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National Trends in Hospitalization for Ambulatory Care Sensitive Conditions among Korean Adults between 2008 and 2019

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Purpose: This study aimed to examine 12-year trends in hospitalization rates for ambulatory care sensitive conditions (ACSC) and factors affecting hospitalization.

Materials and Methods: This study used data on Korean National Health Insurance and Medical Aid patients aged 19 and over who used medical services at least once between January 2008 and December 2019 with an ACSC as their major diagnosis. As of 2019, a total of 12324071 patients were included. To check for any changes in hospitalization, age- and sex-standardized hospitalization rates were obtained for each condition and insurance type, and multiple logistic regression was performed to identify factors affecting hospitalization.

Results: The collective average ACSC hospitalization rate decreased from 5.0% in 2008 to 4.2% in 2019. Specifically, hospitalization rates for hypertension (1.4% in 2008; 0.8% in 2019), diabetes (5.8% in 2008; 3.3% in 2019), and chronic obstructive pulmonary disease and asthma (4.1% in 2008; 3.2% in 2019) decreased, while rates for pneumonia (24.5% in 2008; 28.1% in 2019) and urinary tract infection (UTI) (5.7% in 2008; 6.4% in 2019) increased. The rate for heart failure decreased 2.3% between 2008 and 2012 and then rebounded. The odds of hospitalization among Medical Aid patients were 1.45–4.20 times higher than those of National Health Insurance patients.

Conclusion: Differences in trends were confirmed for ACSC hospitalization rates among different conditions and insurance types in Korea. These results suggest the need for policy reforms aimed at reducing hospitalization for heart failure, pneumonia, and UTI, especially among Medical Aid patients.

Key Words: Ambulatory care sensitive condition, preventable hospitalization, primary health care, quality of health care, health disparity, chronic disease management

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INTRODUCTION

Ambulatory care sensitive conditions (ACSC) refer to conditions for which hospitalization can be prevented with timely and effective outpatient care.[1,2] Accordingly, hospitalizations related to ACSC are called "preventable hospitalizations" and are widely used as an indicator of the quality of primary care.[3] The Agency for Healthcare Research and Quality (AHRQ) in the US has categorized hypertension, diabetes, congestive heart failure, pneumonia, chronic obstructive pulmonary disease (COPD) and asthma, and urinary tract infections (UTI) as ACSCs.[2]

Research on ACSC hospitalization rates and factors contrib-

uting to ACSC hospitalization rates is expansive.[3,4] Studies have shown that weak primary care due to a fragmented medical system centered on a fee-for-service system is one reason for high ACSC hospitalization rates.[4,5] Korea is a representative case of a country that has adopted a fee-for-service payment system and has weak primary care.[4,5] However, previous studies on the rates of preventable hospitalizations for ACSC have only analyzed limited conditions or periods in Korea.[6-10] Thus, there are insufficient data from which to glean an overall view of changes in preventable hospitalizations and related risk factors.

In previous studies, researchers have commonly investigated ACSC hospitalization rates relative to the entire population.[6,8] These indicators have an advantage in that they can measure the degrees of prevention and management of ACSC. On the other hand, they have a disadvantage in that they cannot measure each effect separately. Considering that a previous study concluded that an increase in the number of people with a condition is the factor with the greatest influence on the hospitalization rate for that condition, it is appropriate to evaluate how well patients with ACSC are managed at the primary care level by examining ACSC hospitalization rates relative to patients with ACSC, not the entire population.[11]

Therefore, in this study, we aimed to investigate trends in ACSC hospitalization rates relative to patients with ACSC over the past 12 years in Korea and to examine factors affecting hospitalization as a proxy indicator for the quality of primary care in Korea.

MATERIALS AND METHODS

Study data

This study used National Health Insurance and Medical Aid claims data filed with the Health Insurance Review and Assessment Service (HIRA) in Korea. Two types of claims data are representative of the entire Korean population: the National Health Insurance and Medical Aid programs are two pillars of the public healthcare system in Korea, covering the entire Korean population. National Health Insurance, a public insurance to which Korean citizens with income or assets must subscribe, currently covers about 97% of the population, while Medical Aid, a public assistance program for low-income individuals, covers the remaining 3%.[12] The claims data from January 2008 to December 2019 were used, and data from the year 2020 were excluded from analysis since there is a possibility that trends in healthcare utilization were distorted due to the influence of the coronavirus disease-2019 (COVID-19). This study was exempted from review by the Institutional Review Board of the HIRA (HIRA-2021-118-001).

Study subjects

The subjects of this study were Korean National Health Insurance or Medical Aid patients who used outpatient or inpatient medical services at least once between January 2008 and December 2019 with an ACSC as their major diagnosis. Patients under the age of 19 years were excluded from the data for each year, and as of 2019, a total 12324071 patients were selected out of 13532284 patients by excluding patients under the age of 19 years. The 10th Revision of the International Classification of Diseases (ICD-10) codes defined by the AHRQ as the codes for ACSC, including diabetes, hypertension, COPD and asthma, pneumonia, and UTI, were converted to the corresponding codes in the 7th Revision of the Korean Standard Classification of Diseases (KCD-7) and used to categorize the ACSCs.[2] The KCD-7 codes used for analysis are presented in Supplementary Table 1 (only online).

Variables

Hospitalizations for ACSCs were defined as hospitalizations under disease codes that represent potentially preventable hospitalizations according to the AHRQ, as described above. Annual hospitalization rates were calculated by dividing the number of patients hospitalized for each ACSC every year by the total number of patients with the corresponding ACSC in that year.

$$\text{Hospitalization rate}_{ij} = \frac{\text{Number of patients hospitalized for ACSC}_{ij}}{\text{Number of patients with ACSC}_{ij}} \times 100$$

i=year of interest, j=corresponding ACSC

The patients were grouped into 5-year age groups to determine standardized hospitalization rates and into the following groups for other analyses: 19–44 years, 45–64 years, and ages 65 years and above. The types of health insurance coverage were divided into National Health Insurance (NHI) and Medical Aid coverage. For any comorbidities, the Charlson Comorbidity Index (CCI) was determined.[13] If a patient's inpatient or outpatient treatment claim statements from the year before the period under study included any of the 19 pre-defined comorbid conditions used to determine the CCI, a weighted score of 1–6 points was given for each comorbid condition and the CCI was obtained. With a larger value indicating a greater number or severity of underlying conditions, the sum of the score was grouped into the following four categories: 0 points, 1 point, 2 points, and 3 points and above.

Statistical analysis

Baseline characteristics were assessed based on the population in 2019. Chi-square tests were performed to identify any differences in socio-demographic characteristics according to hospitalization for ACSCs in general and for each individual condition by year. In addition, to assess changes in hospitalization rates over the past 12 years, the baseline demographic composition was used to obtain age-and sex-standardized

hospitalization rates, and multiple logistic regression was performed to identify any trends. Multiple logistic regression was also performed by year to identify any factors that may have had an influence on the hospitalization of patients. Moreover, to assess changes in hospitalization rates according to type of insurance, age- and sex-standardized hospitalization rates for both National Health Insurance and Medical Aid patients were obtained. All statistical analyses were performed using SAS Enterprise Guide 7.1 (SAS Institute Inc., Cary, NC, USA).

RESULTS

Fig. 1 shows the age- and sex-standardized hospitalization rates between 2008 and 2019. The collective ACSC hospitalization rate was 5.0% in 2008 but decreased to 4.2% in 2019, the difference being statistically significant (p<0.001). A review of the individual conditions showed that the hospitalization rate for hypertension was 1.4% in 2008 and continued to decrease every year until 0.8% in 2019 (p<0.001). The hospitalization rate for diabetes was 5.8% in 2008 and decreased 0.1% p–0.3% p annually until reaching 3.3% in 2019 (p<0.001). The hospitalization rate for COPD and asthma also decreased from 4.1% in 2008 to 3.2% in 2019 (p<0.001). On the other hand, the hospitalization rates for pneumonia (24.5% in 2008 and 28.1% in 2019) and UTI (5.7% in 2008 and 6.4% in 2019) gradually increased (p<0.001). The hospitalization rate for heart failure was 11.4% in 2008 and decreased to 9.1% in 2012 before rebounding and reaching 10.8% in 2019. The sex- and age- standardized number of patients are presented in Supplementary Table 2 (only online).

We also discovered changes from 2008 to 2019 in age- and sex-standardized hospitalization rates for each condition according to the type of insurance. Throughout the study period, Medical Aid patients show higher hospitalization rates than National Health Insurance patients for all conditions. Hospitalization rates for hypertension, diabetes, and COPD and asthma among Medical Aid patients decreased more drastically than those among National Health Insurance patients for the same conditions, while the hospitalization rates for pneumonia and UTI showed the opposite results. Hospitalization rates for heart failure have been on the rise since 2011 for both National Health Insurance and Medical Aid patients.

Table 1 shows the socio-demographic characteristics of the study population as of 2019. In 2019, there were 12324071 patients with at least one ACSC, and among them, 512630 (4.2%) were inpatients. The hospitalization rate of women was 4.4%, which was slightly higher than that of men at 3.9%. In addition, the hospitalization rate of Medical Aid patients was 12.2%, which was higher than that of National Health Insurance patients at 3.7%.

Table 2 shows the characteristics of hospitalized and non-hospitalized patients with each condition in 2019. Among the ACSCs, the top two conditions with the greatest number of patients were hypertension and diabetes, amounting to 6729938 patients (54.6%) and 3542666 patients (28.7%), respectively. The condition with the highest hospitalization rate was pneumonia (194032 patients, 28.1%), followed by heart failure (17088 pa-

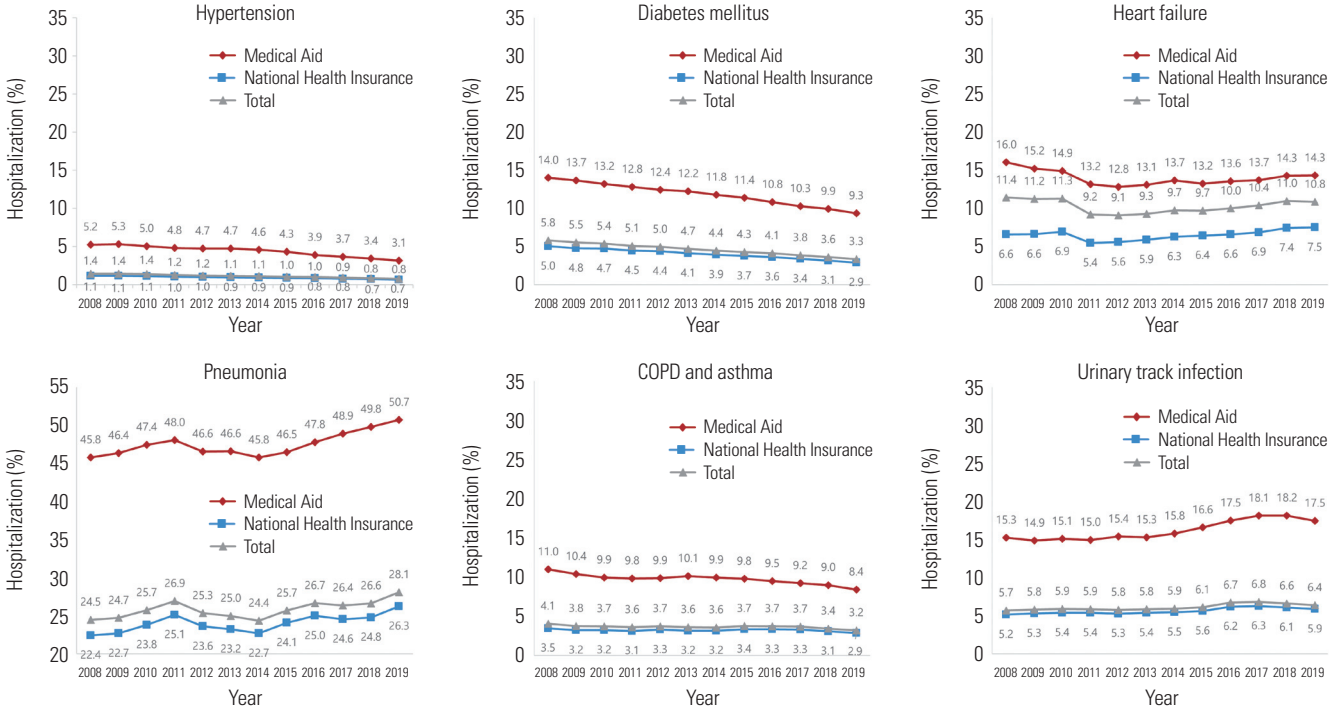

Fig. 1. Trends of hospitalization rates for ambulatory care sensitive conditions from 2008 to 2019.

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Table 1. Baseline Characteristics of the Study Population in 2019

Characteristics	Total (n=12324071)	Hospitalized (n=512630)	Not hospitalized (n=11811441)	*p* value
Sex				<0.001
Men	5740581 (46.6)	225025 (3.9)	5515556 (96.1)	
Women	6583490 (53.4)	287605 (4.4)	6295885 (95.6)	
Age				<0.001
65≤	4717445 (38.3)	315804 (6.7)	4661173 (98.8)	
45–64	5567401 (45.2)	140554 (2.5)	5426847 (97.5)	
19–44	1779693 (14.4)	56272 (3.2)	1723421 (96.8)	
Insurance type				<0.001
Medical Aid	621060 (5.0)	75757 (12.2)	545303 (87.8)	
Nation Health Insurance	11703011 (95.0)	436873 (3.7)	11266138 (96.3)	
CCI				<0.001
≥3	422548 (3.4)	56494 (13.4)	366054 (86.6)	
2	841877 (6.8)	69886 (8.3)	771991 (91.7)	
1	2592380 (21.0)	148883 (5.7)	2443497 (94.3)	
0	8467266 (68.7)	237367 (2.8)	8229899 (97.2)	

CCI, Charlson Comorbidity Index.
Data are presented as n (%).

tients, 10.8%), UTI (104662 patients, 6.4%), diabetes (117799 patients, 3.3%), COPD and asthma (60307 patients, 3.2%), and hypertension (51782 patients, 0.8%) in descending order. Supplementary Table 3 (only online) lists the characteristics according to disease and hospitalization between 2008 and 2018.

Table 3 shows the analysis results of factors influencing hospitalization for each condition as of 2019. Medical Aid patients exhibited a higher risk of hospitalization than National Health Insurance patients in all of the conditions, and the difference was statistically significant [odds ratio (OR) for hypertension: 4.20, 95% confidence interval (CI): 4.10–4.29; OR for diabetes: 3.20, 95% CI: 3.15–3.25; OR for heart failure: 1.45, 95% CI: 1.38–1.52; OR for pneumonia: 2.16, 95% CI: 2.12–2.21; OR for COPD and asthma: 2.44, 95% CI: 2.38–2.49; OR for UTI: 2.16, 95% CI: 2.12–2.21]. The differences in the composition of inpatients by year for each ACSC are presented in Supplementary Table 3 (only online). Among inpatients, the proportion of patients under 65 years of age has decreased (14.8% in 2008 and 11% in 2019), and the proportion of patients with NHI (80.0% in 2008 and 85.2% in 2019) and high CCI (CCI 3 and higher: 8.2% in 2008 and 11.0% in 2019) increased. Supplementary Table 4 (only online) lists the adjusted OR for hospitalization between 2008 and 2018.

DISCUSSION

This study examined the quality of primary care in Korea and any disparity according to patient socio-demographic characteristics through analysis of changes in hospitalization rates for ACSCs over the past 12 years, as well as factors that influenced hospitalization. As of 2019, the collective average ACSC hospitalization rate was 4.2%, which was a decrease from 5.0% in 2008. Although there are few prior studies that have analyzed hospitalization rates of all ACSCs, previous studies showed that Korea's preventable hospitalization rates were consistently higher than the Organization for Economic Co-operation and Development (OECD) average.[14] Despite recent decreases in ACSC hospitalization rates, Korea's primary care still requires further improvements.

A closer look at the individual conditions shows that the hospitalization rates for diabetes, hypertension, and COPD and asthma, which are all chronic conditions, are on the decline. However, hospitalization rates for heart failure, pneumonia, and UTI, which are complications of other diseases, have increased. The decrease in hospitalization rates for chronic conditions may be interpreted as the result of proactive policies in Korea to strengthen primary care with a focus on diabetes and hypertension.[6] The increase in hospitalizations for heart failure is expected to be largely due to the rapid population aging in Korea, although there is also the possibility that the increase is the result of ineffective management of patients with hypertension and diabetes (the most common risk factors for heart failure).[15-17] In addition, discovery of asymptomatic patients through Korea's excessively performed, marketized health checkups may be another cause of the sharp increase in the hospitalization rates for heart failure.[18] Population aging is thought to be the most important contributing factor for the increase in the hospitalization rates of pneumonia patients, and it is also estimated that the hospitalization rates for pneumonia and UTI increased due to factors related to healthcare providers, as inpatient care is more advantageous for healthcare providers under the fee-for-service payment system of Korea.[4]

As a socio-demographic factor influencing ACSC hospitalization rates, the risk of hospitalization was higher for men, older patients, patients with multiple comorbidities, and Medical

Table 2. Characteristics according to Disease and Hospitalization in 2019

Characteristics	Hypertension			Diabetes			Heart failure		
	Hospitalized	Not hospitalized	*p* value	Hospitalized	Not hospitalized	*p* value	Hospitalized	Not hospitalized	*p* value
Total	51782 (0.8)	6678156 (99.2)		117799 (3.3)	3424867 (96.7)		17088 (10.8)	140509 (89.2)	
Sex			<0.001			<0.001			0.235
Men	23124 (0.7)	3329060 (99.3)		65487 (3.4)	1878987 (96.6)		6995 (11.0)	56854 (89.0)	
Women	28658 (0.8)	3349096 (99.2)		52312 (3.3)	1545880 (96.7)		10093 (10.8)	83655 (89.2)	
Age			<0.001			<0.001			<0.001
65≤	31958 (1.0)	3075684 (99.0)		61788 (3.8)	1575612 (96.2)		14464 (12.5)	101165 (87.5)	
45–64	16661 (0.5)	3155829 (99.5)		45328 (2.8)	1583794 (97.2)		2213 (6.0)	34469 (94.0)	
19–44	3163 (0.7)	446643 (99.3)		10683 (3.9)	265461 (96.1)		411 (7.8)	4875 (92.2)	
Insurance type			<0.001			<0.001			<0.001
Medical Aid	10029 (3.1)	309311 (96.9)		22236 (9.3)	215916 (90.7)		2510 (15.2)	14000 (84.8)	
Nation Health Insurance	41753 (0.7)	6368845 (99.3)		95563 (2.9)	3208951 (97.1)		14578 (10.3)	126509 (89.7)	
CCI			<0.001			<0.001			<0.001
≥3	3468 (2.0)	172265 (98.0)		11617 (6.9)	156914 (93.1)		3013 (18.3)	13451 (81.7)	
2	5055 (1.2)	403691 (98.8)		14991 (5.0)	283750 (95.0)		3334 (14.2)	20120 (85.8)	
1	12894 (1.0)	1227937 (99.0)		28583 (3.8)	731975 (96.2)		4989 (10.7)	41630 (89.3)	
0	30365 (0.6)	4874263 (99.4)		62608 (2.7)	2252228 (97.3)		5752 (8.1)	65308 (91.9)	
Characteristics	**Pneumonia**			**COPD and asthma**			**Urinary tract infection**		
	Hospitalized	Not hospitalized	*p* value	Hospitalized	Not hospitalized	*p* value	Hospitalized	Not hospitalized	*p* value
Total	194032 (28.1)	496720 (71.9)		60307 (3.2)	1821833 (96.8)		104662 (6.4)	1534562 (93.6)	
Sex			<0.001			<0.001			<0.001
Men	95836 (32.0)	203386 (68.0)		30318 (3.6)	816103 (96.4)		18624 (13.0)	125001 (87.0)	
Women	98196 (25.1)	293334 (74.9)		29989 (2.9)	1005730 (97.1)		86038 (5.8)	1409561 (94.2)	
Age			<0.001			<0.001			<0.001
65≤	136184 (45.3)	164537 (54.7)		40158 (5.1)	740178 (94.9)		58042 (13.8)	361057 (86.2)	
45–64	37482 (17.9)	172197 (82.1)		15143 (2.3)	641714 (97.7)		29229 (4.3)	647044 (95.7)	
19–44	20366 (11.3)	159986 (88.7)		5006 (1.1)	439941 (98.9)		17391 (3.2)	526461 (96.8)	
Insurance type			<0.001			<0.001			<0.001
Medical Aid	26329 (50.7)	25599 (49.3)		9958 (8.4)	108375 (91.6)		12417 (17.5)	58694 (82.5)	
Nation Health Insurance	167703 (26.3)	471121 (73.7)		50349 (2.9)	1713458 (97.1)		92245 (5.9)	1475868 (94.1)	
CCI			<0.001			<0.001			<0.001
≥3	27335 (56.4)	21132 (43.6)		7090 (6.2)	107912 (93.8)		9246 (19.3)	38774 (80.7)	
2	29400 (43.8)	37664 (56.2)		10386 (5.5)	179787 (94.5)		13037 (12.2)	94217 (87.8)	
1	59831 (34.0)	115894 (66.0)		27922 (3.6)	739132 (96.4)		26332 (8.4)	285652 (91.6)	
0	77466 (19.4)	322030 (80.6)		14909 (1.8)	795002 (98.2)		56047 (4.8)	1115919 (95.2)	

COPD, chronic obstructive pulmonary disease; CCI, Charlson Comorbidity Index.
Data are presented as n (%).

Aid patients, which is consistent with the results of previous studies.[5,18,19] Hospitalization rates according to type of insurance, in particular, showed a notably significant difference: Medical Aid patients showed a 1.45 to 4.20 times higher odds of hospitalization than National Health Insurance patients. This is consistent with previous studies that found that lower income levels are associated with lower continuity of care and worse health status.[5,20] Low-income groups have been found to exhibit relatively weak understanding of their illnesses and a limited ability to manage their health, which translates to low medication adherence.[21] Moreover, the burden of direct and indirect costs of treatment makes it difficult for low-income groups to continue receiving outpatient care, ultimately putting them at higher risk of preventable hospitalization.[20,21] The difference according to type of insurance is especially pronounced for hypertension and diabetes, which are conditions that are relatively easy to manage among ACSCs.[20,21] These results suggest that policies to strengthen access to primary care among vulnerable groups are insufficient and that unnecessary hospitalizations are taking place.

According to Starfield's model of the primary care domain, it is important that chronic conditions are managed continuously and properly through timely and effective outpatient care.[1,22] Chronic conditions that are not properly managed lead to complications, which in turn result in high medical expenditures due to hospitalization or emergency room visits.[19,23] Due to the

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Table 3. Adjusted OR for Hospitalization in 2019

	Adjusted OR (95% CI)					
	Hypertension	Diabetes	Heart failure	Pneumonia	COPD and asthma	Urinary tract infection
Sex						
Men	0.95 (0.94–0.97)	1.11 (1.09–1.12)	1.13 (1.09–1.17)	1.26 (1.25–1.28)	1.20 (1.18–1.22)	2.04 (2.01–2.08)
Women	1.00	1.00	1.00	1.00	1.00	1.00
Age						
65≤	1.10 (1.06–1.14)	0.79 (0.77–0.81)	1.50 (1.35–1.66)	4.65 (4.57–4.73)	3.51 (3.40–3.61)	3.70 (3.63–3.77)
45–64	0.68 (0.66–0.71)	0.64 (0.63–0.66)	0.73 (0.65–0.81)	1.46 (1.44–1.49)	1.78 (1.73–1.84)	1.27 (1.25–1.29)
19–44	1.00	1.00	1.00	1.00	1.00	1.00
Insurance type						
Medical Aid	4.20 (4.10–4.29)	3.20 (3.15–3.25)	1.45 (1.38–1.52)	2.16 (2.12–2.21)	2.44 (2.38–2.49)	2.16 (2.12–2.21)
Nation Health Insurance	1.00	1.00	1.00	1.00	1.00	1.00
CCI						
≥3	2.45 (2.36–2.54)	2.29 (2.24–2.34)	2.19 (2.09–2.30)	2.68 (2.62–2.73)	2.04 (1.98–2.10)	2.42 (2.35–2.48)
2	1.65 (1.60–1.70)	1.73 (1.69–1.76)	1.67 (1.59–1.75)	1.80 (1.77–1.84)	1.98 (1.93–2.04)	1.69 (1.65–1.73)
1	1.46 (1.43–1.49)	1.33 (1.31–1.35)	1.26 (1.21–1.32)	1.46 (1.45–1.48)	1.61 (1.58–1.64)	1.33 (1.31–1.35)
0	1.00	1.00	1.00	1.00	1.00	1.00

COPD, chronic obstructive pulmonary disease; CCI, Charlson Comorbidity Index; OR, odds ratio; CI, confidence interval.
Adjusted ORs were adjusted for sex, age, insurance type, and CCI.

characteristics of chronic conditions, the quality of primary healthcare in a society is known to have a significant impact on the management of patients with chronic conditions.[1,24] As Korea is an OECD member state with relatively good access to outpatient services, a factor known to influence preventable hospitalizations,[25] Korea's high ACSC hospitalization rates appear to be attributable to structural problems with other factors that influence preventable hospitalizations: the healthcare delivery system and the payment system.[26,27]

In the UK, patients are treated and referred by their primary care physician.[28] In the US, the Accountable Care Organization model, which focuses on a value-based payment system and integrated care model, is growing.[29] In contrast to these countries, Korea's lack of a primary care physician system and freedom in patient choices on medical institutions lower the continuity of care and make it difficult to expect any gatekeeping effects, resulting in patient overcrowding at secondary and tertiary medical institutions.[27,29-31] In addition, it is known that when there is a high availability of beds, healthcare professionals under the fee-for-service payment system, the main payment system employed in Korea, tend to relax the conditions for admission and encourage patients to be treated as inpatients.[32-35] Considering the above, the fact that Korea has the second highest number of acute care beds among the OECD member states may be a cause of the high hospitalization rates.[25] Accordingly, a reform toward a more integrated healthcare delivery system of primary, secondary, and tertiary care, as well as overhaul of the payment system, is necessary for more efficient use of healthcare resources and improvement of the quality of care.

There are a few limitations to this study. First, there were limitations due to the use of administrative data. The National Health Insurance claims data used in this study, like other administrative data, lack detailed clinical information, such as laboratory test results. Accordingly, there is difficulty with verifying that a patient's hospitalization was in fact a "preventable hospitalization," which this study intended to examine, and it is possible that the study did not reflect the exact health statuses of patients, including the severity of their conditions. To overcome these limitations, analysis of data was restricted to data corresponding to the diagnosis codes of ACSCs define by the AHRQ in the US as "preventable hospitalizations." Moreover, the data were adjusted using information from the claims data, such as the sex, age, and CCI scores of patients, which are known to be useful in estimating patient health status. Second, sociological factors known to affect patient health were incorporated in a limited manner using secondary data. In particular, patient financial circumstances, a factor discussed in detail in this study, were simply classified in terms of the patients' type of insurance. Accordingly, it is likely that differences in healthcare use trends depending on the type of insurance were reflected in the effects, whereas the effects according to the income level may have been underestimated.

Despite these limitations, this study has multiple strengths. First, the study presents a representative overview of longitudinal changes in the country's primary care system through its analysis of all claims data for ASCS cases over the past 12 years filed under National Health Insurance or Medical Aid, which together cover the entire Korean population. Second, the study offers a robust definition of ACSC by classifying ACSC according to the diagnosis codes for preventable hospitalizations suggested by the AHRQ, and the fact that it focused on the management of ACSC by looking at the hospitalization rates relative to patients with ACSC, while excluding the effects of the rising

number of patients with ACSC, sets it apart from previous studies. Third, the study is meaningful in that the investigation of issues facing Korea despite its rapid economic development and achievement of universal health coverage helps provide insight into issues other countries with similar healthcare systems may also be facing.

In conclusion, although the collective ACSC hospitalization rate in Korea has been continuously decreasing over the past 12 years, there are observably different results among the conditions and insurance types. Our results suggest that policy reforms are necessary to enhance the quality of primary care in Korea, more specifically policies aimed at reducing hospitalization rates for heart failure, pneumonia, and UTIs, particularly among Medical Aid patients.

AUTHOR CONTRIBUTIONS

Conceptualization: Jin Yong Lee. Data curation: Hyeki Park. Formal analysis: Hyeki Park. Funding acquisition: Hyeki Park. Investigation: Hyeki Park, Mi Jung Son, and Da Won Jung. Methodology: Hyeki Park and Hyejin Lee. Project administration: Hyeki Park. Resources: Hyeki Park. Software: Hyeki Park. Supervision: Jin Yong Lee and Hyejin Lee. Validation: Mi Jung Son and Hyejin Lee. Visualization: Hyeki Park. Writing—original draft: Hyeki Park, Mi Jung Son, and Da Won Jung. Writing—review & editing: Hyeki Park, Jin Yong Lee, and Hyejin Lee. Approval of final manuscript: all authors.

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