.6041]***
MSFM index	0.6921
	[0.3249]**
Spouse's ADLs index	−0.448
	[0.7716]
Spouse's MSFM index	−0.0091
	[0.4319]
Index of distance from the nearest child	−0.0849
	[0.0768]
Any diagnosis during the past year (yes=1)	4.7426
	[0.2952]***
Having a family doctor (yes=1)	8.1291
	[0.3588]***
Perceived health status (very good)	−2.7684
	[0.5904]***
Perceived health status (good)	−0.4495
	[0.2795]
Perceived health status (bad)	1.7748
	[0.3878]***
Perceived health status (very bad)	−0.3023
	[1.4154]
Perceived health status (non-response)	−1.0038
	[0.9005]
Elderly dummy	0.3769
	[0.5139]
Year dummy	−1.2229
	[0.2463]***
Constant	−21.6411
	[12.0805]*
Sigma constant	6.7039
	[0.1154]***
N	5098

Table 6. Effect of the reduction in copayment in the association between medical care utilization and physical functioning

	Number of visits	Out-of-pocket payment per visit	Total OOP payment per month
Age	−0.3507	0.3683	0.2717
	[0.2968]	[0.1871]**	[0.3934]
Age squared age	0.0026	−0.0023	−0.0016
	[0.0023]	[0.0014]	[0.0032]
Sex			−0.4669
			[0.2261]**
Wave 2 cities (2009=1)			1.5981
			[0.3555]***
ADLs index	0.0716	0.0835	−1.9556
	[0.4567]	[0.2153]	[0.8153]**
MSFM index	0.7273	−0.137	1.0501
	[0.2878]**	[0.1148]	[0.4278]**
Spouse's ADLs index	−0.304	0.1957	−0.4095
	[0.3389]	[0.3094]	[0.7720]
Spouse's MSFM index	0.2707	0.0767	0.0034
	[0.2090]	[0.1074]	[0.4320]
Index of distance from the nearest child	−0.1958	0.0624	−0.0868
	[0.1290]	[0.0450]	[0.0768]
Any diagnosis during the past year (yes=1)			4.7448
			[0.2953]***
Having a family doctor (yes=1)	0.4499	−0.0588	8.1283
	[0.1534]***	[0.2083]	[0.3589]***
Perceived health status (very good)	−0.0411	−0.1072	−2.7664
	[0.2023]	[0.1776]	[0.5906]***
Perceived health status (good)	−0.0097	0.0448	−0.4435
	[0.0837]	[0.0499]	[0.2796]
Perceived health status (bad)	0.5296	0.0579	1.7697
	[0.2530]**	[0.0992]	[0.3877]***
Perceived health status (very bad)	0.5611	0.5472	−0.3358
	[0.7878]	[0.4576]	[1.4212]
Perceived health status (non-response)	−0.2466	0.1282	−1.0134
	[0.1625]	[0.1783]	[0.9010]
Elderly dummy	0.3787	−0.6504	0.5234
	[0.2153]*	[0.1144]***	[0.5323]
Year dummy			−1.222
			[0.2463]***
Elderly dummy x ADLs index	0.1414	0.0886	0.69
	[0.8005]	[0.2641]	[1.1854]
Elderly dummy x MSFM index	−0.7672	0.1088	−0.7804
	[0.3392]**	[0.1554]	[0.6089]
Constant	12.2589	−5.9823	−20.8394
	[9.5102]	[6.0433]	[12.0945]*
Sigma constant			6.7029
			[0.1153]***
N	5098	2679	5098