

Factors associated with the choice of tertiary hospitals in patients with diabetes or hypertension

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<Abstract>

당뇨 또는 고혈압 환자의 상급종합병원 이용에 미치는 요인

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목적: 이 연구는 당뇨와 고혈압 환자의 상급종합병원 이용에 미치는 요인을 관찰하였다.

방법: 이 연구는 한국보건사회연구원과 국민건강보험공단이 공동으로 조사하는 한국의료패널 자료를 사용하였다 (2008년, 2010년, 2012년). 연구대상은 20세 이상 성인이었으며 각 2008년에 2409명, 2010년에 2424명, 2012년에 2429명을 관찰하였다. 당뇨와 고혈압에 대한 외래방문 건수는 총 64,438건이었으며 당뇨 또는 고혈압 환자의 3차 의료기관 선택에 영향을 주는 요인을 관찰하기 위해 다수준 로지스틱 회귀분석을 활용하였다.

결과: 교육수준이 높은 환자가 낮은 환자에 비해 상급종합병원을 이용할 확률이 각각 2008년에 2.04배, 2010년에 1.83배, 그리고 2012년에 1.65배 더 높았다. 또한 고소득 환자가 저소득 환자에 비해 3차 의료기관을 이용할 확률이 2008년에 1.77배, 2010년 1.91배 그리고 2012년 1.94배 더 높았다.

결론: 정책입안자들은 의료전달 시스템과 관련하여 정책을 실행할 때 이러한 환자의 특징을 고려할 필요가 있다.

중심단어: 보건의료전달, 상급종합병원, 당뇨, 고혈압

I . Introduction

Diabetes and hypertension are common diseases in both Korea and other developed countries [1]. As of 2011 in Korea, the reported prevalence rate of diabetes and hypertension was 7.7% and 28%, respectively [2, 3]. In comparison with other

Organisation for Economic Cooperation and Development (OECD) countries, the recent estimated prevalence of type 2 diabetes in Korea is higher (6.9%) [4]. In addition, this rate is continuously rising, making this an important public health issue as heavier social and economic burdens are created along with the rapid increase of this

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prevalence rate [5].

To alleviate such disease-based burdens, many developed countries are already developing and implementing detailed policies for the prevention and care of diabetes and hypertension [6–11]. In Korea, the need for systematic management plans through sustainable and comprehensive tailored treatment of diabetes and hypertension is recognized. However, amidst an unclear establishment of medical institute functions and the medical care delivery system in the Korean public health care system, the phenomenon of patients flocking to large general hospitals is intensifying [12].

The total number of healthcare institutes (excluding pharmacies) in Korea in 2010 was 59,856: 44 tertiary hospitals, 2,741 hospital-level medical institutes (including general hospitals), and 57,071 clinics, which make up 0.07%, 4.6%, and 95.3% of the total, respectively [13]. However, the medical expenses paid by the National Health Insurance Corporation to medical institutes in 2010 was 22.8% to tertiary hospitals, 38.5% to hospital-level medical institutes (including general hospitals), and 38.7% to clinic-level medical institutes [14]. Therefore, patients are crowding to tertiary hospitals, which make up not even 0.1% of the institutes yet receive approximately 23% of the total medical costs.

The phenomenon of patients crowding to tertiary hospitals is not exclusive to the severely ill. When looking at the composition of outpatients, 32.5% of them had milder illnesses that could have been treated at a clinic-level medical institution [15]. Furthermore, for outpatients at large hospitals, cancer was the most common disease; however, the next two most common diseases were diabetes and hypertension [16].

To tackle this issue, the Korean government increased the coinsurance rate of tertiary hospitals, (as per a 2011 policy) where the coinsurance rate

of medical institutions' costs above the general hospital level were raised for 50 selected illnesses, including colds, hypertension, and diabetes, that are treatable in clinic-level medical institutions [17]. In addition, in 2012, to induce clinic-level medical institutes to manage diabetes and hypertension, the chronic disease management system was implemented and the coinsurance rate was reduced by 10% for patients who chose to be treated in clinics. However, the policy intervention needs to be supplemented with relevant evidence and it is important to examine what factors are associated with the medical utilization of patients with chronic diseases.

Only a few previous studies examined the factors associated with the choice of tertiary hospitals in South Korea. Lee et al. [18] examined factors associated with diabetes outpatient use of tertiary or general hospitals as their usual source of care. They found that patients with higher education, income, and Charlson's comorbidity index (CCI) levels were more likely to use tertiary or general hospitals. Lee et al. [19] also investigated factors associated with hypertension outpatients' choice of healthcare providers in Korea. They found that lower income and less education were associated with a higher frequency of clinic visits. However, previous studies examined the factors using one-year data only. We wonder whether these factors are associated with the choice of tertiary hospitals in patients with hypertension or diabetes consistently.

This research examined Korean diabetes or hypertension patients and their usage of medical institutes. Specifically, we analyzed the socioeconomic factors affecting the usage of tertiary hospitals. Lastly, the changes in medical treatment patterns of patients with diabetes or hypertension was examined according to socioeconomic factors.

II . Methods

1. Data

The 1st, 3rd, and 5th year (2008, 2010, and 2012, respectively) data from the Korea Health Panel was collected by the Korea Public Health Social Research Center and the National Health Insurance Corporation. The Korea Health Panel research was conducted to create basic data on Korea's healthcare usage, medical expenditures, health level, and medical behavior. To maintain the legitimacy of a national scale study, the data extraction frame was set to 90% of the 2005 population housing survey. A stratified clustered systematic method was used to select the sample of households for this research. First, sample enumeration was extracted; second, sample households were extracted from the sample enumeration.

2. Study sample

Participants comprised adults aged over 20 years; 7262 people's household members (2,409 in 2008, 2,424 in 2010, and 2,429 in 2012) had 64,438 outpatient visits (21,055 in 2008, 21,606 in 2010, and 21,777 in 2012) for diabetes or hypertension. We utilized three years' worth of data due to differences in disease classification. Patients who were diagnosed with diabetes or hypertension at each study period were selected as participants. Meanwhile, as analysis of the usage pattern of different types of medical institutes was the central purpose of this research, cases where medical institutes other than clinic level, hospital, and tertiary hospital were visited were not considered. In addition, the type of medical institutes for outpatient may

have differed for each visit; therefore, the cases when a patient visited more than two types of medical institutes were removed from analysis.

3. Variables

This study included sex, age, education level, marital condition, income, participation in economic activities, form of medical insurance (i.e., health insurance, medical care assistant), existence of a disability, subjective health condition, and CCI as variables. Education level and income were set as socioeconomic specific variables. CCI was originally developed to describe the death risk of patients in experimental studies; however, it is also widely used as a common method of describing comorbidity severity. CCI was calculated using a Quan algorithm, a coding method of the tenth edition of the International Statistical Classification of Diseases and Related Health Problems (ICD-10). The reason for this was that the classification for illness codes of the Korea Health Panel was based on the sixth edition of the Korean Classification Disease (KCD-6), which is similar to the ICD-10 and made one-to-one matching of illness codes possible [20].

The CCI provided a number between 1 and 6 for 17 illness categories according to the severity of the disease and provided information on comorbidity [21]. The CCI in this study was set to the accumulated amount of all comorbidity scores reported when visiting medical institutes for a year. Any overlapping cases of illnesses included in the same illness category were not calculated.

Medical law distinguishes types of medical institutes as clinics or hospitals by the size and level of medical treatment, and sets additional standards or requisites for general hospitals, special hospitals, and tertiary hospitals.

Table 1. General characteristics of diabetes mellitus or hypertension outpatients

Variable	2008					2010					2012				
	Total	%	Tertiary hospital	%	p-value	Total	%	Tertiary hospital	%	p-value	Total	%	Tertiary hospital	%	p-value
Total	2409		527			2424		519			2429		482		
Sex					.0026					.0056					.0094
Male	1,067	44.3	255	23.9		1092	45.0	253	23.2		1087	44.8	237	21.8	
Female	1,342	55.7	272	20.3		1332	55.0	266	20.0		1342	55.2	245	18.3	
Age					< .0001					.1415					.6686
20-49	303	12.6	57	18.8		252	10.4	54	21.4		241	9.9	49	20.3	
50-59	549	22.8	106	19.3		517	21.3	95	18.4		450	18.5	88	19.6	
60-69	811	33.7	176	21.7		750	30.9	156	20.8		715	29.4	137	19.2	
≥ 70	746	31.0	188	25.2		905	37.3	214	23.6		1023	42.1	208	20.3	
Education level					.0015					.0073					.0681
Below elementary school	1,081	44.9	212	19.6		1078	44.5	218	20.2		1068	44.0	194	18.2	
Middle school	407	16.9	90	22.1		425	17.5	80	18.8		416	17.1	81	19.5	
High school	584	24.2	123	21.1		592	24.4	126	21.3		627	25.8	128	20.4	
Above university	337	14.0	102	30.3		329	13.6	95	28.9		318	13.1	79	24.8	
Marital status					.0564					.0737					.1303
Married	1,795	74.5	410	22.8		1813	74.8	399	22.0		1800	74.1	361	20.1	
Divorced or widowed or unmarried	585	24.3	109	18.6		577	23.8	110	19.1		598	24.6	114	19.1	
Income					.0984					.7105					.6791
Lowest	671	27.9	152	22.7		671	27.7	133	19.8		626	25.8	118	18.8	
Low	519	21.5	103	19.8		505	20.8	102	20.2		544	22.4	109	20.0	
Middle	450	18.7	91	20.2		462	19.1	102	22.1		464	19.1	83	17.9	
High	354	14.7	75	21.2		398	16.4	89	22.4		413	17.0	88	21.3	
Highest	397	16.5	103	25.9		382	15.8	92	24.1		380	15.6	84	22.1	
Health insurance type					< .0001					< .0001					< .0001
Health insurance	2,207	91.6	439	19.9		2176	89.8	421	19.3		2217	91.3	404	18.2	
Medical aid	202	8.4	88	43.6		248	10.2	98	39.5		212	8.7	78	36.8	
Economic activities					< .0001					.0018					.0013
Yes	1,189	49.4	204	17.2		1190	49.1	220	18.5		1192	49.1	201	16.9	
No	1,220	50.6	323	26.5		1234	50.9	299	24.2		1237	50.9	281	22.7	
Self-rated health										< .0001					< .0001
Good	-	-	-	-		765	31.6	139	18.2		654	26.9	97	14.8	
Normal	-	-	-	-		875	36.1	142	16.2		972	40.0	172	17.7	
Bad	-	-	-	-		609	25.1	183	30.0		684	28.2	175	25.6	
Disability					< .0001					< .0001					< .0001
Yes	241	10.0	88	36.5		295	12.2	88	29.8		312	12.8	88	28.2	
No	2,168	90.0	439	20.2		2129	87.8	431	20.2		2117	87.2	394	18.6	
Charlson's Comorbidity Index					< .0001					< .0001					< .0001
0	1,762	73.1	299	17.0		1775	73.2	309	17.4		1834	75.5	297	16.2	
1	559	23.2	187	33.5		580	23.9	171	29.5		455	18.7	120	26.4	
≥ 2	88	3.7	41	46.6		69	2.8	39	56.5		140	5.8	65	46.4	

The Korea Health Panel conducted its studies on a variety of medical institutes; however, this study divided medical institutes into two groups: clinics and hospitals (including general hospitals) and tertiary hospitals. Although tertiary hospitals are a separate category in the Medical Service Delivery System, there are only approximately 40 of them and they are typically situated in selected big cities, resulting in accessibility problems.

4. Statistical analysis

The Statistical Analysis System (SAS) version 9.2 (SAS Institute Inc., Cary, NC, USA) was used for data analysis. Difference in outpatient usage rate of diabetes or hypertension patients was analyzed with a chi-square test. A binary logistic regression model was used to analyze the factors contributing to higher usage of tertiary hospitals in relation to clinics and hospital-level medical institutes.

III. Results

Table 1 shows participants' general characteristics and usage level of tertiary hospitals. The statistically significant variables included the following: first, there were more men than women and 2/3 were aged over 60 years; most of the patients were married and had health insurance; elderly patients aged over 70 years used tertiary hospital the most (25.2% in 2008, 23.6% in 2010, and 20.3% in 2012); and more patients with medical care assistance used tertiary hospitals than ones with health insurance did (43.6% in

2008, 39.5% in 2010, and 36.8% in 2012). For subjective health condition, those who responded as having a bad health condition had highest usage level (30.0% in 2010 and 25.6% in 2012), and people with a disability (36.5% in 2008, 29.8% in 2010, and 28.2% in 2012), and patients with more than 2 CCI (46.6% in 2008, 56.5% in 2010, and 46.4% in 2012) used tertiary hospitals the most.

Table 2 displays the deciding factors that diabetes or hypertension patients had for using tertiary hospitals rather than clinics or other hospitals. Of the socioeconomic factors, patients with a higher education level had a much higher chance of using tertiary hospitals than ones with less education by 2.04, 1.83, and 1.65 times in 2008, 2010, and 2012, respectively. In addition, patients with the highest income had a 1.77, 1.91, and 1.94 times higher probability of using tertiary hospitals than ones with the lowest income in 2008, 2010, and 2012, respectively. Lastly, patients with medical-aid as their medical insurance type, a lower subjective health condition, and more than 2 CCI had a higher probability of using tertiary hospitals.

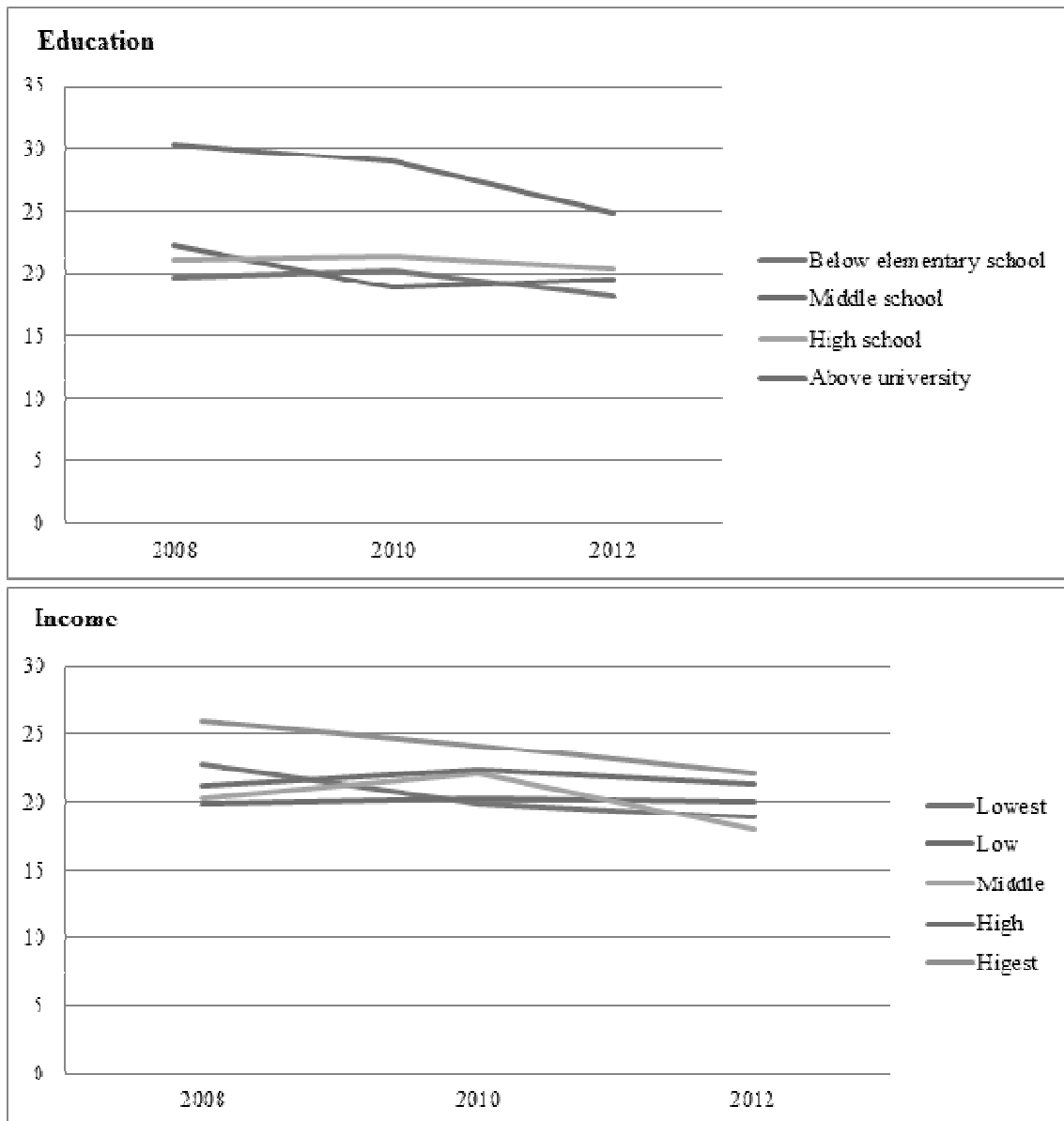
Figure 1 shows the change of tertiary hospital usage level depending on the socioeconomic factors of diabetes or hypertension patients for the past 5 years. First, the usage level depending on education level decreased over time and this decrease was largest for patients with the highest level of education. In addition, a similar observation was made for income level income where the usage of tertiary hospitals continuously declined over the last 5 years with the largest decrease existing for patients with the highest income level.

Table 2. Factors associated with outpatients' use of tertiary hospitals

Variable	2008			2010			2012			
	OR [§]	95% CI		OR	95% CI		OR	95% CI		
Sex										
Male	1.00			1.00			1.00			
Female	0.97	0.75	1.24	0.96	0.74	1.24	0.84	0.65	1.09	
Age										
20-49	1.00			1.00			1.00			
50-59	1.20	0.81	1.77	1.02	0.66	1.58	1.00	0.64	1.57	
60-69	1.23	0.83	1.82	1.12	0.72	1.73	0.99	0.64	1.54	
≥ 70	1.44	0.94	2.21	1.23	0.78	1.93	0.98	0.61	1.57	
Education level										
Below elementary school	1.00			1.00			1.00			
Middle school	1.28	0.93	1.75	1.07	0.77	1.49	1.15	0.83	1.59	
High school	1.13	0.83	1.54	1.11	0.80	1.54	1.10	0.80	1.51	
Above university	2.04	1.41	2.95	1.83	1.23	2.72	1.65	1.11	2.46	
Marital status										
Divorced or widowed or unmarried	1.00			1.00			1.00			
Married	1.56	1.16	2.09	1.34	0.99	1.83	1.13	0.85	1.52	
Income										
Lowest	1.00			1.00			1.00			
Low	1.10	0.80	1.51	1.27	0.90	1.78	1.48	1.05	2.08	
Middle	1.27	0.91	1.79	1.52	1.08	2.16	1.45	0.99	2.11	
High	1.41	0.98	2.03	1.69	1.15	2.48	2.05	1.36	3.07	
Highest	1.77	1.25	2.52	1.91	1.29	2.82	1.94	1.26	2.97	
Health insurance type										
Health insurance	1.00			1.00			1.00			
Medical aid	3.29	2.32	4.67	2.88	2.04	4.05	2.66	1.85	3.84	
Economic activities										
Yes	1.00			1.00			1.00			
No	1.55	1.20	2.00	1.18	0.91	1.51	1.45	1.11	1.88	
Self-rated health										
Good				1.00			1.00			
Normal	-	-	-	0.85	0.65	1.11	1.23	0.93	1.62	
Bad	-	-	-	1.79	1.34	2.37	1.77	1.31	2.39	
Disability										
No	1.00			1.00			1.00			
Yes	1.66	1.21	2.28	1.11	0.79	1.54	1.31	0.96	1.79	
Charlson Comorbidity Index										
0	1.00			1.00			1.00			
1	2.43	1.93	3.07	1.75	1.36	2.24	1.65	1.26	2.15	
≥ 2	3.62	2.24	5.84	4.34	2.54	7.41	4.46	3.02	6.58	

§ Adjusted odds ratio (OR) from multiple logistic regression analysis with all variables in Table 1.

OR: odds ratio, CI: confidence interval



<Figure 1> Tertiary hospital utilization rate by education and income, 2008-2012

IV. Discussion

This study was designed to understand the reasons behind the usage of tertiary hospitals for outpatient treatment of diabetes and hypertension patients, which is a critical component of the chronic illness management system, and provide basic data for the designing of future policies. Our results showed that patients with a high education level (above undergraduate level), a high income,

medical-aid assistance as their form of medical insurance, a poor subjective health condition, and a high level of CCI had a higher probability of using tertiary hospitals.

First, the result of patients with a high education level and high income having a higher chance of using tertiary hospitals was consistent with previous studies [22, 23]. Using tertiary hospitals can be a personal burden; perhaps this encourages more usage of clinic-level medical

institutes; however, this does not affect high income patients as much as it does lower income patients [18]. In addition, since absolute price for equivalent treatment is more expensive in tertiary hospitals, this could lower the accessibility of severe patients.

Next, in terms medical insurance type, medical-aid assistance receivers were more likely to use tertiary hospitals than patients with health insurance. Medical aid assistance was introduced in 1977 with reforms of the medical protection act to protect low-income families that were not guaranteed basic necessities [19]. However, when the financial burden of medical costs and an increase in recipients' medical usage became an issue, the government introduced a selected hospital system to manage benefit days for recipients in 2005. The selected hospital system is a policy where patients who frequently visit hospitals voluntarily decide on a selected hospital before their benefit days are exceeded to receive treatment from that specific hospital.

In this policy, only clinic-level hospitals could be selected, making clinic-level medical institutes the primary institutes for care and treatment. Only patients with rare, incurable diseases would have selected hospital-level medical institutes. However, consistent with prior studies, patients with medical-aid assistance had a higher chance of using tertiary hospitals, which reveals the policy's failure since it was supposed to prioritize selection of clinic-level medical institutes and allow usage of hospitals only through request. In addition, medical assistance recipients had a high preference towards tertiary hospitals even after adjusting for socioeconomic and medical necessity factors, which shows the need for systematic changes to prevent excessive medical treatments [24]. However, these changes require a careful approach since patients with too much of a

personal burden (e.g., financial) could be undertreated or not treated at all.

In this study, patients with worse subjective health and patients with high CCI had a higher chance of using a tertiary hospital. In 2009, the government tried to discourage the usage of tertiary hospitals for outpatients by raising the personal burden from 50% to 60%. However, a cautious approach is needed as a poor subjective health condition and high CCI could mean that the severity of the disease is serious or has complications that cannot be treated by primary medical institutes.

There are two problems with public healthcare caused by a vague medical delivery system in Korea: first, the excessive competition in size and quality is derived from a lack of distinction in the roles and functions of the different medical institutes. Consequently, competition for high-priced medical facilities and sickbeds is getting fiercer. Second, the excessive competition of medical resources and the phenomena of patients flocking to large hospitals from unequal distribution of medical resources is increasing.

The government has been implementing new policies since 2009 for the re-establishment of the medical delivery system, according to types of medical institutes, and primary medical institutes to improve the management of diabetes and hypertension. The core of such policies is to discourage outpatient treatment for non-critical illnesses at tertiary hospitals and induce appropriate management of chronic diseases in clinic-level institutes.

This study has some limitations. First, this research only used panel data from 2012, meaning that the panel data is limited by only being cross-sectional. Second, there could be a problem with erroneous diagnoses. Outpatient diagnoses used by the Korea Medical Panel should be from

receipt or household account; however, in some cases, the polltaker had to resort to memory, which lowers diagnoses' credibility. Third, there could have been problems with the CCI. Although the diagnosis code that was categorized by the Korea Medical Panel was relatively similar to the KCD-6, some disease codes were not subdivided resulting in cases where inaccurate categorization of CCI scores occurred. Therefore, the accurate calculation of CCI scores was somewhat limited. Finally, it is necessary to pay attention to the interpretation because policy interventions such as an increase in co-payment by tertiary hospitals may affect our results.

Korea has overlapping functions between medical institutes due to an absence of systematic organization in categorized functions and the medical delivery system. Therefore, medical resources are not used efficiently and patients suffer from increased waiting time and failure to secure appropriate treatment in time. Basically, tertiary hospitals that were established for severe disease treatment and fostering medical human resources are faced with a high percentage of minor illnesses from outpatients. In such situations, the competition between varied categories of medical institutes is intensified and an inefficient distribution of medical resources and the national public health cost expenditures are exacerbated. The result is a burden to medical consumers. Moreover, medical costs are higher in hospital-level medical institutes than they are in clinic-level institutes causing negative effects on the financial stability of the health insurance fund.

To solve such problems, it is important to first analyze what factors affect patients' decisions when choosing what medical institute to seek help from, and then build policies to induce patients according a specific type of medical institute. Especially for chronic diseases, legal, systematic devices should

be prepared to induce patients in a manner where it is clear that clinic-level medical institutes manage outpatient treatments and hospital-level medical institutes manage those requiring hospitalization.

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