Available online at www.sciencedirect.com

Public Health

journal homepage: www.elsevier.com/puhe

Original Research

The impact of differential cost sharing of prescription drugs on the use of primary care clinics among patients with hypertension or diabetes

Eunja Park [a], *Daeeun Kim* [b], *Sookja Choi* [c,*]

[a] *Resarch Fellow, Korea Institute for Health and Social Affairs, Sejong, South Korea*
[b] *Department of Epidemiology, University of North Carolina at Chapel Hill, NC, USA*
[c] *Assistant Professor, Red Cross College of Nursing, Chung-Ang University, Seoul, South Korea*

ARTICLE INFO

Article history:
Received 30 January 2019
Received in revised form
3 May 2019
Accepted 4 May 2019
Available online 29 June 2019

Keywords:
Chronic disease
Diabetes
Cost sharing
Healthcare policy
Hypertension
Primary care

ABSTRACT

Objectives: Since 2011, the Korean government has implemented differential cost sharing to increase the utilization of primary care clinics for the management of chronic diseases. The objective of this study was to examine the impact of the prescription drug cost-sharing increase on outpatients' selection of the medical care institution.

Study design: This was a pre–post comparison study.

Methods: Participants were 34,842 patients with hypertension and 13,886 patients with type 2 diabetes, who were all newly prescribed. Data were collected via national health insurance system claims. The change in the main medical care institution for disease management before and after the cost sharing policy was analyzed using logistic regression analysis.

Results: Nearly 18% of participants with hypertension and 22% of participants with diabetes used tertiary care or general hospital outpatient services before the policy was implemented. After the increased prescription drug coinsurance rate (by 10–20%), the likelihood of selecting primary care clinics or small hospitals was significantly higher among patients with hypertension within 1 year (odds ratio [95% confidence interval] = 1.29 [1.19–1.41]) than before. However, the policy effect was not significant among patients with diabetes.

Conclusions: The cost sharing policy was effective in inducing patients with hypertension to manage their chronic disease in primary care institutions; however, this was not true for patients with diabetes. The assurance of high-quality disease management services and low out-of-pocket expenses may be needed to encourage patients with chronic diseases to use primary care clinics.

* *Corresponding author*. Red Cross College of Nursing, Chung-Ang University, 84 Heukseok-ro, Dongjak-gu, 06974 Seoul, South Korea. Tel.: +82 2 820 6862; fax: +82 2 824 7961.
E-mail address: sjchoi2u@cau.ac.kr (S. Choi).

https://doi.org/10.1016/j.puhe.2019.05.005
0033-3506/

Introduction

Concerns regarding the socioeconomic burden of chronic diseases have increased globally.[1] Primary care clinics are essential for the efficient, national management of chronic diseases.[2,3] The Republic of Korea faces the highest rate of growth in health expenditure, more than double the OECD (Organisation for Economic Co-operation and Development) average.[4] Total health expenditure as a percentage of GDP (Gross Domestic Product) has doubled in the last 20 years, from 3.7% in 1995 to 7.4% in 2017.

The Korean government introduced social health insurance for industrial workers in large corporations in 1977. This was gradually extended to the self-employed and eventually covered the entire population in 1989. Although Korea achieved universal coverage through the mandatory national health insurance (NHI), public expenditure accounted for 55% of the total health expenditure in 2011; however, the percentage of out-of-pocket (OOP) payments of total health expenditure decreased from 52% in 1995 to 35% in 2011. High OOP payment results from copayment for insured services and full payment for uncovered services, most of which involve new technology and medication with uncertain cost-effectiveness.[5]

Because the role and function of medical institutions are not clearly or exclusively defined, there are some clinics that have inpatient beds. In the Korean healthcare system, there is no gatekeeper for controlling healthcare utilization. Citizens are not required to register with any healthcare provider, although there are many local clinics. Thus, patients can access any level of healthcare facilities for their first visit, and ensuing contacts under nominal restrictions which are hardly working, as long as they can afford to pay higher OOP payments in general hospitals and tertiary hospitals. The lack of differentiation of the roles of healthcare providers and the absence of a gatekeeping system have been highlighted as causes of inefficiency in healthcare delivery.[5]

Although the national health insurance system (NHIS) of South Korea suggests that patients should use medical services at tertiary care or general hospitals after visiting primary medical care clinics, the lack of formal gatekeepers allows patients to choose the type of medical care institution they want for chronic disease management.[6] Consequently, many patients use outpatient care services at tertiary care or general hospitals.[7] For example, Lee et al.[8] reported that about 85% of the hospital outpatient service utilization among patients with hypertension was unnecessary.

The Korean government has introduced several policy measures to establish medical service delivery systems and enhance the use of primary care clinics to manage chronic diseases. Furthermore, they have increased cost sharing in tertiary care institutions. The coinsurance rate for doctors' consultation fees increased from 50% to 60% among outpatients of tertiary care or general hospitals in July 2009.[9] In October 2011, the Korean government implemented a differential cost sharing policy for prescription drug expenditures for 52 mild chronic diseases, including hypertension and diabetes. Their aim was to induce patients to manage their diseases at primary medical care settings. Before the policy, all outpatients paid 30% of the prescription drug costs as OOP expenses; however, after the policy, patients with one of these 52 diseases had to co-pay 50% at tertiary hospitals, 40% at general hospitals, and 30% at small hospitals and primary care clinics.[10]

Previous studies examining the effect of these cost sharing policies in South Korea have shown inconsistent results. Several studies reported a reduced utilization of outpatient medical services at tertiary care or general hospitals after the policy, including the number of patients, outpatient visits, and medical costs.[9,11,12] Byeon et al.[9] also showed that the number of outpatients at tertiary care hospitals decreased; however, they found that the number of outpatients at small hospitals or clinics did not increase. There is a knowledge gap concerning why the cost sharing policy did not lead to a significant increase in using medical services in primary care settings. Few studies have examined whether differential cost sharing of prescription drug expenditures influences patients' behavior such as the selection of a medical care setting for chronic disease management.

Hypertension and diabetes are not only highly prevalent chronic diseases but also the main targets of national chronic disease management.[13,14] Various community programs have been implemented to improve disease management among patients with hypertension and diabetes.[15,16] Many patients with hypertension or diabetes take medication for a prolonged time, and the proportion of pharmaceutical costs is high among the total healthcare costs of the patients;[17] therefore, patients are likely to be affected by the cost sharing associated with their medication expenditures.

The objective of this study was to examine the impact of prescription drug cost-sharing increase on outpatients' selection of a medical care setting. Specifically, we analyzed the selection of the medical care institution among newly prescribed patients with hypertension or diabetes before and after policy implementation.

Methods

Data

We used nationally representative health insurance claims data from the NHIS (database NHIS-2016-2-052). This included patient information (age, sex, and health insurance type and contribution) and medical service utilization information (hospitalization, outpatient medical services, and medication prescriptions).[18]

The inclusion criteria included patients aged ≥20 years, who visited medical care institutions for the treatment of hypertension (I10.0, I10.9, and I10) or type 2 diabetes (E11.2–E11.9), and who were newly prescribed with medication for treatment. Patients who had been prescribed antihypertensive or antidiabetes drugs in the last two years or who were prescribed medication for the disease less than 3 times a year were excluded. Those who did not have a main medical care institution for the management of hypertension or diabetes (i.e., 612 and 213 patients, respectively) were also excluded.

Study design

A differential cost sharing policy for prescription drugs for hypertension and diabetes was implemented in October 2011, and we compared the new patients' selection of the main medical institution before and after the policy to assess the policy effect. The study period was divided into two periods: before (period 1 = Oct 1, 2009, to Sep 30, 2010; period 2 = Oct 1, 2010, to Sep 30, 2011) and after (period 3 = Oct 1, 2011, to Sep 30, 2012; period 4 = Oct 1, 2012, to Sep 30, 2013) the policy was implemented. There was no other change in cost sharing of prescription drugs except for that of the target policy during that period. Because we analyzed the first-year data of patients who were newly prescribed with antihypertensive or antidiabetes drugs, there was no significant difference in socioeconomic characteristics and health status by the study period.

We collected outpatients' visit records using hypertension and diabetes disease codes for each period. Participants were 34,842 patients with hypertension and 13,886 patients with diabetes, who were evenly distributed across the four study periods.

This study was approved by the Institutional Review Board of the Korea Institute for Health and Social Affairs (IRB number 2016-05).

Variables

The dependent variable—patients' main medical care institution for disease management—was defined as the patients' most frequently visited medical institution (≥60% of their total annual visits). Medical care institutions included tertiary care or general hospitals, small hospitals, and primary care clinics, which were combined as primary care clinics/small hospitals and tertiary care hospitals/general hospitals in the regression models.

Patients' sociodemographic characteristics included age, sex, income, residential area, and health insurance type. Age (years) was classified into four groups considering the data distribution: 20–49, 50–64, 65–74, and ≥75 years. Residential area was divided into metropolitan, urban, and rural. We used an income quintile variable measured using NHI contribution. As beneficiaries of the NHI, patients were entitled to insurance benefits and contribution payments. The health insurance type was divided into two groups: employee insured and the self-employed insured.

Furthermore, patients' health status was measured using the Charlson Comorbidity Index (CCI), which was developed in 1987 based on the 1-year mortality data of internal medicine patients admitted to a single hospital in New York and initially validated with a cohort of patients with breast cancer.[19] The index encompasses 19 weighted medical conditions, and diseases were classified into scores of 1, 2, 3, and 6.[20] The CCI was calculated according to Quan's methods and was grouped as scores of 0, 1, 2, and ≥ 3.[21]

Statistical analyses

We first examined patients' characteristics and the distribution of the most frequently visited medical care institutions. Logistic regression models were used to examine whether the cost sharing policy affected the dependent variable—patients' selection of the medical care institution for the treatment of hypertension or diabetes. The independent variables included time of first prescription, age, sex, income, residential area, health insurance type, and CCI. Two-tailed *P*-values <0.05 were considered significant, and all data analyses were performed using SAS 9.2 (SAS Institute, Cary, NC, USA) software.

Results

Patient characteristics are shown in Table 1.

Changes before and after the policy are shown in Table 2 and Fig. 1. Before the introduction of the policy (periods 1 and 2), about 75% of newly prescribed patients with hypertension selected primary care clinics as their main medical institution. This increased after one year but decreased after two years. The proportion of patients who used small hospitals increased from period 1 to 4. Furthermore, nearly 70% of patients with diabetes selected primary care clinics as their main treatment institutions before the policy, which remained largely unchanged until period 4, when it slightly decreased. However, the utilization of small hospitals increased from period 1 to 4 for these patients.

Table 3 shows the results of the logistic regression analysis for the selection of primary care clinics or small hospitals as patients' main medical institution for hypertension or diabetes. Patients with hypertension were more likely to visit primary care settings within 1 year of policy implementation, which decreased by period 4. The policy had non-significant effects among patients with diabetes.

The likelihood of selecting primary care settings was significantly higher for women, older patients, and rural residents compared with their counterparts. Patients with a high income or comorbidity (CCI scores ≥ 1) had a lower possibility of selecting primary care settings compared with their counterparts, especially, patients whose CCI was ≥1 or ≥ 2 for hypertension and diabetes, respectively (Table 3). The result of subgroup analysis indicated that patients with hypertension aged 50–64 years and patients with diabetes with a CCI ≥ 3 were more likely to select primary care clinics or small hospitals as their main medical institution after the 2011 policy (Supplemental Tables).

Discussion

This article examined the influence of differential cost sharing on patients' selection of the medical care institution. We found that the 2011 policy—which resulted in increased cost sharing of prescription drugs for tertiary care or general hospital outpatient services—was associated with newly prescribed patients with hypertension managing their disease more in primary care clinics or small hospitals instead of tertiary care or general hospitals. This is consistent with a previous study that showed a decrease in the number of outpatients using tertiary care or general hospitals in 2011–2012.[9]

Table 1 – Sociodemographic characteristics and the CCI of the study population.

Variables	Category	Hypertension (n = 34,842)%	Diabetes (n = 13,886)%
Period	Period 1 (Oct.ober 2009–Sept.ember 2010)	8812 (25.3)	3167 (22.8)
	Period 2 (Oct. ober 2010–September. 2011)	9391 (27.0)	3644 (26.2)
	Period 3 (October. 2011–September. 2012)	8764 (25.2)	3834 (27.6)
	Period 4 (October. 2012–September. 2013)	7875 (22.6)	3241 (23.3)
Sex	Men	18,006 (51.7)	7779 (56.0)
	Women	16,836 (48.3)	6107 (44.0)
Age (years)	20–49	10,179 (29.2)	3592 (25.9)
	50–64	14,861 (42.7)	5895 (42.5)
	65–74	6477 (18.6)	3050 (22.0)
	≥75	3325 (9.5)	1349 (9.7)
Income	1 (low)	5472 (15.7)	2089 (15.0)
	2	5367 (15.4)	2047 (14.7)
	3	6194 (17.8)	2518 (18.1)
	4	7545 (21.7)	3078 (22.2)
	5 (high)	10,264 (29.5)	4154 (29.9)
Area	Metropolitan	15,469 (44.4)	6320 (45.5)
	Urban	15,788 (45.3)	6133 (44.2)
	Rural	3585 (10.3)	1433 (10.3)
Health insurance type	Self-employed insured	12.858 (36.9)	5346 (38.5)
	Employee insured	21,984 (63.1)	8540 (61.5)
CCI	0	24,935 (71.6)	2255 (16.2)
	1	6458 (18.5)	7377 (53.1)
	2	1487 (4.3)	1153 (8.3)
	≥3	1962 (5.6)	3101 (22.3)

CCI, Charlson Comorbidity Index.

Table 2 – Changes in the main medical institutions between October 2009 and September 2013 among newly prescribed patients with hypertension or diabetes.

	Tertiary care or general hospital, n (%)	Small hospital, n (%)	Primary medical care clinic, n (%)
Hypertension			
Period 1 (October 2009–September 2010)	1549 (17.6)	661 (7.5)	6602 (74.9)
Period 2 (October 2010–September 2011)	1649 (17.6)	653 (7.0)	7089 (75.5)
Period 3 (October 2011–September 2012)	1284 (14.7)	709 (8.1)	6771 (77.3)
Period 4 (October 2012–September 2013)	1291 (16.4)	699 (8.9)	5885 (74.7)
Diabetes			
Period 1 (October 2009–September 2010)	703 (22.2)	272 (8.6)	2192 (69.2)
Period 2 (October 2010–September 2011)	824 (22.6)	293 (8.0)	2527 (69.4)
Period 3 (October 2011–September 2012)	821 (21.4)	336 (8.8)	2677 (69.8)
Period 4 (October 2012–September 2013)	733 (22.6)	322 (9.9)	2186 (67.5)

Cost sharing has been mainly used to prevent unnecessary healthcare service use. Previous studies have indicated that cost sharing of medical services or prescription drug expenses influences the medical utilization by patients with chronic diseases.[22,23] Our results showed that cost sharing could be used to induce new patients with hypertension to select primary care clinics as their main care institution. Because the first selection of a medical care institution can lead to continual use, this policy may contribute to the increase in primary care clinic use for the management of hypertension.

However, there was no significant change in the selection of the medical care institution among patients with diabetes after the 2011 policy. This may be because patients with diabetes consider not only the cost of care but also the quality of care when selecting medical care institutions owing to the risk of diabetes complications. Compared with other chronic conditions, diabetes was reported to have a stronger influence on patients' happiness and a feeling of satisfaction in life, measured by subjective well-being.[24] Thus, patients may put a premium on the quality of care provided by the medical institution. Tertiary care or general hospitals can provide more specialized care compared with primary care clinics; in fact, although many physicians in primary care clinics are board-certified specialists and the medical costs are lower than those at tertiary care or general hospitals, most Korean patients prefer tertiary care or general hospital outpatient services.[25] In the subgroup analysis, patients with diabetes with a CCI ≥3 showed the significant effect of cost sharing of prescription drugs. These patients may select primary care

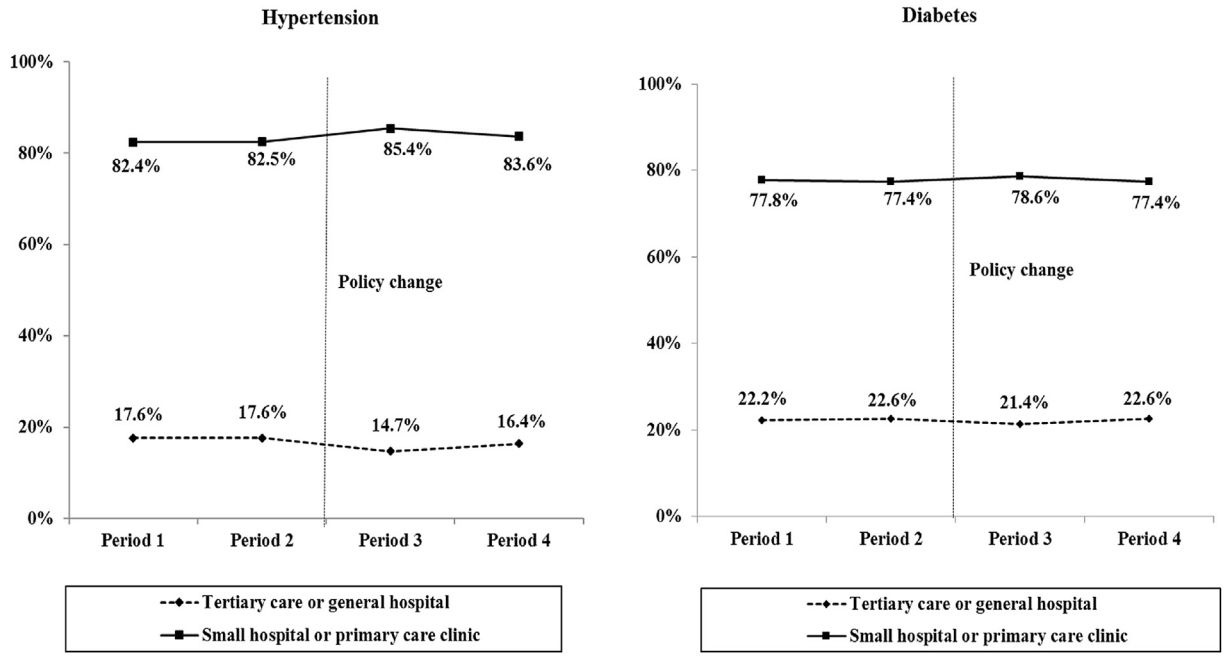

Fig. 1 – Changes in the main medical institutions before and after policy change among newly prescribed patients with hypertension or diabetes.

Table 3 – Factors influencing the selection of primary care clinics or small hospitals as the main medical institution for the management of hypertension or diabetes.

	Hypertension	Diabetes
	OR (95% CI)	OR (95% CI)
Period		
Period 1 (October 2009–September 2010)	1.00	1.00
Period 2 (October 2010–September 2011)	1.00 (0.93–1.08)	0.97 (0.86–1.09)
Period 3 (October 2011–September 2012)	1.29 (1.19–1.41)	1.03 (0.92–1.16)
Period 4 (October 2012–September 2013)	1.11 (1.02–1.21)	0.95 (0.84–1.07)
Sex		
Men	1.00	1.00
Women	1.18 (1.11–1.25)	1.19 (1.09–1.29)
Age (years)		
20–49	1.00	1.00
50–64	1.24 (1.16–1.33)	1.11 (1.00–1.23)
65–74	1.34 (1.23–1.47)	1.33 (1.18–1.50)
≥75	1.09 (0.98–1.21)	1.26 (1.08–1.48)
Income		
1 (low)	1.00	1.00
2	1.02 (0.91–1.13)	1.03 (0.88–1.20)
3	0.97 (0.88–1.08)	1.05 (0.90–1.21)
4	0.94 (0.85–1.03)	0.92 (0.80–1.05)
5 (high)	0.80 (0.73–0.88)	0.78 (0.68–0.88)
Area		
Metropolitan	1.00	1.00
Urban	1.07 (1.00–1.13)	1.08 (0.99–1.18)
Rural	1.14 (1.03–1.27)	1.21 (1.04–1.40)
Health insurance type		
Self-employed insured	1.00	1.00
Employee insured	0.90 (0.85–0.96)	0.92 (0.85–1.00)
CCI		
0	1.00	1.00
1	0.38 (0.36–0.41)	0.72 (0.63–0.81)
2	0.26 (0.23–0.29)	0.32 (0.27–0.38)
≥3	0.29 (0.26–0.32)	0.45 (0.39–0.51)

OR, odds ratio; CI, confidence interval; CCI, Charlson Comorbidity Index.

clinics or small hospitals as main medical institutions to reduce medication expenditure due to multimorbidity.

Our findings suggest that the introduction of this policy change in cost sharing showed only a transitory effect in some chronic diseases and has failed to establish a more efficient medical care delivery system. This shows that the unique status of hospitals as primary care facilities relates to how medical care institutions have been established in Korea. Historically, hospitals have played a role as primary care institutions. In the course of the rapid transition from an absolute lack of medical care institutions just decades ago to the recent abundance, many private clinics developed into small-sized hospitals.[26] A sharp increase in the number of privately owned medical care institutions, accompanied by the unclear division of their role and function, blurred the boundaries between a hospital and clinic.[27] Furthermore, as a consequence of private sector–led hospitals encouraging profit-sensitive activities, which is to some extent related to supplier inducement and rapid adoption of new technology, most healthcare providers work in the private sector.[25]

In our analysis, women and patients aged 50–64 years showed a higher probability of selecting primary care clinics as their main treatment institution compared with their counterparts. This is consistent with Choi et al.,[10] who showed that high-income patients had a significant likelihood of selecting tertiary care or general hospitals, indicating that increased OOP expenses did not motivate rich patients to select primary care clinics or small hospitals for the management of hypertension or diabetes. Chernew et al.[28] also suggested that low-income individuals are more sensitive to co-payment changes than high-income individuals because of the proportion of income lost to medical expenditures. Concurrently, high-income individuals are more likely to purchase supplementary private insurance and thus face a relatively lower net price and are not as burdened by cost sharing as low-income individuals.[29]

Several studies have indicated that cardiovascular medication co-payment may influence hospitalization because of underutilization of medication.[30,31] Because the OOP share of healthcare expenditures is high in South Korea,[32] there is a need to consider the effect of a higher OOP payment on disease management and patients' financial burden. According to Goldman et al., who comprehensively analyzed the effects of prescription drug cost sharing on drug use, a 10% increase in user burden reduced prescription drug spending by 2–6%. Moreover, in some chronic diseases—such as diabetes, congestive heart failure, lipid disorder, and schizophrenia—the use of medical services has increased. By reducing or stopping medication because of users' burden, the illness is insufficiently managed, and it thus becomes more serious and requires additional medical services.[22]

This study has several limitations. First, because differential cost sharing was implemented nationwide, we could not analyze variables using case–control group comparison. The effects of the policy could differ after 2013; however, we could only analyze the data within two years of the policy being implemented because of the limited time periods of the data of health insurance claims. Because the policy effects are inconsistent and show time differences,[33] further studies should evaluate long-term policy effects. Second, the NHIS data did not contain detailed clinical data. Although our study population comprised newly prescribed patients and comorbidity was adjusted for using the CCI, disease severity may influence participants' selection of the medical institution.

In conclusion, the effects of the 2011 prescription drug cost sharing policy differed according to the chronic disease. The cost sharing policy was effective in inducing patients with hypertension to visit primary care clinics; however, it was ineffective at prompting patients with diabetes to do so. The assurances of high-quality disease management services and lower OOP expenses may be needed to promote patients with chronic diseases to use primary care clinics. If patients consider primary care clinics as effective for the treatment of their disease including the prevention of diabetes complications, they would select primary care clinics as their main medical institutions. Primary health care is important in national chronic disease management in terms of efficient resource use and effective disease management. Disease management programs should be developed and implemented for patients with diabetes in primary care clinics. In addition, policy makers need to understand the various factors influencing the selection of the medical institution and consider the difference in policy response based on the characteristics of the patients.

Author statements

Ethical approval

The Institutional Review Board of the Korea Institute for Health and Social Affairs approved this study (IRB number # 2016-09).

Funding

This study was supported by funds from the Korea Institute for Health and Social Affairs, Sejong, South Korea (research number 2016-01: Healthcare Service Utilization among Korean Patients with Chronic Disease: Focusing on Hypertension and Type 2 Diabetes Mellitus).

Competing interests

None declared.

Author contributions

E. Park and S. Choi conceptualized the article and wrote the manuscript. D. Kim performed the analyses and helped revise the manuscript. All authors have approved the final draft.

REFERENCES

1. Lozano R, Naghavi M, Foreman K, Lim S, Shibuya K, Aboyans V, et al. Global and regional mortality from 235 causes of death for 20 age groups in 1990 and 2010: a systematic analysis for the Global Burden of Disease Study 2010. *The Lancet* 2012;**380**(9859):2095–128.

2. Beaglehole R, Epping-Jordan J, Patel V, Chopra M, Ebrahim S, Kidd M, et al. Improving the prevention and management of chronic disease in low-income and middle-income countries: a priority for primary health care. *The Lancet* 2008;**372**(9642):940–9.
3. Bodenheimer T, Lorig K, Holman H, Grumbach K. Patient self-management of chronic disease in primary care. *J Am Med Assoc* 2002;**288**(19):2469–75.
4. *OECD health data*. 2018. http://www.oecd.org/els/health-systems/health-data.html.
5. World Health Organization. Regional office for the western pacific. In: *Republic of Korea health system review*. Manila: WHO Regional Office for the Western Pacific; 2015. http://www.who.int/iris/handle/10665/208215.
6. Sung NJ, Suh SY, Lee DW, Ahn HY, Choi Y-J, Lee JH, et al. Patient's assessment of primary care of medical institutions in South Korea by structural type. *Int J Qual Health Care* 2010;**22**(6):493–9.
7. Kim S, Kwon S. Has the National Health Insurance improved the inequality in the use of tertiary-care hospitals in Korea? *Health Policy* 2014;**118**(3):377–85.
8. Lee JY, Jo M-W, Yoo W-S, Kim HJ, Eun SJ. Evidence of a broken healthcare delivery system in Korea: unnecessary hospital outpatient utilization among patients with a single chronic disease without complications. *J Korean Med Sci* 2014;**29**(12):1590–6.
9. Byeon JN, Ghang HY, Lee HB. Differential cost-sharing and utilization of outpatients care by types of medical institutions. *Korea Soc Policy Rev* 2014;**21**(2):35–55.
10. Choi JN, Jo JS, Ryu S. Effectiveness of coinsurance policy change on prescription drug coverage. *Journal of Health Informatics and Statistics* 2016;**41**(2):248–59.
11. Lee HJ, Jang SI, Park EC. The effect of increasing the coinsurance rate on outpatient utilization of healthcare services in South Korea. *BMC Health Serv Res* 2017;**17**(1):152.
12. Kim HJ, Kim YH, Kim HS, Woo JS, Oh SJ. The impact of outpatient coinsurance rate increase on outpatient healthcare service utilization in tertiary and general hospital. *Health Policy Manag* 2013;**23**(1):19–34.
13. Miranda JJ, Kinra S, Casas JP, Davey Smith G, Ebrahim S. Non-communicable diseases in low- and middle-income countries: context, determinants and health policy. *Trop Med Int Health* 2008;**13**(10):1225–34.
14. Chun KH, Paek KW, Lee SJ, Park CY. A national chronic disease management model and evaluation of validity of primary care physician(PCP) model in Korea. *Korean J of Health Policy & Administration* 2009;**19**(3):92–108.
15. Cho J. The direction of reform for enhancing primary care. *J Korean Med Assoc* 2016;**59**(7):482–5.
16. Nam HM, Woo SH, Cho YJ, Choi YJ, Back SY, Yoon SY, et al. Effects of nutritional education practice program for cardio cerebrovascular high-risk group at the education information center. *Korean J Community Nutr* 2011;**16**(5):580–91.
17. Bernard DM, Banthin JS, Encinosa WE. Health care expenditure burdens among adults with diabetes in 2001. *Med Care* 2006;**44**(3):210–5.
18. Lee J, Lee JS, Park SH, Shin SA, Kim K. Cohort profile: the national health insurance service–national sample cohort (NHIS-NSC), South Korea. *Int J Epidemiol* 2017;**46**(2):e15.
19. Charlson ME, Pompei P, Ales KL, MacKenzie CR. A new method of classifying prognostic comorbidity in longitudinal studies: development and validation. *J Chronic Dis* 1987;**40**(5):373–83.
20. Jang S, Park C, Jang S, Yoon H-K, Shin CS, Kim D-Y, et al. Medical service utilization with osteoporosis. *Endocrinol Metab* 2010;**25**(4):326–39.
21. Quan H, Sundararajan V, Halfon P, Fong A, Burnand B, Luthi J-C, et al. Coding algorithms for defining comorbidities in ICD-9-CM and ICD-10 administrative data. *Med Care* 2005;**43**(11):1130–9.
22. Goldman DP, Joyce GF, Zheng Y. Prescription drug cost sharing: associations with medication and medical utilization and spending and health. *J Am Med Assoc* 2007;**298**(1):61–9.
23. Kim J, Ko S, Yang B. The effects of patient cost sharing on ambulatory utilization in South Korea. *Health Policy* 2005;**72**(3):293–300.
24. Böckerman P, Johansson E, Saarni SI. Do established health-related quality-of-life measures adequately capture the impact of chronic conditions on subjective well-being? *Health Policy* 2011;**100**(1):91–5.
25. Kwon S. Thirty years of national health insurance in South Korea: lessons for achieving universal health care coverage. *Health Policy Plan* 2009;**24**(1):63–71.
26. Yun H, Lee SI. *Primary care and health care reform in Korea*. Sejong: Korea Development Institute; 2012.
27. Kim AM, Cho S, Kim HJ, Jung H, Jo M-W, Lee JY, et al. Primary care patients' preference for hospitals over clinics in Korea. *Int J Environ Res Public Health* 2018;**15**(6):1119.
28. Chernew M, Gibson TB, Yu-Isenberg K, Sokol MC, Rosen AB, Fendrick AM. Effects of increased patient cost sharing on socioeconomic disparities in health care. *J Gen Intern Med* 2008;**23**(8):1131–6.
29. Korda RJ, Clements MS, Kelman CW. Universal health care no guarantee of equity: comparison of socioeconomic inequalities in the receipt of coronary procedures in patients with acute myocardial infarction and angina. *BMC Public Health* 2009;**9**(1):460.
30. Choudhry NK, Fischer MA, Avorn JL, Lee JL, Schneeweiss S, Solomon DH, et al. The impact of reducing cardiovascular medication copayments on health spending and resource utilization. *JACC (J Am Coll Cardiol)* 2012;**60**(18):1817–24.
31. Cole JA, Norman H, Weatherby LB, Walker AM. Drug copayment and adherence in chronic heart failure: effect on cost and outcomes. *Pharmacotherapy* 2006;**26**(8):1157–64.
32. Jeong H-S. Korea's national health insurance—lessons from the past three decades. *Health Aff* 2011;**30**(1):136–44.
33. O'Sullivan ERG, Berner M. *Research methods for public administration*. 5th ed. Pearson Education; 2008.

Appendix A. Supplementary data

Supplementary data to this article can be found online at https://doi.org/10.1016/j.puhe.2019.05.005.