

National Health Insurance Data Analysis for the Second-Wave Development of Korean Medicine Clinical Practice Guidelines in South Korea

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Objectives: After the evidence-based Korean medicine clinical practice guidelines (KM-CPGs) for 30 targeted diseases were developed in 2021, 34 diseases have been proposed for the second-wave development of the KM-CPGs. The purpose of this study was to investigate the development priorities of the candidate diseases into the second-wave development of KM-CPGs in south Korea.

Methods: In this study, we analyzed the Health Insurance Review and Assessment Service National Patient Sample data from 2017 to 2018 to determine the demand and economic importance of the candidates for the second-wave development of KM-CPGs in real-world clinical settings in Korea.

Results: The annual number of visits and patients, annual healthcare expenditure per patient, and healthcare expenditure per institution were analyzed. Musculoskeletal disorders, including sciatica and adhesive capsulitis of the shoulder, were the most important topics regarding the number of visits and patients and annual healthcare expenditure per institution. Specifically, sciatica (52.05% of the total number of visits, 48.34% of the total number of patients, and 42.12% of the total treatment expenditure per institution) showed overwhelmingly high proportions. However, cerebral palsy (36.03% of the total number of inpatient visits and 24.55% of the total number of inpatient patients) was a more important topic in inpatient clinical settings than musculoskeletal conditions or cancer, and healthcare expenditure per patient in this topic had the highest ranking. Furthermore, fractures were found to be highly important in inpatient clinical settings. No patients had influenza A virus infection or posttraumatic stress disorders who visited the KM medical institution of interest.

Conclusion: This study highlights the gap between the real-world clinical setting and the research field in some topics. The results of this study can provide guidance for the second-wave development of KM-CPGs in the future.

Keywords: korean medicine, clinical practice guideline, healthcare utilization, national health insurance data

INTRODUCTION

South Korea has a unique dual medical system, which includes traditional medicine similar to China and Taiwan [1]. Korean medicine (KM), which provides medical care with treatments such as acupuncture, herbal medicine, moxibustion, cupping therapy, and chuna manual therapy, is used to treat diseases and enhance public health in South Korea [2]. However, the “lack of scientific evidence” reduces the public trust in KM, even though the prevalence of KM use in Korea is more than 60% [3]. The relatively limited evidence versus the high usage rate is a challenge that complementary and integrative medicine (CIM) also faces worldwide [4].

In this context, a national project (Korean Medical Standard Clinical Practice Guideline Project, 2016-2022) to develop and implement the evidence-based KM clinical practice guidelines (KM-CPGs) was initiated in 2016, funded by the Ministry of Health and Welfare, Republic of Korea, based on the third National Comprehensive Plan for KM Development (2016-2020). At the time of project implementation, 30 targeted diseases for the KM-CPGs development were selected by comprehensively reviewing the strengths and limitations of KM, the public use of KM, and the possibility of public or private insurance coverage. The KM-CPGs for the 30 diseases were developed in 2021 [5], the first-wave development of KM-CPGs. Health authorities decided to develop novel CPGs in the newly funded Korean Medicine Innovative Technology Development Project. Therefore, new candidate diseases have been proposed for the second-wave development of KM-CPGs by the National Institute for Korean Medicine Development (NIKOM). Prioritizing the diseases for CPGs is a crucial issue for both medical professionals and policymakers; however, there is no evidence regarding the status of KM healthcare utilization for those diseases in South Korea.

In this study, we analyzed the demand and economic importance of the candidate diseases for the second-wave development of KM-CPGs in real-world clinical settings using the Health Insurance Review and Assessment Service (HIRA)’s National Patient Sample (NPS) data, which can be used as a criterion for the second-wave development of future KM-CPGs. This analysis may elucidate KM usage in South Korea, which is one of the countries where CIM is most popular. It can be referenced for policymaking in countries that use the same treatments. This study was conducted with support from the Korean Medicine Innovative Technology Development Project under

NIKOM, which supervises the second-wave development of KM-CPGs. This study aimed to investigate the development priorities of the candidate diseases in the second-wave development of KM-CPGs.

MATERIALS AND METHODS

1. Candidate diseases proposed for the second-wave development of KM-CPGs

We selected the candidate diseases proposed for the second-wave development of KM-CPGs based on the previous two planning projects conducted by NIKOM in 2019 and 2020 funded by the Ministry of Health and Welfare. The ‘Advance Planning Study for Korean Medicine Innovative Technology Development Project’ conducted in 2019 suggested 29 candidates, including frozen shoulder and asthma. The ‘Demand Survey of Priority Diseases for the Development of Korean Medicine Clinical Practice Guidelines’ conducted in 2020 suggested 10 candidates, including coronavirus disease 2019 (COVID-19). Disability (e.g., sequelae of cerebral palsy), was added as a candidate by NIKOM based on policy necessity, and a total of 34 candidates were listed, excluding overlapping candidates (Table 1).

2. Data source

The HIRA-NPS is a secondary data source stratified by patient units according to gender and age group for one year from the date of commencement of care after removing information about individuals and corporations from the National Health Insurance (NHI) claims raw data [6]. These are datasets that sampled 3% of all patients in Korea and contain data on approximately 1.4 million individuals per year [6]. This sample is representative of the entire patient population in South Korea and is generalizable to the entire South Korean population [6]. In this study, we analyzed data from the HIRA-NPS from 2017-2018. The dataset was provided by HIRA at the request of NIKOM in October 2020, with the purpose of establishing the development priorities of the candidate diseases into the second-wave development of KM-CPGs. This study was approved by the Institutional Review Board (IRB) of Dongeui University Korean Medicine Hospital (IRB No. DH-2022-04; approved on April 18, 2022). The need for patient consent was waived as this dataset includes untraceable and deidentified secondary claims.

Table 1. First-wave development of KM-CPGs and candidates for second-wave development of KM-CPGs

Classification by disease	First-wave development of KM-CPGs (2016-2021)	Candidates for second-wave development of KM-CPGs
Diseases of the musculoskeletal system and connective tissue	(1) Postoperative syndrome (2) Traffic accident injury syndrome (3) LSS (4) Ankle sprain (5) Shoulder pain (6) Cervical pain (7) cLBP (8) L-HIVD	(1) Adhesive capsulitis of shoulder (2) C-HIVD (3) Sciatica (4) Fracture (5) Thoracic outlet syndrome
Diseases of the nervous system	(9) Migraine (10) Dizziness (11) PD (12) Insomnia (13) Facial nerve palsy	(6) Disorders of ANS
Diseases of the circulatory system	(14) Stroke (15) Common cold (16) Hypertension (17) Cold hands and feet	(7) Peripheral vascular disease (8) Liver dysfunction (9) Hyperlipidemia
Diseases of the digestive system	(18) Functional dyspepsia (19) TMD	(10) GERD (11) Gastritis (12) Ulcerative colitis (13) (primary) Constipation (14) Functional diarrhea (15) Stomatitis (16) Disturbances of salivary secretion
Diseases of the respiratory system	(20) Allergic rhinitis	(17) Asthma (18) H1N1 (19) COVID-19
Neoplasm (cancer)	(21) Breast cancer	(20) Cancer
Mental and behavioral disorders	(22) Anxiety disorder (23) Dementia (24) ASD	(21) PTSD
Diseases of the genitourinary system	(25) Dysmenorrhea (26) Menopause disorder	(22) Perinatal care (including hyperemesis gravidarum) (23) PMS (24) BPH (25) PCOS
Diseases of the skin and subcutaneous tissue	(27) Atopic dermatitis	(26) Zoster [herpes zoster] (27) Alopecia areata (28) Psoriasis (29) Eczema (including seborrheic dermatitis) (30) Acne
Diseases of the otolaryngeal system		(31) Tinnitus
Symptoms and signs not elsewhere classified	(28) Fatigue (29) Cancer accompanying symptoms	(32) TBI (33) Geriatric care (such as elderly frailty)
Special purpose code	(30) Hwa-byung (anger syndrome in KM)	(34) Disabled (such as cerebral palsy)

ANS, autonomic nervous system; ASD, autism spectrum disorder; BPH, benign prostatic hyperplasia; C-HIVD, cervical herniated intervertebral disk; cLBP, chronic low back pain; COVID-19, coronavirus disease of 2019; CPG, clinical practice guideline; GERD, gastroesophageal reflux disease; H1N1, Influenza A virus subtype; KM, Korean medicine; L-HIVD, lumbar herniated intervertebral disk; LSS, lumbar spinal stenosis; PCOS, polycystic ovary syndrome; PD, Parkinson's disease; PMS, premenstrual tension syndrome; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury; TMD, temporomandibular disorders.

Table 2. ICD-code of candidates for second-wave development of KM-CPGs

Candidates for second-wave development of KM-CPGs	ICD codes
(1) Adhesive capsulitis of shoulder	M75.0
(2) c-HIVD	M50 (M50.0, M50.1, M50.2, M50.3, M50.8, M50.9)
(3) Sciatica	M54.3 (M54.30, M54.36, M54.37, M54.38, M54.39), M54.4 (M54.40, M54.45, M54.46, M54.47, M54.48, M54.49)
(4) Fracture	S22, S32, S42, S52, S62, S72, S82, S92, T02, T08, T10, T12
(5) Thoracic outlet syndrome	G54.0
(6) Disorders of ANS	G90 (G90.0, G90.1, G90.2, G90.3, G90.4, G90.5, G90.6, G90.7, G90.8, G90.9)
(7) Peripheral vascular disease	I73 (I73.0, I73.1, I73.8, I73.9)
(8) Liver dysfunction	R94.5
(9) Hyperlipidemia	E78 [E78.0 (E78.00, E78.08), E78.1, E78.2, E78.3, E78.4, E78.5]
(10) GERD	K21 (K21.0, K21.9), R12
(11) Gastritis	K29 (K29.0, K29.1, K29.2, K29.3, K29.4, K29.5, K29.6, K29.7)
(12) Ulcerative colitis	K51 (K51.0, K51.2, K51.3, K51.8, K51.9)
(13) (primary) Constipation	K59 [K59.0 (K59.00, 59.01, 59.02, 59.09)]
(14) Functional diarrhea	K59.1
(15) Stomatitis	K12 (K12.0, K12.1, K12.2, K12.3)
(16) Disturbances of salivary secretion	K117
(17) Asthma	J45 [J45.0 (J45.00, J45.01, J45.02, J45.03, J45.09), J45.1 (J45.10, J45.11, J45.12, J45.13, J45.19), J45.8 (J45.80, J45.81, J45.88), J45.9], J46
(18) H1N1	J09, J11
(19) COVID-19	Excluded from the analysis.
(20) Cancer	
(20-1) Total	C00-C97
(20-2) Liver & bile duct cancer	C22-C24
(20-3) Thyroid cancer	C73
(20-4) Bone cancer	C40-C41
(20-5) Brain tumor	C70.0, C71
(20-6) Head and neck cancer	C00-C14, C30-C32
(20-7) Lymph cancer	C77, C81-C88
(20-8) Esophageal cancer	C15
(20-9) Kidney, bladder & urinary tract cancer	C64-C68
(20-10) Female genital cancer	C51-C58
(20-11) Stomach cancer	C16
(20-12) Breast cancer	C50
(20-13) Prostate cancer	C61
(20-14) Colorectal cancer	C18-C21
(20-15) Pancreatic cancer	C25
(20-16) Skin cancer	C43-C44
(20-17) Hematological cancer	C90-C95
(20-18) Respiratory system cancer	C33-C34
(21) PTSD	F43.1
(22) Hyperemesis gravidarum	O21 (O21.0, O21.1, O21.2, O21.8, O21.9)
(23) PMS	N94.3, N94.4, N94.5, N94.6

Table 2. Continued

Candidates for second-wave development of KM-CPGs	ICD codes
(24) BPH	N40 (N40.0, N40.1, N40.2, N40.3, N40.8)
(25) PCOS	E28.2
(26) Zoster [herpes zoster]	B02 (B02.0, B02.1, B02.2, B02.3, B02.7, B02.8, B02.9)
(27) Alopecia areata	L63 (L63.0, L63.1, L63.2, L63.8, L63.9)
(28) Psoriasis	L40 [L40.0 (L40.00, L40.01, L40.02, L40.08), L40.1, L40.4, L40.5, L40.8, L40.9]
(29) Seborrheic dermatitis	L21 (L21.0, L21.1, L21.8, L21.9)
(30) Acne	L70 (L70.0, L70.1, L70.2, L70.3, L70.4, L70.5, L70.8, L70.9)
(31) Tinnitus	H93.1
(32) TBI	S06 [S06.0 (S06.00, S06.01), S06.1 (S06.10, S06.11), S06.2 (S06.20, S06.21), S06.3 (S06.30, S06.31), S06.4 (S06.40, S06.41), S06.5 (S06.50, S06.51), S06.6 (S06.60, S06.61), S06.7 (S06.70, S06.71), S06.8 (S06.80, S06.81), S06.9 (S06.90)], S09 (S09.0, S09.1, S09.2, S09.7, S09.8, S09.9)
(33) Geriatric care (such as elderly frailty)	R53 in elderly population (65 years or older)
(34) Cerebral palsy	G80-G83

ANS, autonomic nervous system; BPH, benign prostatic hyperplasia; c-HVD, cervical herniated intervertebral disk; COVID-19, coronavirus disease of 2019; CPG, clinical practice guideline; GERD, gastroesophageal reflux disease; H1N1, Influenza A virus subtype; KM, Korean medicine; PCOS, polycystic ovary syndrome; PMS, premenstrual tension syndrome; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury.

3. Topics of interest

We matched all disease candidates with the related codes of the Tenth Revision of the International Statistical Classification of Diseases and Related Health Problems (ICD-10) before the data analysis. Among the suggested 34 disease candidates, we classified 20) cancer further as 20-1) total cancer; 20-2) liver and bile duct cancer; 20-3) thyroid cancer; 20-4) bone cancer; 20-5) brain tumor; 20-6) head and neck cancer; 20-7) lymph cancer; 20-8) esophageal cancer; 20-9) kidney, bladder, and urinary tract cancer; 20-10) female genital cancer; 20-11) stomach cancer; 20-12) breast cancer; 20-13) prostate cancer; 20-14) colorectal cancer; 20-15) pancreatic cancer; 20-16) skin cancer; 20-17) hematological cancer; and 20-18) respiratory system cancer. Some KM-CPGs for cancers from the first-wave development of KM-CPGs have been published for both specific and total cancers (numbers 21 and 29 on the first-wave development in Table 1). Therefore, in this analysis, both total cancer and specific cancer were analyzed to support both development strategies. Since COVID-19 was listed in the ICD-10 from March 2020, we excluded it from this analysis because it was not included in the 2017-2018 HIRA-NPS. Finally, we analyzed 50 topics in this study. The ICD codes of the topics were defined for the HIRA-NPS analysis (Table 2).

4. Analysis

The criteria for the analysis of the 50 topics were as follows: 1) period: 2017-2018; 2) diagnosis: only allowed if the topics of interest are included in the primary diagnosis, but not the secondary diagnosis; 3) institutions: KM primary clinics, KM hospitals, long-term care hospitals, and public healthcare centers where KM medical services are provided; 4) patient type: outpatient, inpatient, and total; and 5) treatment type: any type of insured KM treatment, including acupuncture, moxibustion, and herbal medicine. The following four outcomes were analyzed: annual total number of visits, annual total number of patients, healthcare expenditure (1,000 KRW) per patient, and healthcare expenditure (1,000 KRW) per institution. At this time, the “healthcare expenditure” used in the cost analysis means out-of-pocket money and the NHI’s contribution due to the characteristics of health insurance data. The annual results for all outcomes were calculated using the mean values of two years’ data (2017-2018). We performed all statistical analyses using R for Windows 4.1.3 (Ross Ihaka and Robert Gentleman, New Zealand). Finally, we visualized the results with Excel heatmaps and data bars (Microsoft Corp., Redmond, WA, USA).

RESULTS

1. Annual number of visits

The top five diseases with the highest annual number of total visits were: sciatica (135,894.5), adhesive capsulitis shoulder (29,768), tinnitus (13,256.5), total cancer (12,241), and cervical herniated intervertebral disk (c-HIVD) (11,495). The top five diseases with the highest annual number of outpatient visits were similar: sciatica (135,335.5), adhesive capsulitis shoulder (29,610.5), tinnitus (13,232.5), c-HIVD (11,256), and total cancer (10,410.5). However, the top five diseases with the highest annual number of inpatient visits were as follows: cerebral palsy (3,058), total cancer (1,830.5), sciatica (559), fracture (524), and breast cancer (503) (Fig. 1).

2. Annual number of patients

The top five diseases with the highest number of outpatients and the highest total number of patients per year were as follows: sciatica (19,595 and 19,818), adhesive capsulitis shoulder (5,724.5 and 5,769), gastritis (2,243.5 and 2,255.5), c-HIVD (1,909.5 and 2,085.5), and tinnitus (1,719.5 and 1,725). However, the top five diseases with the highest annual inpatients were: cerebral palsy (581.5), total cancer (513.5), sciatica (223), fracture (206), and c-HIVD (176) (Fig. 2).

3. Annual healthcare expenditure (1,000 KRW) per patient

The top five diseases with the highest annual total healthcare expenditure per patient were: cerebral palsy (4,393.42); kidney, bladder, and urinary tract cancer (3,890.95); total cancer (3,702.13); breast cancer (3,532.49); and fracture (3,424.21). The top five diseases with the highest annual outpatient expenditure per patient were: cerebral palsy (970.73); head and neck cancer (874.96); female genital cancer (778.11); kidney, bladder, and urinary tract cancer (752.93); and liver and bile duct cancer (743.33). The top five diseases with the highest annual inpatient healthcare expenditure per patient were: cerebral palsy (3,422.69); kidney, bladder, and urinary tract cancer (3,138.03); fracture (3,018.88); total cancer (3,010.36); and breast cancer (2,806.56) (Fig. 3).

4. Annual healthcare expenditure (1,000 KRW) per institution

The top five diseases with the highest annual total healthcare expenditure per institution were: sciatica (3,027,944.64), adhesive capsulitis of the shoulder (670,129.15), total cancer (602,798.11), c-HIVD (494,857.70), and cerebral palsy (429,471.7). The top five diseases with the highest annual outpatient treatment expenditure per institution were: sciatica (2,851,550.41), adhesive capsulitis of the shoulder (639,588.84), c-HIVD (282,119.59), tinnitus (271,948.11), and total cancer (234,424.62). However, the top five diseases with the highest annual inpatient treatment expenditure per institution were: total cancer (368,373.49), cerebral palsy (367,273.64), c-HIVD (212,738.11), fracture (188,514.92), and sciatica (176,394.23) (Fig. 4).

DISCUSSION

According to the analysis of the HIRA-NPS, musculoskeletal conditions, including sciatica and adhesive capsulitis of the shoulder, yielded the highest number of KM visits and patients during 2017-2018. Among them, sciatica was a high proportion of the total number of visits and patients (52.05% of the total number of visits and 48.34% of the total number of patients). The total number of visits and patients were mostly correlated with outpatient settings. Based on the amount of healthcare utilization, musculoskeletal disorders ranked high in terms of healthcare expenditure per institution. That is, the treatment expenditure per institution for sciatica accounted for 42.12% of the total amount. This is consistent with previous studies that indicated CIM treatments are commonly used for musculoskeletal conditions [7].

However, in addition to musculoskeletal disorders, some important topics were presented at KM institutions. Cerebral palsy ranked the highest for inpatient healthcare utilization (36.03% of the total number of inpatient visits and 24.55% of the total number of inpatient patients), followed by total cancer. Based on the healthcare expenditure per patient, cerebral palsy ranked highest, followed by some cancer types, including kidney, bladder, and urinary tract cancer; breast cancer; and stomach cancer. A recent cross-sectional Canadian study has found that 27% of patients with cerebral palsy used CIM [8], which was supported by our findings, especially in the inpatient setting in South Korea.

Number	Topics	Outpatient_(annual) number of visits	Inpatient_(annual) number of visits	Total_(annual) number of visits
3	Sciatica	135335.5	559	135894.5
1	Adhesive capsulitis of shoulder	29610.5	157.5	29768
31	Tinnitus	13232.5	24	13256.5
22_1	Cancer_total	10410.5	1830.5	12241
2	c-HIVD	11256	239	11495
11	Gastritis	8937.5	27	8964.5
29	Seborrheic dermatitis	6546	0	6546
34	Cerebral palsy	2922.5	3058	5980.5
13	(primary) Constipation	3889.5	42	3931.5
10	GERD	3743	19	3762
23	PMS	3234	2.5	3236.5
22_12	Breast cancer	2488	503	2991
28	Psoriasis	2320.5	2.5	2323
27	Alopecia areata	1893.5	0	1893.5
14	Functional diarrhoea	1750.5	2.5	1753
4	Fracture	861	524	1385
17	Asthma	1316.5	37.5	1354
22_10	Female genital cancer	1091.5	156.5	1248
23_14	Colorectal cancer	894	231.5	1125.5
22_11	Stomach cancer	820.5	200.5	1021
22_3	Thyroid cancer	842.5	67	909.5
26	Zoster [herpes zoster]	881	16.5	897.5
6	Disorders of ANS	851.5	10.5	862
22_2	Liver & bile duct cancer	659	112.5	771.5
23_18	Respiratory system cancer	551.5	195	746.5
15	Stomatitis	609	4	613
5	Thoracic outlet syndrome	607.5	0	607.5
25	PCOS	588	0	588
23_13	Prostate cancer	440.5	47.5	488
16	Disturbances of salivary secretion	467	0.5	467.5
7	Peripheral vascular disease	454	2.5	456.5
32	TBI	291	155.5	446.5
23_15	Pancreatic cancer	357.5	77	434.5
22_9	Kidney, bladder & urinary tract cancer	377.5	42	419.5
22_7	Lymph cancer	329	10	339
30	Acne	315	0	315
12	Ulcerative colitis	313	1	314
24	BPH	291.5	4.5	296
23_17	Hematological cancer	174	29.5	203.5
22_6	Head and neck cancer	168.5	21	189.5
9	Hyperlipidaemia	123	7.5	130.5
23_16	Skin cancer	106	7.5	113.5
22_5	Brain tumor	67.5	15	82.5
22_8	Esophageal cancer	53	22	75
22	Hyperemesis gravidarum	74.5	0	74.5
33	Elderly frailty	54	17.5	71.5
22_4	Bone cancer	15.5	4.5	20
8	Liver dysfunction	1.5	0	1.5
18	H1N1	0	0	0
21	PTSD	0	0	0

Figure 1. Annual number of visits by topics (average, 2017-2018). BPH, benign prostatic hyperplasia; c-HIVD, cervical herniated intervertebral disk; COVID-19, coronavirus disease of 2019; CPG, clinical practice guideline; GERD, gastroesophageal reflux disease; H1N1, Influenza A virus subtype; PCOS, polycystic ovary syndrome; PMS, premenstrual tension syndrome; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury. Note. In each column, a cell close to red or blue means that cell has a high or low value, respectively. The yellow bar inside each cell represents the value of outcome.

Number	Topics	Outpatient_(annual) number of patients	Inpatient_(annual) number of patients	Total_(annual) number of patients
3	Sciatica	1959.5	223	19818
1	Adhesive capsulitis of shoulder	5724.5	44.5	5769
11	Gastritis	2243.5	12	2255.5
22_1	c_HIVD	1909.5	176	2085.5
31	Tinnitus	1719.5	5.5	1725
34	Cancer_total	704.5	513.5	1218
23	PMS	908.5	1.5	910
13	(primary) Constipation	892	14.5	906.5
10	GERD	808	8.5	816.5
2	Cerebral palsy	210	581.5	791.5
29	Seborrhoeic dermatitis	784	0	784
14	Functional diarrhoea	638	2	640
4	Fracture	104.5	206	310.5
22_12	Breast cancer	156	130.5	286.5
28	Psoriasis	219.5	1.5	221
17	Asthma	188.5	14	202.5
27	Alopecia areata	184	0	184
26	Zoster [herpes zoster]	166.5	14.5	181
15	Stomatitis	173.5	1.5	175
5	Thoracic outlet syndrome	155	0	155
6	Disorders of ANS	132	7.5	139.5
22_11	Stomach cancer	71	61.5	132.5
23_14	Colorectal cancer	54.5	57.5	112
23_18	Respiratory system cancer	44.5	61	105.5
22_3	Thyroid cancer	80	22	102
22_10	Female genital cancer	57.5	42.5	100
32	TBI	53	37	90
22_2	Liver & bile duct cancer	49	38	87
7	Peripheral vascular disease	84	1	85
30	Acne	82	0	82
16	Disturbances of salivary secretion	73	0.5	73.5
25	PCOS	64.5	0	64.5
33	Elderly frailty	42	6	48
24	BPH	38.5	2.5	41
23_15	Pancreatic cancer	20	19	39
22_9	Kidney, bladder & urinary tract cancer	23	14	37
23_13	Prostate cancer	24.5	12.5	37
9	Hyperlipidaemia	32.5	3	35.5
22	Hyperemesis gravidarum	32.5	0	32.5
22_7	Lymph cancer	25	6	31
12	Ulcerative colitis	28.5	0.5	29
22_6	Head and neck cancer	8.5	7	15.5
23_17	Hematological cancer	10.5	5	15.5
23_16	Skin cancer	6	4	10
22_8	Esophageal cancer	3	6	9
22_5	Brain tumor	5	3	8
22_4	Bone cancer	2	1	3
8	Liver dysfunction	1	0	1
18	H1N1	0	0	0
21	PTSD	0	0	0

Figure 2. Annual number of patients by topics (average, 2017-2018). BPH, benign prostatic hyperplasia; c-HIVD, cervical herniated intervertebral disk; COVID-19, coronavirus disease of 2019; CPG, clinical practice guideline; GERD, gastroesophageal reflux disease; H1N1, Influenza A virus subtype; PCOS, polycystic ovary syndrome; PMS, premenstrual tension syndrome; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury. Note. In each column, a cell close to red or blue means that cell has a high or low value, respectively. The yellow bar inside each cell represents the value of outcome.

Number	Topics	Outpatient_ (annual) healthcare expenditure (1,000 KRW) per patient	Inpatient_ (annual) healthcare expenditure (1,000 KRW) per patient	Total_ (annual) healthcare expenditure (1,000 KRW) per patient
2	Cerebral palsy	970.7328	3422.69105	4393.42385
22_9	Kidney, bladder & urinary tract cancer	752.9284	3138.02635	3890.95475
34	Cancer_total	691.7686	3010.35725	3702.12585
22_12	Breast cancer	725.9327	2806.55885	3532.49155
4	Fracture	405.3219	3018.88405	3424.20595
22_11	Stomach cancer	588.284445	2714.16945	3302.453895
22_2	Liver & bile duct cancer	743.33158	2511.62585	3254.95743
23_18	Respiratory system cancer	652.97665	2560.08065	3213.0573
22_10	Female genital cancer	778.105195	2215.27425	2993.379445
23_15	Pancreatic cancer	636.5914	2309.85905	2946.45045
3	Sciatica	551.7782	2285.213	2836.9912
22_1	c_HIVD	420.089535	2311.93935	2732.028885
32	TBI	222.34451	2505.854	2728.19851
22_6	Head and neck cancer	874.96085	1842.58495	2717.5458
23_14	Colorectal cancer	659.183545	1927.8826	2587.066145
22_4	Bone cancer	220.595	2221.249	2441.844
17	Asthma	241.546775	2160.58035	2402.127125
26	Zoster [herpes zoster]	368.54325	1994.541	2363.08425
23_13	Prostate cancer	534.07885	1795.6363	2329.71515
1	Adhesive capsulitis of shoulder	409.181555	1910.73165	2319.913205
6	Disorders of ANS	274.0281	2003.2915	2277.3196
22_3	Thyroid cancer	424.652885	1482.0815	1906.734385
22_8	Esophageal cancer	1077.86875	746.42635	1824.2951
11	Gastritis	233.942425	1345.69275	1579.635175
28	Psoriasis	294.81505	1113.27	1408.08505
10	GERD	167.427915	1140.07325	1307.501165
23_17	Hematological cancer	569.39635	718.48075	1287.8771
31	Tinnitus	372.82395	906.06165	1278.8856
23_16	Skin cancer	496.3149	684.794	1181.1089
22_7	Lymph cancer	678.126325	383.18883	1061.315155
22_5	Brain tumor	595.1704	317.28	912.4504
12	Ulcerative colitis	262.9372	630.594	893.5312
9	Hyperlipidaemia	136.34286	598.76085	735.10371
23	PMS	181.63137	447.2375	628.86887
33	Elderly frailty	90.297175	513.58585	603.883025
15	Stomatitis	148.13881	423.933	572.07181
14	Functional diarrhoea	110.34838	385.0475	495.39588
24	BPH	250.11625	202.28085	452.3971
13	(primary) Constipation	168.6133	253.33135	421.94465
25	PCOS	376.64995	0	376.64995
29	Seborrhoeic dermatitis	324.2658	0	324.2658
27	Alpecia areata	278.36332	0	278.36332
16	Disturbances of salivary secretion	172.30705	78.2	250.50705
7	Peripheral vascular disease	86.40859	148.8725	235.28109
5	Thoracic outlet syndrome	196.99086	0	196.99086
30	Acne	146.3641	0	146.3641
22	Hyperemesis gravidarum	119.457665	0	119.457665
8	Liver dysfunction	31.486	0	31.486
18	H1N1	0	0	0
21	PTSD	0	0	0

Figure 3. Annual healthcare expenditure (1,000 KRW) per patient according to topic (average, 2017-2018). BPH, benign prostatic hyperplasia; c-HIVD, cervical herniated intervertebral disk; COVID-19, coronavirus disease of 2019; CPG, clinical practice guideline; GERD, gastroesophageal reflux disease; H1N1, Influenza A virus subtype; KRW, Korean won; PCOS, polycystic ovary syndrome; PMS, premenstrual tension syndrome; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury. Note. In each column, a cell close to red or blue means that cell has a high or low value, respectively. The yellow bar inside each cell represents the value of outcome.

Number	Topics	Outpatient (annual) healthcare expenditure (1,000 KRW) per institution	Inpatient (annual) healthcare expenditure (1,000 KRW) per institution	Total (annual) healthcare expenditure (1,000 KRW) per institution
3	Sciatica	2851550.409	176394.2257	3027944.635
1	Adhesive capsulitis of shoulder	639588.8425	30540.30815	670129.1506
34	Cancer_total	234424.6221	368373.4882	602798.1103
22_1	c_HIVD	282119.5911	212738.1114	494857.7025
2	Cerebral palsy	62198.038	367273.6393	429471.6773
31	Tinnitus	271948.1132	1951.5499	273899.6631
4	Fracture	19876.2824	188514.9214	208391.2038
11	Gastritis	187452.1805	8287.014	195739.1945
22_12	Breast cancer	52553.07385	96653.08735	149206.1612
29	Seborrhoeic dermatitis	132967.1881	0	132967.1881
10	GERD	77603.69796	3926.65125	81530.34921
13	(primary) Constipation	75878.06062	3347.7253	79225.78592
23	PMS	69505.22306	784.563	70289.78806
22_11	Stomach cancer	20714.32971	41633.1936	62347.52331
23_18	Respiratory system cancer	12485.99235	49130.6959	61616.68825
23_14	Colorectal cancer	20331.52131	36066.4971	56398.01841
22_10	Female genital cancer	23404.57961	32000.9586	55405.53821
28	Psoriasis	45476.50451	1113.27	46589.77451
22_2	Liver & bile duct cancer	13517.88248	32854.34975	46372.23223
32	TBI	6322.18731	36018.9236	42341.11091
17	Asthma	24576.4639	13923.0946	38499.5585
27	Alopecia areata	38474.49054	0	38474.49054
26	Zoster [herpes zoster]	17523.28853	19249.6285	36772.91703
14	Functional diarrhoea	36000.53966	621.225	36621.76466
22_3	Thyroid cancer	20664.67282	15399.9222	36064.59502
6	Disorders of ANS	17856.5524	12270.9505	30127.5029
23_15	Pancreatic cancer	7148.490035	17178.01795	24326.50799
22_9	Kidney, bladder & urinary tract cancer	9125.3851	13690.09705	22815.48215
23_13	Prostate cancer	9863.62415	8418.53535	18282.1595
5	Thoracic outlet syndrome	14049.81872	0	14049.81872
25	PCOS	13184.89305	0	13184.89305
15	Stomatitis	12091.01578	423.933	12514.94878
22_7	Lymph cancer	8029.258415	1308.16899	9337.427405
22_6	Head and neck cancer	4091.9251	4414.34615	8506.27125
16	Disturbances of salivary secretion	8229.601	78.2	8307.801
7	Peripheral vascular disease	7861.094655	297.745	8158.839655
12	Ulcerative colitis	7047.5227	630.594	7678.1167
30	Acne	6593.82571	0	6593.82571
24	BPH	5482.1855	574.12505	6056.31055
23_17	Hematological cancer	3660.2694	1859.8795	5520.1489
22_8	Esophageal cancer	1409.0125	2766.6435	4175.656
23_16	Skin cancer	2464.57605	1036.8455	3501.42155
9	Hyperlipidaemia	2449.356745	866.76005	3316.116795
33	Elderly frailty	1091.768975	1833.6751	2925.444075
22_4	Bone cancer	354.25	2221.249	2575.499
22_5	Brain tumor	1404.74995	832.45	2237.19995
22	Hyperemesis gravidarum	1515.633005	0	1515.633005
8	Liver dysfunction	31.486	0	31.486
18	H1N1	0	0	0
21	PTSD	0	0	0

Figure 4. Annual healthcare expenditure (1,000 KRW) per institution according to topic (average, 2017-2018). BPH, benign prostatic hyperplasia; c-HIVD, cervical herniated intervertebral disk; COVID-19, coronavirus disease of 2019; CPG, clinical practice guideline; GERD, gastroesophageal reflux disease; H1N1, Influenza A virus subtype; KRW, Korean won; PCOS, polycystic ovary syndrome; PMS, premenstrual tension syndrome; PTSD, posttraumatic stress disorder; TBI, traumatic brain injury. Note. In each column, a cell close to red or blue means that cell has a high or low value, respectively. The yellow bar inside each cell represents the value of outcome.

Fractures ranked high in terms of the number of inpatient visits and inpatient patients (fourth place in both cases) and inpatient treatment expenditure per patient (third place) and institution (fourth place). In a 2007 study, Canadian researchers found that the rate of CIM use in patients with fractures was 35% [9]. However, the use of CIM in patients with fractures is not well studied, with more research focusing on osteoporosis [10], a major cause of fractures. Therefore, our findings highlight this gap between real-world clinical and research in fracture.

In this sample, no patients who visited the KM medical institution of interest had influenza A virus infection or post-traumatic stress disorder (PTSD). Because the HIRA-NPS includes 3% of all patients in South Korea [6], the use of KM for influenza A virus infection or PTSD may have been omitted. Nevertheless, the use of KM for these conditions is thought to be small compared with that for other diseases. There are many studies on CIM, particularly herbal medicine, for acute infectious diseases, including influenza A virus infection [11], and their importance is emphasized in the COVID-19 era [12]. PTSD is also a popular research topic in the CIM field [13]. However, the use of KM for these purposes in KM institutions is rare, indicating another gap between the real-world clinical and research fields.

In this study, we analyzed data from the HIRA-NPS from 2017 to 2018 to investigate the demand and economic importance of disease candidates for the second-wave development of KM-CPGs in real-world clinical settings in South Korea. We were able to prioritize the second-wave development of future KM-CPGs. However, this study had the following limitations. First, because this study is based on data from 2017 to 2018, its generalizability to other years is limited. Additionally, since this data was generated before the ICD code for COVID-19 was generated, the HIRA-NPS analysis for COVID-19 was impossible in this study. Second, we did not perform an analysis according to the type of KM treatment. Therefore, the importance and demand for KM treatments, such as acupuncture, moxibustion, and herbal medicine, performed by KM doctors were not revealed in this study. Finally, since this study did not analyze the types of KM institutions, including KM clinics, KM hospitals, long-term care hospitals, and public health centers, the demand and economic importance of candidate topics in each KM institution type were not analyzed.

CONCLUSION

According to the analysis of data from the HIRA-NPS, 2017-2018, musculoskeletal disorders, including sciatica and adhesive capsulitis of the shoulder, were the leading topics in terms of the number of visits and patients and treatment expenditure per institution. However, cerebral palsy was a more important topic in terms of inpatient clinical settings than musculoskeletal conditions or cancer and had the highest treatment expenditure per patient. Furthermore, fractures are highly important in inpatient clinical settings. This study highlights the gap between the real-world clinical setting and the research field. This study guides the second-wave development of future KM-CPGs.

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AUTHORS' CONTRIBUTIONS

Minjung Park conceived and designed the study. Chan-Young Kwon and O-Jin Kwon analyzed and visualized the data. Chan-Young Kwon and Seungwon Shin wrote the manuscript draft. Wonkyung Moon and Namkwen Kim reviewed and edited the manuscript. Minjung Park and Seungwon Shin critically revised the manuscript. All authors contributed to data interpretation, and all authors approved the final version of the manuscript.

DATA AVAILABILITY

The data presented in this study are available in the article.

CONFLICTS OF INTEREST

The authors declare no conflict of interest.

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