

ORIGINAL RESEARCH

Impact of indemnity private health insurance on emergency department visits and expenditures

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Abstract

Indemnity private health insurance (PHI) is a type of private insurance that pays actual medical expenses. We investigated the effect of subscriptions to indemnity PHI on emergency department (ED) expenses and the number of ED visits. This study was a retrospective study using Korea Health Panel Data from 2013 to 2017. The exposure variable was subscription of indemnity PHI. The control group did not subscribe to indemnity PHI throughout the study period, while the insured group had not subscribed to indemnity PHI in 2013 to 2014, but had done so in 2016 to 2017. The outcomes were ED expenses (per visit) and the number of ED visits. The outcomes were compared between before and after indemnity PHI subscription and between the insured and control groups. A total of 1919 subjects (265 insured and 1654 control group) were included. Univariable analyses indicated no difference in emergency medical use according to indemnity PHI subscription and the time period. However, multivariable modeling analysis showed that ED expenses were significantly higher for the insured group (US\$5.7 more ED expense, $p = 0.036$; US\$4.3 more ED expense per visit, $p = 0.035$). In addition, education level, chronic disease, disability status, economic activity and body mass index were associated with emergency medical use. This study suggests that indemnity PHI subscription can increase emergency medical expenses without an increase in visit frequency. Further studies are necessary to validate these results using another dataset.

Keywords

Health expenditure; Indemnity; Health insurance; Emergency department

1. Introduction

Indemnity private health insurance (PHI) is a type of insurance that pays for the actual expenses incurred by a patient. When the financial burden of healthcare cost is reduced, there is the possibility of a moral hazard that could increase medical use by the subscriber, and research suggests that insurance coverage may lead to the consumption of healthcare services above an efficient level [1]. According to a meta-analysis of the effect of receiving insurance on healthcare service utilization, both in-patient and out-patient medical use increased by 0.51% and 1.26%, respectively [2]. In the United States, an empirical study on Medigap, a form of supplemental insurance for Medicare, found that subscribed patients used more medical services than unsubscribed patients and spent more on medical care [3].

In Korea, several studies have investigated the moral hazard effects of PHI. One study suggested that supplemental PHI exerts substantial moral hazard effects and increases total expenditures of social health insurance by an estimated 1.9–6.6% [4]. In another study, individuals with PHI had good subjective health but utilized more outpatient care [5]. Others have reported that PHI subscribers were about 14 percentage points

more likely to visit physicians than those who were not [6]. Additionally, researchers noted that out-patient and in-patient medical use increased by 1.59 and 1.52 times, respectively, for individuals with PHI [7].

However, the effect of PHI on the use of emergency medical care has not been studied much. Since the ED is usually visited only in cases of an emergency, one would suspect that any moral hazard would be relatively less than that for out-patient use. The aim of this study was to analyze the impact of indemnity PHI on emergency medical use.

2. Materials and methods

2.1 Health insurance setting

Korea has adopted a single social health insurance system led by the government called the National Health Insurance Service (NHIS, covering approximately 97% of the population) and Medicaid (covering the remaining 3%). Provider reimbursement is based on a fee-for-service system. Patients are required to pay a copayment that is 20% of the total costs incurred for covered inpatient services and 30–60% for covered outpatient services according to the hospital grade.

NHIS covered services should be provided at prices set by the government, and patients are forbidden to purchase covered services out-of-pocket (OOP). Services not covered by social health insurance are not subject to the government's fee regulation and patients can purchase these OOP [8]. Patients are responsible for 43% of all healthcare costs on average [4]. In Korea, patients can go directly to a tertiary hospital ED, if they wish, by paying an additional deductible, but the burden of this cost is eliminated if they have indemnity PHI.

2.2 Data source

Data were obtained from Korea Health Panel Data (KHPD, version 1.6). The KHPD is an official longitudinal survey approved by the government that has been conducted annually since 2008 by the NHIS and the Korea Institute for Health and Social Affairs [9–11]. The panel survey aims to produce representative statistics regarding medical service use, medical expenditures, and financial sources. The sampling frame was 90% of the national population investigated in the 2005 census of Korea, and two steps of probability proportionate stratified cluster sampling were conducted. First, sample clusters were extracted by region; thereafter, sample households were extracted. Finally, family members from sample households constituted the panel. The survey included a self-report questionnaire and in-person interviews with trained investigators; receipts for medical charges and prescriptions were referenced to support information on the use of medical services, as provided by household members. Although most surveys were conducted within 1 year, the exact time gap between medical service use and survey completion was not available [12].

2.3 Study subjects and groups

A total of 11,770 household members who responded to surveys between 2013 and 2017 were included in this study. Exclusion criteria were individuals under 20 and over 59 years who have difficulty enrolling in medical insurance, low-income individuals insured by Medicaid who have different patterns of medical use [13], individuals who terminated their indemnity PHI during the study period, and individuals with missing values for study variables.

The control group was defined as individuals who did not subscribe to indemnity PHI throughout the entire study period, while the insured group comprised those who did not subscribe in 2013 and 2014 but did in 2016 and 2017. The year 2015 was set as a transition period, because we could not accurately delineate a before and after period. Emergency medical use was measured according to ED expenses (per visit) and the number of ED visits. We made two comparisons to analyze the effect of indemnity PHI on emergency medical use: (1) medical use in the period before and after indemnity PHI subscription within each group, and (2) differences (between the period before and after subscription) of medical use between the insured group and the control group.

2.4 Variable definitions

The exposure variable was a subscription to indemnity PHI. The type of PHI was classified into fixed-benefit (insurance

pay fixed amount), indemnity (insurance pay actual loss), and mixed-type. Among these, when the subjects had at least one indemnity-type or mixed-type, they were defined as having indemnity PHI. The PHI was mainly sold as fixed-benefit types, but indemnity-type products began to be sold around 2008 in Korea.

The dependent variables used in the analysis were age, sex, marital status (married vs. other), education level (primary, middle or high school, college or higher), economic activity, family income status (1–5 quintiles), geographic area (capital area, cities, other region), number of chronic diseases (none, 1, 2, 3 or more), body mass index (BMI; underweight, normal, overweight), smoking status (non-smoking, past smoking, current smoking), drinking (non-drinking, more than once a month, more than once a week), disability status, and subscription to fixed-rate medical insurance. Chronic diseases included hypertension, diabetes, hyperlipidemia, tuberculosis, arthropathy, ischemic heart disease and cerebrovascular disease.

2.5 Statistical analyses

To compare the baseline characteristics of insured and control groups, data were summarized as the frequency and percentage for each variable and then the chi-square test or Fisher's exact test was performed. ED expenses were summarized as means and standard deviations, while number of ED visits were as median (min–max) because it is difficult to assume a normal distribution. Medical expense amounts are described in Korean won (KRW; 1000 won $\approx$ 0.8 US dollars).

Independent two sample *t*-test was used to compare between groups and paired *t*-test for comparison between time periods for ED expenses. Mann-Whitney U test was used to compare between groups and Wilcoxon signed rank test for time periods for ED visits. Multivariable modeling analysis was performed with variables identified as significant in univariable analysis to adjust for variables affecting emergency medical use. The ED expenses and expense per visit were analyzed using a linear mixed model by applying the identity-link-normal distribution, while the number of ED visits was analyzed using the generalized estimating equation model by applying log-link-Poisson distribution [14].

Statistical analyses were performed using SAS version 9.4 (SAS Institute, Cary, NC, USA). All statistical tests were two-tailed, and $p < 0.05$ was considered statistically significant.

3. Results

3.1 Characteristics of the study subjects

A total of 1919 subjects (1654 control group and 265 insurance group) were finally included for analysis (Fig. 1). There were significant differences between the two groups with respect to the proportions of sex, residential region, disability, and subscription to fixed-benefit PHI. In relatively more detail, the insured group comprised more women, more individuals who lived in metropolitan cities, more patients without disabilities, and more subscribers to fixed-rate PHI (Table 1).

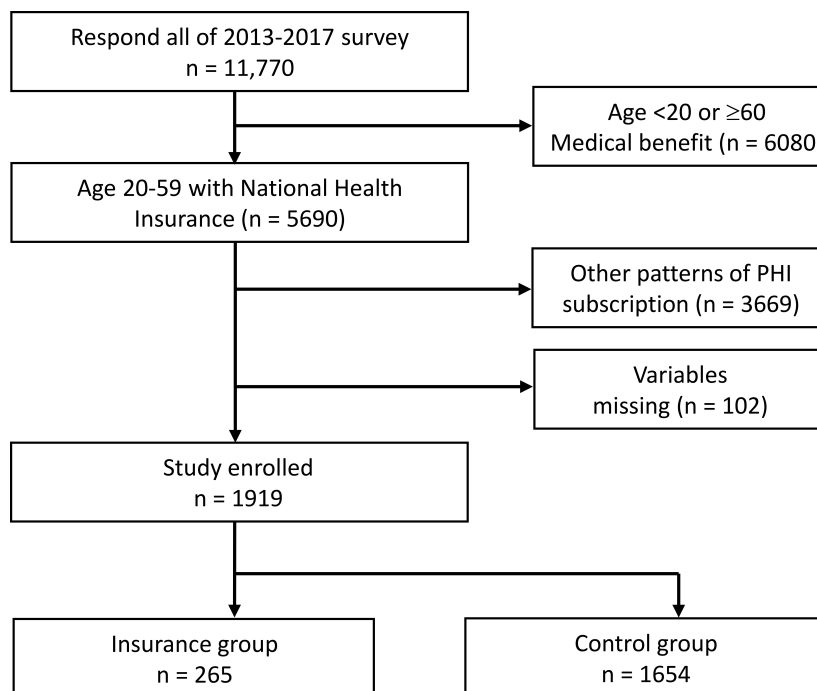


FIGURE 1. Flow chart of the study subjects. Among 11,770 who responded to surveys between 2013 and 2017, finally 1919 subjects were enrolled in the analysis. The control group did not subscribe to PHI throughout the entire study period, while the insurance group was defined as those who did not subscribe to PHI in an initial period (2013 to 2014) but did in the following period (2016 to 2017). PHI: private health insurance.

3.2 ED expenses and the number of visits

The ED expenses (per visit) and the number of ED visits did not show any significant differences in the period before and after indemnity PHI subscription in each group, and there was no difference in the changes (before after difference) of medical use in the insured group, compared to the control group (Table 2).

3.3 Multivariable modeling

The relationship between indemnity PHI status and ED use after controlling for covariates is shown in Table 3. ED expenses were significantly higher in the insured group (ED expense 7261 KRW more, $p = 0.036$; ED expense per visit 5561 KRW more, $p = 0.035$). The number of ED visit was not associated with indemnity PHI subscription. In addition, multivariable analyses showed that education level, chronic disease, and disability status were associated with both ED expenses and the number of ED visits. Economic activity and BMI were only associated with the number of ED visits.

4. Discussion

The results of this study suggest that subscription to indemnity PHI in Korea may increase ED expenses without increasing the number of ED visits. The increased amount of ED expense per visit was 5561 KRW ($\approx \$4.3$ US).

In terms of the number of ED visits, the study subjects did not seem to visit the ED more frequently even with indemnity PHI subscription. There are several possibilities to explain this result. First, the baseline frequency of ED visit in Korea is high because of relatively low medical charges and easy access

to emergency medical care. A study conducted in the United States found that people with a recent change in insurance status had an increased number of ED visits and those with recently subscribed PHI visited the ED 1.24 times more often than those who had continued insurance [15]. Therefore, this result may not be applicable to another healthcare system. Second, since emergency patients should pass through a triage process to enter the ED, a patient with non-emergent problems may be recommended to the out-patient clinic. Therefore, indemnity PHI subscription may not result in an additional increase in the frequency of ED visits. A previous study also reported that the association for PHI with ED visits is not significant [4].

In multivariable modeling analysis controlling for variables, ED expenses and expenses per visit were significantly associated with indemnity PHI. The ED expenses and expense per visit were analyzed using a linear mixed model, which is an extension of a simple linear model and is of particular use when there is non-independence in the data. The number of ED visits was analyzed using the generalized estimating equation model, which can be used with non-normal data, such as binary or count data [14]. The increase in medical expenses despite the lack of an increase in the number of ED visits may be the result of a higher proportion of consent to tests or treatments conducted in the ED among PHI subscribers. In particular, items that are not covered by social health insurance are subject to consent prior to being performed, and indemnity PHI subscribers who are less burdened with costs may agree more easily.

Policies for PHI can be changed as needed, and the impact on medical use may change accordingly. In 2009, the indemnity

TABLE 1. Baseline characteristics of the study subjects.

Variables	Overall	Indemnity PHI		<i>p</i> -value
		Control (n = 1654)	Insured (n = 265)	
Gender				
Male	1028 (53.6)	913 (55.2)	115 (43.4)	0.001
Female	891 (46.4)	741 (44.8)	150 (56.6)	
Age				
20–29	69 (3.6)	61 (3.7)	8 (3.0)	0.091
30–39	368 (19.2)	303 (18.3)	65 (24.5)	
40–49	553 (28.8)	476 (28.8)	77 (29.1)	
50–59	929 (48.4)	814 (49.2)	115 (43.4)	
Marital status				
Single, divorced	762 (39.7)	656 (39.7)	106 (40.0)	0.917
Married	1157 (60.3)	998 (60.3)	159 (60.0)	
Education level				
Primary	10 (0.5)	9 (0.5)	1 (0.4)	0.689
Middle, high school	736 (38.4)	640 (38.7)	96 (36.2)	
College	1173 (61.1)	1005 (60.8)	168 (63.4)	
Economic activity				
No	615 (32.1)	527 (31.9)	88 (33.2)	0.663
Yes	1304 (68.0)	1127 (68.1)	177 (66.8)	
Household income				
1st quintile	101 (5.3)	94 (5.7)	7 (2.6)	0.184
2nd quintile	309 (16.1)	260 (15.7)	49 (18.5)	
3rd quintile	487 (25.4)	426 (25.8)	61 (23.0)	
4th quintile	519 (27.1)	445 (26.9)	74 (27.9)	
5th quintile	503 (26.2)	429 (25.9)	74 (27.9)	
Region				
Capital area	797 (41.5)	681 (41.2)	116 (43.8)	0.013
Cities	532 (27.7)	445 (26.9)	87 (32.8)	
Others	590 (30.8)	528 (31.9)	62 (23.4)	
Chronic diseases				
None	1284 (66.9)	1100 (66.5)	184 (69.4)	0.620
1	374 (19.5)	324 (19.6)	50 (18.9)	
2	169 (8.8)	151 (9.1)	18 (6.8)	
3 or more	92 (4.8)	79 (4.8)	13 (4.9)	
Body mass index				
Underweight (<18.5)	105 (5.5)	92 (5.6)	13 (4.9)	0.074
Normal (18.5–23)	911 (47.5)	768 (46.4)	143 (54.0)	
Overweight (≥23)	903 (47.0)	794 (48.0)	109 (41.1)	
Smoking status				
Non-smoker	1168 (60.9)	994 (60.1)	174 (65.7)	0.055
Ex-smoker	213 (11.1)	180 (10.9)	33 (12.5)	
Current smoker	538 (28.0)	480 (29.0)	58 (21.9)	
Drinking status				
Non-drinking	661 (34.5)	564 (34.1)	97 (36.6)	0.551
>1/month	565 (29.4)	485 (29.3)	80 (30.2)	
>1/week	693 (36.1)	605 (36.6)	88 (33.2)	
Disability status				
No	1855 (96.7)	1592 (96.3)	263 (99.3)	0.012
Yes	64 (3.3)	62 (3.8)	2 (0.8)	
Fixed-benefit PHI				
No	547 (28.5)	493 (29.8)	54 (20.4)	0.001
Yes	1372 (71.5)	1161 (70.2)	211 (79.6)	

Data are presented as n (%). Groups were statistically compared using the chi square test or Fisher's exact test.
PHI, private health insurance.

TABLE 2. Comparison of emergency medical use according to indemnity PHI subscription status.

Variables	Group	Before (2013, 2014)	After (2016, 2017)	<i>p</i> -value	Difference (After-Before)	<i>p</i> -value
ED expense (KRW)						
	Control	8261 ± 49,632	10,219 ± 52,016	0.255	1958 ± 69,936	0.266
	Insured	13,985 ± 72,801	10,124 ± 41,923	0.435	-3861 ± 80,347	
ED expense/visit (KRW)						
	Control	6534 ± 41,546	7338 ± 35,412	0.543	803 ± 53,706	0.352
	Insured	11,118 ± 56,251	8164 ± 32,528	0.439	-2953 ± 62,055	
ED visit (number)						
	Control	0 (0-6)	0 (0-8)	0.302	0 (-6-7)	0.379
	Insured	0 (0-4)	0 (0-3)	0.157	0 (-3-3)	

KRW: Korean Won; ED: emergency department; PHI: private health insurance.

Data presented with mean ± standard deviation or median (min-max).

Independent two sample *t*-test was used to compare between groups and paired *t*-test for comparison between time periods for ED expenses.

Mann-Whitney *U* test was used to compare between groups and Wilcoxon signed rank test for time periods for ED visits.

TABLE 3. Results of multivariable modeling to evaluate the effect of variables on emergency medical use.

Variables	ED expense (KRW)		ED expense/visit (KRW)		ED visit (number)	
	B (95% CI)	<i>p</i>	B (95% CI)	<i>p</i>	RR (95% CI)	<i>p</i>
Insurance						
No	ref		ref		ref	
Yes	7261 (492-14,030)	0.036	5561 (388-10,735)	0.035	1.093 (0.751-1.591)	0.643
Time period						
Before	ref		ref		ref	
After	1958 (-1574-5491)	0.277	803 (-1896-3503)	0.560	1.123 (0.930-1.356)	0.230
Education level						
Primary	ref		ref		ref	
Middle, high school	-29,355 (-52,582-6129)	0.013	-11,047 (-28,799-6704)	0.223	0.416 (0.219-0.789)	0.007
College	-28,251 (-51,568-4934)	0.018	-9851 (-27,672-7969)	0.279	0.389 (0.203-0.745)	0.004
Economic activity						
No	ref		ref		ref	
Yes	-1487 (-5599-2625)	0.478	-699 (-3841-2444)	0.663	0.797 (0.642-0.991)	0.041
Chronic diseases						
None	ref		ref		ref	
1	6605 (2279-10,931)	0.003	4618 (1312-7924)	0.006	1.473 (1.173-1.849)	0.001
2	15,919 (9794-22,043)	<0.001	9055 (4374-13,735)	0.001	2.267 (1.733-2.964)	<0.001
3 or more	11,355 (3344-19,366)	0.006	8363 (2241-14,486)	0.007	2.699 (1.955-3.727)	<0.001
Body mass index						
Underweight (<18.5)	ref		ref		ref	
Normal (18.5-23)	-3721 (-11,256-3814)	0.333	-2205 (-7963-3554)	0.453	0.584 (0.414-0.825)	0.002
Overweight (≥23)	-3678 (-11,460-4104)	0.354	-2351 (-8299-3596)	0.438	0.644 (0.452-0.919)	0.015
Disability status						
No	ref		ref		ref	
Yes	13,879 (4337-23,422)	0.004	6327 (-966-13,620)	0.089	1.880 (1.324-2.669)	0.001

KRW: Korean Won; ED: emergency department; B: regression coefficient; CI: confidence interval; RR: relative risk. ED expenses were analyzed using a linear mixed model, and the number of ED visits was analyzed using a generalized estimating equation model.

PHI policy in Korea was changed to require the subscriber to pay 10% of their co-payments even if they purchased the indemnity-type insurance. This policy is expected to limit injudicious use of healthcare services. In fact, there was a report that the number of out-patient clinic visits per person decreased after implementation of this policy [16]. Since 2016, the policy has been reinforced so that indemnity PHI cannot pay ED entrance charges (about \$50 US) for patients who are classified into a non-emergency category, when using a regional emergency center. Therefore, such policy changes may have reduced the frequency of ED visits of indemnity PHI subscribers. We see similarities with the copayment policy for Medicaid in the US. A study suggested that copayments may be an effective tool for reducing the use of the ED for nonurgent care among the nonelderly adults in the Medicaid population [17]. The copayment amounts ranged from \$0 to \$6, with a median value of \$3. There was a statistically significant 6.3 percentage point decrease in the probability that a given ED visit is nonurgent when a copayment is in place, compared to when there is no copayment policy.

In addition to indemnity PHI, several variables were associated with emergency medical expenses and visit frequency. When the subject had higher education level or economic activity, ED expenses were lower and visits to the ED were less frequent. Low socioeconomic status is associated with reduced preventive healthcare and deterioration of chronic diseases through inadequate management, translating to a greater need for urgent ED care [18]. Indeed, in this study, the number of chronic diseases showed a positive association with ED expenses and the number of ED visits. For example, when a subject had more than two chronic diseases, ED expenses were higher (11,355 KRW, $p = 0.006$) as were the number of ED visits (2.67 times, $p < 0.001$), compared to those without chronic diseases. BMI was associated with the number of ED visits only, while those who had a disability showed higher ED expenses (13,879 KRW, $p = 0.004$) and a greater number of ED visits (1.88 times, $p = 0.001$).

The limitations of this study are as follows. First, this study reflects the specific context of the healthcare system in Korea, and it is difficult to generalize our results to different healthcare systems. Second, the KHPD did not collect information on disease severity, emergency status, and types of healthcare institutions; therefore, we could not analyze these variables. The acuity and severity of emergency patients can affect the quantity of healthcare utilization, but such a relationship was not reflected in the model. Third, this study focused on the actual loss-type PHI, not all types of PHI, such as the fixed amount type.

5. Conclusions

This study suggests that subscription to indemnity PHI does not increase the frequency of ED visits, but is associated with increased ED expenses. However, further studies are necessary to validate this result using other datasets from different healthcare systems.

ABBREVIATIONS

KHPD, Korea Health Panel Data; PHI, private health insurance; ED, emergency department; KRW, Korean Won (1000 KRW = 0.8 US dollar).

AVAILABILITY OF DATA AND MATERIALS

Not applicable.

AUTHOR CONTRIBUTIONS

JWK and SPC—designed this study; YJC, JSY and HSC—provided help and advice on study progression; HSL and SJ—statistically analyzed the data; JWK and SPC—wrote the draft manuscript. All authors contributed editorial changes to the manuscript. All authors read and approved the final manuscript.

ETHICS APPROVAL AND CONSENT TO PARTICIPATE

This study was reviewed and approved by the Institutional Review Board of Yonsei University Gangnam Severance Hospital (3-2021-0169), and the need for informed consent was waived due to the study's retrospective nature.

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CONFLICT OF INTEREST

The authors declare no conflict of interest.

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