

Empirical Analysis of Nursing Home Duration

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I. Introduction

Nursing home care expenditures have been growing rapidly with the aging of the U.S. population. Hospitals' early discharge policies, which were widely employed after Medicare's adoption of prospective payment system (known as DRG) in 1983, also contributed to the growth of nursing home care expenditures. Nursing home care accounts for as much as 9 percent of the total U.S. personal health care expenditures which has risen faster than has the rest of the U.S. economy over the last several decades.¹⁾ This growth trend is expected to continue.

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1) Levit, K.R., et al., "National Health Expenditures 1990," Health Care Financing Review, Vol. 13, No. 1, 1991, pp. 29-54.

The nursing home care expenditures in Korea is also expected to grow rapidly in near future. As the population ages and the economy becomes industrialized, the demand for nursing home care will increase in Korea. It is because the time cost of caring elderly people by family members becomes more expensive as the economy grows. It is therefore desirable to develop policies for efficiently satisfying the growing demand for nursing home care.

The nursing home industry in Korea has been poor and lacked data useful for policy analysis. As an alternative, this study analyzes a U.S. data set, the 1989/90 Illinois Long-Term Care Facility Survey data, which interviewed all of the nursing homes located in Illinois, U.S.A.

The objective of analyzing the U.S. data is to examine the determinants of nursing home duration and to estimate the expected duration of nursing home patients. The findings in this study are expected to help us understand the utilization and provision of nursing home care, and to provide useful policy implications for efficient resource allocation for long-term care.

This paper is organized as follows. Possible determinants of nursing home duration are explained in the next section. In section III the data are described. Nursing home duration is analyzed descriptively in section IV, and statistically in section V. Concluding remarks are made in the final section.

II. Determinants of Nursing Home Duration

Socio-economic variables have recently received attention for the understanding of nursing home utilization. Wealth, payment source, out-of-pocket nursing home prices, and prices of long-term care alternatives are among the variables analyzed by researchers.²⁾ Garber and

2) Garber, A.M., and MaCurdy, T.E., "Predicting Nursing Home Utilization among the High-Risk Elderly," in *Issues in the Economics of Aging*, Wise, D.A. (ed.), Chicago: The University of Chicago Press, 1990, pp. 249-71.; Greene, V.L., Lovely, M.E., and Ondrich, J.I., "Do Community-Based, Long-Term-Care Services Reduce Nursing Home Use? A Transition Probability Analysis," *The Journal of Human Resources*, Vol. 28, 1993, pp. 227-317.; Headen, A.E., "Economic Disability and Health Determinants of the Hazard of Nursing Home Entry," *Journal of Human Resources*, Vol. 28, No. 1, 1993, pp. 80-110.; Kane, R.A., and Kane, R.L., *Long-Term Care: Principles, Programs and Policies*, New York: Springer Publishing Company, 1987, Ch. 2.; Liu, K., and Manton, K., "The Length of Stay

MaCurdy explore the relation between the duration of nursing home stay and the source of payment for nursing home care.³⁾ They conclude that the incentive effects of the subsidies for nursing home care would play an important role in nursing home utilization.

In identifying the determinants of nursing home duration, this study examines the characteristics of patients and nursing homes as well as socio-economic variables of the county in which the nursing home is located. A priori expectations about the effects of possible determinants is as follows.

Age-at-admission is expected to be a significant factor for nursing home duration. Older patients tend to be less likely to return home and to stay probably until death, all else being equal. In the statistical analysis in section V, a term of age squared is also included to allow for more flexibility in the relationship and to represent a decreasing marginal effect of age on the duration. Garber and MaCurdy also included the squared age term in their analysis of nursing home duration.⁴⁾

Payment source would be a major determinant for the decision of nursing home duration, given the fact that it is very costly to stay in a nursing home without any financial support. Since Medicare pays for nursing home charges with limitations, its patients are expected to stay as short as possible. The same is true for private-pay and insurance patients. In contrast, Medicaid patients are financed fully, and they have little incentive to return home. Further, since they will not be covered for alternative care by Medicaid once they return to private residence, they don't want to be discharged early.

Level of care could be a determinant for the duration. Seriously ill patients are expected to return to hospital for medical treatment or to die before long.

Household income might have a mixed effect on nursing home duration. High income patients

Pattern of Nursing Home Admissions," *Medical Care*, Vol. 21, 1983, pp. 1211-22.; Weissert, W.G., and Cready, C.M., "Toward a Model for Improved Targeting of Aged at Risk of Institutionalization," *Health Services Research*, Vol. 24, No. 4, 1989, pp. 485-510.

3) Garber, A.M., and MaCurdy, T.E., "Payment Source and Episodes of Institutionalization," in *Issues in the Economics of Aging*, Wise, D.A. (ed.), Chicago: The University of Chicago Press, 1992, pp. 249-271.

4) *Ibid.*

can afford to pay for nursing home care. However, they are usually ineligible for public support of Medicaid and would cut the duration. It is therefore expected that income has a negative effect on the duration. On the contrary, the time cost of patients' family members is expected to have a positive effect on the duration. Since high income families tend to have higher time opportunity costs, their nursing home duration would be long.

Finally, the more beds available for nursing home care, the longer the patients can stay, all else being equal. To measure the availability of nursing home beds in a region, this analysis used the bed rate, defined as the number of set-up beds per 100 persons of 65 years old or older.

III. Data Description

The 1989/90 Illinois Long-Term Care Facility Survey data are the major data source for the analysis in this study. The data were collected annually by the Illinois Department of Public Health. In compliance with the Illinois Health Facilities Planning Act (Illinois Revised Statutes 1987, chapter 111½, paragraph 1151 et seq.), all nursing homes are required to provide information requested in the survey. In the data set, there are 1,082 nursing homes in total.

The data set also contains information on a total of 4,834 discharges which occurred during the month of April 1990 across the 1,082 nursing homes in Illinois. All the discharged patients received general nursing care during their stay and were 65 years old or older at their admission. For all of the discharges, the data set contains information on their age, age-at-admission, level of care, payment source and the destination to which they were discharged. It also has information on the nursing homes from which they were discharged: their ownership, location (rural or urban area), etc.⁵⁾

5) Since the data do not have information about the prices of nursing home care and its alternative care, this study was unable to estimate the sensitivity of nursing home duration to the prices. This was a limitation of using the secondary data set.

IV. Descriptive Analysis of Nursing Home Duration

Table 1 summarizes the duration by payment source. It is noted that Medicaid patients usually stayed much longer (a median of 249) than any others. Since Medicare pays fully or partially for nursing home charges only during the first one-hundred days, its patients had short stays: the mean was 73 days and the median was 20 days. The short stays by Medicare patients are related to their large proportion among the total discharges, i.e., 1,393 out of the total of 4,834, representing 28.8%. However, Medicare patients were only 4.2% of the total nursing home residents as of April 1, 1990.

Level of care seems to be a significant factor for the duration. The second panel in Table 1 shows that patients who needed skilled care stayed much shorter (a median of 27 days) than patients who need sheltered care (a median of 514 days). One possible reason for this short stay would be the Medicare's maximum coverage up to 100 days.

The last panel in Table 1 groups the discharges according to the types of destination. It is noted that patients who returned to private residence stayed for a relatively short period, the median being 22 days. Since nursing home care is very expensive, patients would like to return home if they do not have enough financial support. Long stays were observed for the patients who died in nursing homes. Probably they did not have any other options except staying in a nursing home.

In Table 1 no systematic difference is observed in the ages at admission and at discharge. The oldest admitted (discharged) patient was at the age of 107 (108).

<Table 1> Summary Statistics of Length of Stay and Ages at Admission and Discharge

	Mean	st. dev.	Median	IQR	Min	Max
<i>Payment source</i>						
Medicaid (n=1,379)						
Length of stay(days)	693	1008	249	894	1	6567
Age at admission	81	8	82	12	65	105
Age at discharge	83	8	83	12	65	108
Medicare (n=1,393)						
Length of stay(days)	73	238	20	29	15	2709

Age at admission	80	8	80	11	65	107
Age at discharge	80	8	80	11	65	107
Private payment (n=1,916)						
Length of stay(days)	350	726	65	296	1	11676
Age at admission	83	7	84	10	65	102
Age at discharge	84	7	84	10	65	107
Private insurance (n=71)						
Length of stay(days)	71	174	17	46	1	1168
Age at admission	81	8	80	12	67	97
Age at discharge	81	8	80	12	67	97
<i>Level of care</i>						
Skilled nursing care (n=2,131)						
Length of stay(days)	199	590	27	70	1	11676
Age at admission	81	8	81	12	65	107
Age at discharge	81	8	82	12	65	107
Intermediate nursing care (n=2,421)						
Length of stay(days)	506	867	108	574	1	6567
Age at admission	83	8	83	11	65	105
Age at discharge	84	8	84	11	65	108
Sheltered care (n=83)						
Length of stay(days)	814	1073	514	1044	1	5170
Age at admission	83	7	83	7	69	100
Age at discharge	85	7	85	8	69	100

<i>Discharge destination</i>						
Hospital (n=1,525)						
Length of stay(days)	428	741	92	440	1	5880
Age at admission	82	8	82	11	65	105
Age at discharge	83	8	83	11	65	108
Death (n=1,254)						
Length of stay(days)	676	1083	161	906	1	11676
Age at admission	83	8	84	11	65	107
Age at discharge	85	8	85	11	65	107
Private residence (n=1,322)						
Length of stay(days)	58	147	22	40	1	2883
Age at admission	81	7	81	11	65	102
Age at discharge	81	7	81	11	65	102

Other long-term-care facility (n=507)						
Length of stay(days)	263	542	47	196	1	5170
Age at admission	82	8	82	11	65	102
Age at discharge	82	8	83	12	65	102

<Table 2> Parameter Estimates of Length-of-Stay Regressions

Variable	Model 1		Model 2	
	Estimate	std. error	Estimate	std. error
Intercept	0.8376	2.3677	4.0107**	0.3852
Age	0.0894	0.0577	0.0112**	0.0033
Age ²	-0.0005	0.0004	---	---
Dummy for payment source				
Medicaid	1.1319**	0.0627	1.1272**	0.0626
Medicare	-0.0834**	0.0810	-0.8358**	0.0810
Dummy for level-of-care				
Skilled care	-1.4060**	0.2081	-1.4140**	0.2080
Intermediate care	-1.1070**	0.2026	-1.1133**	0.2026
Income	0.000005	0.000004	0.000005	0.000004
Bed rate	0.0369**	0.0120	0.0369**	0.0121
R-square	0.204		0.2037	

- Note: 1) Model 1 includes a AGE² variable in addition to all other variables in Model 2.
 2) The baseline for the payment source dummy variables is private-pay and insurance.
 3) The baseline for the level-of-care dummy variables is sheltered care.
 4) * and ** denote being significant at the level of 0.1 and 0.01, respectively.

V. Statistical Analysis of Nursing Home Duration

While I have discussed possible determinants of and their effects on nursing home duration in previous sections, a statistical analysis clearly requires a more concrete specification of the relationship between nursing home duration and explanatory variables. I employ the following log-linear model:

$$\log(\text{LOS}_i) = a_0 + a_1 \text{AGE}_i + a_2 \text{AGE}_i^2 + a_3 \text{MED}_i + a_4 \text{MCR}_i + a_5 \text{SKL}_i + a_6 \text{INT}_i + a_7 \text{INCOME}_i + a_8 \text{RATE}_i + u_i \quad (1)$$

where

$\text{MED}_i = 1$ if patient i was financed by Medicaid

$\text{MCR}_i = 1$ if patient i was financed by Medicare

$\text{SKL}_i = 1$ if patient i received skilled nursing care

$\text{INT}_i = 1$ if patient i received intermediate nursing care

$\text{INCOME}_i =$ median income in the county where the patient i 's nursing home was located

$\text{RATE}_i =$ bed rate (number of beds per 100 persons of 65 years old or older) in the county

where the patient i 's nursing home was located, and u_i is a normal variate.

Table 2 presents the estimation results for the specification (1), called Model 1. Model 2 in the table is the same as Model 1 except that it does not include the AGE^2 term. Consistent with a priori expectations, the coefficient of AGE is positive and significant in Model 2. In Model 1, the coefficient estimates for AGE and AGE^2 are consistent with our expectations, indicating the AGE had a positive impact on the duration but with a decreasing marginal rate. Although the coefficients are individually insignificant at a usual significance level, they are jointly significant.

Medicaid patients' durations were longer on average by 1.1319 days than private-patients'. In contrast, Medicare patients stayed for significantly shorter periods. It indicates that the payment

source is a significant factor for nursing home duration.

Level of care had also significant effects on nursing home duration. Patients who received skilled or intermediate care were discharged after a shorter period. That would be because they returned to the hospital for medical treatment or were expired.

The income level in the region did not have a significant effect. There may have existed two conflicting effects by the income level. The higher the income level is, the higher the opportunity cost is for the time spent by family members for elderly family members, thus predicting a longer stay in a nursing home. In contrast, if the income level is higher in a certain region, less people would be eligible for Medicaid than elsewhere. Since Medicaid is associated with longer duration, shorter duration would be implied for higher income levels.

<Table 3> Expected Quantiles of Days in Nursing Home

	25th	50th	75th
	<i>Private-pay or Insurance</i>		
Baseline	49	158	509
Age=75	61	197	636
Age=85	70	224	722
Skilled care	12	39	124
Intermediate care	16	52	167
	<i>Medicaid</i>		
Baseline	151	489	1581
Age=75	190	612	1973
Age=85	216	695	2243
Skilled care	37	120	385
Intermediate care	50	162	518
	<i>Medicare</i>		
Baseline	21	69	221
Age=75	27	86	276
Age=85	30	97	314
Skilled care	5	17	54
Intermediate care	7	23	73

Note: The baseline in each group is characterized by 65 years old and sheltered care, evaluated at the median income (\$32,281) and the bed supply rate (7.8 beds per 100 persons of 65 years or older) in Illinois, 1990.

The bed rate was significant for determining nursing home duration. With more beds supplied per elderly, or less excess demand for nursing home care, nursing home patients would be less pressed to be discharged from a nursing home. High bed rates may be at least part of the reason for long stays in nursing homes.

I also analyzed other factors including nursing home ownership, urban/rural region, and unemployment rates, and found that they were not significant. The results reported above are consistent with theoretical predictions and results by other researchers, thus tending to validate the statistical models employed for this analysis.

For a diagnostic check, I reestimated the regression models with excluding seemingly outlying or influential observations. There was little change in the coefficient estimates, supporting the robustness of the results reported in Table 2.

To illustrate the implications of the coefficient estimates, Table 3 reports the expected nursing home duration for several types of elderly patient. As an example, a private-pay patient who requires sheltered care is expected to stay in a nursing home for 158 days with an interquartile range of 460 (= 509-49) days when he/she is admitted at the age of 65 years. The estimates of the expected lengths of stay highlight the significant effects of payment source and level of care.

VI. Conclusions

This study has examined the determinants of nursing home duration and estimated the expected duration. It was found that payment source was a primary factor for determining nursing home duration. As long as they were financed by government welfare programs such as Medicaid, nursing home patients did not have an incentive to return home early although they didn't require skilled nursing care. Given the scarcity of nursing home resources, it is desirable to encourage them to return to private homes by supporting alternative cares such as home visit care.

The results from analysis of the U.S. data provide implications for Korean welfare policy. As

the demand for nursing home care is expected to grow rapidly, the government will be required to develop policies to promote supply of nursing home care and, at the same time, to financially support disabled elderly people who cannot afford to nursing home care. The U.S. experience indicates that unlimited support like Medicaid will induce long stay of nursing home patients and therefore lead to a wasteful use of scarce resources and to an increased burden on the government. Therefore, it is suggested that welfare programs for nursing home care be designed with the consideration of providing incentives for early discharges.