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The Characteristics of Uncovered Medical Service Expenses for Frequent Main Diagnoses among the Elderly Patients*

Su-Jeong Lee[1], Moo-Sik Lee[2], HyoNam Lim[3], Kwang-Hwan Kim[4]†

[1]Department of Public Health, The Graduate School of Public Health and Welfare, Konyang University
[2]Dept. of Preventive Medicine, College of Medicine, Konyang University
[3]College of Nursing, Konyang University
[4]Konyang University · Dept. of Hospital Management, Konyang University

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ABSTRACT

This study analyzed the general characteristics, hospitalization characteristics, treatment outcome characteristics, number of days of hospitalization, and non-coverage of the elderly patients over 65 years of age. A total of 2,619 patients were selected from January 1, 2016 to December 31, 2016 by using K hospital's medical record team's discharge record summary information.

The results of the analysis of the elderly patients showed that the top 5 diagnoses were chemoradiotherapy (Z51) for 930 patients (35.5%), cataract (H26) for 570 patients (21.8%), angina pectoris (I20) for 455 patients (17.4%), 381 patients (14.5%) with pneumonia (J18) and 283 patients (10.8%) with cerebral infarction (I63).

In general characteristics, non-covered medical expenses were higher for health insurance patients than for uncovered medical expenses, and hospitalization characteristics and treatment outcome characteristics were higher than uncovered medical expenses for emergency patients and surgical patients. In conclusion, we were able to deduce from the results of this study that in order to control the increase in the uncovered medical expenses of hospitalized patients, it is possible to manage the number of days of hospitalization reasonably and manage it appropriately considering the personal characteristics of patients such as severity and death.

* This paper is excepted from a part of the master's thesis authored by Su-Jeong Lee (2017).

† Corresponding Author : Kwang-Hwan Kim, Konyang University · Dept. of Hospital Management, Konyang University (kkh@konyang.ac.kr)

1. Introduction

The development of medical technology directly or indirectly affects the public health, and hence, many changes are taking place in the health care services. With the development of medical technology and the improved accessibility of medical services, the mortality rate has decreased, further resulting in an increase in the average life expectancy. In the most OECD countries, the number of elderly people aged 65 or older is growing rapidly, and baby boomers born after World War II have either retired or are about to retire at large. As these baby boomers begin to join the elderly group, there is a growing concern that the cost of public health will rise astronomically.

In particular, for Korea, as the fastest aging population in the world, aging population attracts even greater attention as a phenomenon. The proportion of elderly people aged 65 or older in the total population increased steadily from 3.1% in 1970 to 7.2% in 2000, becoming an aging society, and is expected to enter the aged society in 2017, and 20.9% of the population are expected to enter the super aged society, followed by 24.2% in 2030, and 37.1% in 2050. And in particular, the proportion of the elderly population aged 85 or older is projected to increase from 0.9% in 2012 to 2.5% in 2030 and 7.7% in 2050.

The population's aging phenomenon is closely related to the future trend of national health expenditure in Korea. Elderly people who are physically fragile are suffering from degenerative chronic diseases and require long-term medical services. Therefore, the aging of the population will increase the cost of medical care. In particular, as the life expectancy increases due to the development of medicine, the elderly population is continuously increasing and the welfare policy of the elderly is required variously.

It is easy to expect that the increase in medical expenses will be a big burden on insurance finances because the future healthcare environment has a higher proportion of elderly people and an increase in life expectancy.

The proportion of elderly people aged 65 or older has increased by an annual average of 7.1% since 2008, accounting for 38.3% of total medical use in 2011, which grew from 7.1% on average per year from 2008, and captured 41.4% of total medical care costs (65 years of age or older), and the distribution of high amount patients by age group with medical expenses of over 3 million won is continuously increasing since 2008, and accordingly, it is necessary to change the medical environment according to the entry of aged society.

In addition, following the launch of the new administration, the government announced to expand the application of health insurance for medical treatment from the uncovered item which is the core of 'health insurance guarantee strengthening countermeasure.' In case of Korea, the percentage of directly borne medical expenses by citizens is 36.8%, which is 1.9 times higher than the OECD average (19.6%) and the second highest rate after Mexico (40.8%). Therefore, the new government (2017) announced that all medical expenses will be paid except for beauty and cosmetics, but if the cost and effectiveness is low, it will be transferred and managed to health insurance as a preliminary benefit with differentiated application of self contribution.

Every year, the Korea Health Insurance Association and the Korea Health Insurance Management Corporation publish data on the medical expenses of medical insurance patients, however, these

data are for requesting medical expenses, and specific data on medical care and noncoverage are missing, so the substance of medical expenses is difficult to review. Therefore, this study used actual hospital data to overcome some limitations of existing data. In addition, the elderly patients were selected as the 5th place in the main diagnosis, and they analyzed the medical use behavior of the uncovered medical expenses and studied the effective management method.

The purpose of this study is to investigate the characteristics of uncovered medical expenses for the diagnosis of 65 year old patients. It is important to understand the relationship between uncovered medical expenses for the diagnosis of the upper 5th diagnosis of high frequency main diagnosis in order to properly manage and explore directions for development of the uncovered medical expenses. Based on these results, we intend to improve the cost reduction and clinical efficacy, and utilize it as basic data for improving acute care hospital utilization and hospital medical quality of the elderly patients.

2. Materials and Methods

2.1 Subjects

The subjects of this survey were the elderly patients aged 65 years or older at the K university hospital in the D region for top 5th.

The survey period was from January 1, 2016 to December 31, 2016, based on the date of discharged patients over 65 years of age. Of the total 2,630 patients, one car insurance, two industrial accidents, and one general one were excluded from the payment method of medical expenses. In addition, 2,619 subjects were selected for the final examination, further excluding 2 cases of thoracic surgery, 3 cases of infectious diseases, 1 case of rehabilitation medicine and 3 cases of urology for the total of 7 people.

As a result of selecting top 5 patients for main diagnostic name, the subjects were selected by the main diagnoses of chemoradiotherapy and radiotherapy (Z51), cataract (H26), angina pectoris (I20), unspecified pneumonia (J18) and cerebral infarction (I63).

The subjects were selected and granted diagnostic code by the 7th Korean Standard Classification of Diseases and Causes of Death and the 9th International Classification of Diseases. The data needed for the study were summarized from the medical record form, and information including patient information, hospitalization, diagnosis, operation code, and other basic information was used (Fig. 1).

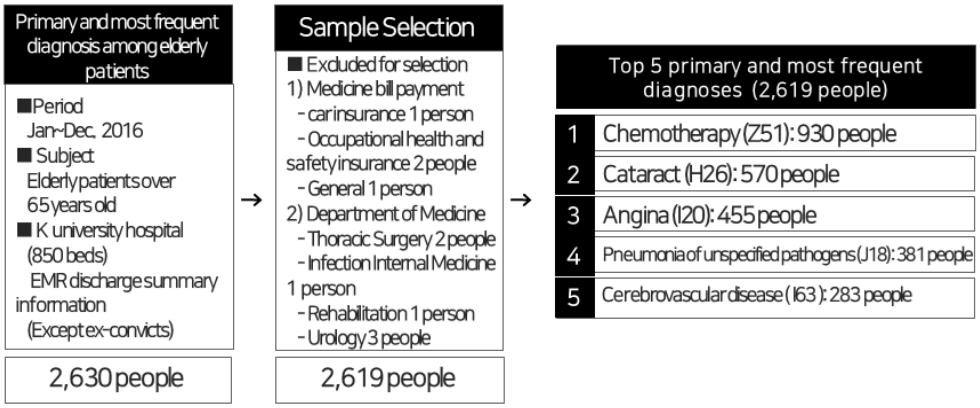

Fig 1. Survey subjects

2.2 Method

The study method was analyzed based on the EMR (Electronic Medical Record) data of D region's K University Hospital. For the protection of the subjects, the research was conducted under the approval of the K University Hospital's bioethics committee (IRB No. 201709008), and the collected data were reclassified according to the research purpose.

According to the Korean Standard Classification of Diseases and Causes of Death, the top 5 diagnostic categories of high frequency were selected.

General characteristics were classified into gender, age, and medical expense payment method. Gender and age were classified into male and female, aged 65-74, 75-84, and 80 years or older, and the medical expense payment method was classified into health insurance and medical care.

The characteristics of hospitalization were classified as admission route, admission history, admission season, department, operation, and anesthetic method. The hospitalization was classified into 3 types of emergency room, outpatient and outpatient surgery, and only two cases of cataract surgery (H26) were included. The questionnaire was divided into two types, direct visit and via other hospital. The hospitalized seasons were divided into the spring (March to May), summer (June to August), autumn (September to November), and winter (December to February). Clinical departments were divided into medical and surgical departments, and were classified according to the operation. Among the patients who underwent surgery, anesthesia was divided into partial anesthesia and complete anesthesia.

Treatment outcome characteristics were classified into clinical outcomes and discharge types. The results were classified as death within 48 hours, death after 48 hours, unexpected discharge, diagnosis only, improvement, and lack of improvement. The type of discharge was classified as death, discharge of the patient, transfer to another hospital, and after discharge instruction.

Finally, the main diagnoses were analyzed by general characteristics, hospitalization characteristics, and medical outcomes for the top 5 diagnostic categories of high frequency.

In this study, the main diagnostic categories were those diagnosed as the last diagnoses during

the period of treatment, except for the former patients, and the medical expenses were calculated for the noncoverage of the total medical expenses (Table 1) (Fig. 2).

Table 1. Subject characteristics

Characteristic	Item	variable		
General characteristic	Gender	① Male	② Female	
	Age	① 65 - 74	② 75 - 84	③ 85 or olde
	Medical expenses payment method	① Health Insurance	② Medical benefits	
Admission characteristic	Admission route	① Emergency room	② Outpatient clinic	③ Outpatient surgery
	Visiting route	① In person	② Via other hospital	
	Admission season	① Spring	② Summer	
		③ Fall	④ Winter	
	Treatment department	① Internal medicine	② Surgery	
	Whether having surgery	① Yes	② No	
	Anesthesia Method	① Complete anesthesia	② Partial anesthesia	
Treatment Outcome characteristic	Treatment results	① Died within 48 hours	② Died after 48 hours	③ Discharge without prospect
		④ Only diagnosis	⑤ Improved	⑥ Not improved
	Discharge Type	① Death	② Voluntary discharge	③ Transfer to other hospital
		④ Following discharge instruction		

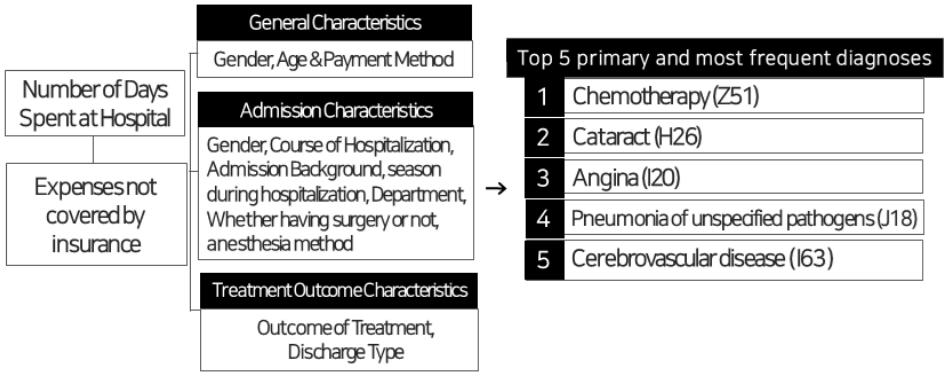

Fig. 2. Research method

2.3 Statistical analysis

Analysis was performed by using the records on the results of discharged patients of the hospital subject to research, and R program, a statistical software, was used for processing. All statistical

tests were performed on both sides at a significance level of $p < 0.05$. As for the analytical method, frequency analysis, independent sample t-test, one-way ANOVA and correlation analysis were performed on general characteristics, hospitalization characteristics, and outcome of the treatment.

3. Results

3.1 Survey subjects' characteristics

3.1.1 Survey subjects' general characteristics

Out of 2,619 subjects, 1,383 (52.8%) were male and 1,236 (47.2%) were female, with more males than females. The number of male patients by diagnosis was 533 cases (57.3%) of chemoradiotherapy (I51), 250 cases (54.9%) of angina, 236 cases (61.9%) of unspecified pneumonia (HJ18), 146 cases (51.6%) of cerebral infarction, but in the case of cataract (H26), 352 (61.8%) were female and 218 (38.2%) were male, respectively.

The most common age group was 65-74 (1,326) (50.7%), 75-84 were 1,056 (40.3%), and those over 85 years were 237 (9.0%). Among the top five diagnoses, 578 (62.2%) were diagnosed with chemoradiotherapy (Z51), 254 patients (55.8%) were with angina pectoris (I20) and 303 patients (53.1%) were diagnosed with cataract. In the case of unspecified pneumonia (HJ18) and cerebral infarction (I63), 179 patients (47.0%) and 135 patients (47.7%) were of 72-84 age as the most common patients, and patients of 85 years of age or older were also 107 (28.1%) and 52 (18.4%), respectively.

The payment method of medical expenses was as follows: 2,467 (94.2%) had health insurance, 152 (5.8%) had medical care, 875 (94.1%) had chemoradiotherapy (Z51), 541 (94.9%) had cataract (H26), 425 (93.4%) had angina pectoris, 353 (92.7%) had unspecified pneumonia (J18), and 273 (96.5%) had cerebral infarction (I63) (Table 2).

Table 2. General characteristics of survey subjects

Unit: people (%)

Classification	Chemoradiotherapy (Z51)	Cataract (H26)	Angina (I20)	Unspecified pneumonia (J18)	Cerebral infarction (I63)	Total
Gender						
Male	533 (57.3)	218 (38.2)	250 (54.9)	236 (61.9)	146 (51.6)	1,383 (52.8)
Female	397 (42.7)	352 (61.8)	205 (45.1)	145 (38.1)	137 (48.4)	1,236 (47.2)
Age						
65-74	578 (62.2)	303 (53.1)	254 (55.8)	95 (24.9)	96 (33.9)	1,326 (50.7)
75-84	332 (35.7)	233 (40.9)	177 (38.9)	179 (47.0)	135 (47.7)	1,056 (40.3)
85 or older	20 (2.1)	34 (6.0)	24 (5.3)	107 (28.1)	52 (18.4)	237 (9.0)
Medical expenses payment method						
Health insurance	875 (94.1)	541 (94.9)	425 (93.4)	353 (92.7)	273 (96.5)	2,467 (94.2)
Medical benefits	55 (5.9)	29 (5.1)	30 (6.6)	28 (7.3)	10 (3.5)	152 (5.8)
Total	930 (35.5)	570 (21.8)	455 (17.4)	381 (14.5)	283 (10.8)	2,619 (100.0)

3.1.2 Survey subjects' inpatient characteristics

In terms of admission route, 1,719 (65.6%) were hospitalized as outpatients, 564 (21.6%) were hospitalized via emergency room, and 336 (12.8%) were hospitalized via outpatient surgery. 926 patients were admitted for chemoradiotherapy (Z51) (99.6%), 364 for angina pectoris (I20) (80.0%), 105 for unspecified pneumonia (HJ18) (27.6%) and 91 for cerebral infarction (I63) (32%), and the greatest number was 336 for cataract (H26) for outpatient surgery.

The most frequent cases were direct visits (2,372 persons) (90.6%) and 247 via other hospital (9.4%). The most frequent diagnoses among via other hospital were pneumonia (J18) for 132 patients (34.6) and cerebral infarction (I63) for 72 patients (25.4%).

There were no significant differences in seasonal distribution for admission, but spring was the most frequent with 710 patients (27.1%), followed by winter with 675 (25.8%), summer with 639 (24.4%) and autumn with 595 patients (22.7%), and there was no significant difference in terms of diagnostic name.

In terms of medical subject, the number of internal medicine patients was 1,384 patients (52.8%), which was higher than 1,235 surgery patients (47.2%). In the internal medicine, 543 patients (58.4%) were treated with chemoradiotherapy (Z51), 455 patients (100.0%) with angina pectoris (I20), and 380 patients (99.7%) with unspecified pneumonia (J18).

In surgery and anesthesia method, 569 (99.8%) patients underwent partial anesthesia with 557 (97.7%) cataracts, and whether the rest underwent surgery was minimal (Table 3).

Table 3. Inpatient characteristics of survey subjects

Unit: people (%)

Classification	Chemoradiotherapy (Z51)	Cataract (H26)	Angina (I20)	Unspecified pneumonia (J18)	Cerebral infarction (I63)	Total
Admission route						
Emergency room	4 (0.4)	1 (0.2)	91 (20.0)	276 (72.4)	192 (67.8)	564 (21.6)
Outpatient clinic	926 (99.6)	233 (40.9)	364 (80.0)	105 (27.6)	91 (32.2)	1,719 (65.6)
Outpatient surgery	-	336 (58.9)	-	-		336 (12.8)
Visiting route						
In person	922 (99.1)	570 (100.0)	420 (92.3)	249 (65.4)	211 (74.6)	2,372 (90.6)
Via other hospital	8 (0.9)	-	35 (7.7)	132 (34.6)	72 (25.4)	247 (9.4)
Admission season						
Spring	245 (26.3)	175 (30.7)	127 (27.9)	102 (26.8)	61 (21.6)	710 (27.1)
Summer	283 (30.4)	103 (18.1)	101 (22.2)	81 (21.3)	71 (25.1)	639 (24.4)
Fall	179 (19.3)	134 (23.5)	102 (22.4)	110 (28.9)	70 (24.7)	595 (22.7)
Winter	223 (24.0)	158 (27.7)	125 (27.5)	88 (23.0)	81 (28.6)	675 (25.8)
Treatment department						
Internal medicine	543 (58.4)	-	455 (100.0)	380 (99.7)	6 (2.1)	1,384 (52.8)
Surgery	387 (41.6)	570 (100.0)	-	1 (0.3)	277 (97.9)	1,235 (47.2)
Surgery						
Yes	35 (3.8)	569 (99.8)	-	2 (0.5)	2 (0.7)	608 (23.2)
No	895 (96.2)	1 (0.2)	-	379 (99.5)	281 (99.3)	2,011 (76.8)
Anesthetic method						
Partial anesthesia	35 (3.8)	557 (97.7)	-	1 (0.3)	1 (0.4)	594 (22.7)
Complete anesthesia	-	12 (2.1)	-	1 (0.3)	1 (0.4)	14 (0.5)
Not applicable	895 (96.2)	1 (0.2)	-	379 (99.5)	281 (99.3)	2,011 (76.8)
Total	930 (35.5)	570 (21.8)	455 (17.4)	381 (14.5)	283 (10.8)	2,619 (100.0)

3.1.3 Characteristics of treatment results

The number of days of hospitalization and the status of uncovered medical expenses according to treatment characteristics are as follows.

In terms of the treatment results, 2,518 people (96.2%) were discharged following improvement, the number of deaths in 48 hours was 60 (2.3%), 17 (0.6%) did not improve, 16 (0.6%) died within 48 hours, and 5 were diagnosed only (0.2%), and 3 were discharged without prospect of improvement (0.1%). The most common type of discharge was death, voluntary discharge, other hospital transfer, discharge after instruction, and 96.3% (2,522) after discharge was the highest, followed by 2.9% (76 people) of deaths, 0.6% (16 people) of voluntary discharge, and 0.2% (5 persons) transferred to other hospitals.

Most of the patients were discharged after instruction from the hospital due to improvement, but in the unspecified pneumonia (J18) and cerebral infarction (I63), there were 62 deaths (16.3%), and 11 cerebral infarction (I63) patients (3.9%) (Table 4).

Table 4. Characteristics of treatment results of survey subjects

Unit: people (%)

Classification	Chemoradiotherapy (Z51)	Cataract (H26)	Angina (I20)	Unspecified pneumonia (J18)	Cerebral infarction (I63)	Total
Treatment results						
Died within 48 hours	-	-	-	15 (3.9)	1 (0.4)	16 (0.6)
Died after 48 hours	3 (0.3)	-	-	47 (12.3)	10 (3.6)	60 (2.3)
Discharge without prospect	-	-	4 (0.9)	3 (0.8)	-	3 (0.1)
Only diagnosis	-	-	-	-	1 (0.4)	5 (0.2)
Improved	923 (99.2)	570 (100.0)	447 (98.2)	312 (82.0)	266 (93.8)	2,518 (96.2)
Not improved	4 (0.5)	-	4 (0.9)	4 (1.0)	5 (1.8)	17 (0.6)
Discharge type						
Death	3 (0.3)	-	-	62 (16.3)	11 (3.9)	76 (2.9)
Voluntary discharge	2 (0.2)	-	1 (0.2)	6 (1.6)	7 (2.5)	16 (0.6)
Transfer to other hospital	-	-	2 (0.4)	-	3 (1.1)	5 (0.2)
Following discharge instruction	925 (99.5)	570 (100.0)	452 (99.4)	313 (82.1)	262 (92.5)	2,522 (96.3)
Total	930 (35.5)	570 (21.8)	455 (17.4)	381 (14.5)	283 (10.8)	2,619 (100.0)

3.2 Uncovered medical expenses of survey subjects

3.2.1 Uncovered medical expenses following general characteristics of survey subjects

The general characteristics of the survey subjects were only significant for the payment method of the medical expenses. There was statistically significant difference ($p < 0.01$) between uncovered

medical expenses average of 362,626 won for health insurance and 260,632 won for medical benefits. There was no significant difference in diagnosis by gender and age, but only cataract (H26) and angina pectoris (I20) were noted in the payment method. For the uncovered medical expenses of cataracts (H26), the patients with insurance benefits was 413,198 won on average, but the medical benefit patients were 132,137 won, and in the case of angina pectoris (I20), the insurance benefit patients paid 479,384 won the medical benefit patients paid 357,282 won, thereby being statistically significant. ($p < 0.001$) ($p < 0.05$) (Table 5).

Table 5. Uncovered medical expenses following the general characteristics of survey subjects

Unit: Won, mean ± standard deviation

Classification	Chemoradiotherapy (Z51)		Cataract (H26)		Angina (I20)		Pneumonia (J18)		Cerebral infarction (I63)		Total	
	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value		
Gender		0.590		0.957		0.919		0.474		0.871		0.608
Male	192,998	±542,440	398,343	±207,388	472,536	±276,633	421,531	±436,660	559,353	±409,695	353,570	±449,361
Female	173,959	±520,145	399,243	±187,414	469,867	±280,149	456,620	±506,267	552,054	±338,622	362,265	±413,475
Age		0.201		0.202		0.468		0.610		0.311		0.099
65-74	198,995	±519,196	409,235	±196,891	479,899	±298,139	425,021	±449,051	614,799	±422,722	347,141	±435,630
75-84	151,492	±518,744	392,531	±199,918	467,638	±246,550	458,695	±477,025	533,161	±340,876	358,532	±421,728
85 or older	330,768	±979,699	350,426	±130,313	407,932	±276,781	403,811	±457,158	505,762	±366,667	412,775	±461,639
Payment method		0.728		0.000***		0.020*		0.185		0.428		0.005**
Health insurance	183,349	±519,289	413,198	±187,645	479,384	±280,275	443,767	±477,065	559,221	±381,118	363,610	±429,922
Medical benefits	209,090	±720,578	132,137	±130,063	357,282	±215,093	322,911	±222,407	462,971	±194,009	261,326	±467,141
Total	184,871	±532,836	398,898	±195,115	471,333	±277,918	434,885	±464,040	555,819	±376,322	357,674	±432,736

*$p<0.05$, **$p<0.01$, ***$p<0.001$, by t-test or one way ANOVA test.

3.2.2 Uncovered medical expenses following inpatient characteristics of survey subjects

In terms of admission route, there was statistically significant difference ($p < 0.001$) between emergency room (487,057 won), outpatient surgery (358,550 won) and outpatient (315,052 won). In the department of treatment, the uncovered medical expenses for internal medicine were 379,655 won, and 333,040 won for surgical department ($p < 0.01$). The operation was 379,655 won for surgery and 346,173 won for non-surgery ($p < 0.01$). In the anesthetic method, partial anesthesia was 389,578 won and complete anesthesia was 656,012 won ($p < 0.001$).

For each diagnostic name, cataract (H26) and angina pectoris (I20) were statistically significant in the hospitalization characteristics and hospitalization cost of uncovered medical expenses. In the case of uncovered medical expenses for cataract (H26), outpatient surgery patient was 358,550 won, outpatient was 457.954 won, and emergency patients were 196,338 won, showing statistical significance ($p < 0.001$). In the case of cerebral infarction (I63), there was a statistically significant difference ($p < 0.05$) between the outpatient of 413,418 won and the emergency room of 485,812 won. In the admission season, only cataract patients showed a significant level of uncovered medical

expenses, and spring (428,599 won) was the highest for uncovered medicale expenses, followed by summer, autumn and winter ($p < 0.01$). In the treatment department, at the chemoradiotherapy (Z51), the internal medicine was 261,179 won, which was higher than 77,803 won for the surgery department and was also statistically significant ($p < 0.001$). Surgery had large difference with 1,438,519 won for surgery patients and 549,537 won for non-surgery patients (I63), being statistically significant ($p<0.01$) (Table 6).

Table 6. Uncovered medical expenses following hospitalization characteristics of survey subjects

Unit: Won, mean ± standard deviation

Classification	Chemoradiotherapy (Z51)		Cataract (H26)		Angina (I20)		Pneumonia (J18)		Cerebral infarction (I63)		Total	
	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value	Uncovered medical expenses	*p*-value		*p*-value
Admission route		0.242		0.000***		0.026*		0.116		0.545		0.000***
Emergency room[a]	495,736 ±874,347		196,338 -		413,418 ±268,026		457,928 ±486,372		565,166 ±381,582		487,057 ±428,982	b,c<a
Outpatient clinic[b]	183,528 ±531,266		457,954 ±267,331		485,812 ±278,818		374,316 ±395,182		536,100 ±366,268		315,052 ±464,324	
Outpatient surgery[c]	-		358,550 ±104,826		-		-				358,550 ±104,826	
Visiting route		0.514				0.628		0.458		0.579		0.000***
In person	183,807 ±532,386		398,899 ±195,115		473,157 ±278,735		422,015 ±466,511		548,559 ±373,256		344,180 ±431,381	
Via other hospital	307,489 ±608,451		-		449,454 ±270,880		459,163 ±460,125		577,098 ±387,034		487,253 ±425,079	
Admission season		0.998		0.007**		0.092		0.018		1.515		0.675
Spring[a]	189,431 ±448,602		428,599 ±221,488	a<d	511,548 ±300,894		402,800 ±444,604	c<b	613,697 ±406,145		373,103 ±400,579	
Summer[b]	181,193 ±578,200		413,689 ±195,217		469,856 ±219,542		435,745 ±481,979		527,955 ±301,031		335,091 ±469,353	
Fall[c]	181,255 ±600,865		398,468 ±187,597		418,043 ±254,849		361,163 ±308,615		492,676 ±395,550		340,664 ±418,337	
Winter[d]	187,430 ±502,690		356,726 ±161,603		475,154 ±308,245		563,436 ±594,406		591,227 ±391,471		377,816 ±440,929	
Treatment department		0.000***						0.383		0.852		0.006**
Internal medicine	261,179 ±678,952		-		471,333 ±277,918		435,950 ±464,186		584,183 ±256,906		379,655 ±524,048	
Surgery	77,803 ±127,855		398,899 ±195,115		-		30,300 -		555,205 ±378,792		333,040 ±297,233	
Surgery		0.560		0.415				0.027*		0.001**		0.013*
Yes	236,375 ±573,369		399,178 ±195,173		-		1,155,531 ±679,047		1,438,519 ±1,119,215		395,713 ±252,672	
No	182,857 ±531,431		239,906 ±0.00		-		431,082 ±460,967		549,537 ±364,076		346,173 ±473,344	
Anesthetic method				0.430								0.000***
Partial anesthesia	236,375 ±573,369		398,230 ±191,210		-		675,372 ±0.00		647,114 ±0.00		389,578 ±234,167	
Complete anesthesia	-		443,213 ±341,756		-		1,635,690 ±0.00		2,229,923 ±0.00		656,012 ±636,404	
Total	184,871 ±532,836		398,898 ±195,115	471,333	±277,918		434,885 ±464,040		555,819 ±376,322		357,674 ±432,736	

*p<0.05, **p<0.01, ***p<0.001, t-test or one way ANOVA test.
[a,b,c,d] Group means that there is a statistical difference in the mean by the Scheffé post test.

3.2.3 Uncovered medical expenses and treatment results

In the relationship between treatment characteristics and uncovered medical expenses of all survey subjects, the results of medical treatment and discharge were significant. In the treatment results, death was the highest for 642,157 won, followed by voluntary discharge for 527,676 won, transfer

to other hospital for 447,678 won, and discharge after instruction for 347,844 won (p <0.001), and in terms of discharge type, death was 642,157 won, voluntary discharge 527,676 won, transfer to other hospital 447,678 won, and discharge after instruction was 347,844 won (p <0.001).

As for each diagnostic name, angina pectoris (I20) and pneumonia (J18) were statistically significant in terms of the results of medical treatment. In the case of angina pectoris (I20), uncovered medical expenses were 477,850 won for improvement, 192,440 won for diagnosis only, 21,947 won for lack of improvement, and the uncovered medical expenses were statistically significant (p<0.001). In the case of pneumonia (J18), as for uncovered medical expenses, death after 48 hours was 728,097 won, discharge with no prospect was 491,777 won, improvement was 397,086 won, death within 48 hours was 324,638 won and lack of improvement was 308,742 won, which was statistically significant (p <0.000). Finally, the discharge type was the highest at 2,158,400 won for patients voluntarily discharged from chemoradiotherapy (Z51), the lowest at 928,803 won for death, and 178,191 won after discharge instruction (p <0.001). In the case of pneumonia (J18), as for uncovered medical expenses, the deceased patients were the highest for 630,486 won, 399,358 won for discharge after instruction, 267,002 won for voluntary discharge, being statistically significant (p <0.001) (Table 7).

Table 7. Uncovered medical expenses following characteristics of treatment results of survey subjects

Unit: Won, mean ± standard deviation

Classification	Chemoradiotherapy (Z51)			Cataract (H26)			Angina (I20)			Pneumonia (J18)			Cerebral infarction (I63)			Total	
	Uncovered medical expenses		*p*-value	Uncovered medical expenses		*p*-value	Uncovered medical expenses		*p*-value	Uncovered medical expenses		*p*-value	Uncovered medical expenses		*p*-value		
Treatment results			0.050						0.001**			0.000***			0.796		0.006**
Died within 48 hours[a]		-			-			-		324,638	±191,851		679,063	±0.00		346,789	±205,437
Died after 48 hours[b]	928,803	±533,537			-			-		728,097	±674,312		624,831	±353,578		720,921	±622,120
Discharge without prospect[c]	182,085	±532,340			-			-		491,777	±191,906			-		491,777	±191,906
Only diagnosis[d]		-			-		192,440	±181,381	f<e	397,086	±421,166		180,031	±0.00		189,958	±157,179
Improved[e]	182,085	±532,340			-		477,850	±275,410			-		555,737	±380,390		349,783	±426,071
Not improved[f]	269,779	±264,198			-		21,947	±8,971		308,742	±371,459		472,716	±238,848		280,320	±285,872
Dicharge type			0.000***						0.091			0.001**			0.510		0.000***
Death	928,803	±533,537			-			-		630,486	±617,801		629,761	±335,832		642,157	±580,070
Voluntary discharge	2,158,400	±2,968,487			-		18,220	-		267,002	±281,589		357,968	±202,236		527,676	±1,021,148
Transfer to other hospital		-			-		186,169	±192,747			-		622,017	±104,893		447,678	±267,915
Following discharge instruction	178,191	±514,807			-		473,598	±277,217		399,358	±420,666		557,243	±382,537		347,844	±418,809
Total	184,871	±532,836		398,898	±195,115		471,333	±277,918		434,885	±464,040		555,819	±376,322		357,674	±432,736

*p<0.05, **p<0.01, ***p<0.001, t-test or one way ANOVA test.
[a,b,c,d,e,f] Group means that there is a statistical difference in the mean by the Scheffé post test.

3.3 Correlation of diagnostic name variables of survey subjects

We analyzed the correlation between gender, age, hospital admission, surgery status, number of days of hospitalization, and uncovered medical expenses according to the diagnosis of the survey subjects. As a result, there was no significant correlation in chemoradiotherapy (Z51).

In cataract (H26), there was a positive correlation between the number of days of hospitalization

and the uncovered medical expenses, being statistically significant ($p < 0.05$). This means that the number of days of hospitalization is smaller and the uncovered medical expenses is smaller when a patient is admitted to a hospital through outpatient surgery than a patient who is hospitalized through an emergency room or outpatient clinic. The outpatient surgery is a surgery that does not require hospitalization during surgery and can be discharged on the day of surgery, reducing the time and economic loss due to hospitalization before and after surgery and the burden on the operation, thereby becoming common in developed countries such as the United States with the medical technological development. There was a statistically significant difference ($p < 0.05$) between the number of days of hospitalization and the uncovered medical expenses, being statistically significant, and there was no significant difference between the other variables.

In the case of angina pectoris (I20), there was a negative correlation with uncovered medical expenses in the admission route, being statistically significant ($p < 0.05$). As a result of analyzing the correlation between the number of days of hospitalization and the uncovered medical expenses, there was a positive correlation between the number of days of hospitalization and the uncovered medical expenses, showing a statistically significant difference ($p < 0.05$).

In pneumonia (J18), there was a statistically significant difference ($p < 0.01$) ($p < 0.05$) between the number of days of hospitalization and the uncovered medical expenses. This means that patients who underwent surgery had longer days of hospitalization and higher uncovered medical expenses than the non-surgery patients. As a result of analyzing the correlation between the number of days of hospitalization and the uncovered medical expenses, there was a statistically significant difference between the number of days of hospitalization and uncovered medical expenses ($p < 0.01$).

In the cerebral infarction (J63), there was a statistically significant positive correlation between age and gender, and there was a positive correlation between the hospitalization and age ($p < 0.01$). There was a correlation between gender and admission route for the number of days of hospitalization. In the case of gender, positive correlation was observed, and the duration of hospitalization was longer for males than females ($p < 0.05$). The negative correlation was found in the hospital admission route, which means that the hospital stay in the emergency room was longer ($p < 0.01$). In the surgery department, there was a positive correlation between surgery and the number of days of hospitalization. In the case of cerebral infarction, for surgery and longer hospital stay, the uncovered medical expenses were higher, showing a statistically significant difference ($p < 0.01$) (Table 8).

Table 8. Correlation between variables of diagnostic categories of survey subjects

Classification		Gender	Age	Admission route	Surgery	Number of days of hospitalization
Chemoradiotherapy (Z51)	Age	0.010				
	Admission route	0.024	0.026			
	Surgery	0.024	0.028	0.013		
	Number of days of hospitalization	−0.043	−0.022	−0.027	−0.061	
	Uncovered medical expenses	−0.018	−0.029	−0.038	0.019	0.211***

Classification		Gender	Age	Admission route	Surgery	Number of days of hospitalization
Cataract (H26)	Age	−0.018				
	Admission route	−0.028	0.005			
	Surgery	0.053	0.016	0.050		
	Number of days of hospitalization	−0.003	0.007	−0.299***	0.011	
	Uncovered medical expenses	0.002	−0.079	−0.242***	0.034	0.172***
Angina (I20)	Age	0.078				
	Admission route	0.044	−0.054			
	Surgery	−	−	−		
	Number of days of hospitalization	−0.088	0.096*	−0.041	−	
	Uncovered medical expenses	−0.005	−0.030	0.104*	−	0.402***
Unspecified pneumonia (J18)	Age	0.020				
	Admission route	0.000	−0.086			
	Surgery	0.018	−0.072	−0.045		
	Number of days of hospitalization	−0.040	−0.004	−0.006	0.156**	
	Uncovered medical expenses	0.037	−0.012	−0.081	0.113*	0.435***
Cerebral infarction (I63)	Age	0.292***				
	Admission route	−0.061	−0.212***			
	Surgery	0.003	−0.008	0.032		
	Number of days of hospitalization	0.138*	0.067	−0.190**	0.066	
	Uncovered medical expenses	−0.010	−0.099	−0.036	0.198**	0.475***

*p<0.05, **p<0.01, ***p<0.001

4. Discussion

Korea's medical and health insurance system has the highest growth rate of medical expenses in the world in recent years. Given the rapid aging of the population in Korea, future medical expenditures, health insurance expenditures and government welfare expenditures will continue to increase. In addition, since the mid 2000s, the policy on the protection of health insurance has been promoted and the policy on non-coverage has attracted much attention, and yet, one of the reasons as to why various policies introduced to enhance the protection of national health insurance have not played a large effective role is the lack of efficient management of the uncovered medical care.

Therefore, the core of health and welfare policy in Korea may be summarized as the increase

of medical resources and the increase of medical expenses due to the expansion of medical resources and medical insurance due to the aging of the population. In this background, we analyzed the number of days of hospitalization and uncovered medical expenses for the top 5 main diagnoses of high frequence. The top 5 main diagnoses of high frequency according to the survey period were chemoradiotherapy (Z51), cataract (H26), angina pectoris (I20), unspecified pneumonia (J18) and cerebral infarction (I63). Such diagnostic categories were also closely related to the cause of death in Korea. In 2006 through 2016, 3 major causes of death were found to be malignant neoplasm, cerebrovascular disease, and heart disease, and in case of peumonia, the number of deaths increased steadily from 2004 to 4th place from 2015. Cataracts are also known to be the most common surgery in 2016 due to the effects of aging.

In the general characteristics of the top 5 diagnoses, the higher the elderly group, the higher the uncovered medical expenses for some diagnoses.

Among the admission characteristics, the uncovered medical expenses were higher by 175,005 won than the outpatient when they were admitted to the emergency room. This is because of the severity of the patient and other additional costs for the emergency room patients. As shown in a research by Park (2001), the higher the severity, the longer the duration of the hospital stay. In the treatment department, 1,384 patients (52.8%) were in the internal medicine department, which was similar to 1,235 patients (47.2%) of the surgery department. In addition, the duration of hospitalization for surgery was 1.56 days, which was shorter than 5.73 days for patients who did not undergo surgery, which was probably due to the effects of 570 patients with cataract (H26) who undergo surgery.

In the treatment results' characters, there were significant differences in the outcome of the treatment and the type of discharge. As for each diagnostic name, most patients were discharged from the hospital following improvement and discharge instruction. However, even though the number of days of hospitalization was small in the case of death, the uncovered medical expenses were relatively high. This can be seen in the context of the increase in the death related medical expenses for the elderly who are close to death in terms of the elderly medical expenses according to researches such as Kim (2017) and Seok (2012). In particular, unspecified pneumonia (J18) had more deaths than other diagnoses. Pneumonia is the leading cause of death among the elderly patients, and in 2016, pneumonia caused deaths among the elderly aged 65 or older were 32.2 people per 100,000 people. This suggests that the elderly's pneumonia, unlike young adults', is more common, has a high mortality rate, and causes serious economic costs as seen through the results of the research by Jung (2008).

The correlation between the uncovered medical expenses and the number of days of hospitalization was all positive for the 5 diagnostic categories. Management of the uncovered medical expenses will benefit all medical consumers, suppliers and countries. The decrease in the number of days of hospitalization leads to the improvement of the bed rotation rate, which improves the quality of care for new patients and improves hospitals' returns. In addition, even from the patient's perspective, discharging after improvement will help save the medical expenses and enable the health insurance finances. The most important aspect of the current administration's medical policy is the provision of uncovered medical expenses, which is a policy to reduce the burden of national healthcare costs

by gradually applying uncovered medical expenses to health insurance. By strengthening the health insurance coverage of medical expenses by 2022, the government has announced that it will guarantee coverage through the people's health insurance, and the controversy has continued. Therefore, the government is currently planning to apply approximately 3,800 uncovered items in the form of covered and provisionally covered benefits.

The limitations of this study is that only the patients who were discharged from January through December 2016 were selected as the survey subject for the top 5 diagnostic categories of high frequency during the same term at an actual general hospital. However, despite such limitations, it was meaningful that we selected the top diagnostic categories for the patients who stayed at an actual general hospital, analyzed the number of days of hospitalization and the characteristics of uncovered medical expenses, and provided general data on general characteristics, hospitalization characteristics, and treatment results' characteristics.

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