

The hospital length of stay associated with
geropsychiatric illness and comorbidity:
A Korean national health insurance
database study

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ABSTRACT

Objective: To analyze the influence of ‘psychiatric illness and comorbidity’ to LOS in elderly population and to evaluate patients’ and institutional characteristics to affect ‘long stay’.

Method: All reimbursement claims for 17,097 geropsychiatric inpatients supported by the National Health Insurance Program (NHIP) from Jan. 01 2005 to 30 Jun. 2006 were analyzed. Firstly, the relation between LOS and geropsychiatric illness with comorbidity was evaluated. The principal outcome variable was geropsychiatric inpatients’ length of stay (LOS). The predictor variables were principal psychiatric diagnoses (F00-F99 at ICD-10) and comorbidities (All codes at ICD-10). And other variables, such as gender, age, and institutional characteristics were controlled. Secondly, ‘long stay’ was defined as staying more than the 50th and the 90th percentile of LOS. Then, according to type of institutions, individual characteristics (psychiatric diagnoses, comorbidity, gender, age) and institutional characteristics (type of medical institution, ownership, location, inpatient capacity, and the number of physician) of ‘long stay’ were investigated.

Results: The LOS of geropsychiatric patients among NHIP beneficiaries was 80.82 ± 121.77 (ranges from 1 to 547) days during 18 months. Firstly, ‘principal psychiatric diagnosis’ and ‘comorbidity’ were significantly associated with LOS;

under adjusted comparison, compared to ‘dementia’, ‘somatoform disorders’, ‘phobic and other anxiety disorders’, and ‘mental and behavioural disorders due to use of alcohol’ were positively associated with LOS. And both ‘psychiatric and non-psychiatric comorbidity’ significantly prolonged LOS. Secondly, according to the type of institutions, characteristics of ‘long stay’ were different. As a result of logistic regression analyses with all patients, ‘type of institution’ was the most prominent factor related to long stay, followed by ‘comorbidity’. Whereas, among patients admitted in ‘general hospitals and tertiary care hospitals’, ‘comorbidity’ was the most significant factor. In ‘long-term care hospitals’, the influence of ‘comorbidity’ and ‘institutional characteristics’ were notable.

Conclusion: The LOS of geropsychiatric patients was relatively long in Korea. Based on this result, to determine appropriated LOS, ‘comorbidities’ as well as ‘principal diagnoses’ should be evaluated. Furthermore, roles and responsibilities of each type of medical institution for ‘acute care’, ‘chronic care’, and ‘long-term care’ should be systematically established. Then, the proper LOS should be determined by stage-specific guidelines.

Key words: length of stay, geropsychiatric illness mental illness, principal diagnosis, comorbidity, long stay

1. INTRODUCTION

1.1 Background

Since the 1960-70s, in North America and Europe, the direction of policies for people with mental illness has been to reduce length of hospital stay and to evolve various community care services (Alwan, Johnstone & Zolese, 2008). These efforts have been continuously questioned whether short stay is enough to provide appropriate care for the individual patients with different and complicated issues. However at present, the benefits of short stay are generally agreed in the aspect of cost-effective use of health care resource with non-inferior outcome (Alwan, Johnstone & Zolese, 2008; Kirshner, 1982; Patrick, Smith, Schleifer, *et al*, 2006), prevention of patients' social isolation, and improvement of quality of life (Megens & Van Meijel, 2006).

Meanwhile, in Korea, traditionally medical institutions have played a major role in taking care of people with mental problems and community services have not been actively evolved. Therefore, the length of stay (LOS) of psychiatric patients has been prolonged. Since the 1990s, long stays in mental health-related fa-

cilities and the evaluation of appropriate hospitalization has been issued (Cho, Lee, Cho, *et al*, 2006; Lee, Kim & Lee, 1999; Lee, Kim, Lee, *et al*, 1998). The mean LOS of adult psychiatric patients in a stratified random sample of 10 medical institutions was 566.6 days (median 104 days) (Cho, Lee, Cho, *et al*, 2006) and the investigated rate of appropriate psychiatric hospitalization was 45.1 percent (Lee, Kim & Lee, 1999). According to the national epidemiologic survey (MOHW, 2001), only 8.9 percent of psychiatric patients were consulted by physicians, psychiatrists, and other mental health professionals, which means some psychiatric patients utilize too much health care resources and others do not use these resources at all.

In a rapidly aging society, public mental health should pay attention to long LOS, inappropriate hospital stay, and unequal distribution of health care resources, especially in the elderly population. However, relevant researches to define proper LOS and reduce LOS have been rarely performed. Therefore, to investigate the relationship between LOS, psychiatric illness, and comorbidity in elderly population would provide valuable evidence for the effective management of hospital stays.

1.2 Objectives

The aims of this study were as follows; *(i)* to analyze the influence of ‘psychiatric illness and comorbidity’ to LOS in elderly population based on analyses of the national health insurance administration data, *(ii)* to define ‘long stay’ according to the type of medical institutions and then to evaluate both patients’ and institutional characteristics to affect LOS. Also, based on the understanding of factors related to long stays, the possibility of reducing LOS to proper levels were suggested.

2. METHODS

2.1 Data

The data source of this study was all reimbursement claims for geropsychiatric inpatients who were supported by the National Health Insurance Program (NHIP) from medical institutions which treated the patients from 01 Jan. 2005 to 30 Jun. 2006. ‘Geropsychiatric patient’ here was defined as the patient who was 65 years old or more and principal diagnosis was recorded as ‘mental and behavioral disorders (*the International Classification of Diseases and Related Health Problems 10th revision* [ICD-10] codes F00-F99)’. The final dataset was drawn from 17,097 geropsychiatric patients admitted in 435 medical institutions.

2.2 Measures and variables

In the first part of this study, the relation between LOS and geropsychiatric illness with comorbidity was focused. The principal outcome variable was geropsychiatric inpatients’ length of stay (LOS). The LOS had a significantly right-skewed distribution, therefore it was natural logarithmic transformed to correct non-normal

distribution for ordinary least square analyses (Blank, Hixon, Gruman, *et al*, 2005; Creed, Tomenson, Anthony, *et al*, 1997). The predictor variables were principal psychiatric diagnoses (F00-F99 at ICD-10) and the secondary diagnoses (All codes at ICD-10). To see the influence of these variables, they were categorized for analyses. In case of principal diagnoses, since there was no standard guideline in reviewed literatures (Blais, Matthews, Lipkis-Orlando, *et al*, 2003; Cohen & Casimir, 1989; Ettner & Hermann, 1998; Lyketsos, Dunn, Kaminsky, *et al*, 2002; Mai, Gosselin, Varan, *et al*, 1993; Maier, Wächtler & Hofmann, 2007; Sogaard, Godt & Blinkenberg, 1992; Snowden, Walaszek, Russo, *et al*, 2004; Young & Harsch, 1989), 6 commonly reported diagnostic codes at ICD-10 and rest of them were grouped; ‘dementia (F00-F03)’, ‘mental and behavioural disorders due to use of alcohol (F10)’, ‘schizophrenia (F20)’, ‘depressive episode and recurrent depressive disorder (F32, F33)’, ‘phobic and other anxiety disorders (F40, F41)’, ‘somatoform disorders (F45)’, and ‘others (others in F00-F99)’. Regarding the secondary diagnoses were categorized and defined as follows; ‘no secondary diagnosis (no comorbidity)’, ‘comorbid with other F-code diagnosis (psychiatric comorbidity)’, and ‘comorbid with other than F-code diagnosis (non-psychiatric comorbidity)’. The controlled variables were gender, age, and institutional characteristics. Patient’s age was counted on 01 Jan. 2005 then grouped by 5 years of interval; 65–69, 70–74, 75–79, 80–84, 85–89, and ≥ 90 years old. The type of institution was divided into 7

categories; psychiatric clinic, psychiatric hospital, clinic, hospital, general hospital, tertiary care hospital, and long-term care hospital. The type of ownership was divided into three categories; government, private group (nonprofit corporation owned by juridical person), and private person (clinic owned by natural person). Location was classified into three; metropolis, small or medium city, and rural area. The number of full-time physician(s) was corrected per 100 beds in order to standardize it with the inpatient capacity of each institution.

In the second part of this study, characteristics of long stays were investigated. The principal outcome variable was a natural logarithmic transformed LOS. The dependent variables were all individual characteristics such as categorized principal diagnoses, comorbidities, gender, age groups and institutional characteristics. In previous Korean studies, LOS was significantly different according to the type of mental health facilities (Cho, Lee, Cho, *et al*, 2006; Lee, Kim, Lee, *et al*, 1998). Therefore according to the mean LOSs in each type of institutions, they were reclassified into three groups; ‘general hospital and tertiary care hospital’, ‘(psychiatric) clinics and hospitals’, and ‘long-term care hospital’. A consistent definition of ‘long stay’ was not available (Tulloch, Fearon & David, 2008), as a distribution of LOS was significantly right-skewed in the dataset, ‘long stay’ was defined based on the 50th and the 90th percentile of LOS. Namely, LS₅₀ was defined as ‘Long Stays

more than the 50th percentile of LOS (median LOS)' and LS₉₀ was done as 'Long Stays more than the 90th percentile of LOS'.

2.3 Analytic procedures

In the first part of this study, a one-way analysis of variance (ANOVA) was performed to determine whether there was any significant difference among LOS in the different principal diagnoses. The ANOVA was repeated for comorbidities and age groups. Gender difference of LOS was evaluated by t-test. Relative LOS associated with principal diagnosis and comorbidity was investigated by ordinary least squares analyses. According to the comorbidities, four models were built; *(i)* total patients, *(ii)* patients without comorbidity, *(iii)* patients with psychiatric comorbidity, and *(iv)* patients with non-psychiatric comorbidity. In the second part of this study, series of logistic regression analyses were performed to evaluate characteristics of long stays (LS₅₀, LS₉₀) according to the re-classified type of institutions; *(i)* all medical institutions, *(ii)* general hospitals and tertiary care hospitals, *(iii)* (psychiatric) clinics and hospitals, and *(iv)* long-term care hospitals.

Values of $p < 0.05$ were considered statistically significant. All analyses were performed using SAS version 9.1 (SAS institute Inc., Cary, NC, USA).

3. RESULTS

3.1 LOS associated with geropsychiatric illness and comorbidity

3.1.1 Characteristics of geropsychiatric inpatients

The mean age of total 17,097 patients was 74.47 ± 7.09 years old, 57.11% were female and 42.89% were male. During 18 months of the investigated period, the mean LOS was 80.82 ± 121.77 days (ranges from 1 to 547 days) and the median was 29 days. The most commonly reported principal diagnoses were, ‘mental and behavioural disorders due to use of alcohol (F10, 25.03%)’, followed by ‘dementia (F00-F03, 24.79%)’, ‘depressive episode and recurrent depressive disorder (F32-F33, 22.21%)’, and ‘schizophrenia (F20, 18.87%)’. Among total patients, 35.86% had no comorbidity, 26.45% had psychiatric comorbidities, and 37.69% had non-psychiatric comorbidities. Characteristics of total and each sub-group of patients divided by comorbidity were summarized in Table 1. In each sub-group, proportion of principal diagnoses was different. In the group of patients without comorbidity, more than half of patients were diagnosed with ‘dementia’, followed by ‘somatic disorders (11.82%)’. Among the patients with psychiatric comorbidity, their

principal diagnoses were either 'depressive episode and recurrent depressive disorder' or 'schizophrenia'. Meanwhile, in the group of patients with non-psychiatric comorbidity, their principal diagnoses were mainly either 'mental and behavioural disorders due to use of alcohol' or 'dementia'.

Table 1 Characteristics of geropsychiatric inpatients

	Total (N=17,097)		No comorbidity (N=1,252)		Psychiatric comorbidity (N=6,116)		Non- psychiatric comorbidity (N=9,729)	
	N	%	N	%	N	%	N	%
Principal Diagnosis								
Dementia (F00-F03)	4,238	24.79	631	50.40	0	0.00	3,607	37.07
Mental and behavioural disorders due to use of alcohol (F10)	4,279	25.03	0	0.00	0	0.00	4,279	43.98
Schizophrenia (F20)	3,227	18.87	0	0.00	2,634	43.07	593	6.10
Depressive episode and recurrent depressive disorder (F32-F33)	3,798	22.21	0	0.00	3,482	56.93	316	3.25
Phobic anxiety disorders, other anxiety disorders (F40, F41)	659	3.85	0	0.00	0	0.00	659	6.77
Somatoform disorders (F45)	421	2.46	148	11.82	0	0.00	273	2.81
Others in F00-F99	455	2.66	473	37.78	0	0.00	2	0.02
Gender								
Male	7,333	42.89	623	49.76	2,690	43.98	4,020	41.32
Female	9,764	57.11	629	50.24	3,426	56.02	5,709	58.68
Age (years)								
65-69	5,215	30.50	491	39.22	2,086	34.11	2,637	27.10
70-74	4,191	24.51	310	24.76	1,556	25.44	2,325	23.90
75-79	3,507	20.51	210	16.77	1,219	19.93	2,078	21.36
80-84	2,430	14.21	136	10.86	755	12.34	1,539	15.82
85-89	1,276	7.46	66	5.27	366	5.98	844	8.68
≥90	479	2.80	39	3.12	134	2.19	306	3.15

3.1.2 Characteristics of medical institutions

Table 2 showed the characteristics of medical institutions. Among 435 institutions, types of medical institution were psychiatric clinics (16.55%), psychiatric hospital (7.36%), clinic (6.90%), hospital (29.89%), general hospital (25.29%), tertiary care hospital (9.89%), and long-term care hospital (4.14%). Majority of institutions were owned by private sectors; 44.60% by 'private group', 45.29% by 'private person', and 10.11% of institutions were owned by 'government'. Institutions were located in metropolis (44.60%), small or medium-sized city (45.29%), and rural area (10.11%). The mean number of beds was 334.72 ± 288.64 (ranges from 15 to 2,193). The number of physicians which was corrected per 100 beds was 9.28 ± 12.05 .

Characteristics of medical institutions in each comorbidity group were summarized in table 2. Under unadjusted comparisons, in general, institutional characteristics were similar between patients with psychiatric and non-psychiatric comorbidity, but they were different from patients without comorbidity. Patients without comorbidity were more likely to stay in 'psychiatric clinics' and less likely in 'general hospitals', they tended to stayed in institutions owned by 'private person' rather than 'private group', compared to the patients with comorbidity.

Table 2 Characteristics of medical institutions

Discrete characteristics	Total (N=435)		No comorbidity (N=284)		Psychiatric comorbidity (N=386)		Non-psychiatric comorbidity (N=391)	
	N	%	N	%	N	%	N	%
Type of medical institutions								
Psychiatric clinic	72	16.55	60	21.13	50	12.95	41	10.49
Psychiatric hospital	32	7.36	20	7.04	31	8.03	31	7.93
Clinic	30	6.90	17	5.99	23	5.96	22	5.63
Hospital	130	29.89	93	32.75	123	31.87	128	32.74
General hospital	110	25.29	53	18.66	98	25.39	108	27.62
Tertiary care hospital	43	9.89	31	10.92	43	11.14	43	11.00
Long-term care hospital	18	4.14	10	3.52	18	4.66	18	4.60
Ownership								
Government	27	6.21	19	6.69	24	6.22	27	6.91
Private group	233	53.56	133	46.83	219	56.74	228	58.31
Private person	175	40.23	132	46.48	143	37.05	136	34.78
Location								
Metropolis	194	44.60	123	43.31	168	43.52	171	43.73
Small city	197	45.29	132	46.48	179	46.37	178	45.52
Rural area	44	10.11	29	10.21	39	10.10	42	10.74
Continuous characteristics								
	Mean	S.D.	Mean	S.D.	Mean	S.D.	Mean	S.D.
Inpatient capacity: the number of beds	334.72	288.64	338.19	318.55	356.92	293.33	363.89	288.20
The number of physicians (per 100 beds)	9.28	12.05	8.68	12.24	9.66	12.56	9.83	12.49

3.1.3 Univariate analyses

As a result of ANOVAs and t-test, the mean LOSs among principal diagnoses, among comorbidities, among age groups, between gender were significantly different ($p < 0.0001$ in each category). Table 3 showed the mean LOS of each group of principal diagnosis and comorbidity. As a result of analysis with total patients, the mean LOS was 80.82 ± 121.77 days. Among principal diagnoses, LOS due to ‘somatoform disorders’ was 97.92 ± 150.85 days, the longest, followed by stays due to ‘schizophrenia (90.51 ± 126.89 days)’, ‘mental and behavioural disorders due to use of alcohol (85.83 ± 126.37 days)’, and ‘phobic and other anxiety disorders (83.03 ± 123.88 days)’. Among groups of comorbidities, LOS of patients with psychiatric comorbidity was 82.39 ± 120.01 days, the longest, followed by stays of patients with non-psychiatric comorbidity (80.83 ± 122.65 days), and without comorbidity (73.10 ± 123.27 days). The statistical difference among 3 groups was evaluated by Tukey’s multiple-comparison procedure.

In addition, according to the groups of comorbidities, mean LOS of each principal diagnosis was calculated. Under the un-adjusted comparison, among patients without any comorbid illness, patients with ‘somatoform disorders’ stayed longer than patients with ‘dementia’ and ‘others’. Among patients with psychiatric comorbidity, LOS of patients with ‘schizophrenia’ was longer than that of patients with

‘depressive episode and recurrent depressive disorder’. Among patients with non-psychiatric comorbidity, LOSs of ‘somatoform disorders’ was the longest, followed by that of ‘others’, ‘mental and behavioural disorders due to use of alcohol’, ‘phobic anxiety disorders, other anxiety disorders’, ‘depressive episode and recurrent depressive disorder’, ‘schizophrenia’, and ‘dementia’.

Table 3 Univariate Analyses

	Total (N=17,097)						No comorbidity (N=1,252)						Psychiatric comorbidity (N=6,116)						Non-psychiatric comorbidity (N=9,615)					
	N	Mean	S.D	p	N	Mean	S.D	p	N	Mean	S.D	p	N	Mean	S.D	p	N	Mean	S.D	p				
Principal Diagnosis																								
Dementia (F00-F03)	4,238	74.04	116.29	<0.0001	631	73.74	127.63	<0.0001	0	-	-	0	-	-	-	3,607	74.10	114.21	<0.0001					
Mental and behavioural disorders due to use of alcohol (F10)	4,279	85.83	126.37		0	-	-		0	-	-	0	-	-	-	4,279	85.83	126.37						
Schizophrenia (F20)	3,227	90.51	126.89		0	-	-		2,634	94.09	126.62	<0.0001	593	74.58	126.98									
Depressive episode and recurrent depressive disorder (F32, F33)	3,798	74.08	114.20		0	-	-		3,482	73.54	113.98		316	80.03	116.68									
Phobic anxiety disorders, other anxiety disorders (F40, F41)	659	83.03	123.88		0	-	-		0	-	-	0	-	-	-	659	83.03	123.88						
Somatiform disorders (F45)	421	97.92	150.85		148	93.06	140.31		0	-	-	0	-	-	-	273	100.56	156.46						
Others in F00-F99	20	66.09	110.35		473	65.99	110.56		0	-	-	0	-	-	-	2	88.50	40.31						
Comorbidity																								
No comorbidity	1,252	73.10	123.27	<0.0001																				
Psychiatric comorbidity	6,116	82.39	120.01																					
Non-psychiatric comorbidity	9,615	80.83	122.65																					
Total	17,097	80.82	121.77		1,252	73.1	123.27		6,116	82.39	120.01		9,615	80.83	122.65									

3.1.4 Ordinary least square analyses

To investigate the relative length of stay associated with principal diagnosis and comorbidity, series of ordinary least square analyses were performed according to the classified group of comorbidities, such as group of (i) total patients, (ii) patients without comorbidity, (iii) patients with psychiatric comorbidity, and (iv) patients with non-psychiatric comorbidity. All regression analyses were adjusted for age groups, gender, and characteristics of medical institutions, such as type of institution, type of ownership, location, the number of beds, and the number of physicians per 100 beds. A referent principal diagnosis was ‘dementia’ in all analyses, except the analysis with the group of psychiatric comorbidity. In this group, LOS of ‘schizophrenia’ was the as a referent because there was no patient with ‘dementia’. A referent group of the secondary diagnoses was patients with ‘no comorbidity’ (Table 4).

As a result of the first analysis with total patients, compared to the LOS of patients with ‘dementia’, that of patients with ‘somatoform disorders’ was longer by 43.68% ($p < 0.0001$), ‘phobic and other anxiety disorders’ by 19.26% ($p = 0.0007$), and ‘mental and behavioural disorders due to use of alcohol’ by 16.68% ($p < 0.0001$). According to the influence of comorbidity, relative to LOS of patients without comorbid-

ity, stays of patients with psychiatric comorbidity and non-psychiatric comorbidity were significantly longer by 73.71% ($p < 0.0001$) and 49.86% ($p < 0.0001$), respectively. In the second analysis with patients without comorbidity, LOS due to 'somatoform disorders' was 86.27% longer than the referent ($p < 0.0001$). In the third analysis with patients with psychiatric comorbidity, LOS of 'depressive episode and recurrent depressive disorder' was 19.80% shorter ($p < 0.0001$) than that of 'schizophrenia', the referent. In the last group with patients diagnosed non-psychiatric comorbidity, compared to the referent, LOS of patients with 'somatoform disorders' was longer by 40.98% ($p < 0.0001$), that of 'depressive episode and recurrent depressive disorder' patients, 'phobic and other anxiety disorders', and 'mental and behavioural disorders due to use of alcohol' were longer by 24.28% ($p = 0.0019$), 20.14% ($p = 0.2014$), and 17.05% ($p < 0.0001$), respectively.

Table 4 Ordinary least square analyses

	Total (N=17,097)					No comorbidity (N=1,252)					Psychiatric comorbidity (N=6,116)					Non-psychiatric comorbidity (N=9,615)				
	N	P.E.	S.E.	p		N	P.E.	S.E.	p		N	P.E.	S.E.	p		N	P.E.	S.E.	p	
Principle Diagnosis																				
Dementia (F00-F03): Reference	4,238	-			631	-				0	-				3,607	-				
Mental and behavioural disorders due to use of alcohol (F10)	4,279	0.1668	0.0300	<0.0001	0	-				0	-				4,279	0.1705	0.0303	0.0303	<0.0001	
Schizophrenia (F20)	3,227	0.0971	0.0507	0.0555	0	-				2,634	(ref)	(ref)	(ref)	(ref)	593	-0.0379	0.0594	0.5234	0.5234	
Depressive episode and recurrent depressive disorder (F32, F33)	3,798	-0.0304	0.0538	0.5720	0	-				3,482	-0.1980	0.0332	<0.0001	<0.0001	316	0.2428	0.0782	0.0782	0.0019	
Phobic anxiety disorders, other anxiety disorders (F40, F41)	659	0.1926	0.0565	0.0007	0	-				0	-				659	0.2014	0.0568	0.0568	0.0004	
Somatiform disorders (F45)	421	0.4368	0.0700	<0.0001	148	0.8627	0.1949	<0.0001	<0.0001	0	-				273	0.4098	0.0843	0.0843	<0.0001	
Others in F00-F99	20	-0.1653	0.0785	0.0352	473	-0.1099	0.1007	0.2753	0.2753	0	-				2	0.5190	0.9393	0.9393	0.5806	
Comorbidity																				
No comorbidity: Reference	1,252	-																		
Psychiatric comorbidity	6,116	0.7371	0.0717	<0.0001																
Non-psychiatric comorbidity	9,615	0.4986	0.0537	<0.0001																
Adjusted R-square	0.2014				0.1657					0.1836					0.2139					

Note 1. The analyses were adjusted for gender, age, and characteristics of medical institutions; type of institution, type of ownership, location, the number of beds, and the number of physicians per 100 beds. 2. In the analysis of group with 'psychiatric comorbidity', 'schizophrenia (F20)' was regarded as a referent group due to no 'dementia' patient in this group. 3. N denotes the number of patients, P.E. denotes parameter estimate, and S.E. denotes standard error.

3.2 Characteristics of long stays

Previous Korean studies showed that LOS in each type of mental health facilities was significantly different (Cho, Lee, Cho, *et al*, 2006; Lee, Kim, Lee, *et al*, 1998). Thus, before investigating characteristics of patients and institutions of long stays, each type of institutions were re-classified by its mean LOS. The mean LOSs of patients admitted in ‘general hospitals’ and ‘tertiary care hospitals’ were 31.99 ± 56.34 and 21.72 ± 27.72 days, respectively, therefore there were grouped as ‘general hospitals and tertiary care hospitals’. The mean LOSs in ‘psychiatric clinic’, ‘psychiatric hospital’, ‘clinic’, and ‘hospital’ were 97.81 ± 130.94 , 139.58 ± 168.37 , 115.58 ± 141.41 , and 104.45 ± 131.45 days, respectively, thus these were considered as ‘(psychiatric) clinics and hospitals’. ‘Long-term care hospital’ was separately analyzed (Table 5).

Table 5 Re-classification of medical institutions

Type of medical institutions	The No. of		Mean LOS (days)	S.D.	Re-classified medical institutions	The No. of		Mean LOS (days)	S.D.
	hospital	patients				hospital	patients		
General hospital	110	3,702	31.99	56.34	General hospital and tertiary care hospitals	153	6,420	27.64	46.70
Tertiary care hospital	43	2,718	21.72	27.72					
Psychiatric clinic	72	1,003	97.81	130.94					
Psychiatric hospital	32	759	139.58	168.37	(Psychiatric)				
Clinic	30	466	115.58	141.41	clinics and hospitals	264	8,810	107.31	135.88
Hospital	130	6,582	104.45	131.45					
Long-term care hospital	18	1,867	138.71	157.48	Long-term care hospital	18	1,867	138.71	157.48
Total	435	17,097	80.82	121.77		435	17,097	80.82	121.77

3.2.1 Characteristics of long stays in all institutions

Based on the dataset with 17,097 patients, the median LOS was 29 days and the 90th percentile of LOS was 249 days. Thus, LS₅₀ was defined as ‘stays more than 29 days’ and LS₉₀ was ‘stays more than 249 days’ in this group. Logistic regression analyses were performed to evaluate patients’ and institutional characteristics of long stay (Table 6).

Among ‘principal psychiatric diagnoses’, there were significant differences of long stays. Relative to patients with ‘dementia’, odds ratios for LS₅₀, OR(LS₅₀), of patients with ‘mental and behavioural disorders due to use of alcohol’, ‘depressive episode and recurrent depressive disorder’, and ‘somatoform disorders’ were 1.207 (95% C.I. 1.096-1.329), 0.799 (95% C.I. 0.670-0.953), and 1.488 (95% C.I. 1.180-1.877), respectively. According to the analysis of LS₉₀, relative to patients with ‘dementia’, odds ratios for LS₉₀, OR(LS₉₀), of patients with ‘mental and behavioural disorders due to use of alcohol’, ‘schizophrenia’, ‘phobic anxiety disorders, other anxiety disorders’, and ‘somatoform disorders’ were 1.515 (95% C.I. 1.295-1.773), 1.417 (95% C.I. 1.080-1.861), 1.527 (95% C.I. 1.150-2.027), 1.861 (95% C.I. 1.328-2.609), respectively. In addition to principal diagnoses, ‘comorbidity’ was a prominent factor associated with long stays. Relative to patients without comorbidi-

ty, OR(LS₅₀) of patients with ‘psychiatric comorbidity’ and ‘non-psychiatric comorbidity’ were 2.592 (95% C.I. 2.056-3.266) and 1.715 (95% C.I. 1.447-2.033), respectively. But this significance disappeared in the analysis of LS₉₀. About ‘age groups’, relative to patients aged 65-69 years old, OR(LS₅₀) of patients aged ‘80-84’ and ‘85-89’ were 1.120 (95% C.I. 1.005-1.249) and 1.248 (95% C.I. 1.087-1.433), respectively. Similarly, OR(LS₉₀) of patients aged ‘80-84’ and ‘85-89’ were 1.222 (95% C.I. 1.031-1.448) and 1.233 (95% C.I. 1.007-1.509).

According to the analyses with data from all institutions, ‘type of medical institutions’ was the most prominent factors associated with long stays. Relative to ‘general hospital’, OR(LS₅₀) of ‘psychiatric clinic’, ‘psychiatric hospital’, ‘clinic’, ‘hospital’, and ‘long-term care hospital’ were 3.960 (95% C.I. 3.276-4,788), 4.775 (95% C.I. 3.939-5.790), 5.413 (95% C.I. 4.065-6.507), 3.762 (95% C.I. 3.322-4.260), and 5.613 (95% C.I. 4.781-6.590), respectively. In case of LS₉₀, OR(LS₉₀) of each type of medical institution were 6.762 (95% C.I. 4.575-9.993), 3.986 (95% C.I. 2.742-5.794), 5.965 (95% C.I. 3.879-9.172), 2.665 (95% C.I. 1.908-3.724), and 4.211 (95% C.I. 2.921-6.071), respectively. Regarding ‘ownership’, relative to government institutions, OR(LS₅₀) of institutions owned by ‘private group’ and ‘private person’ were 0.864 (96% C.I. 0.763-0.978) and 0.708 (96% C.I. 0.622-0.806), and OR(LS₉₀) of institutions owned by ‘private person’ 0.599 (95% C.I. 0.499-0.719).

Table 6 Characteristics of long stays in all institutions

Total number of patients (N=17,097)	Long stays more than the 50 th per- centile of LOS (n=8,503)		Long stays more than the 90 th per- centile of LOS (n=1,709)		
Patients' characteristics					
Principal Diagnosis					
Dementia (F00-F03): Reference	1.000			1.000	
Mental and behavioural disorders due to use of alcohol (F10)	1.207	[1.096,	1.329]	1.515 [1.295,	1.773]
Schizophrenia (F20)	1.001	[0.848,	1.183]	1.417 [1.080,	1.861]
Depressive episode and recurrent dep- ressive disorder (F32-F33)	0.799	[0.670,	0.953]	1.151 [0.864,	1.534]
Phobic anxiety disorders, other anxiety disorders (F40, F41)	1.115	[0.927,	1.341]	1.527 [1.150,	2.027]
Somatoform disorders (F45)	1.488	[1.180,	1.877]	1.861 [1.328,	2.609]
Others in F00-F99	1.009	[0.789,	1.289]	1.081 [0.717,	1.629]
Comorbidity					
No comorbidity: Reference	1.000			1.000	
Psychiatric comorbidity	2.592	[2.056,	3.266]	1.356 [0.931,	1.975]
Non-psychiatric comorbidity	1.715	[1.447,	2.033]	1.180 [0.893,	1.560]
Gender					
Female: Reference	1.000			1.000	
Male	1.095	[1.023,	1.173]	1.007 [0.901,	1.124]
Age (years)					
65-69: Reference	1.000			1.000	
70-74	0.974	[0.890,	1.065]	1.078 [0.922,	1.259]
75-79	1.026	[0.933,	1.129]	1.134 [0.967,	1.330]
80-84	1.120	[1.005,	1.249]	1.222 [1.031,	1.448]
85-89	1.248	[1.087,	1.433]	1.233 [1.007,	1.509]
≥90	1.154	[0.939,	1.419]	1.306 [0.987,	1.728]

Table 6 Characteristics of longer stays in total institutions, continued

Total number of patients (N=17,097)	Long stays more than the 50 th per- centile of LOS (n=8,503)		Long stays more than the 90 th per- centile of LOS (n=1,709)	
	OR	[95% C.I.]	OR	[95% C.I.]
Characteristics of medical institutions				
Discrete characteristics				
Type of medical institutions				
General hospital: Reference	1.000		1.000	
Psychiatric clinic	3.960	[3.276, 4.788]	6.762	[4.575, 9.993]
Psychiatric hospital	4.775	[3.939, 5.790]	3.986	[2.742, 5.794]
Clinic	5.143	[4.065, 6.507]	5.965	[3.879, 9.172]
Hospital	3.762	[3.322, 4.260]	2.665	[1.908, 3.724]
Tertiary care hospital	0.927	[0.795, 1.080]	0.950	[0.309, 2.919]
Long-term care hospital	5.613	[4.781, 6.590]	4.211	[2.921, 6.071]
Ownership				
Government : Reference	1.000		1.000	
Private group	0.864	[0.763, 0.978]	0.896	[0.747, 1.075]
Private person	0.708	[0.622, 0.806]	0.599	[0.499, 0.719]
Location				
Metropolis : Reference	1.000		1.000	
Small or medium city	1.077	[0.999, 1.162]	1.278	[1.125, 1.452]
Rural area	1.112	[0.986, 1.253]	1.175	[0.984, 1.404]
Continuous characteristics				
Inpatient capacity: the number of beds	0.979	[0.974, 0.984]	0.857	[0.830, 0.884]
The number of physicians (per 100 beds)	1.046	[1.031, 1.060]	1.043	[1.013, 1.074]
c statistics	0.729		0.766	

Note: C.I. denotes confidence interval

3.2.2 Characteristics of long stays in general hospitals and tertiary care hospitals

The number of patients admitted in general hospitals and tertiary care hospitals was 6,420. Among them 3,154 patients stayed longer than the median LOS, 14 days, (LS₅₀). 633 patients stayed longer than the 90th percentile of LOS which was 59 days (LS₉₀).

Table 7 showed the patients' and institutional characteristics of long stays in this group. According to the analytic result, 'comorbidity' was the most significant factor associated with long stays. Relative to patients without comorbidity, OR(LS₅₀) of patients with 'psychiatric comorbidity' and 'non-psychiatric comorbidity' were 6.050 (95% C.I. 3.896-9.395) and 2.875 (95% C.I.1.964 -4.209), respectively. OR(LS₉₀) of patients with 'psychiatric comorbidity' was 3.290 (95% C.I. 1.471-7.356). Regarding principal diagnoses, relative to patients with 'dementia', OR(LS₅₀) of 'mental and behavioural disorders due to use of alcohol', 'depressive episode and recurrent depressive disorder', and 'somatoform disorders' were 0.807 (95% C.I. 0.695-0.937), 0.602 (95% C.I. 0.468-0.774), and 1.703 (95% C.I. 1.233-2.535), respectively. OR(LS₉₀) of patients with 'depressive episode and recurrent depressive disorder' was 0.514 (95% C.I. 0.319-0.829). Although these was no sig-

nificant gender difference in cases of LS₅₀, OR(LS₉₀) of male patients was 1.308 (95% C.I. 1.102-1.551), relatively to female. Regarding age groups, relative to patients aged 65-69 years old, OR(LS₅₀) of patients aged '70-74', '75-79', '80-84', and '85-89' were 0.848 (95% C.I. 0.749-0.961), 0.828 (95% C.I. 0.719-0.953), 0.677 (95% C.I. 0.567-0.809), and 0.598 (95% C.I. 0.456-0.784), respectively. These findings were not shown in the cases of LS₉₀.

Regarding institutional characteristics, relative to government institutions, OR(LS₅₀) of institutions owned by 'private person' was 0.598 (95% C.I. 0.409-0.875). About location, relative to institutions located in metropolis, OR(LS₅₀) of institutions located in rural area was 1.636 (95% C.I. 1.130-2.368).

Table 7 Characteristics of long stays in general hospitals and tertiary care hospitals

Total number of patients (N=6,420)	Long stays more than the 50 th per- centile of LOS (n=3,145)		Long stays more than the 90 th per- centile of LOS (n=633)	
	OR	[95% C.I.]	OR	[95% C.I.]
Patients' characteristics				
Principal Diagnosis				
Dementia (F00–F03): Reference	1.000		1.000	
Mental and behavioural disorders due to use of alcohol (F10)	0.807	[0.695, 0.937]	0.915	[0.709, 1.180]
Schizophrenia (F20)	0.819	[0.649, 1.033]	0.820	[0.526, 1.276]
Depressive episode and recurrent de- pressive disorder (F32-F33)	0.602	[0.468, 0.774]	0.514	[0.319, 0.829]
Phobic anxiety disorders, other anxiety disorders (F40, F41)	1.118	[0.857, 1.458]	1.140	[0.717, 1.810]
Somatoform disorders (F45)	1.703	[1.233, 2.353]	1.487	[0.894, 2.473]
Others in F00-F99	0.616	[0.315, 1.207]	1.016	[0.346, 2.980]
Comorbidity				
No comorbidity: Reference	1.000		1.000	
Psychiatric comorbidity	6.050	[3.896, 9.395]	3.290	[1.471, 7.356]
Non-psychiatric comorbidity	2.875	[1.964, 4.209]	1.733	[0.875, 3.432]
Gender				
Female: Reference	1.000		1.000	
Male	1.049	[0.945, 1.164]	1.308	[1.102, 1.551]
Age (years)				
65-69: Reference	1.000		1.000	
70-74	0.848	[0.749, 0.961]	0.932	[0.749, 1.160]
75-79	0.828	[0.719, 0.953]	1.063	[0.839, 1.346]
80-84	0.677	[0.567, 0.809]	1.243	[0.937, 1.649]
85-89	0.598	[0.456, 0.784]	1.530	[1.026, 2.280]
≥90	0.865	[0.528, 1.419]	1.416	[0.697, 2.878]

Table 7 Characteristics of long stays in general hospitals and tertiary care hospitals, continued

Total number of patients (N=6,420)	Long stays more than the 50 th per- centile of LOS (n=3,145)		Long stays more than the 90 th per- centile of LOS (n=633)	
	OR	[95% C.I.]	OR	[95% C.I.]
Characteristics of medical institutions				
Discrete characteristics				
Type of medical institutions				
General hospital: Reference	1.000		1.000	
Tertiary care hospital	1.005	[0.874, 1.156]	0.893	[0.692, 1.152]
Ownership				
Government : Reference	1.000		1.000	
Private group	0.803	[0.645, 1.000]	0.916	[0.676, 1.243]
Private person	0.598	[0.409, 0.875]	0.603	[0.339, 1.074]
Location				
Metropolis : Reference	1.000		1.000	
Small or medium city	1.017	[0.902, 1.145]	1.028	[0.845, 1.251]
Rural area	1.636	[1.130, 2.368]	0.926	[0.574, 1.494]
Continuous characteristics				
Inpatient capacity: the number of beds	0.995	[0.991, 0.999]	0.955	[0.946, 0.963]
The number of physicians (per 100 beds)	1.014	[0.998, 1.030]	1.027	[0.999, 1.056]
c statistics	0.608		0.679	

Note: C.I. denotes confidence interval

3.2.3 Characteristics of long stays in (psychiatric) clinics and hospitals

The number of patients admitted in (psychiatric) clinics and hospitals was 8,810. Among them, 4,388 patients stayed longer than the median LOS, 48 days (LS₅₀), and 879 patients stayed longer than the 90th percentile of LOS, 322 days (LS₉₀).

The characteristics of long stay patients and institutions were summarized in Table 8. As a result of analyses, among principal diagnoses, relative to patients with ‘dementia’, OR(LS₅₀) of patients with ‘mental and behavioural disorders due to use of alcohol’ was 1.334 (95% C.I. 1.177-1.513) and OR(LS₉₀) was 1.266 (95% C.I. 1.024-1.565), respectively. OR(LS₉₀) of patients with ‘somatoform disorders’ was 0.342 (95% C.I. 0.122-0.957). Regarding comorbidity, relative to patients with ‘no comorbidity’, OR(LS₅₀) of patients with psychiatric and non-psychiatric comorbidity were 1.727 (95% C.I. 1.275-2.338) and 1.441 (95% C.I. 1.179-1.761), respectively. But these findings were not shown in the analysis of LS₉₀. In ‘(psychiatric) clinics and hospitals’, variation due to type of institution was significant. Relative to ‘hospital’, ‘psychiatric clinic’, ‘psychiatric hospital’ and ‘clinic’ had more cases of long stays, both LS₅₀ and LS₉₀. Compared to ‘government institutions’, OR(LS₅₀) of institutions owned by ‘private group’ and ‘private person’ were 0.672 (95% C.I. 0.558-0.809) and 0.553 (95% C.I. 0.454-0.674), respectively. However, OR(LS₉₀)

of institutions owned by 'private group' was 1.493 (95% C.I. 1.073-2.079). About location, relative to institutions in metropolis, OR(LS₉₀) of institutions located in small or medium city and rural area were 1.291 (95% C.I. 1.086-1.535). and 1.498 (95% C.I. 1.205-1.862), respectively. The OR(LS₅₀) per the unit increase of inpatient capacity was 0.806 (95% C.I. 0.780-0.833) and OR(LS₉₀) was 0.842 (95% C.I. 0.792-0.896).

Table 8 Characteristics of long stays in (psychiatric) clinics and hospitals

Total number of patients (N=8,810)	Long stays more than the 50 th per- centile of LOS (n=4,388)		Long stays more than the 90 th per- centile of LOS (n=879)	
	OR	[95% C.I.]	OR	[95% C.I.]
Patients' characteristics				
Principal Diagnosis				
Dementia (F00–F03): Reference	1.000		1.000	
Mental and behavioural disorders due to use of alcohol (F10)	1.334	[1.177, 1.513]	1.266	[1.024, 1.565]
Schizophrenia (F20)	1.234	[0.975, 1.561]	1.362	[0.931, 1.993]
Depressive episode and recurrent de- pressive disorder (F32-F33)	1.009	[0.786, 1.295]	1.025	[0.681, 1.543]
Phobic anxiety disorders, other anxiety disorders (F40, F41)	1.284	[0.993, 1.660]	0.988	[0.634, 1.540]
Somatoform disorders (F45)	1.215	[0.805, 1.834]	0.342	[0.122, 0.957]
Others in F00-F99	0.986	[0.747, 1.303]	0.671	[0.405, 1.113]
Comorbidity				
No comorbidity: Reference	1.000		1.000	
Psychiatric comorbidity	1.727	[1.275, 2.338]	1.021	[0.622, 1.676]
Non-psychiatric comorbidity	1.441	[1.179, 1.761]	0.886	[0.632, 1.243]
Gender				
Female: Reference	1.000		1.000	
Male	1.09	[0.994, 1.194]	1.014	[0.871, 1.180]
Age (years)				
65-69: Reference	1.000		1.000	
70-74	1.032	[0.916, 1.164]	0.940	[0.769, 1.149]
75-79	1.131	[0.998, 1.283]	1.016	[0.825, 1.252]
80-84	1.180	[1.024, 1.359]	1.065	[0.845, 1.341]
85-89	1.445	[1.213, 1.722]	1.071	[0.806, 1.422]
≥90	1.128	[0.879, 1.449]	1.079	[0.717, 1.622]

Table 8 Characteristics of long stays in (psychiatric) clinics and hospitals, continued

Total number of patients (N=8,810)	Long stays more than the 50 th percentile of LOS (n=4,388)		Long stays more than the 90 th per- centile of LOS (n=879)	
	OR	[95% C.I.]	OR	[95% C.I.]
Characteristics of medical institutions				
Discrete characteristics				
Type of medical institutions				
Hospital: Reference	1.000		1.000	
Psychiatric clinic	1.477	[1.254, 1.739]	2.003	[1.505, 2.666]
Psychiatric hospital	1.135	[0.965, 1.335]	1.615	[1.286, 2.028]
Clinic	1.625	[1.322, 1.997]	2.390	[1.725, 3.310]
Ownership				
Government : Reference	1.000		1.000	
Private group	0.672	[0.558, 0.809]	1.493	[.073, 2.079]
Private person	0.553	[0.454, 0.674]	0.856	[0.600, 1.222]
Location				
Metropolis : Reference	1.000		1.000	
Small or medium city	1.029	[0.932, 1.136]	1.291	[1.086, 1.535]
Rural area	1.028	[0.902, 1.173]	1.498	[1.205, 1.862]
Continuous characteristics				
Inpatient capacity: the number of beds	0.806	[0.780, 0.833]	0.842	[0.792, 0.896]
The number of physicians (per 100 beds)	1.019	[0.992, 1.046]	1.006	[0.965, 1.047]
c statistics	0.622		0.636	

Note: C.I. denotes confidence interval

3.2.4 Characteristics of long stays in long-term care hospitals

The number of patients admitted in long-term care hospitals was 1,867, and the median LOS was 66 days. Among them 926 patients stayed longer than the 50th percentile of LOS (LS₅₀) and 186 patients stayed longer than the 90th percentile of LOS, 413 days (LS₉₀).

The results of logistic regression analyses were summarized in Table 9. Among principal diagnoses, relative to patients with ‘dementia’, OR(LS₅₀) of patients with ‘mental and behavioural disorders due to use of alcohol’ was 1.475 (95% C.I. 1.124-1.936), and OR(LS₉₀) of patients with ‘somatoform disorders’ was 2.545 (95% C.I. 1.142-5.272). In this group, the influence of ‘comorbidity’ was noticeable. Relative to patients without comorbidity, OR(LS₅₀) of patients with psychiatric and non-psychiatric comorbidity were 4.028 (95% C.I. 1.829-8.872) and 4.023 (95% C.I. 2.024-7.996), respectively. OR(LS₉₀) of patients with psychiatric and non-psychiatric comorbidity were 10.534 (95% C.I. 3.292-33.711) and 8.148 (95% C.I. 3.166-20.969), respectively. The influence of ‘ownership’ and ‘location’ were also prominent in this group. Relative to government institutions, OR(LS₅₀) of institutions owned by ‘private group’ and ‘private person’ were 0.417 (95% C.I. 0.289-0.601) and 0.382 (95% C.I. 0.286-0.510), respectively. Moreover OR(LS₉₀) of them

were 0.100 (95% C.I. 0.051-0.064) and 0.110 (95% C.I. 0.064-0.190), respectively. About location, relative to metropolis, OR(LS₅₀) of institutions located in small city and rural area were 2.115 (95% C.I. 1.578-2.835) and 2.005 (95% C.I. 1.231-3,267), respectively. Furthermore, OR(LS₉₀) of them were 9.119 (95% C.I. 4.869-17.045) and 4.402 (95% C.I. 1.147-16.893), respectively. OR(LS₅₀) per unit increase of the number of physicians was 1.247 (95% C.I. 1.130-1.375), and OR(LS₉₀) was 1.577 (95% C.I. 1.128-1.938).

Table 9 Characteristics of long stays in long-term care hospitals

Total number of patients (N=1,867)	Long stays more than the 50 th per- centile of LOS (n=926)		Long stays more than the 90 th per- centile of LOS (n=186)	
	OR	[95% C.I.]	OR	[95% C.I.]
Patients' characteristics				
Principal Diagnosis				
Dementia (F00–F03): Reference	1.000		1.000	
Mental and behavioural disorders due to use of alcohol (F10)	1.475	[1.124, 1.936]	1.708	[0.984, 2.967]
Schizophrenia (F20)	1.261	[0.816, 1.948]	0.859	[0.385, 1.919]
Depressive episode and recurrent depressive disorder (F32-F33)	1.227	[0.797, 1.892]	0.926	[0.397, 2.159]
Phobic anxiety disorders, other an- xiety disorders (F40, F41)	0.990	[0.631, 1.553]	0.676	[0.304, 1.501]
Somatoform disorders (F45)	1.422	[0.828, 2.440]	2.454	[1.142, 5.272]
Others in F00-F99	-		-	
Comorbidity				
No comorbidity: Reference	1.000		1.000	
Psychiatric comorbidity	4.028	[1.829, 8.872]	10.534	[3.292, 33.711]
Non-psychiatric comorbidity	4.023	[2.024, 7.996]	8.148	[3.166, 20.968]
Gender				
Female: Reference	1.000		1.000	
Male	0.820	[0.670, 1.002]	0.717	[0.501, 1.028]
Age (years)				
65-69: Reference	1.000		1.000	
70-74	1.017	[0.703, 1.472]	1.197	[0.610, 2.347]
75-79	1.126	[0.791, 1.602]	1.224	[0.638, 2.346]
80-84	1.102	[0.775, 1.566]	1.025	[0.537, 1.954]
85-89	1.090	[0.745, 1.594]	1.376	[0.697, 2.713]
≥90	1.207	[0.742, 1.963]	1.215	[0.513, 2.882]

Table 9 Characteristics of long stays in long-term care hospitals, continued

Total number of patients (N=1,867)	Long stays more than the 50 th per- centile of LOS (n=926)		Long stays more than the 90 th per- centile of LOS (n=186)	
	OR	[95% C.I.]	OR	[95% C.I.]
Characteristics of medical institutions				
Discrete characteristics				
Ownership				
Government : Reference	1.000		1.000	
Private group	0.417	[0.289, 0.601]	0.100	[0.051, 0.193]
Private person	0.382	[0.286, 0.510]	0.110	[0.064, 0.190]
Location				
Metropolis : Reference	1.000		1.000	
Small or medium city	2.115	[1.578, 2.835]	9.110	[4.869, 17.045]
Rural area	2.005	[1.231, 3.267]	4.402	[1.147, 16.893]
Continuous characteristics				
Inpatient capacity: the number of beds	1.053	[0.953, 1.164]	0.984	[0.759, 1.276]
The number of physicians (per 100 beds)	1.247	[1.130, 1.375]	1.577	[1.283, 1.938]
c statistics	0.636		0.767	

Note: Among principal diagnoses, 'others in F00-F99' was not included in the analyses due to too small number of subjects (n=6). C.I. denotes confidence interval

4. DISCUSSION

This was the first study to investigate a national administration dataset of geropsychiatric inpatients representing almost all geriatric population supported by NHIP (National Health Insurance Program) in Korea. Especially in this study, the relation between LOS and ‘principal psychiatric diagnoses’ and ‘comorbidities’ of 17,097 geropsychiatric patients admitted in 435 medical institutions from Jan. 01 2005 to 30 Jun. 2006 were analyzed. In addition, for long stays, characteristics of individuals and institutions were analyzed.

4.1 Study design and methods

This study was a retrospective review of national health insurance administration data. In prior researches to investigate determinants of psychiatric LOS or to define characteristics of long-stay patients, various study designs were used. The majority were retrospective chart or record reviews (Blais, Matthews, Lipkis-Orlando, *et al*, 2003; Blank, Hixon, Gruman, *et al*, 2005; Compton, Craw & Rudisch, 2006; Conwell, Nelson, Kim, *et al*, 1989; Goldstein & Grant, 1974; Hallak, Crippa, Vansan, *et al*, 2003; McCrone & Phelan, 1994; Mercier, Renaud & King, 1994; Watanabe-Galloway & Zhang, 2007; Zilber, Popper & Lerner, 1990). Rela-

tively few prospective studies of admission (Creed, Tomenson, Anthony, *et al*, 1997; Jakubaschk, Waldvogel & Würmle, 1993; White, Parrella, McCrystal-Simon, *et al*, 1997) including cohort studies (Priest, Fineberg, Merson, *et al*, 1995; Snowden, Walaszek, Russo, *et al*, 2004), cross-sectional studies or surveys (Cohen & Casimir, 1989; Lee, Kim, Lee, *et al*, 1998), randomized controlled trials (Glick, Hargreaves, Drues, *et al*, 1976; Glick, Hargreaves, Raskin, *et al*, 1975; Hirsch, 1979), and case-control studies (Brown, Miller, Ekstrom, *et al*, 1991; Jakubaschk & Kopp, 1989; Tulloch, Fearon & David, 2008) were performed. The strength of retrospective data review was to deal with the large-scale data for relatively long period. However LOS due to mental illnesses was largely affected by severity of illness, socio-cultural characteristics, etc., thus national administration data provides limited information.

To investigate influence of ‘principal diagnoses’ and ‘comorbidity’ to LOS, ordinary least squares analyses were performed. To evaluate characteristics of long stays, logistic regression analyses were performed. In regression analyses, a principal outcome variable was logarithmic transformed LOS because LOS had a significantly right-skewed distribution (Blank, Hixon, Gruman, *et al*, 2005; Creed, Tomenson, Anthony, *et al*, 1997).

4.2 Consideration of the study results

4.2.1 LOS associated with geropsychiatric illness and comorbidity

In worldwide, LOS and factors to affect LOS of psychiatric patients in elderly population have not been actively studied and their results were inconclusive. In foreign studies, affective disorders, schizophrenia, organic brain disease, dementia, alcoholism, etc. were common cause of admission in geriatric patients. Among them, affective disorders including depressive mood, severity of depressive illness were reported to increase LOS, whereas, dementia, organic brain disease, and alcoholism were related to relatively short LOS (Cohen & Casimir, 1989; Conwell, Nelson, Kim, *et al*, 1989; Goldstein & Grant, 1974).

In Korea, based on the analyses of the national health insurance administration data, common mental illnesses of geropsychiatric inpatients as well as LOS of patients with each diagnosis were different from foreign result. Common mental illnesses of Korean geropsychiatric inpatients were ‘mental and behavioural disorders due to use of alcohol’, ‘dementia’, ‘depressive episode and recurrent depressive disorder’, ‘schizophrenia’, ‘anxiety disorders’, and ‘somatoform disorders’. Among them, under the adjusted comparison, LOSs due to ‘dementia’, ‘schizophrenia’, and

'depressive episode and recurrent depressive disorder' were not significantly different. Whereas, 'mental and behavioural disorders due to use of alcohol', 'anxiety disorders', and 'somatoform disorders' were associated with long LOS.

Mental and behavioral disorders due to use of alcohol (F10)

'Mental and behavioural disorders due to use of alcohol' was the most common diagnosis to cause geropsychiatric inpatient care in Korea. 4,279 patients, 25.03% of total patients, admitted medical institutions due to it, and their mean LOS was 85.83 ± 126.37 days. This unique finding was supported by previous Korean researches. The mean amount of alcohol consumption per day of Korean population was huge, 8.1g in 2005 (MOHW, 2006), and lifetime prevalence of alcohol abuse and alcohol dependence adjusted by age and gender was 15.9% which accounted for more than half of lifetime prevalence of all psychiatric illnesses, 30.9 % (MOHW, 2001). Moreover, daily alcohol drinking rate in elderly population was reported more than that in younger population, especially prominent in female (Lee, Chung, Cho, *et al*, 2008). Since more severe patients tend to stay in hospitals, higher proportion of female patients with alcohol-related problems was in line with the previous study result. Therefore public health should be aware that alcohol related problems were serious in female, as well as in male. In addition, not only treatment,

but also prevention and rehabilitation should be focused.

Dementia (F00-F03)

4,238 patients, 24.79% of total, admitted in medical institutions due to ‘dementia’ and their mean LOS was 74.04 ± 116.29 days. Among them, 85.11% of patients had non-psychiatric comoridity. According to the published data, although these results were based on acute care hospitals, LOS due to ‘dementia’ in other countries were much shorter than our result; 11.1 days (Sajatovic, Friedman, Sabharwal, *et al*, 2004), 7.7~12.8 days (Bourgeois, Hilty, Wegelin, *et al*, 2006), and 23~32 days (Kunik, Edwards, Molinari, *et al*, 2001)

Depressive episode and recurrent depressive disorder (F32, F33)

The number of patients diagnosed ‘depressive episode and recurrent depressive disorder’ was 3,798 (22.21%), the mean LOS was 74.08 ± 114.20 days. 91.68% of patients in this group had psychiatric comorbidities, rest of them had non-psychiatric comorbidities. Although in foreign researches of geropsychiatric inpatients, depression was related to long LOS, it was not the case in Korea. Also LOS in depression group was investigated to be possibly affected by comorbid diseases (Cairney, Corna, Veldhuizen, *et al*, 2008; Lyketsos, Dunn, Kaminsky, *et al*, 2002; Schubert, Yokley, Sloan, *et al*, 1995; Sloan, Yokley, Gottesman, *et al*, 1999), but in

this study, because all depressed patients had comorbidity, the influence of comorbidity could not be separately investigated.

Schizophrenia (F20)

3,227 patients (18.87%) were diagnosed 'schizophrenia'. The mean LOS were 90.51 ± 126.89 days and all patients had either psychiatric or non-psychiatric comorbidities. Schizophrenia is generally regarded as major psychosis with onset in late adolescence or early adult, minority of patients experience the first episode in middle or old age (Howard, Rabins, Seeman, *et al*, 2000). Therefore the presence of schizophrenia in elderly is either recurrent or late-onset schizophrenia. According to the review focused on recurrent schizophrenia which is majority of schizophrenia in late life, roughly half of geriatric patients with schizophrenia had favorable outcomes, but full recovery was rare and different treatment strategy may be required for each symptom (Cohen, Vahia, Reyes, *et al*, 2008). In terms of LOS in patients with schizophrenia, determinants of LOS were not concluded (Sajatovic, Sultana, Bingham, *et al*, 2002) and debates of proper LOS have been continued. Deinstitutionalization of long-stay patient with schizophrenia have been studied and suggested to develop and activate community care programs (Grinshpoon, Shershevsky, Levinson, *et al*, 2003; Hirsch, 1979; Oshima, Mino & Inomata, 2007; Ryu, Mizuno,

Sakuma, *et al*, 2006). Meanwhile another study showed that brief-length of stay patients would be hospitalized within 30 days after discharge than would patients treated for longer periods (Appleby, Desai, Luchins, *et al*, 1993). In previous Korean researches which were targeted or adult population though, among diagnoses, ‘schizophrenia (Lee, Kim, Lee, *et al*, 1998)’ or ‘psychiatric disorders (Cho, Lee, Cho, *et al*, 2006)’ were related to long LOS. According to this study result, ‘schizophrenia’ itself was not associated with long LOS in elderly patients but it always combined with comorbidities. Therefore to evaluate proper LOS of patients with ‘schizophrenia’, comorbidity as well as other clinical characteristics, such as onset of illness, recurrent should be considered.

Phobic anxiety disorders, other anxiety disorders (F40, F41)

The number of patients with anxiety disorders was 659 (3.85%), all patients in this group had non-psychiatric comorbidities. The mean LOS was 83.03 ± 123.88 days. Anxiety disorders in elderly population were systematically reviewed by the Longitudinal Aging Study Amsterdam; the overall prevalence of anxiety disorders was estimated at 10.2% (Beekman, Bremmer, Deeg, *et al*, 1998), 6 years after baseline, persistent rate of anxiety disorders was 23% and 47% of patients were suffered from subclinical anxiety symptoms (Schuermans, Comijs, Beekman, *et al*, 2005),

and it was associated with increased disability and diminished well-being (de Beurs, Beekman, van Balkom, *et al*, 1999). Korean epidemiology survey with all age group also showed high lifetime prevalence (8.8%) and mean days of impaired function per months due to anxiety disorders was estimated 3.29 days, which was similar to psychoses, 3.97 days (MOHW, 2001). Although anxiety disorders are not generally considered as serious psychiatric illness, they are commonly comorbid with other illnesses in chronic pattern. Thus further attention to proper inpatient care of anxiety disorders is needed.

Somatoform disorders (F45)

The number of patients in this group was the smallest, 421 (2.46%), but LOS was the longest, 97.92 ± 150.85 days. 35.15% of patients did not have comorbidity and 64.85% of patients had non-psychiatric comorbidity. In this group, institutional variation of LOS was peculiar. 31.12% of patients stayed in long-term care hospitals and their mean LOS was 199.89 ± 210.87 days. However, 24.79% of patients were stayed in tertiary care hospital and their mean LOS was 22.05 ± 20.63 days. Therefore, the longest LOS was accounted for type of institution rather than individual characteristics. Although geriatric somatoform disorders have not been well investigated, some researches to focus on health care utilization for somatoform

disorders were available. The patients with somatoform disorders suffer from clinically significant but unexplained physical symptoms (Oyama, Paltoo & Greengold, 2007). Somatizing patients tend to deny their psychological problem and dissatisfied with their medical care, prior researches showed somatizing patients spent more healthcare utilization and cost than non-somatizing patients (Barsky, Orav & Bates, 2005; De Waal, IA, JAH, *et al*, 2004; Fink, 1992; Fink, 1993). In addition, persistent somatization was not a rare phenomenon (0.6 per 1,000 men and 3.2 per 1,000 women) but a serious burden on health care system (Fink, 1992; Fink, 1993). In the epidemiological study in Korea, lifetime prevalence of somatoform disorders was estimated 0.5%, mean days of impaired function per month due to somatoform disorder was 4.96 days which was longer than that of all psychiatric disorders, 2.60 days (MOHW, 2001). The result of this study was in line with prior foreign and local researches; somatoform disorders were not rare but high burdened illnesses, therefore further investigation to determine proper LOS and to set guideline for effective care of the elderly patients with somatoform disorders.

Others (Others in F00-F99)

The group of 'others' consisted of various diagnoses except above mentioned ones among F00-F99. The number of patients in this group was 473 (2.77%), and the mean LOS was the shortest, 65.99 ± 110.56 days. Even though very heterogeneous diagnoses were mixed in this group, the shortest mean LOS was possibly explained that common serious mental illnesses were excluded in previous diagnostic categories. Furthermore almost all patients in this group did not have any comorbidity which was a factor associated with long LOS.

Psychiatric and non-psychiatric comorbidities

The influence of both psychiatric and non-psychiatric comorbidities was prominent in this study. Regarding comorbidity, foreign researches for adult population were only available. In case of psychiatric comorbidity, influence to LOS was inconsistent (Bradley & Zarkin, 1996; Draper & Luscombe, 1998; Keown, Holloway & Kuipers, 2005). However medical comorbidities were generally shown to prolong hospital stay in general (Lyketsos, Dunn, Kaminsky, *et al*, 2002; Schubert, Yokley, Sloan, *et al*, 1995; Sloan, Yokley, Gottesman, *et al*, 1999). Even though, in this study, the influence of psychiatric and non-psychiatric comorbidity was incon-

sistent in each principal diagnosis, comorbidity was one of the most important factors to determine LOS.

4.2.2 Characteristics of long stays

To investigate characteristics of long stay, according to their mean LOS, type of institutions were re-classified into three groups; ‘general hospital and tertiary care hospital’, ‘(psychiatric) clinics and hospitals’, and ‘long-term care hospital’. The notable characteristics in each re-classified institutions as follows.

First, based on the dataset with 17,097 patients, among individual characteristics, ‘principal psychiatric diagnoses’ and ‘comorbidity’ were significantly associated with long stays. Especially, in case of ‘comorbidity’, compared to patients without comorbidity, patients groups with psychiatric and non-psychiatric comorbidity had 2.592 (95% C.I. 2.056-3.266) and 1.715 (95% C.I. 1.447-2.033) times more cases of LS_{50} (long stays more than the median LOS), respectively. However, ‘comorbidity’ did not affect to cases of LS_{90} (long stays more than the 90th percentile of LOS). Regarding the influence of ‘comorbidity’, prior researches for either geriatric patients or extremely long stay cases such as LS_{90} were not available. According to the result of this study, ‘comorbidity’ was a factor related to long stays, but, for extremely long stays, other factor such as ‘type of institution was mainly

associated with long stays. Among characteristics of medical institutions, 'type of institution' was significantly associated with long stays. Relative to 'general hospital' and 'tertiary care hospital', 'hospital', 'psychiatric clinic', 'psychiatric hospital', 'clinic', and 'long-term care hospital' had 3.762 ~ 5.613 times more cases of LS₅₀, respectively. The fact that 'psychiatric hospital' and 'psychiatric clinic' had similar proportion of long stay cases compared to 'long-term care hospital' which provides long-term care service was questionable. However, a previous Korean study also showed a similar result that the median LOS of patients admitted in 'private mental hospital' was the longest among medical institutions and many patients stayed for 1 to 3 years (Lee, Kim, Lee, *et al*, 1998). According to this, especially 'psychiatric clinic' and 'psychiatric hospital' seemed to provide long-term care service. Thus, before evaluating appropriateness of LOS, roles and responsibilities of each type of medical institution for 'acute care', 'chronic care', and 'long-term care' should be systematically established.

Next, based on the analyses of 6,420 patients admitted in 'general hospitals' and 'tertiary care hospitals', 'comorbidity' was the most prominent factor related to long stays. Relative to patients without comorbidity, patients group with 'psychiatric comorbidity' and 'non-psychiatric comorbidity' had 6.050 (95% C.I. 3.896-9.395) and 2.875 (95% C.I. 1.964 -4.209) times mores of LS₅₀, respectively. Thus, to evaluate proper LOS of patients admitted in acute care hospitals, although previous

researches showed inconsistent results especially for the influence of ‘psychiatric comorbidity’ (Bradley & Zarkin, 1996; Draper & Luscombe, 1998; Keown, Holloway & Kuipers, 2005), ‘comorbidity’ should be importantly considered.

Third, among 8,810 patients admitted in ‘(psychiatric) clinics’ and ‘hospitals’, ‘principal diagnoses’, ‘comorbidity’, ‘type of medical institution’, ‘ownership’, ‘location’, and ‘the number of physicians per 100 beds’ were significantly related to long stays, but no one was notably influencing factor.

Last, among 1,867 patients admitted in ‘long-term care hospitals’, ‘comorbidity’, ‘ownership’ and ‘location’ were relatively significantly associated with long stays. In case of ‘comorbidity’, patients group with psychiatric and non-psychiatric comorbidity had around 4 times more cases of LS₅₀. Moreover, different from whole patient group, this group of patients also had over 8 times more cases of LS₉₀. This result could be explained by two different reasons; in principle, ‘comorbidity’ was probably one of the most important factors for long-term care. However, it was possibly related to receiving reimbursements of prescribed medication(s) rather than progress of mental or physical illnesses. Under the current Korean reimbursement guideline, medication can be reimbursed only if it was prescribed according to regulation including diagnosis. Therefore without coding of ‘comorbidity’, both medical institutions and patients could not be reimbursed to use additional medication(s). Moreover, since there was no limitation of the number of prescribed drugs

and duration of medication, mismatch between diagnostic code and real diagnosis may exist. The influence of 'ownership' and 'location' were also prominent in this group. As compared to 'government institutions', institutions owned by 'private group' and 'private person' had less than half of LS₅₀ cases, and only 10% of LS₉₀ cases. About 'location', compared to 'metropolis', institutions located in 'small or medium city' and 'rural area' had more than two times of LS₅₀ cases. Furthermore, in case of LS₉₀, institutions in 'small or medium city' had 9.119 (95% C.I. 4.869-17.045) times more than that in 'metropolis'. Although there was no referent data to investigate characteristics of long-term care hospitals, based on the above mentioned result, there were unique characteristics that long-term care hospitals owned by 'government' or located in 'small or medium' had much more long stay cases. It was partially explained that several local governments established long-term care hospitals in small or medium cities as a part of community work, and they tended to keep operation rate of sick bed rather than to focus efficient patient care service. Furthermore, general perception of mental illness and psychiatric patient is very negative in Korea, patients' family and society prefer inpatient care for patients with mental illness. In fact, this trend was more or less similar in each type of hospital, the investigated rate of appropriate psychiatric hospitalization was 45.1 percent (Lee, Kim & Lee, 1999).

4.3 Implications of mental health policy

Global trend of psychiatric care is deinstitutionalization and rehabilitation in community based on supportive study results; a U.S. study showed that improvement of geriatric patients (n=299) was comparable to that of younger patients (n=5,630) in general psychiatric units (Snowden, Walaszek, Russo, *et al*, 2004). Also according to a meta-analysis of 6 randomized trials, the outcome of planned short stay was not inferior to long stay (Alwan, Johnstone & Zolese, 2008). In addition, study in Taiwan concluded that depressed patients with a long hospital stay would not gain treatment benefit over patients with short stay. (Cheng, Liao, Lee, *et al*, 2007). However, the LOS of geropsychiatric inpatients in Korea was relatively long. In fact, Korean culture is still reluctant to take care of psychiatric patients in society. Presently, medical institutions can receive reimbursement for psychiatric inpatients care without proper regulation regarding LOS. Therefore, from an institutional perspective, even if the amount of reimbursement from the government is small in some cases, it is still profitable. Therefore they try to keep patients as long as they have empty beds. From the perspective of patients' family and society, admission care for patients was considered a less stressful and less expensive option compared to providing rehabilitation programs for patients. Some patients preferred to stay in hospitals, rather than living in society, because it is often difficult to find a

job and cope with family and society. In fact, the investigated rate of appropriate psychiatric hospitalization was only 45.1 percent (Lee, Kim & Lee, 1999). Therefore, to reduce unnecessary inpatient care and to evolve proper community care, each type of institution should play a different role in taking care of patients. For example, general hospitals and tertiary care hospitals treat patients with acute and serious mental illness, psychiatric clinics and hospitals treat patients with serious mental illness, clinics and hospitals treat patient with mild to moderate mental illness, and long-term care hospitals treat patients with chronic and mild to moderate mental illness. For patients who do not need medical service, community care facilities should take care of their rehabilitation and adjusting back into society. Secondly, to evaluate proper LOS and treatment guidelines, especially in geropsychiatric patients, principle psychiatric diagnosis and comorbidity should be considered.

4.4 Limitations and future research agenda

The dataset analyzed in this study was from national administrative data. Here, inaccuracy in the reporting of diagnosis may exist according to characteristics of physicians or institutions. In addition, to deal with a dataset, only reported principal diagnosis and the secondary diagnosis were included, re-classified, and then analyzed. As a result, the influence of anything other than secondary diagnosis or detailed characteristics of each diagnosis was not considered. In addition, national administration data has a merit to reflect the total elderly population in Korea, yet available information was limited to patient characteristics (recorded diagnoses, age, and gender) and institutional characteristics (type of institution, ownership, location, the number of beds, and the number of physicians). Since the regression models with these variables accounted for around 20% of variance of LOS, important factors to contribute LOS, such as severity of illness, onset and duration of illness, recurrence, past medical history, family history, physical and social functioning, socioeconomic status, etc. could not be evaluated. Therefore randomized controlled trial or prospective cohort study should be followed to evaluate comprehensive relation between LOS and its possible factors.

As a result of the study, comorbidity was a significant factor related to long

LOS. However, considering the recorded comorbidity, their patterns were unexpectedly homogeneous. In case of patients with ‘mental and behavioral disorders due to the use of alcohol’, they all had ‘non-psychiatric comorbidity. Among patients with ‘depressive episode and recurrent depressive disorder’, a majority of patients had ‘psychiatric comorbidity’ and the rest of them had ‘non-psychiatric comorbidity’. Such findings were possibly related to receiving reimbursements of prescribed medication(s). Under the current reimbursement system, if a physician prescribes antipsychotics and antidepressant to a patient with schizophrenia based on scientific evidence, the patient or institution could not receive reimbursement using antidepressant. Thus, possibly, comorbidities were not medically diagnosed illnesses, but automatically diagnosed for the purpose of receiving reimbursement of additional medication(s). Vice versa, even if a patient has a comorbid illness, if the patient doesn’t need extra treatment or medication, the comorbidity might not be recorded. Therefore, to improve validity of national administration data, diagnosis and reimbursable medication should be separately handled or flexibly set, and continuous education for standardized and precise recording is needed. These might help accurate recording and promoting effective care to reduce LOS via effective treatment, rather than long inpatient care.

In this study, to focus on LOS associated with influence of principal diagnosis and comorbidity, we analyzed only NHIP (National Health Insurance Program) beneficiaries. Because MAP (Medical Aid Program) beneficiaries are supposed to pay much less than NHIP beneficiaries or not to pay at all, patients are more likely to stay longer and institutions tend to keep patients in their institutions. Therefore, type of health security was known as one of major factors to determine LOS in psychiatric care (Yoon, 2006) as well as all medical care (Kim, 2000). The proportion of health care cost for NHIP beneficiaries is 97% and that of MAP beneficiaries is 3% in total, but in geropsychiatric inpatients, 64% were covered by NHIP and 36% by MAP. Moreover, the mean LOS of MAP beneficiaries was 128.16 ± 166.22 days, much longer than that of NHIP beneficiaries (80.82 ± 121.77 days). Thus further investigation for characteristics of MAP beneficiaries is needed to understand whole geriatric hospital stays.

5. CONCLUSION

This was the first study to investigate a national administration dataset of geropsychiatric inpatients representing almost all geriatric population supported by NHIP (National Health Insurance Program) in Korea. Especially in this study, the relation between LOS and ‘principal psychiatric diagnoses’ and ‘comorbidities’ of 17,097 geropsychiatric patients admitted in 435 medical institutions from 01 Jan. 2005 to 30 Jun. 2006 were analyzed. In addition, for long stays, characteristics of individuals and institutions were analyzed. The main results were as follows; First, the LOS of Korean geropsychiatric patients supported by NHIP was relatively long, 80.82 ± 121.77 days (ranges from 1 to 547 days) during 18 months. The most commonly reported principal diagnoses were, ‘mental and behavioural disorders due to use of alcohol (F10, 25.03%)’, followed by ‘dementia (F00-F03, 24.79%)’, ‘depressive episode and recurrent depressive disorder (F32-F33, 22.21%)’, and ‘schizophrenia (F20, 18.87%)’. Among total patients, 35.86% had no comorbidity, 26.45% had psychiatric comorbidities, and 37.69% had non-psychiatric comorbidities. Second, ‘principal psychiatric diagnosis’ was one of the factors associated with LOS. As a result of ordinary least square regression analysis adjusted for age groups, gender and characteristics of medical institutions, compared to the LOS of patients with ‘dementia’, LOS due to ‘somatoform disorders’ was longer by 43.68%

($p < 0.0001$), 'phobic and other anxiety disorders' by 19.26% ($p = 0.0007$), and 'mental and behavioural disorders due to use of alcohol' by 16.68% ($p < 0.0001$). Besides that, the influence of comorbidities was prominent. LOSs of patients with psychiatric and non-psychiatric comorbidity were 73.71% ($p < 0.0001$) and 49.86% ($p < 0.0001$) longer, respectively. Third, according to the type of institutions, characteristics of long stays were different. As a result of logistic regression analyses with all patients, 'type of institution' was the most prominent factor related to long stay, followed by 'comorbidity'. Whereas, among patients admitted in 'general hospitals and tertiary care hospitals', 'comorbidity' was the most significant factor. In 'long-term care hospitals', the influence of 'comorbidity' and 'institutional characteristics' were notable.

According to the study result, public mental health should pay attention to following important things. The LOS of geropsychiatric patients was inappropriately long, which means without intervention of public health, the health care burden for geropsychiatric inpatients care will continuously increase. Based on objective evidence, public mental health should put efforts on determining appropriate LOS and reducing LOS. In addition, the common psychiatric diagnoses of geriatric inpatients were quite different from foreign studies; the fact that 'mental and behavioral disorders due to the use of alcohol' was the most common reason for admission was

surprising. Also, along with ‘dementia’, ‘depressive episode and recurrent depressive disorder’, and ‘schizophrenia’, ‘anxiety disorders’, and ‘somatoform disorder’ were common psychiatric principal diagnoses with LOSs that were similar or longer than that of major diagnoses. The possible reason for this was partly explained by institutional variation such as, long-term care hospitals and psychiatric hospitals that tend to keep their patients with these diagnoses. Third, the majority of patients had either ‘psychiatric comorbidities (26.45%)’ or ‘non-psychiatric comorbidities (37.69%)’, with ‘comorbidity’ being one of the most significant factors that determined LOS. Especially in ‘general hospitals’, ‘tertiary care hospitals’, and ‘long-term care hospitals’, ‘comorbidity’ was more significantly related to long stays. But careful interpretation is needed because recording ‘comorbidity’ may be confounded by reimbursement of additional medications. Fourth, in an acute care setting, principal diagnosis and comorbidity played an important role to determine LOS. However, in a chronic or long-term care setting, LOS was mainly affected by institutional characteristics rather than patients’ characteristics. Therefore to determine appropriated LOS, ‘comorbidities’ as well as ‘principal diagnoses’ should be evaluated. Furthermore, in the perspective of public mental health, roles and responsibilities of each type of medical institution for ‘acute care’, ‘chronic care’, and ‘long-term care’ should be systematically established. Then, according to each stage of care, the proper LOS should be evaluated by stage-specific guidelines. Finally, a

relatively high proportion of geropsychiatric inpatients was MAP beneficiaries, whose LOS was much longer than NHIP beneficiaries. Therefore further investigations for those people are needed to set harmonized policies for the entire elderly population.

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Abstract in Korean

주진단 및 동반질환이 노인정신질환자의 재원일수에 미치는 영향 : 건강보험 청구자료를 중심으로

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본 연구에서는 노인정신질환 입원환자를 대상으로 주진단과 동반질환이 재원일수에 미치는 영향을 분석하고, 재원일수가 긴 환자들의 개인 특성 및 병원 특성을 조사함으로써 향후 적절한 재원일수를 결정하고 재원일수를 합리적으로 줄일 수 있는 방안을 모색하고자 하였다.

노인정신질환 환자는 65세 이상, 주진단이 정신 및 행동 장애(ICD-10에서 F00-F99)인 환자로 정의하였고, 2005년 1월 1일부터 2006년 6월 30일까지 435개 의료기관에서 건강보험 적용을 받는 총 17,097명의 노인정신질환 환자를 치료한 건강보험청구 자료를 분석하였다.

주요결과변수는 환자의 재원일수, 독립변수는 환자특성 (주진단,

부진단, 성, 연령)과 의료기관특성 (종별, 설립구분별, 지역별, 병상수, 의사수)으로 설정하였다.

연구 결과 18개월의 관찰기간 동안 건강보험환자 중 노인정신질환 환자의 평균 재원일수는 80.82 ± 121.77 일 (1~547일)이었다. 주진단과 동반 질환이 재원일수에 미치는 영향을 분석하기 위해 성별, 연령, 의료기관 특성을 보정한 후 OLS 회귀분석(Ordinary least square regression)을 시행한 결과 치매 환자에 비해 정신분열병, 우울증삽화 및 반복성 우울장애 환자의 재원일수에는 유의한 차이가 없었으나, 신체형 장애, 불안 장애, 알코올 사용으로 인한 정신 및 행동 장애 환자의 경우 재원일수가 유의하게 길었다. 특히 동반질환은, 정신질환 및 정신질환 이외의 동반질환 모두, 유의하게 재원일수를 증가시키는 것으로 나타났다. 다음으로 ‘장기 입원’과 관련된 환자특성 및 의료기관특성을 살펴보기 위해 로지스틱 회귀분석을 시행한 결과, 모든 의료기관의 ‘장기 입원’에는 종별 의료기관, 동반질환의 영향이 가장 컸다. 하지만 종합병원과 3차 병원에서의 ‘장기 입원’에는 동반질환이, 장기요양 병원에서는 동반질환 및 설립구분별 (국·공립), 지역별 (중소도시) 특성이 ‘장기 입원’에 큰 영향을 미쳤다.

우리나라의 정신질환 특히 노인정신질환 환자의 재원일수는 상대적으로 길다. 더욱이 정신질환 환자의 입원치료에 대해 구체적인 재원적절성 평가가 이루어지지 않고 사회구성원들이 정신질환 환자

돌보기를 꺼려하는 우리나라의 상황에서 재원일수는 길 수 밖에 없다. 하지만 한정된 의료자원을 효율적으로 이용하기 위해서는 적절한 재원일수를 결정하고, 재원일수를 줄이려는 노력이 필요하다. 이 연구에 기초해 ‘중별 의료기관’이 ‘장기 입원’에 가장 큰 영향을 미치는 만큼 각 중별 의료기관들이 급성기, 만성기, 장기요양 치료에 대해 각각의 역할을 수행할 수 있도록 체계적인 구조를 마련해야 한다. 또한 각 중별 의료기관에서 적절한 재원일수를 평가할 때에는 환자 증상의 단계뿐만 아니라 정신과적 진단 및 부진단을 고려하여야 한다.

핵심되는 말: 재원일수, 노인정신질환, 정신질환, 진단, 동반질환, 장기 입원