Research Article

Use of Western Medicine and Traditional Korean Medicine for Joint Disorders: A Retrospective Comparative Analysis Based on Korean Nationwide Insurance Data

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This study aimed to compare the usage of Western medicine and traditional Korean medicine for treating joint disorders in Korea. Data of claims from all medical institutions with billing statements filed to HIRA from 2011 to 2014 for the four most frequent joint disorders were used for the analysis. Data from a total of 1,100,018 patients who received medical services from 2011 to 2014 were analyzed. Descriptive statistics are presented as type of care and hospital type. All statistical analyses were performed using IBM SPSS for Windows version 21. Of the 1,100,018 patients with joint disorders, 456,642 (41.5%) were males and 643,376 (58.5%) were females. Per diem costs of hospitalization in Western medicine clinics and traditional Korean medicine clinics were approximately 160,000 KRW and 50,000 KRW, respectively. Among costs associated with Western medicine, physiotherapy cost had the largest proportion (28.78%). Among costs associated with traditional Korean medicine, procedural costs and treatment accounted for more than 70%, followed by doctors’ fees (21.54%). There were distinct differences in patterns of medical care use and cost of joint disorders at the national level in Korea. This study is expected to contribute to management decisions for musculoskeletal disease involving joint disorders.

1. Introduction

Musculoskeletal diseases are one of the leading causes of disability worldwide. It is a major contributor to health burden and health care costs [1]. Korea has a rapidly aging population due to the decrease in birth rate and increase in life expectancy. The percentage of the population aged 65 years or older will increase from 10.3% in 2008 to 15.6% in 2020 and 38.2% in 2050 [2]. Previous studies have reported findings on the prevalence of musculoskeletal disease [3, 4]. As the Korean population continues to age, the economic burden of musculoskeletal disease will continue to increase. The total economic burden of treating musculoskeletal is about 8.1 billion dollars [2]. Musculoskeletal diseases are the most common health problems that require the use of traditional Korean medicine [5], an integral part of prevailing practice and belief systems throughout Korea’s history. Starting from the late 19th century, Western medical practices were introduced by Christian missionaries to Korea. These practices quickly supplanted traditional Korean medicine in institutional health care. After the Korean War, the government revived interest in traditional Korean medicine and established colleges that specialize in that field, in addition to colleges of Western medicine [6]. With this historical background, the Korean medical system is characterized by a dual [7, 8], mutually exclusive medical system consisting of Western medicine and traditional Korean medicine practices [9]. In Korea, primary care physicians work mostly in solo private practices and are reimbursed on a fee-for-service basis. This
system enables patients to choose and retain individual physicians regardless of changes in employment status. Therefore, Koreans can use both Western and traditional Korean medicine to treat musculoskeletal disorders. Previous studies have assessed the prevalence and cost of Korean medicine [5, 6, 10–13]. However, most of these studies did not focus on joint disorders [11, 14–16]. Particularly, the statuses of health care utilization associated with joint disorders including the scale of the whole population and health care costs of patients receiving treatment for joint disorders are currently unknown. Therefore, the objective of this study was to analyze claim data submitted to the Korean National Health Insurance (NHI) and assessed by the Health Insurance Review and Assessment Service (HIRA) to compare medical care use between Western medicine and traditional Korean medicine. The results of this study will provide basic information for future management decisions for musculoskeletal diseases especially joint disorders in Korea.

2. Materials and Methods

2.1. Data Source. This study used claims data from the 2011–2014 National Patient Sample (NPS) dataset of HIRA. Datasets generated and/or analyzed for this study period are available from the HIRA-NPS repository [17]. The NPS includes 3% sample data of 2011–2014 national insurance billing data. It can represent the country as a whole (46 million patients). The total number of filed claims and total health expenditure have increased steadily. As of 2011, the total number of filed claims has reached 1.3 billion, with a total health expenditure of ~51.5 trillion KRW. Patients were stratified according to sex and age in 5-year intervals. These HIRA claim data are compiled by health care providers nationwide. They correspond to the number of claims submitted by patients. Claims from patients with the Medicaid program, government expenditures, and veteran patients are also included in these claim data [18]. All data were deidentified to ensure patient confidentiality. The HIRA Research Ethics Committee of South Korea approved the study protocol.

2.2. Study Population. After reviewing frequent diseases each year in traditional Korean medicine as described previously [19], patients with the following four most frequent joint disorders were included in this study: M17 (gonarthrosis [arthrosis of knee]), M75 (shoulder lesions), S63 (dislocation, strain, and sprain of joints and ligaments at wrist and hand level), and S93 (dislocation, strain, and sprain of joints and ligaments at ankle and foot level). Although dorsalgia (M54) was at the top of the list, it was excluded from analysis since there was no change in ranking by year. To observe changes in the ranking of diseases by year, the remaining joints were included in the study. We focused on musculoskeletal disorders and injuries of the extremities. The diagnoses were coded using the 6th revision of the Korean Classification of Diseases (KCD-6) adapted from the International Classification of Diseases, 10th revision. Data from the billing statements for patients with missing cost data and those with zero total cost were excluded. Patient might have visited more than once during the study period (i.e., more than one claim per patient). Therefore, the number of claims in this study was higher than the total number of patients. A total of 7,996,903 claims for 1,100,018 patients with joint diseases with prefix codes of M17, M75, S63, and S93 in primary diagnoses were included for analysis through discussion of a panel of three clinicians (one public health specialist, one Korean medical doctor, and one statistician). A total of 1,100,018 patients were finally included in our analysis (Figure 1).

2.3. Episode Creating Process. Claims data provided by HIRA included raw data of treatment prescriptions for all patients who received medical services over the course of one year after removing personal and corporate information. Because the claims were submitted monthly, charges in the statement reflected up to one month of information. In other words, patients who had been hospitalized for more than one month would have been charged separately for each month. In such cases, errors such as overestimation of the number of inpatients and underestimation of medical expenses might occur when performing statistical analyses. Therefore, episodes, involving collecting and calibrating several claims charged monthly for one consecutive medical practice were used. In this study, separated claim forms of hospitalized patients were bundled into one hospitalization episode. Variables used in the episode creating process included claims identification key, patient identification key, insurance type, main diagnosis code, treatment type, treatment start date, and treatment end date.

2.4. Main Descriptive Variables. The main descriptive variables were frequency and cost of medical care without addressing a specific hypothesis. Frequency included the number of hospitalizations and outpatient visits in Western medicine and traditional Korean medicine clinics, intervention (surgical and nonsurgical), and annual usage. Rehabilitation-related nonsurgical interventions were classified according to National Evidence-based Healthcare Collaborating Agency reports [20].

Cost included average cost per patient and cost per day (per diem) for joint disorders. Medical costs determined to be eligible for reimbursement by HIRA out of treatment costs were indicated in the submitted insurance claim statement. Medical costs, that is, the sum of benefits reimbursed by the insurer (Korean National Health Insurance Service) to the medical care institutions, were classified as INSUP and self-payment costs paid by the beneficiary (patient) as SLF. It was expressed as total treatment cost in Korean Won (1,000,000 KRW). Each patient’s medical costs were calculated as the sum of costs listed on their claims. The average treatment amount was the amount of total medical expenses for one year divided by the number of patients. Per diem was the amount of total medical expenses for one year divided by the number of days of hospitalization or in an outpatient clinic.

The number of reimbursed days included the number of hospitalized days or outpatient visits and in-care drug prescription days. These days were defined based on the number of visits (for outpatient departments) or the length of hospital stay (for inpatient departments) of patients indicated...
Evidence-Based Complementary and Alternative Medicine

Number of T20 claims with joint ICD codes M17, M75, S63, S93 in the NHP 2011–2014
(i) 2011: 1,885,740
(ii) 2012: 1,999,160
(iii) 2013: 2,052,435
(iv) 2014: 2,081,344

Excluded claims unmatched between T20 and T30, T40, T53
(i) 2011: 2,480
(ii) 2012: 3,314
(iii) 2013: 2,327
(iv) 2014: 2,342

Number of T20 claims in the NHP 2011–2014
(i) 2011: 1,883,260
(ii) 2012: 1,995,846
(iii) 2013: 2,050,108
(iv) 2014: 2,079,002

Excluded claims with missing cost or 0 total cost
(i) 2011: 5,373
(ii) 2012: 1,818
(iii) 2013: 1,388
(iv) 2014: 2,724

Number of T20 claims in the NHP 2011–2014
(i) 2011: 1,481,325
(ii) 2012: 1,559,336
(iii) 2013: 1,594,147
(iv) 2014: 1,599,926

Excluded claims of which main disease is not M17 and M75, S63, S93

Aggregated claims connected within a patient, a main disease, a medical type, a medical institution, an insurance type among hospitalization cases

Patients included for analysis in T20 claims
(i) 2011: 268,048
(ii) 2012: 273,752
(iii) 2013: 278,170
(iv) 2014: 280,048
Total: 1,100,018 patients

Figure 1: Flowchart of the study sample.

in the submitted insurance claim statement [14]. Days per episode were calculated as total reimbursed days divided by the total number of episodes. Patient and medical institution-related characteristics are defined as follows.

2.5. Patient Characteristics. Patient characteristics included gender, age, medical insurance type, severity of disease, existence of surgery, and type of medicine. The main attending hospital characteristics included hospital type, region, ownership, the number of beds, the number of Western doctors, and the number of traditional medical practitioners. Patient demographic data obtained from the NHI claims database included gender, age, and medical insurance type (NHI, Medicaid, and others) at the date of visit of a health care institution and the most frequently visited ones. Individuals were qualified for Medicaid if they had a household income of less than $600 per month. Medical services for veterans and beneficiaries were free of charge as government expenditure. Severity was measured using the Charlson Comorbidity Index (CCI) [21] defined as the sum of weights related to each condition for which a patient had available claim data. The CCI score was determined based on the presence of specific ICD-10 codes during one year [22]. In this study, CCI at initiation was used as the CCI score of each patient.

2.6. Medical Institution Characteristics. The types of medical practice were divided into three as follows: traditional,
Western, and both traditional and Western. Hospital was the main attending medical institution which was visited most frequently by the patient for care. If visit frequency per institution was the same, the main attending hospital was the last health care institution that the patient visited. Medical institutions included Tertiary and General Hospitals, hospitals, long-term care hospitals, Western Clinics, Dental Hospitals and Clinics, Public Health Hospitals (admission facility-equipped health center), Public Health Centers, Local Public Health Clinics, Traditional Hospitals, and Traditional Clinics. Region and ownership were the characteristics of the medical institution that the patient visited.

2.7. Statistical Analysis. Basic characteristics of the study sample are presented as frequencies and percentages. They are presented for each operational definition. Descriptive statistics are presented as type of care and hospital type. All statistical analyses were performed using SPSS version 21 for Windows (IBM Corp., Armonk, NY, USA).

3. Results

The general characteristics of the study population are summarized in Table 1.

A total of 1,100,018 patients were included, including 456,642 (41.5%) males and 643,376 (58.5%) females. All four years (from 2011 to 2014) showed higher percentages of females than males. Patients under 29 years of age accounted for the largest proportion (23.3%), followed by those in their 50s (20.5%) and 60s (16.8%). A total of 1,050,691 (95.5%) patients were enrolled in the NHI scheme while the remaining 49,012 patients (4.5%) were enrolled in Medicaid. Patients with knee arthrodesis accounted for the most (24.2%), followed by those with foot joint disease. More than half (32.5%) of these patients had knee arthropathy. Approximately 70% (70.5%) of patients had mild joint disorder with CCI score of 0. Among the 1,100,018 patients, 18,041 (1.6%) patients underwent surgery while the majority (98.4%) of patients underwent nonsurgical procedures. For body regions where basic physical therapy was performed more than three times, the knee and shoulder regions accounted for more than 25%. For regions that needed surgery, the knees accounted for the most. For regions that underwent acupuncture two times or more, the shoulder, hand, and foot areas accounted for 30% or more (Table 2). Regardless of disease type, only 1.6% of patients underwent surgery, of which knee surgery was the most frequently performed type (43%–44%). The results of nonsurgical intervention distribution are shown in Table 3. The main attending medical institutions included 58,245 (5.3%) Tertiary and General Hospitals, 118,408 (10.8%) hospitals, 8,638 (0.8%) Western Clinics, 592,155 (53.8%) long-term care hospitals, 6,473 (29.6%) Traditional Hospitals, and (28.7%) Traditional Clinics. However, the results were different for hospitalization and outpatient visits (Table 4). Hospitalization was mainly in the order of hospitals > long-term care hospital > Western Clinic. This is mainly due to the characteristics of patients who require surgery. On the other hand, among the same primary clinic institutions, Traditional Clinics showed a higher proportion than Western Clinic for outpatients. The admission rates were 96.90% in Western medicine clinics and 3.10% in traditional Korean medicine clinics. Among all outpatient visits, 67.85% involved orthodox medicine while 32.15% involved traditional Korean medicine. In Western medicine clinics, patients were hospitalized most frequently in hospitals, followed by long-term care hospitals. Hospitalization at hospital level gradually decreased from 37.17% in 2011 to 36.37% in 2014. On the other hand, the percentage of patients who were hospitalized mainly in Traditional Hospitals increased from 2.12% in 2011 to 3.28% in 2014. Outpatient visits accounted for most visits to hospitals (Western medicine: 56.26%; Traditional Korean medicine: 31.69%). While the percentage of outpatients at Western medicine clinics steadily increased from 66.19% in 2011 to 68.93% by 2014, the percentage of outpatients at traditional Korean medicine clinics steadily decreased from 33.81% in 2011 to 31.07% in 2014. Most (91.0%) institutions were privately owned, and most (80.4%) of them were located outside Seoul. The majority (95.2%) of institutions had fewer than 5 beds. There was no significant difference among the four groups according to year. The total average treatment cost (RPE) is the sum of INSUP and SLF paid to medical care institution. RPE per patient was 185,933 KRW in 2011, 192,290 KRW in 2012, 202,967 KRW in 2013, and 208,739 KRW in 2014. Women incurred more medical expenses in 2011 to 2014 compared to men. Expenditure was increased with age. It peaked in patients in their 70s with a minimum of 377,448 KRW to a maximum of 388,445 KRW. In terms of expense by the type of joint lesion, knee lesions (M17) had the highest expense among the four types of joint disorders, followed by shoulder lesions (M75). As the severity of lesion was increased, the expense was also increased. However, the difference in expense was not statistically insignificant. Patients who were hospitalized spent 20 times more than those who were not hospitalized. The average treatment costs per patient in inpatient care and outpatient care were 192,414 and 65,319 KRW, respectively. Patients who used only traditional Korean medicine spent twice less than those who only used Western medicine. The range of RPE for Western medicine was from 181,225 KRW to 198,661 KRW. The range of RPE for traditional Korean medicine was from 82,019 KRW to 96,325 KRW. There were no differences in costs over 400,000 KRW among hospitals that practiced Western medicine (Tertiary and General Hospital, hospital, and Western Clinic). Costs for Western medicine hospitals were the highest, followed by that for Traditional Hospitals and long-term care hospitals (Table 5).

The frequency and total medical expenditures for Western medicine and traditional Korean medicine are shown in Table 6. There were 21,894,252 claims with a cost of 168,024,474 (1000 KRW) for Western medicine. However, there were only 9,628,946 claims with a cost of 38,602,696 (1000 KRW) for traditional Korean medicine. The medical expense per visit in an outpatient clinic was 22,000 KRW for Western medicine and about 18,000 KRW for traditional Korean medicine. The day per episode of traditional Korean medicine was longer than that of Western medicine. After analyzing the medical cost of claims for Western medicine
Table 1: General characteristics of patients and hospitals.

| Category                        | 2011      | (%)  | 2012      | (%)  | 2013      | (%)  | 2014      | (%)  | Total      | (%)  |
|---------------------------------|-----------|------|-----------|------|-----------|------|-----------|------|------------|------|
| Patient total                   | 268,048   | 100  | 273,752   | 100  | 278,170   | 100  | 280,048   | 100  | 1,100,018  | 100  |
| Gender                          |           |      |           |      |           |      |           |      |            |      |
| Male                            | 111,101   | (41.4)| 113,592   | (41.5)| 115,219   | (41.4)| 116,730   | (41.7)| 456,642    | (41.5)|
| Female                          | 156,947   | (58.6)| 160,160   | (58.5)| 162,951   | (58.6)| 163,318   | (58.3)| 643,376    | (58.5)|
| Age (yr)                        |           |      |           |      |           |      |           |      |            |      |
| ≤29                             | 64,226    | (24.0)| 64,564    | (23.6)| 63,712    | (22.9)| 63,696    | (22.7)| 256,198    | (23.3)|
| 30–39                           | 27,303    | (10.2)| 27,272    | (10.0)| 27,047    | (9.7)| 27,176    | (9.7)| 108,798    | (9.9)|
| 40–49                           | 42,286    | (15.8)| 41,452    | (15.1)| 41,188    | (14.8)| 40,898    | (14.6)| 165,754    | (15.1)|
| 50–59                           | 53,565    | (20.0)| 56,005    | (20.5)| 58,252    | (20.9)| 58,201    | (20.8)| 226,023    | (20.5)|
| 60–69                           | 44,704    | (16.7)| 46,036    | (16.8)| 46,949    | (16.9)| 47,622    | (16.8)| 184,381    | (16.8)|
| 70–79                           | 35,964    | (13.4)| 38,443    | (14.0)| 41,092    | (14.8)| 42,915    | (15.3)| 158,414    | (14.4)|
| Medical insurance type*         |           |      |           |      |           |      |           |      |            |      |
| National Health Insurance       | 255,160   | (95.2)| 261,381   | (95.5)| 266,015   | (95.6)| 268,135   | (95.7)| 1,050,691  | (95.5)|
| Medicaid                        | 12,828    | (4.8)| 12,289    | (4.5)| 12,069    | (4.3)| 11,817    | (4.2)| 49,012     | (4.5)|
| Others                          | 60        | (0.0)| 73        | (0.0)| 86        | (0.0)| 96        | (0.0)| 315        | (0.0)|
| Lesion of joint†                |           |      |           |      |           |      |           |      |            |      |
| M17                             | 141,148   | (52.6)| 143,697   | (52.4)| 145,346   | (52.3)| 147,274   | (52.6)| 577,465    | (52.5)|
| M75*                            | 16,677    | (6.2)| 16,401    | (6.0)| 17,223    | (6.2)| 16,858    | (6.0)| 67,159     | (6.1)|
| S63                             | 46,659    | (17.4)| 47,900    | (17.5)| 48,776    | (17.6)| 49,269    | (17.6)| 192,604    | (17.5)|
| S93                             | 63,564    | (23.7)| 65,754    | (24.0)| 66,825    | (24.0)| 66,647    | (23.8)| 262,790    | (23.9)|
| Severity (CCI‡)                 |           |      |           |      |           |      |           |      |            |      |
| 0                               | 157,575   | (74.4)| 154,798   | (74.4)| 151,540   | (74.3)| 115,851   | (58.4)| 579,764    | (70.5)|
| 1                               | 37,600    | (17.7)| 37,236    | (17.9)| 36,331    | (17.8)| 49,180    | (24.8)| 160,347    | (19.5)|
| 2                               | 11,630    | (5.5)| 11,245    | (5.4)| 11,097    | (5.4)| 21,684    | (10.9)| 55,656     | (6.8)|
| 3+                              | 5,045     | (2.4)| 4,792     | (2.3)| 4,874     | (2.4)| 11,556    | (5.8)| 26,263     | (3.2)|
| Surgery                         |           |      |           |      |           |      |           |      |            |      |
| No                              | 264,211   | (98.6)| 269,325   | (98.4)| 273,412   | (98.3)| 275,029   | (98.2)| 1,081,977  | (98.4)|
| Yes                             | 3,837     | (1.4)| 4,427     | (1.6)| 4,758     | (1.7)| 5,019     | (1.8)| 18,041     | (1.6)|
| Patient total                   | 268,048   | (100)| 273,752   | (100)| 278,170   | (100)| 280,048   | (100)| 1,100,018  | (100)|
| Type of medicine                |           |      |           |      |           |      |           |      |            |      |
| Traditional                     | 64,453    | (24.1)| 63,426    | (23.2)| 63,234    | (22.7)| 61,159    | (21.8)| 252,272    | (22.9)|
| Both                            | 40,901    | (15.3)| 40,824    | (14.9)| 41,482    | (14.9)| 40,793    | (14.6)| 164,000    | (14.9)|
| Western                         | 162,550   | (60.7)| 169,502   | (61.9)| 173,454   | (62.4)| 178,096   | (63.6)| 683,602    | (62.2)|
| Hospital type§                  |           |      |           |      |           |      |           |      |            |      |
| Tertiary and General Hospital   | 13,100    | (4.9)| 14,125    | (5.2)| 14,911    | (5.4)| 16,109    | (5.8)| 58,245     | (5.3)|
| Hospital                        | 25,672    | (9.6)| 29,657    | (10.8)| 30,968    | (11.1)| 32,111    | (11.5)| 118,408    | (10.8)|
| Western Clinic                  | 1,912     | (7.6)| 2,138     | (8.0)| 2,268     | (8.0)| 2,320     | (8.0)| 8,638      | (8.0)|
| Long-term care hospital         | 145,278   | (54.2)| 146,694   | (53.6)| 149,037   | (53.6)| 151,146   | (54.0)| 592,155    | (53.8)|
| Traditional Hospital            | 1,631     | (6.0)| 1,631     | (6.0)| 1,628     | (6.0)| 1,583     | (6.0)| 6,473      | (6.0)|
| Traditional Clinic              | 80,423    | (30.0)| 79,507    | (29.0)| 79,357    | (28.5)| 76,779    | (27.4)| 316,066    | (28.7)|
| Category | 2011  |   | 2012  |   | 2013  |   | 2014  |   | Total  |   |
|----------|-------|---|-------|---|-------|---|-------|---|--------|---|
|          | N (%))|   | N (%))|   | N (%))|   | N (%))|   | N (%)) |   |
| Region   |       |   |       |   |       |   |       |   |        |   |
| Seoul (Urban) | 52,548 (19.6) | 53,682 (19.6) | 54,538 (19.6) | 54,907 (19.6) | 215,675 (19.6) |
| Metropolitan city | 68,101 (25.4) | 70,626 (25.8) | 72,117 (25.9) | 72,436 (25.9) | 283,280 (25.8) |
| Other (Rural) | 147,399 (55.0) | 149,444 (54.6) | 151,515 (54.5) | 152,705 (54.5) | 601,063 (54.6) |
| Ownership |       |   |       |   |       |   |       |   |        |   |
| Public   | 1,894 (.7) | 1,916 (.7) | 2,018 (.7) | 2,120 (.8) | 7,948 (.7) |
| Corporation | 20,395 (7.6) | 22,750 (8.3) | 23,886 (8.4) | 24,272 (8.7) | 90,803 (8.3) |
| Private  | 245,726 (91.7) | 249,084 (91.0) | 252,765 (90.9) | 253,654 (90.6) | 1,001,229 (91.0) |
| Number of beds |       |   |       |   |       |   |       |   |        |   |
| ≤5       | 254,565 (95.0) | 261,339 (95.5) | 265,257 (95.4) | 266,216 (95.1) | 1,047,377 (95.2) |
| 6–12     | 8,455 (3.2) | 7,626 (2.8) | 7,959 (2.9) | 8,635 (3.1) | 32,675 (3.0) |
| 13–17    | 2,195 (.8) | 2,444 (.9) | 2,401 (.9) | 2,542 (.9) | 9,582 (.9) |
| 18≤      | 2,820 (1.1) | 2,343 (.9) | 2,552 (.9) | 2,655 (.9) | 10,370 (.9) |
| Number of Western doctors per 100 beds |       |   |       |   |       |   |       |   |        |   |
| ≤4       | 172,528 (64.4) | 257,710 (94.3) | 260,076 (93.7) | 260,036 (93.0) | 950,350 (86.5) |
| 5–11     | 70,428 (26.3) | 11,177 (4.1) | 12,686 (4.6) | 14,624 (5.2) | 108,915 (9.9) |
| 12–19    | 13,829 (5.2) | 2,055 (.8) | 1,897 (.7) | 2,451 (9.9) | 20,232 (1.8) |
| 20≤      | 11,231 (4.2) | 2,469 (.9) | 2,976 (1.1) | 2,474 (9.9) | 19,150 (1.7) |
| Number of traditional doctors per 100 beds |       |   |       |   |       |   |       |   |        |   |
| 0        | 262,580 (98.0) | 270,211 (99.3) | 274,766 (99.4) | 276,741 (99.4) | 1,084,298 (99.0) |
| 1≤       | 5,436 (2.0) | 1,796 (.7) | 1,753 (.6) | 1,686 (.6) | 10,671 (1.0) |

*Medical insurance type divided into National Health Insurance, Medicaid, and others. Others include veterans and beneficiaries who receive care free of charge as a government expenditure. **When one patient had multiple joint diseases, the most frequent disease is indicated. ***A case involving one or more of the other three joint disorders which were included in this study. †Severity was measured using the Charlson Comorbidity Index (CCI), defined as the sum of weights related to each condition for which a patient submitted claims. §Hospital type is the type of medical institution most frequently visited.
Table 2: Distribution of nonsurgical intervention in both WM and traditional medicine according to the corporal name.

| Nonsurgical intervention | Total (N=) | 2011 | 2012 |
|--------------------------|-----------|------|------|
|                          | Total     | M17  | M75  | S63  | S93  | Total | M17  | M75  | S63  | S93  |
| WM Basic physical therapy† | 1,481,969 | 648,757 | 447,224 | 136,972 | 249,016 | 1,560,032 | 683,247 | 471,044 | 144,044 | 261,701 |
| 0                        | N         | 947,982 | 377,024 | 293,443 | 101,240 | 176,275 | 1,000,863 | 410,595 | 298,619 | 106,230 | 185,419 |
| %                        |           | (63.97) | (58.11) | (65.61) | (73.91) | (70.79) | (64.16) | (60.09) | (63.40) | (73.75) | (70.85) |
| 1                        | N         | 32,582  | 13,360  | 6,568  | 6,504  | 6,150  | 38,311  | 14,819  | 9,081   | 7,424   | 6,987   |
| %                        |           | (2.20)  | (2.06)  | (1.47)  | (4.75)  | (2.47)  | (2.46)  | (2.17)  | (1.93)  | (5.15)  | (2.67)  |
| 2                        | N         | 136,773 | 77,169  | 33,618 | 7,892  | 18,094 | 137,871 | 72,622  | 38,010  | 8,468   | 18,771  |
| %                        |           | (9.23)  | (11.89) | (7.52)  | (5.76)  | (7.27)  | (8.84)  | (10.63) | (8.07)  | (5.88)  | (7.17)  |
| 3≤                       | N         | 364,632 | 181,204 | 113,595 | 21,336 | 48,497 | 382,987 | 185,211 | 125,330 | 21,922  | 50,524  |
| %                        |           | (24.60) | (27.93) | (15.58) | (19.48) | (24.55) | (27.11) | (26.61) | (15.22) | (19.31) |          |
| WM Simple rehabilitation‡ | 1,475,271 | 647,748 | 446,473 | 132,184 | 248,866 | 1,551,724 | 681,736 | 469,564 | 139,023 | 261,401 |
| 0                        | N         | 6,698   | 1,009   | 751    | 4,788  | 150    | 8,308   | 1,511   | 1,476   | 5,021   | 300     |
| %                        |           | (.45)   | (.16)   | (.17)  | (3.50) | (.06)  | (.53)   | (.22)   | (.31)   | (3.49)  | (.1)    |
| 1≤                       | N         | 96      | 32      | 39     | 23     | 2      | 24      | 12      | 9       | 3       | —       |
| %                        |           | (.01)   | (.00)   | (.01)  | (.02)  | (.00)  | (.00)   | (.00)   | (.00)   | (.00)   | (.00)   |
| WM Professional rehabilitation§ | 1,481,873 | 648,725 | 447,185 | 136,949 | 249,014 | 1,560,008 | 683,235 | 471,031 | 144,041 | 261,701 |
| 0                        | N         | 1,481,962 | 648,751 | 447,223 | 136,972 | 249,016 | 1,560,029 | 683,244 | 471,040 | 144,044 | 261,701 |
| %                        |           | (100)   | (100)   | (100)  | (100)  | (100)  | (100)   | (100)   | (100)   | (100)   | (100)   |
| 1≤                       | N         | 7       | 6       | 1      | —      | —      | 3       | 3       | —      | —      | —      |
| %                        |           | (.00)   | (.00)   | (.00)  | (.00)  | (.00)  | (.00)   | (.00)   | (.00)   | (.00)   | (.00)   |
| TM          | Acupuncture | Moxibustion | Cupping | Heat & cold therapy |
|-------------|-------------|-------------|---------|---------------------|
| 0           | N           | 982,471     | 1,481,922 | 1,481,712 | 1,481,856 |
|            | %           | (66.29)     | (100)    | (99.98)    | (99.99) |
| 1           | N           | 40,678      | 648,728  | 47  | 257 |
|            | %           | (2.74)      | (100)    | (.00) | (.02) |
| 2≤         | N           | 458,820     | 647,214  | 109 | 8 |
|            | %           | (30.96)     | (100)    | (109) | (.01) |
|            | N           | 1,062,109   | 136,969  | 8  | 275 |
|            | %           | (68.08)     | (100)    | (.02) | (.01) |
|            | N           | 540,051     | 136,964  | 8  | 275 |
|            | %           | (31.92)     | (100)    | (.02) | (.01) |
|            | N           | 299,859     | 136,964  | 8  | 275 |
|            | %           | (18.70)     | (100)    | (.02) | (.01) |
|            | N           | 88,627      | 136,964  | 8  | 275 |
|            | %           | (6.36)      | (100)    | (.02) | (.01) |

Table 2: Continued.
| Nonsurgical intervention       | 2013     | 2014     | 2013     | 2014     |
|-------------------------------|----------|----------|----------|----------|
|                               | Total    | M17      | M75      | S63      | S93      | Total    | M17      | M75      | S63      | S93      |
|                               | (N*)     | 1,594,949| 698,540  | 475,765  | 150,621  | 270,023  | 1,600,774| 706,617  | 468,443  | 152,359  | 273,355  |
| WM Basic physical therapy†    | 1,034,024| 428,800  | 302,461  | 112,026  | 90,737   | 1,033,566| 432,591  | 192,405  | 112,726  | 192,405  |
|                               | (.64)    | (64.83)  | (61.39)  | (74.38)  | (70.64)  | (64.57)  | (61.22)  | (73.99)  | (70.39)  |
| WM Simple rehabilitation‡     | 1,585,834| 696,682  | 474,267  | 145,176  | 97,091   | 1,590,708| 704,479  | 146,791  | 272,996  |
|                               | (99.43)  | (99.73)  | (96.38)  | (99.88)  | (99.37)  | (99.70)  | (99.57)  | (96.35)  | (99.87)  |
| WM Professional rehabilitation§| 1,594,914| 698,521  | 475,749  | 150,621  | 270,023  | 1,600,736| 706,585  | 468,439  | 152,359  | 273,354  |
|                               | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    |
| WM Rehabilitation of CNS      | 1,594,942| 698,538  | 475,760  | 150,621  | 270,023  | 1,600,773| 706,616  | 468,443  | 152,359  | 273,355  |
|                               | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    | (100)    |

**Table 2: Continued.**
Table 2: Continued.

|                | 0 | 1 | 2 ≤ |
|----------------|---|---|-----|
| **Acupuncture** |   |   |      |
| \(N\)          | 1,085,224 | 549,587 | 307,484 | 89,800 | 138,353 | 1,102,972 | 559,982 | 309,311 | 92,009 | 141,670 |
| %              | (68.04) | (78.68) | (64.63) | (59.62) | (51.24) | (68.90) | (79.25) | (66.03) | (60.39) | (51.83) |
| **Moxibustion** |   |   |      |
| \(N\)          | 1,594,876 | 698,484 | 475,756 | 150,619 | 270,017 | 1,600,667 | 706,522 | 468,436 | 152,359 | 273,350 |
| %              | (100.00) | (99.99) | (100) | (100) | (100) | (99.99) | (99.99) | (100) | (100) | (100) |
| **Cupping**     |   |   |      |
| \(N\)          | 1,594,897 | 698,507 | 475,754 | 150,621 | 270,015 | 1,600,734 | 706,584 | 468,439 | 152,358 | 273,353 |
| %              | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) |
| **Heat & cold therapy** |   |   |      |
| \(N\)          | 1,594,897 | 698,507 | 475,754 | 150,621 | 270,015 | 1,600,734 | 706,584 | 468,439 | 152,358 | 273,353 |
| %              | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) | (100) |

* A patient could be hospitalized more than once during the study period, which resulted in more than one claim per patient. Thus, the number of claims in the study was higher than the number of patients.
† Basic physical therapy included superficial heat therapy, cold therapy, deep heat therapy, UV irradiation, transcutaneous electrical nerve stimulation, massage therapy, and simple therapeutic exercise.
‡ Simple rehabilitation included paraffin bath, hydrotherapy, intermittent traction therapy, electric stimulation therapy, laser therapy, therapeutic exercise, motor point block, pneumatic compression, complex decongestive physical therapy, and iontophoresis.
§ Professional rehabilitation included pool therapy, occupational therapy, activities of daily living training, neurogenic bladder training, functional electrical stimulation therapy, myofascial trigger point injection, rehabilitative social work, rehabilitative breathing therapy, rehabilitative functional training, and rehabilitative dysphagia therapy. M17, knee lesions; M75, shoulder lesions; S63, wrist and hand level lesions; S93, ankle and foot level lesions; WM, Western medicine; TM, Korean traditional medicine.
Table 3: Comparison of rate of surgery by diagnostic code.

| Year | Total Unit | Total N  | Knee lesions [M17] N | N% | Shoulder lesions [M75] N | N% | Wrist and hand level [S63] N | N% | Ankle and foot level [S93] N | N% |
|------|------------|----------|----------------------|----|-------------------------|----|-----------------------------|----|-----------------------------|----|
|      |            | 1,481,969| 648,757              | 43.78| 447,224                 | 30.18| 136,972                     | 9.24| 249,016                     | 16.80|
| 2011 | No N       | 1,477,896| 646,826              | (99.73)| 445,926                 | (99.71)| 136,436                     | (99.61)| 248,708                     | (99.88)|
|      | Yes %      | 4,073    | 1,931               | (.27)| 1,298                   | (.29)| 556                         | (.39)| 308                         | (.12)|
|      | Total Unit | 1,560,032| 683,247              | 43.80| 471,040                 | 29.83| 144,044                     | 9.23| 261,701                     | 16.78|
| 2012 | No N       | 1,555,319| 681,193              | (99.70)| 469,334                 | (99.64)| 143,450                     | (99.59)| 261,342                     | (99.86)|
|      | Yes %      | 4,713    | 2,054               | (.30)| 1,706                   | (.36)| 594                         | (.41)| 359                         | (.14)|
|      | Total Unit | 1,594,949| 698,540              | 44.14| 475,765                 | 29.83| 150,621                     | 9.44| 270,023                     | 16.93|
| 2013 | No N       | 1,589,924| 696,372              | (99.68)| 473,895                 | (99.61)| 150,072                     | (99.64)| 269,585                     | (99.84)|
|      | Yes %      | 5,025    | 2,168               | (.32)| 1,870                   | (.39)| 549                         | (.36)| 438                         | (.16)|
|      | Total Unit | 1,600,774| 706,617              | 44.14| 468,443                 | 29.26| 152,359                     | 9.52| 273,355                     | 17.08|
| 2014 | No N       | 1,595,458| 704,410              | (99.67)| 466,431                 | (99.57)| 151,772                     | (99.61)| 272,845                     | (99.81)|
|      | Yes %      | 5,316    | 2,207               | (.33)| 2,012                   | (.43)| 587                         | (.39)| 510                         | (.19)|

* A patient could be hospitalized more than once during the study period, which resulted in more than one claim per patient. Thus, the number of claims in the study was higher than the number of patients.

and traditional Korean medicine, the proportion of each item was different. For Western medicine, the proportion of psychiatric costs was the highest (28.78%), followed by doctors’ fees (27.7%), injections (16.59%), radiotherapy costs (8.74%), and laboratory costs (7.09%). For traditional Korean medicine, the proportion of doctors’ fees was the highest (26.48%), followed by procedural costs (25.16%), injections (13.52%), admission costs (9.23%), and psychiatric costs (7.26%). Regarding traditional Korean medicine, most (70%) medical treatment costs were procedural costs and treatment costs. Doctors’ fees accounted for only 21.54% of the total cost, similar to doctors’ fees for Western medicine. Procedural costs accounted for the most (56.45%) among total cost for Western medicine. The second largest proportion was doctors’ fees (40.49%). Admission costs, medication costs, and laboratory costs comprised less than 1% (Table 7).

In Table 8, it was not possible to use the inspection and image capturing system of 0 only in the Traditional Clinic because of legal restrictions. According to the region of disease, the knee accounted for the most, followed by the shoulder, foot, and hand in terms of hospitalization and outpatient visits. As the years progressed, the number of inpatient and outpatient visits was also increased for all body regions. Among the hospitalized patients, the number of claims for all years after 2011 increased the most for shoulder joints (78.43%) compared to 2011, followed by knees (61.93%), foot (50.72%), and hands (16.29%). On the other hand, outpatient cases occurred in the following order based on the location of the disease: hand (11.24%) > knee (8.49%) > ankle (9.63%) > shoulder (4.35%). According to time (year), difference in current usage patterns was especially different between Western medicine and traditional Korean medicine. Particularly, hospitalization increases for the knee and shoulder areas (shoulder: 105.00%, knee: 250.00%) in traditional Korean medicine were higher than those in Western medicine (shoulder: 77.99%, knee: 58.04%). The proportion of outpatient visits for the hand region in traditional Korean medicine increased steadily (2012: 4.31%, 2013: 14.49%, 2014: 13.46%). However, the shoulder area showed steady decrease (2011: −8.31%, 2012: −9.73%, 2014: −16.45%) (Table 9).

The costs and length of hospitalization by year are shown in Tables 10–17. Basic physical therapy was the most common nonsurgical intervention in Western medicine while acupuncture was the most common nonsurgical intervention in traditional Korean medicine. Both procedures are steady treatments that require two or more treatments. The proportions of acupuncture and basic physical therapy are almost equal (Table 18).

4. Discussion
This study assessed the prevalence and costs of most frequently used treatments for joint disorders in Korea to
Table 4: Number of hospitalizations and outpatient visits by type of medicine in 2011–2014.

| Type of medicine | Hospital type       | Unit* | 2011  | 2012  | 2013  | 2014  | 2011–2014 |
|------------------|--------------------|-------|-------|-------|-------|-------|-----------|
|                  |                    |       | H     | O     | H     | O     | H        | O        |
| Tertiary Hospital|                    |       | 355   | 7,860 | 348   | 10,697| 383      | 11,051   | 455       | 10,817   | 1,541    | 40,425   |
| General Hospital |                    |       | 1,123 | 29,569| 1,263 | 46,307| 1,543    | 47,052   | 1,677     | 52,028   | 5,606    | 174,956  |
| Hospital         |                    |       | 3,232 | 62,241| 4,061 | 127,047| 4,493    | 131,644  | 5,193     | 136,668  | 16,979   | 457,600  |
| Long-term care hospital |        |       | 2,491 | 3,778 | 3,504 | 8,461 | 4,237    | 8,142    | 4,925     | 8,247    | 15,157   | 28,628   |
| Western Clinic   |                    |       | 1,296 | 867,535| 1,383 | 858,553| 1,493    | 874,403  | 1,508     | 881,056  | 5,680    | 3,481,547|
| Dental Hospital  |                    |       | 0     | 14    | 0     | 38    | 0        | 11       | 0         | 18       | 0        | 81       |
| Public Health Center |              |       | 0     | 1,845 | 0     | 2,159 | 0        | 2,441    | 0         | 2,865    | 0        | 9,310    |
| Local Public Health Clinic |       |       | 0     | 442   | 0     | 487   | 0        | 245      | 0         | 236      | 0        | 1,410    |
| Public Health Hospital |              |       | 2     | 1,253 | 1     | 1,151 | 3        | 946      | 1         | 1,060    | 7        | 4,410    |
| Total            |                    |       | 8,499 | 974,537| 10,560| 1,054,900| 12,152   | 1,075,935| 13,759    | 1,092,995| 44,970   | 4,388,367|
|                  |                    |       | 9,725 | 66,19 | 9705 | 68,13 | 96,79    | 68,03    | 96,35     | 68,93    | 96,90    | 67,85    |
| Traditional Hospital |                |       | 184   | 4,035 | 286  | 7,932 | 366      | 7,680    | 469       | 8,818    | 1,305    | 28,465   |
| Traditional Clinic |              |       | 12    | 493,842| 35   | 485,603| 37       | 497,972  | 52        | 483,833  | 136      | 1,961,250|
| Total            |                    |       | 196   | 497,877| 321 | 493,535| 403      | 505,652  | 521       | 492,651  | 1,441    | 1,989,715|
|                  |                    |       | 2,25  | 33.81 | 2.95 | 31.87 | 3.21     | 31.97    | 3.65      | 31.07    | 3.10     | 32.15    |
| Total            |                    |       | 8,695 | 1,472,414| 10,881| 1,548,435| 12,555   | 1,581,587| 14,280    | 1,585,646| 46,416   | 6,188,082|

* Patients with overlapping records were tallied as one patient (overlap was not allowed). H, hospitalization; O, outpatient; WM, Western medicine; TM, Korean traditional medicine.
| Category | 2011 RPE | 2011 INSUP | 2012 RPE | 2012 INSUP | 2013 RPE | 2013 INSUP | 2014 RPE | 2014 INSUP |
|----------|---------|-----------|---------|-----------|---------|-----------|---------|-----------|
| Total    | 185,933 | 140,190   | 45,052  | 192,290   | 144,552 | 47,009    | 202,967 | 152,456   |
| Gender   |         |           |         |           |         |           |         | 49,617    |
| Male     | 130,549 | 95,580    | 33,405  | 135,980   | 99,443  | 34,934    | 145,561 | 106,375   |
| Female   | 225,139 | 171,769   | 53,297  | 232,227   | 176,546 | 55,573    | 243,557 | 185,039   |
| Age (yr) |         |           |         |           |         |           |         |           |
| ≤29      | 72,576  | 50,798    | 21,766  | 75,827    | 53,013  | 22,798    | 80,484  | 56,216    |
| 30–39    | 84,267  | 58,835    | 25,372  | 89,666    | 62,667  | 26,939    | 92,840  | 64,659    |
| 40–49    | 121,156 | 86,493    | 34,503  | 127,488   | 91,277  | 36,107    | 134,378 | 96,345    |
| 50–59    | 193,314 | 139,945   | 52,833  | 196,320   | 141,450 | 54,582    | 207,876 | 150,072   |
| 60–69    | 308,243 | 236,773   | 71,029  | 311,086   | 237,807 | 70,698    | 321,981 | 245,078   |
| 70–79    | 377,448 | 305,038   | 71,466  | 382,637   | 306,720 | 74,275    | 391,056 | 333,167   |
| Medical insurance type |       |           |         |           |         |           |         |           |
| NHI      | 318,775 | 247,050   | 70,286  | 321,522   | 247,790 | 72,013    | 334,876 | 258,239   |
| Medicaid | 298,500 | 288,278   | 9,262   | 300,467   | 291,371 | 8,384     | 307,033 | 295,660   |
| Others   | 302,890 | 0         | 0       | 281,712   | 720     | 0         | 193,558 | 0         |
| Lesion of joint |       |           |         |           |         |           |         |           |
| M17      | 318,775 | 247,050   | 70,286  | 321,522   | 247,790 | 72,013    | 334,876 | 258,239   |
| M17*     | 214,173 | 161,693   | 52,833  | 196,320   | 141,450 | 54,582    | 207,876 | 150,072   |
| M75      | 273,798 | 204,867   | 68,341  | 287,629   | 215,195 | 71,603    | 299,415 | 223,468   |
| S63      | 59,589  | 41,837    | 17,681  | 60,432    | 42,435  | 17,970    | 62,989  | 44,297    |
| S63*     | 145,409 | 103,545   | 41,771  | 154,690   | 110,097 | 44,542    | 162,736 | 46,700    |
| S93      | 80,779  | 56,892    | 23,850  | 83,765    | 58,891  | 24,844    | 88,453  | 62,166    |
| Severity (CCI) |       |           |         |           |         |           |         |           |
| 0        | 203,081 | 153,881   | 47,398  | 209,020   | 157,743 | 50,440    | 221,676 | 167,186   |
| 1        | 199,087 | 150,625   | 47,363  | 211,708   | 159,868 | 50,817    | 223,060 | 168,461   |
| 2        | 212,462 | 161,156   | 50,725  | 204,987   | 155,273 | 49,011    | 230,624 | 174,488   |
| 3+       | 204,016 | 154,551   | 48,973  | 247,400   | 188,624 | 57,910    | 244,925 | 186,833   |
| Hospital admission |       |           |         |           |         |           |         |           |
| No       | 120,367 | 88,290    | 31,661  | 121,813   | 89,057  | 32,334    | 126,287 | 92,267    |
| Yes      | 3,192,333 | 2,519,960 | 659,078 | 2,972,861 | 2,334,061 | 625,995 | 2,932,509 | 2,294,974 |
| Inpatient visit |       |           |         |           |         |           |         |           |
| 1≤       | 172,322 | 129,370   | 42,262  | 178,367   | 133,526 | 44,130    | 187,228 | 140,111   |
| Outpatient visit |       |           |         |           |         |           |         |           |
| 1        | 61,372  | 44,201    | 16,944  | 58,572    | 42,469  | 15,878    | 61,113  | 44,077    |
| 2–3      | 167,073 | 123,186   | 43,449  | 156,721   | 114,800 | 41,323    | 165,529 | 121,119   |
| 4+       | 511,061 | 393,692   | 115,248 | 536,884   | 410,668 | 124,195   | 562,200 | 430,102   |
| Type of medicine |       |           |         |           |         |           |         |           |
| Traditional | 82,089 | 61,845    | 20,154  | 86,266    | 65,161  | 21,076    | 90,827  | 68,827    |
| Both     | 368,924 | 280,760   | 87,644  | 382,499   | 290,307 | 91,415    | 410,128 | 310,688   |
| Western  | 181,225 | 135,985   | 44,240  | 186,151   | 139,155 | 46,017    | 194,305 | 145,102   |
Table 5: Continued.

| Category                      | 2011    | 2012    | 2013    | 2014    |
|-------------------------------|---------|---------|---------|---------|
|                               | RPE     | INSUP   | SLF     | RPE     | INSUP   | SLF     | RPE     | INSUP   | SLF     | RPE     | INSUP   | SLF     |
| Hospital type                 |         |         |         |         |         |         |         |         |         |         |         |         |
| Tertiary and General Hospital | 489,902 | 358,403 | 120,547 | 499,923 | 365,372 | 124,248 | 521,851 | 379,551 | 129,039 | 513,518 | 373,917 | 129,108 |
| Hospital                      | 400,853 | 302,498 | 97,522  | 400,137 | 301,007 | 97,878  | 403,412 | 303,041 | 99,363  | 401,838 | 299,704 | 101,105 |
| Western Clinic                | 439,283 | 346,145 | 92,816  | 490,846 | 388,042 | 102,269 | 549,396 | 431,928 | 117,009 | 601,268 | 473,599 | 125,127 |
| Long-term care hospital       | 151,730 | 115,386 | 36,252  | 152,247 | 115,222 | 36,955  | 161,165 | 121,970 | 39,115  | 164,468 | 124,275 | 40,104  |
| Traditional Hospital          | 170,319 | 116,816 | 53,366  | 190,266 | 132,261 | 57,678  | 206,204 | 143,719 | 62,073  | 254,941 | 178,466 | 76,299  |
| Traditional Clinic            | 123,954 | 93,265  | 30,612  | 126,000 | 94,782  | 31,157  | 133,370 | 100,470 | 32,823  | 138,372 | 104,463 | 33,798  |
| Region                        |         |         |         |         |         |         |         |         |         |         |         |         |
| Seoul (Urban)                 | 193,889 | 144,031 | 48,933  | 204,091 | 151,668 | 51,127  | 207,939 | 153,673 | 52,466  | 217,649 | 161,097 | 55,268  |
| Metropolitan city             | 206,956 | 156,123 | 49,311  | 205,397 | 154,325 | 49,914  | 222,903 | 167,268 | 54,395  | 224,130 | 168,026 | 54,704  |
| Other (Rural)                 | 173,384 | 131,459 | 41,609  | 181,856 | 137,378 | 44,157  | 191,688 | 144,969 | 46,317  | 198,235 | 149,414 | 48,438  |
| Ownership                     |         |         |         |         |         |         |         |         |         |         |         |         |
| Private                       | 356,865 | 272,144 | 78,988  | 502,172 | 389,016 | 108,319 | 458,967 | 355,555 | 96,233  | 446,919 | 343,020 | 100,664 |
| Corporation                   | 399,808 | 296,961 | 96,104  | 395,387 | 293,375 | 95,243  | 414,433 | 306,100 | 100,105 | 428,235 | 315,244 | 105,371 |
| Public                        | 166,882 | 126,175 | 40,558  | 171,337 | 129,080 | 42,132  | 181,359 | 136,620 | 44,574  | 185,770 | 139,770 | 45,822  |

*The sum of INSUP and SLF paid to the medical care institution. The total costs of items determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. †INSUP: the cost reimbursed by the Korean National Health Insurance Service as the insurer. ‡SLF: the self-payment amount paid by the beneficiary. §A case involving one or more of the other three joint disorders which were included in this study.
Table 6: Comparison of medical costs by type of medicine in 2011–2014.

| Unit | Year | Type of medicine | Frequency | Insurance charge | LOS |
|------|------|------------------|-----------|------------------|-----|
|      |      |                  | N* %      | Cost %           | Per diem % |
|      |      |                  |           |                  | Days per episode |
| H   | 2011 | WM               | 8,499 97.75 | 16,542 99.37    | 162,276 10.98 |
|      |      | TM               | 196 2.25   | 105 0.63         | 53,097 12.23  |
|      |      | Total            | 8,695 100 | 16,647 100       | 159,815 11.01 |
|      |      | WM               | 10,560 97.05 | 18,063 99.03    | 157,605 9.67 |
|      | 2012 | TM               | 321 2.95   | 178 0.97         | 57,256 12.18  |
|      |      | Total            | 10,881 100 | 18,240 100       | 154,644 9.75 |
|      |      | WM               | 12,152 96.79 | 19,969 98.65    | 155,222 9.31 |
|      | 2013 | TM               | 403 3.21   | 216 1.35         | 62,217 10.78 |
|      |      | Total            | 12,555 100 | 20,185 100       | 152,237 9.35 |
|      |      | WM               | 13,759 96.35 | 20,077 98.65    | 154,829 8.51 |
|      | 2014 | TM               | 521 3.65   | 276 1.35         | 60,435 10.72 |
|      |      | Total            | 14,280 100 | 20,353 100       | 151,385 8.59 |
| O   | 2011 | WM               | 974,537 66.19 | 23,827 71.81    | 22,030 1.2 |
|      |      | TM               | 497,877 33.81 | 9,354 28.19    | 18,573 1.04 |
|      |      | Total            | 1,472,414 100 | 33,181 100      | 20,861 1.15 |
|      | 2012 | TM               | 1,054,900 68.13 | 24,848 72.24 | 23,555 1.12 |
|      |      | Total            | 1,548,435 100 | 34,399 100      | 22,215 1.09 |
|      |      | WM               | 1,075,935 68.03 | 26,203 72.24 | 24,354 1.11 |
|      | 2013 | TM               | 505,652 31.97 | 10,071 27.76  | 19,917 1.03 |
|      |      | Total            | 1,585,646 100 | 38,104 100     | 24,031 1.08 |
|      |      | WM               | 1,092,995 68.93 | 27,887 73.19 | 25,514 1.1 |
|      | 2014 | TM               | 492,651 31.07 | 10,218 26.81  | 20,740 1.03 |
|      |      | Total            | 1,585,646 100 | 38,104 100     | 24,031 1.08 |

* A patient could be hospitalized more than once during the study period, which resulted in more than one claim per patient. Thus, the number of claims in the study was higher than the number of patients. † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. Costs are expressed in Korean Won (1,000,000 KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of reimbursed days divided by the total number of episodes. The number of reimbursed days includes the number of hospitalized days or outpatient visits and in-care drug prescription days. H, hospitalization; O, outpatient; WM, Western medicine; TM, Korean traditional medicine.

provide basic information for future usual care guidelines that may reduce health expenditures and help solve National Health Insurance deficits. This study used the 2011–2014 HIRA-NPS data consisting of 3% age-stratified and gender-stratified random samples. It appropriately reflected the South Korean population of 2011–2014 to capture real-world medical use and cost in joint disorders.

The results of the study showed that the proportion of female patients was higher compared to that of male patients. This is consistent with previous findings showing that women are more likely to utilize health care than men [23, 24]. This might be due to gender role differences such as occupation, hours of work, and occupational activities including housework and biological factors. Women are typically responsible for childcare and housework while men are typically expected to have a job [25].

The shoulder and knee joints accounted for the most hospital visits and increased steeply. In Korea, musculoskeletal disease accounted for 28.2% of National Health Insurance Corporation (NHIC) inpatient and outpatient claims. Knee joint disease has been ranked the 6th among reasons for inpatient care visit and the 5th among reasons for outpatient care visit among the population aged 65 years or older [26]. The incidence of gonarthrosis has been steadily increasing in Korea. Its rate in women was much higher than that in men [27].

While Western Clinics were the most frequently visited medical institution type between 2011 and 2014, the finding that Traditional Clinics were the next most frequently visited in this study was noteworthy. The Korean medical system is characterized by both Western and traditional Korean medical practices. In 2014, the number of claims from Western medicine was 49,031 for Tertiary and General Hospitals and 16,935 for hospitals and clinics. On the contrary, the number of claims from traditional Korean medicine was 14,729 for hospitals and 7,690 for clinics [26]. These circumstances reflect the high proportion of traditional Korean medicine use for joint disorders [9]. Our results are consistent with previous results showing that Traditional Clinics are the second most visited institution by patients with nonspecific low back pain [14].
### Table 7: Comparison of subgroup costs by type of medicine (2011–2014).

| Type | Unit | Doctors' fees | Admission costs | Medication costs | Injection costs | Anesthesia costs | Physiotherapy costs | Psychotherapy costs | Procedural costs | Laboratory costs | Radiotherapy costs | None | Total* |
|------|------|---------------|-----------------|-------------------|-----------------|-----------------|-------------------|-------------------|----------------|-----------------|-------------------|------|--------|
| WM   | N    | 6,064,234     | 178,833         | 614,097           | 3,632,780       | 697,677         | 6,300,815         | 194               | 791,129        | 1,551,682       | 1,914,274         | 148,537 | 21,894,252 |
|      | %    | 27.7          | 0.82            | 2.8               | 16.59           | 3.19            | 28.78             | 0                 | 3.61           | 7.09            | 8.74              | 0.68  | 100    |
|      | KRW  | 44,499,914    | 15,515,383      | 2,477,317         | 22,718,121      | 9,271,746       | 12,202,897        | 3,897             | 42,278,059     | 5,393,884       | 10,074,191        | 3,589,065 | 168,024,474 |
|      | %    | 26.48         | 9.23            | 1.47              | 13.52           | 5.52            | 7.26              | 0                 | 25.16          | 3.21            | 6                | 2.14  | 100    |
| TM   | N    | 2,074,061     | 6,648           | 332,810           | 0               | 0               | 0                 | 0                 | 3               | 6,932,215       | 8,192             | 0     | 275,017 | 9,628,946 |
|      | %    | 21.54         | 0.07            | 3.46              | 0               | 0               | 0                 | 0                 | 7.198          | 0.09            | 0                | 2.86  | 100    |
|      | KRW  | 15,631,220    | 592,114         | 208,776           | 0               | 0               | 0                 | 0                 | 31             | 21,791,571      | 31,038            | 0     | 347,946 | 38,602,696 |
|      | %    | 40.49         | 1.53            | 0.54              | 0               | 0               | 0                 | 0                 | 56.45          | 0.08            | 0                | 0.9   | 100    |
| Total| N    | 8,138,295     | 185,481         | 946,907           | 3,632,780       | 697,677         | 6,300,815         | 197               | 7,723,344      | 1,559,874       | 1,914,274         | 423,554 | 31,523,198 |
|      | %    | 25.82         | 0.59            | 3                 | 11.52           | 2.21            | 19.99             | 0                 | 24.5           | 4.95            | 6.07              | 1.34  | 100    |
|      | KRW  | 60,131,134    | 16,107,497      | 2,686,093         | 22,718,121      | 9,271,746       | 12,202,897        | 3,929             | 64,069,631     | 5,424,922       | 10,074,191        | 3,937,011 | 206,627,170 |
|      | %    | 29.1          | 7.8             | 1.3               | 10.99           | 4.49            | 5.91              | 0                 | 31.01          | 2.63            | 4.88              | 1.91  | 100    |

*Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as Korean Won (1,000KRW).*
Table 8: Comparison of subgroup $t$ related to type of medicine.

| Type          | Hospital type            | Doctors’ fees | Admission costs | Medication costs | Procedural costs | Anesthesia costs | Psychotherapy costs | Psychiatric costs | Injection costs/procedural costs | Laboratory costs | Radiotherapy costs | Total |
|---------------|--------------------------|---------------|-----------------|------------------|------------------|------------------|---------------------|------------------|-----------------------------------|-----------------|--------------------|-------|
|               | Tertiary Hospital        | (11.96)       | (2.36)          | (6.43)           | (7.60)           | (2.34)           | (3.56)              | (.01)            | (15.63)                           | (30.35)         | (19.76)             | (100) |
|               | General Hospital         | (17.14)       | (2.52)          | (9.43)           | (6.95)           | (1.87)           | (8.68)              | (.01)            | (15.35)                           | (21.44)         | (16.61)             | (100) |
|               | Hospital                 | (17.52)       | (2.44)          | (5.93)           | (6.24)           | (2.56)           | (14.34)             | (.00)            | (17.23)                           | (19.82)         | (13.94)             | (100) |
| TM            | Long-term care hospital  | (23.67)       | (3.96)          | (3.39)           | (.76)            | (.87)            | (17.46)             | (.00)            | (44.73)                           | (1.85)          | (3.31)              | (100) |
|               | Western Clinic           | (31.99)       | (.18)           | (1.29)           | (2.58)           | (3.54)           | (35.12)             | (.00)            | (16.82)                           | (1.98)          | (6.50)              | (100) |
|               | Dental Hospital          | (17.57)       | (.00)           | (.42)            | (.00)            | (.00)            | (.00)               | (.00)            | (82.01)                           | (.00)           | (.00)               | (100) |
|               | Public Health Center     | (.00)         | (.00)           | (.08)            | (1.48)           | (.00)            | (96.83)             | (.00)            | (.35)                             | (1.21)          | (.03)               | (100) |
|               | Local Public Health Clinic| (.00)         | (.00)          | (49.13)          | (.34)            | (.00)            | (47.29)             | (.00)            | (2.68)                            | (.35)           | (.00)               | (100) |
|               | Public Health Hospital   | (35.19)       | (.20)           | (4.47)           | (2.06)           | (.16)            | (18.89)             | (.00)            | (29.61)                           | (2.62)          | (6.79)              | (100) |
| WM            | Traditional Hospital     | (17.99)       | (3.57)          | (2.61)           | (.08)            | (.46)            | (1.44)              | (.00)            | (68.04)                           | (4.17)          | (1.64)              | (100) |
|               | Traditional Clinic       | (21.61)       | (.01)           | (6.44)           | (.00)            | (.09)            | (.00)               | (.00)            | (71.86)                           | (.00)           | (.00)               | (100) |
|               | Total                    | (25.94)       | (.39)           | (3.89)           | (2.52)           | (2.23)           | (20.08)             | (.00)            | (33.67)                           | (4.95)          | (6.10)              | (100) |

WM, Western medicine; TM, Korean traditional medicine.
Table 9: Comparison of lesion frequency by type of medical practice in 2011–2014.

| Class | Year | Type | Knee lesions [M17] | Shoulder lesions [M78] | Wrist and hand level [S63] | Ankle and foot level [S93] |
|-------|------|------|--------------------|------------------------|-----------------------------|-----------------------------|
|       |      |      | Growth† N* %       | Growth† N* %           | Growth† N* %                | Growth† N* %                |
|       |      |      |                    |                        |                             |                             |
| H     | 2011 | WM   | 5,024 97.97        | 2,399 98.36            | 216 97.74                   | 860 94.82                   |
|       |      | TM   | 104 2.03           | 40 1.64                | 5 2.26                     | 47 5.18                     |
|       |      | Total| 5,128 100.00       | 2,439 100.00           | 221 100.00                 | 907 100.00                  |
|       | 2012 | WM   | 25.72 6,316 96.74  | 2797 97.90             | 5.56 204 97.61             | 12.79 970 96.33            |
|       |      | TM   | 104.81 213 3.26    | 65.00 100.00           | 0.00 5 2.39                | −21.28 37 3.67             |
|       |      | Total| 27.32 6,529 100.00 | 28.58 100.00           | 5.43 209 100.00            | 11.03 1,007 100.00         |
|       | 2013 | WM   | 41.04 7,086 96.45  | 53.61 3,685 98.03      | 21.76 263 98.50            | 30.00 1,188 94.59          |
|       |      | TM   | 150.96 261 3.55    | 85.00 74 1.97          | −20.00 4 1.56             | 36.17 64 5.41              |
|       |      | Total| 43.27 7,347 100.00 | 54.12 3,759 100.00     | 20.81 267 100.00           | 30.32 1,182 100.00         |
|       | 2014 | WM   | 58.04 7,940 95.62  | 77.99 4,270 98.12      | 17.13 253 98.44            | 50.70 1,296 94.81          |
|       |      | TM   | 250.00 364 4.38    | 105.00 82 1.88         | −20.00 4 1.56             | 51.06 71 5.19              |
|       |      | Total| 61.93 8,304 100.00 | 78.43 4,352 100.00     | 16.29 257 100.00           | 50.72 1,367 100.00         |
| O     | 2011 | WM   | 508,830 79.13      | 258,936 58.24          | 83,624 61.16               | 123,147 49.65              |
|       |      | TM   | 134,381 20.87      | 185,699 41.64          | 53,306 38.84               | 124,891 50.35              |
|       |      | Total| 643,011 100.00     | 444,635 100.00         | 136,730 100.00             | 248,038 100.00             |
|       | 2012 | WM   | 5.41 536,381 79.33 | 14.91 297,536 63.60    | 5.76 88,439 61.49          | 7.63 132,544 50.85         |
|       |      | TM   | 4.18 139,790 20.67 | −8.31 170,259 36.40    | 4.31 55,394 38.51          | 2.56 128,092 49.15         |
|       |      | Total| 5.16 676,171 100.00| 5.21 467,795 100.00    | 5.19 143,833 100.00        | 5.08 260,636 100.00        |
|       | 2013 | WM   | 7.14 545,161 78.94 | 17.50 304,245 64.47    | 7.08 89,546 59.56          | 11.24 136,983 50.96        |
|       |      | TM   | 8.37 145,411 21.06 | −9.73 167,639 35.53    | 14.49 60,801 40.44         | 5.53 131,801 49.04         |
|       |      | Total| 7.40 690,572 100.00| 6.13 471,884 100.00    | 9.96 150,347 100.00        | 8.36 268,784 100.00        |
|       | 2014 | WM   | 9.18 555,535 79.63 | 17.99 305,510 65.84    | 9.83 91,843 60.39          | 13.77 140,107 51.52        |
|       |      | TM   | 5.90 142,092 20.37 | −16.45 155,153 0.72    | 13.46 60,252 39.61         | 5.55 131,824 48.48         |
|       |      | Total| 8.49 697,627 100.00| 4.35 463,993 100.00    | 11.24 152,095 100.00       | 9.63 271,931 100.00        |

* Patients with overlapping records were tallied as one patient (overlap was not allowed). † Growth rate compared to 2011. H, hospitalization; O, outpatient; WM, Western medicine; TM, traditional Korean medicine.
Table 10: Numbers of hospitalizations for gonarthrosis [M17] patients by hospital type.

| Year | Type of medicine | Hospital type | Frequency | Hospitalization costs | LOS |
|------|------------------|---------------|-----------|-----------------------|-----|
|      |                  |               | N *  | % | Cost† | % | Per diem‡ | Days per episode§ |
| 2011 | Western          | Tertiary Hospital | 204 | 3.98 | 1,225 | 9.50 | 460,420 | 14.20 |
|      |                  | General Hospital | 589 | 11.49 | 3,215 | 24.93 | 254,225 | 22.53 |
|      |                  | Hospital       | 1,689 | 32.94 | 7,044 | 54.62 | 225,222 | 17.68 |
|      |                  | Long-term care hospital | 1,857 | 36.21 | 553 | 4.29 | 94,819 | 4.42 |
|      |                  | Western Clinic | 683 | 13.32 | 794 | 6.16 | 81,749 | 13.64 |
|      |                  | Public Health Hospital | 2 | 0.04 | 1 | 0.01 | 39,420 | 11.00 |
|      | Traditional      | Traditional Hospital | 99 | 1.93 | 62 | 0.48 | 57,349 | 13.10 |
|      |                  | Traditional Clinic | 5 | 0.10 | 2 | 0.02 | 33,235 | 13.80 |
|      |                  | Total | 5,024 | 97.97 | 12,832 | 99.50 | 170,393 | 12.66 |
| 2012 | Western          | Tertiary Hospital | 187 | 2.86 | 1,190 | 8.81 | 490,276 | 14.06 |
|      |                  | General Hospital | 615 | 9.42 | 3,188 | 23.60 | 236,169 | 22.07 |
|      |                  | Hospital       | 2,011 | 30.80 | 7,435 | 55.05 | 212,520 | 15.80 |
|      |                  | Long-term care hospital | 2,792 | 42.76 | 700 | 5.18 | 99,643 | 3.50 |
|      |                  | Western Clinic | 710 | 10.87 | 868 | 6.42 | 78,343 | 13.69 |
|      |                  | Public Health Hospital | 1 | 0.02 | 1 | 0.01 | 42,477 | 19.00 |
|      | Traditional      | Traditional Hospital | 190 | 2.91 | 114 | 0.84 | 62,827 | 12.07 |
|      |                  | Traditional Clinic | 23 | 0.35 | 11 | 0.08 | 33,646 | 15.57 |
|      |                  | Total | 213 | 3.26 | 125 | 0.92 | 59,676 | 12.45 |
| 2013 | Western          | Tertiary Hospital | 195 | 2.65 | 1,287 | 8.79 | 454,263 | 16.49 |
|      |                  | General Hospital | 725 | 9.87 | 3,681 | 25.16 | 234,228 | 21.27 |
|      |                  | Hospital       | 1,997 | 27.18 | 7,678 | 52.49 | 215,432 | 16.46 |
|      |                  | Long-term care hospital | 3,393 | 46.18 | 888 | 6.07 | 98,884 | 3.62 |
|      |                  | Western Clinic | 774 | 10.53 | 939 | 6.42 | 84,784 | 12.97 |
|      |                  | Public Health Hospital | 2 | 0.03 | 1 | 0.01 | 44,311 | 16.00 |
|      | Traditional      | Traditional Hospital | 234 | 3.18 | 140 | 0.96 | 64,218 | 11.45 |
|      |                  | Traditional Clinic | 27 | 0.37 | 14 | 0.10 | 42,487 | 13.56 |
|      |                  | Total | 261 | 3.55 | 154 | 1.05 | 61,970 | 11.67 |
| 2014 | Western          | Tertiary Hospital | 272 | 3.28 | 1,641 | 11.46 | 459,732 | 14.81 |
|      |                  | General Hospital | 727 | 8.75 | 3,723 | 26.01 | 233,047 | 22.00 |
|      |                  | Hospital       | 2,152 | 25.92 | 6,911 | 48.29 | 205,374 | 14.52 |
|      |                  | Long-term care hospital | 4,022 | 48.43 | 1,045 | 7.30 | 102,035 | 3.44 |
|      |                  | Western Clinic | 766 | 9.22 | 783 | 5.47 | 75,945 | 13.00 |
|      |                  | Public Health Hospital | 1 | 0.01 | 0 | 0.00 | 63,640 | 4.00 |
|      | Traditional      | Traditional Hospital | 329 | 3.96 | 193 | 1.35 | 64,804 | 11.00 |
|      |                  | Traditional Clinic | 35 | 0.42 | 16 | 0.11 | 38,910 | 13.77 |
|      |                  | Total | 364 | 4.38 | 209 | 1.46 | 62,314 | 11.26 |
|      |                  | Total | 8,304 | 100.00 | 14,312 | 100.00 | 147,849 | 9.54 |

* Patients with overlapping records were tallied as one patient (overlap was not allowed). † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of hospitalized days divided by the total number of hospitalizations.
Table II: Number of outpatients with gonarthrosis [M17] by hospital type.

| Year | Type of medicine | Hospital type               | Frequency | Outpatient costs | LOS |
|------|------------------|----------------------------|-----------|-----------------|-----|
|      |                  |                            | N*        | Cost†           | Per diem‡ | Days per episode§ |
| 2011 | Western          | Tertiary Hospital          | 3,771     | 199             | 39,490     | 1.76 |
|      |                  | General Hospital           | 13,999   | 689             | 32,279     | 6.26 |
|      |                  | Hospital                   | 28,259   | 1,667           | 28,169     | 2.04 |
|      |                  | Long-term care hospital    | 1,872     | 95              | 15,504     | 3.51 |
|      |                  | Clinic                     | 458,027  | 9,641           | 21,049     | 1.02 |
|      |                  | Public Health Center       | 1,495     | 5               | 3,474      | 1.00 |
|      |                  | Local Public Health Clinic | 389      | 5               | 12,991     | 7.70 |
|      |                  | Public Health Hospital     | 1,018     | 27              | 26,723     | 1.67 |
|      |                  | Total                      | 508,830  | 12,329          | 21,823     | 1.24 |
|      | Traditional      | Tertiary Hospital          | 1,022    | 49              | 16,099     | 2.81 |
|      |                  | General Hospital           | 133,159  | 2,330           | 17,497     | 1.04 |
|      |                  | Total                      | 134,181  | 2,379           | 17,486     | 1.05 |
|      |                  | Total                      | 643,011  | 12,618          | 23,525     | 1.18 |
| 2012 | Western          | Tertiary Hospital          | 4,817     | 215             | 44,547     | 1.55 |
|      |                  | General Hospital           | 20,949   | 720             | 34,367     | 4.58 |
|      |                  | Hospital                   | 54,982   | 1,858           | 33,789     | 1.12 |
|      |                  | Long-term care hospital    | 4,519    | 99              | 22,003     | 1.42 |
|      |                  | Clinic                     | 448,226  | 9,691           | 21,621     | 1.02 |
|      |                  | Public Health Center       | 1,592    | 6               | 3,811      | 1.01 |
|      |                  | Local Public Health Clinic | 439      | 3               | 7,361      | 4.12 |
|      |                  | Public Health Hospital     | 855      | 26              | 30,431     | 1.46 |
|      |                  | Dental Hospital            | 2        | 0               | 24,970     | 1.00 |
|      |                  | Total                      | 536,381  | 12,618          | 23,525     | 1.18 |
|      | Traditional      | Tertiary Hospital          | 2,332    | 50              | 21,369     | 1.16 |
|      |                  | General Hospital           | 137,458  | 2,472           | 17,986     | 1.03 |
|      |                  | Total                      | 139,790  | 2,522           | 18,042     | 1.03 |
|      |                  | Total                      | 676,171  | 15,140          | 22,391     | 1.15 |
| 2013 | Western          | Tertiary Hospital          | 4,949    | 218             | 44,048     | 1.57 |
|      |                  | General Hospital           | 21,512   | 783             | 34,416     | 4.20 |
|      |                  | Hospital                   | 55,199   | 1,879           | 34,034     | 1.12 |
|      |                  | Long-term care hospital    | 4,780    | 104             | 21,854     | 1.49 |
|      |                  | Clinic                     | 456,160  | 10,203          | 22,367     | 1.01 |
|      |                  | Public Health Center       | 1,678    | 6               | 3,442      | 1.05 |
|      |                  | Local Public Health Clinic | 191      | 2               | 12,633     | 6.90 |
|      |                  | Public Health Hospital     | 692      | 23              | 33,579     | 1.97 |
|      |                  | Total                      | 545,161  | 13,219          | 24,248     | 1.16 |
|      | Traditional      | Tertiary Hospital          | 2,306    | 52              | 22,375     | 1.13 |
|      |                  | General Hospital           | 143,105  | 2,639           | 18,443     | 1.03 |
|      |                  | Total                      | 145,411  | 2,691           | 18,505     | 1.03 |
|      |                  | Total                      | 690,572  | 15,910          | 23,039     | 1.14 |
| 2014 | Western          | Tertiary Hospital          | 5,377    | 243             | 45,133     | 1.24 |
|      |                  | General Hospital           | 22,999   | 856             | 37,234     | 3.85 |
|      |                  | Hospital                   | 57,441   | 1,986           | 34,571     | 1.11 |
|      |                  | Long-term care hospital    | 4,748    | 106             | 23,220     | 1.48 |
|      |                  | Clinic                     | 461,684  | 10,962          | 23,742     | 1.01 |
|      |                  | Public Health Center       | 2,372    | 8               | 3,298      | 1.00 |
|      |                  | Local Public Health Clinic | 171      | 2               | 12,230     | 6.67 |
|      |                  | Public Health Hospital     | 732      | 21              | 28,470     | 1.31 |
|      |                  | Dental Hospital            | 11       | 0               | 18,469     | 1.00 |
|      |                  | Total                      | 555,535  | 14,183          | 25,531     | 1.15 |
|      | Traditional      | Tertiary Hospital          | 2,516    | 59              | 23,541     | 1.13 |
|      |                  | Public Health Center       | 139,576  | 2,670           | 19,127     | 1.03 |
|      |                  | Total                      | 142,092  | 2,729           | 19,205     | 1.03 |
|      |                  | Total                      | 697,627  | 16,912          | 24,242     | 1.12 |

* Patients with overlapping records were tallied as one patient (overlap was not allowed). † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They is expressed as a mean and are in Korean Won (1,000,000KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of outpatient visit days including drug prescription days divided by the total number of outpatient visits.
| Year | Type of medicine | Hospital type | Frequency | Hospitalization costs | LOS | Days per episode |
|------|-----------------|---------------|-----------|-----------------------|-----|------------------|
|      |                 |               | N*       | %                     | Cost | %                | Per diem |‡  | Days per episode§ |
| 2011 | Western         | Tertiary Hospital | 135      | 5.54                  | 278  | 9.55             | 377,378 | 6.08 |
|      |                 | General Hospital | 381      | 15.62                 | 765  | 26.31            | 210,523 | 12.83 |
|      |                 | Hospital        | 1,101    | 45.14                 | 1,608 | 55.27            | 203,071 | 8.86 |
|      |                 | Long-term care hospital | 589      | 24.15                 | 69   | 2.37             | 94,749  | 1.45 |
|      |                 | Western Clinic  | 193      | 7.91                  | 167  | 5.74             | 99,580  | 11.10 |
|      |                 | Total           | 2,399    | 98.36                 | 2,886 | 99.24            | 179,142 | 7.69 |
|      | Traditional     | Traditional Hospital | 39       | 1.6                  | 22   | 0.75             | 53203   | 14.26 |
|      |                 | Traditional Clinic | 1        | 0.04                 | 0    | 0.01             | 21440   | 14   |
|      |                 | Total           | 40       | 1.64                 | 22   | 0.76             | 52409   | 14.25 |
|      |                 | Total           | 2,439    | 100.00               | 2,908 | 100.00           | 177,064 | 7.80 |
| 2012 | Western         | Tertiary Hospital | 142      | 4.53                 | 318  | 8.32             | 374,833 | 6.37 |
|      |                 | General Hospital | 468      | 14.92                | 989  | 25.85            | 208,846 | 12.43 |
|      |                 | Hospital        | 1,547    | 49.33                | 2,168 | 56.66            | 200,108 | 8.36 |
|      |                 | Long-term care hospital | 661      | 21.08                | 75   | 1.96             | 98,519  | 1.25 |
|      |                 | Western Clinic  | 252      | 8.04                 | 242  | 6.33             | 138,525 | 9.81 |
|      |                 | Total           | 3,070    | 97.90                | 3,792 | 99.13            | 182,594 | 7.48 |
|      | Traditional     | Traditional Hospital | 62       | 1.98                 | 32   | 0.84             | 58,945  | 11.53 |
|      |                 | Traditional Clinic | 4        | 0.13                 | 1    | 0.03             | 31,056  | 14.25 |
|      |                 | Total           | 66       | 2.10                 | 33   | 0.87             | 57,255  | 11.70 |
|      |                 | Total           | 3,136    | 100.00               | 3,826 | 100.00           | 179,956 | 7.57 |
| 2013 | Western         | Tertiary Hospital | 169      | 4.50                 | 388  | 8.65             | 379,396 | 6.41 |
|      |                 | General Hospital | 582      | 15.48                | 1,212 | 27.01            | 188,152 | 13.07 |
|      |                 | Hospital        | 1,920    | 51.08                | 2,524 | 56.27            | 193,851 | 7.58 |
|      |                 | Long-term care hospital | 739      | 19.66                | 100  | 2.22             | 95,331  | 1.68 |
|      |                 | Western Clinic  | 274      | 7.29                 | 223  | 4.97             | 156,193 | 8.29 |
|      |                 | Public Health Hospital | 1       | 0.03                 | 0    | 0.00             | 89,370  | 1.00 |
|      |                 | Total           | 3,685    | 98.03                | 4,446 | 99.12            | 178,875 | 7.26 |
|      | Traditional     | Traditional Hospital | 68       | 1.81                 | 37   | 0.82             | 64,497  | 10.57 |
|      |                 | Traditional Clinic | 6        | 0.16                 | 3    | 0.06             | 40,844  | 14.17 |
|      |                 | Total           | 74       | 1.97                 | 40   | 0.88             | 62,579  | 10.86 |
|      |                 | Total           | 3,759    | 100.00               | 4,485 | 100.00           | 176,585 | 7.33 |
| 2014 | Western         | Tertiary Hospital | 161      | 3.70                 | 333  | 6.97             | 377,875 | 5.68 |
|      |                 | General Hospital | 671      | 15.42                | 1,214 | 25.45            | 202,746 | 10.41 |
|      |                 | Hospital        | 2,298    | 52.80                | 2,773 | 58.12            | 188,633 | 6.86 |
|      |                 | Long-term care hospital | 817      | 18.77                | 134  | 2.80             | 99,291  | 2.07 |
|      |                 | Western Clinic  | 323      | 7.42                 | 276  | 5.79             | 164,902 | 8.50 |
|      |                 | Total           | 4,270    | 98.12                | 4,730 | 99.12            | 179,097 | 6.58 |
|      | Traditional     | Traditional Hospital | 76       | 1.75                 | 39   | 0.83             | 60,405  | 10.09 |
|      |                 | Traditional Clinic | 6        | 0.14                 | 2    | 0.05             | 23,633  | 17.17 |
|      |                 | Total           | 82       | 1.88                 | 42   | 0.88             | 57,714  | 10.61 |
|      |                 | Total           | 4,352    | 100.00               | 4,772 | 100.00           | 176,810 | 6.66 |

* Patients with overlapping records were tallied as one patient (overlap not allowed). † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of hospitalized days divided by the total number of hospitalizations.
Table 13: Number of outpatients with shoulder lesions [M75] by hospital type.

| Year | Type of medicine | Hospital type | Frequency | Outpatient costs | LOS |
|------|-----------------|---------------|-----------|------------------|-----|
|      |                 |               | N* | %       | Cost† | %       | Per diem‡ | Days per episode§ |
| 2011 | Western         | Tertiary Hospital | 3,279 | 0.74 | 147 | 1.55 | 29,079 | 2.14 |
|      |                 | General Hospital | 8,754 | 1.97 | 420 | 4.42 | 26,730 | 4.09 |
|      |                 | Hospital | 16,434 | 3.70 | 803 | 8.45 | 21,712 | 2.21 |
|      |                 | Long-term care hospital | 1,120 | 0.25 | 47 | 0.50 | 16,906 | 2.84 |
|      |                 | Clinic | 228,892 | 51.48 | 4,559 | 47.99 | 19,916 | 1.01 |
|      |                 | Dental Hospital | 8 | 0.00 | 0 | 0.00 | 18,765 | 1.63 |
|      |                 | Public Health Center | 301 | 0.07 | 1 | 0.01 | 3,204 | 1.00 |
|      |                 | Local Public Health Clinic | 22 | 0.00 | 0 | 0.00 | 5,281 | 1.91 |
|      |                 | Public Health Hospital | 126 | 0.03 | 3 | 0.03 | 23,603 | 2.58 |
|      |                 | Total | 444,635 | 100.00 | 5,980 | 62.96 | 20,345 | 1.21 |
|      | Traditional     | Traditional Hospital | 1,327 | 0.03 | 3 | 0.03 | 23,603 | 1.05 |
|      |                 | Total | 185,699 | 41.76 | 3,519 | 37.04 | 18,738 | 1.04 |
| 2012 | Western         | Tertiary Hospital | 4,805 | 1.03 | 150 | 1.54 | 31,203 | 1.33 |
|      |                 | General Hospital | 16,148 | 3.45 | 418 | 4.29 | 25,811 | 2.07 |
|      |                 | Hospital | 42,956 | 9.18 | 1,004 | 10.29 | 23,931 | 1.05 |
|      |                 | Long-term care hospital | 2,372 | 0.51 | 52 | 0.53 | 21,931 | 1.40 |
|      |                 | Clinic | 230,518 | 49.28 | 4,790 | 49.14 | 20,870 | 1.01 |
|      |                 | Dental Hospital | 5 | 0.00 | 0 | 0.00 | 26,800 | 1.00 |
|      |                 | Public Health Center | 552 | 0.12 | 2 | 0.02 | 3,290 | 1.00 |
|      |                 | Local Public Health Clinic | 12 | 0.00 | 0 | 0.00 | 5,008 | 3.92 |
|      |                 | Public Health Hospital | 168 | 0.04 | 4 | 0.04 | 22,856 | 3.33 |
|      |                 | Total | 297,536 | 63.60 | 6,420 | 65.85 | 21,577 | 1.08 |
|      | Traditional     | Traditional Hospital | 2,348 | 0.50 | 52 | 0.53 | 22,553 | 1.04 |
|      |                 | Total | 170,259 | 36.40 | 3,329 | 34.15 | 19,552 | 1.04 |
| 2013 | Western         | Tertiary Hospital | 5,053 | 1.07 | 167 | 1.63 | 33,032 | 1.29 |
|      |                 | General Hospital | 15,611 | 3.31 | 434 | 4.26 | 27,831 | 2.06 |
|      |                 | Hospital | 46,514 | 9.86 | 1,108 | 10.85 | 23,823 | 1.05 |
|      |                 | Long-term care hospital | 2,105 | 0.45 | 49 | 0.48 | 23,288 | 1.45 |
|      |                 | Clinic | 234,099 | 49.61 | 5,077 | 49.73 | 21,688 | 1.01 |
|      |                 | Dental Hospital | 6 | 0.00 | 0 | 0.00 | 17,590 | 1.00 |
|      |                 | Public Health Center | 701 | 0.15 | 2 | 0.02 | 2,487 | 1.00 |
|      |                 | Local Public Health Clinic | 24 | 0.01 | 0 | 0.00 | 6,914 | 2.96 |
|      |                 | Public Health Hospital | 132 | 0.03 | 3 | 0.03 | 25,864 | 1.74 |
|      |                 | Total | 304,245 | 64.47 | 6,841 | 67.01 | 22,486 | 1.08 |
|      | Traditional     | Traditional Hospital | 2,163 | 0.46 | 51 | 0.50 | 23,727 | 1.09 |
|      |                 | Total | 165,476 | 35.53 | 3,317 | 32.94 | 20,047 | 1.03 |
|      |                 | Total | 471,884 | 100.00 | 10,210 | 100.00 | 21,636 | 1.06 |
| 2014 | Western         | Tertiary Hospital | 4,447 | 0.96 | 149 | 1.42 | 33,281 | 1.34 |
|      |                 | General Hospital | 17,733 | 3.82 | 502 | 4.79 | 28,320 | 2.11 |
|      |                 | Hospital | 48,171 | 10.38 | 1,136 | 10.85 | 23,590 | 1.04 |
|      |                 | Long-term care hospital | 2,106 | 0.45 | 50 | 0.47 | 23,507 | 1.36 |
|      |                 | Clinic | 233,309 | 50.07 | 5,315 | 50.74 | 22,881 | 1.01 |
|      |                 | Public Health Center | 471 | 0.10 | 2 | 0.02 | 3,848 | 1.37 |
|      |                 | Local Public Health Clinic | 35 | 0.01 | 0 | 0.00 | 7,430 | 3.80 |
|      |                 | Public Health Hospital | 21 | 0.05 | 6 | 0.06 | 28,187 | 1.34 |
|      |                 | Total | 305,510 | 65.84 | 7,160 | 68.35 | 23,437 | 1.09 |
|      | Traditional     | Traditional Hospital | 3,333 | 0.72 | 3,243 | 0.69 | 20,903 | 1.03 |
|      |                 | Total | 158,483 | 34.16 | 3,316 | 31.65 | 20,921 | 1.03 |
|      |                 | Total | 463,993 | 100.00 | 10,476 | 100.00 | 22,578 | 1.07 |

*Patients with overlapping records were tallied as one patient (overlap was not allowed). †Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW). ‡Per diem is the average daily cost of services covered by National Health Insurance. §Days per episode are the total number of outpatient visit days including drug prescription days divided by the total number of outpatient visits.
| Year | Type of medicine | Hospital type               | Frequency | Hospitalization costs | LOS | Days per episode |
|------|------------------|-----------------------------|-----------|-----------------------|-----|-----------------|
|      |                  |                             | N*        | %                     | Cost* | % | Per diem‡ | Days per episode§ |
| 2011 | Western          | Tertiary Hospital           | 11        | 4.98                  | 13   | 76.8 | 278,227   | 5.45 |
|      |                  | General Hospital            | 45        | 20.36                 | 43   | 25.65| 179,511   | 6.20 |
|      |                  | Hospital                    | 97        | 43.89                 | 74   | 44.40| 139,886   | 6.36 |
|      |                  | Long-term care hospital     | 11        | 4.98                  | 1    | 0.84 | 61,642    | 2.18 |
|      |                  | Western Clinic              | 52        | 23.53                 | 34   | 20.56| 82,895    | 9.83 |
|      |                  | Total                       | 216       | 97.74                 | 165  | 99.13| 137,482   | 6.90 |
|      | Traditional      | Traditional Hospital        | 4         | 1.81                  | 1    | 0.59 | 50,891    | 4.75 |
|      |                  | Traditional Clinic          | 1         | 0.45                  | 0    | 0.28 | 32,616    | 14.00 |
|      |                  | Total                       | 5         | 2.26                  | 1    | 0.87 | 47,236    | 6.60 |
|      |                  | Total                       | 221       | 100.00                | 166  | 100.00| 135,440   | 6.90 |
| 2012 | Western          | Tertiary Hospital           | 9         | 4.31                  | 10   | 6.32 | 248,187   | 4.89 |
|      |                  | General Hospital            | 32        | 15.31                 | 31   | 20.03| 181,560   | 8.19 |
|      |                  | Hospital                    | 112       | 53.59                 | 87   | 55.96| 127,213   | 7.51 |
|      |                  | Long-term care hospital     | 13        | 6.22                  | 1    | 0.83 | 99,160    | 1.00 |
|      |                  | Western Clinic              | 38        | 18.18                 | 25   | 15.80| 91,169    | 9.32 |
|      |                  | Total                       | 204       | 97.61                 | 154  | 98.93| 132,573   | 7.42 |
|      | Traditional      | Traditional Hospital        | 2         | 0.96                  | 1    | 0.61 | 53,661    | 8.00 |
|      |                  | Traditional Clinic          | 3         | 1.44                  | 1    | 0.46 | 41,900    | 7.33 |
|      |                  | Total                       | 5         | 2.39                  | 2    | 1.07 | 46,604    | 7.60 |
|      |                  | Total                       | 209       | 100.00                | 156  | 100.00| 130,517   | 7.43 |
| 2013 | Western          | Tertiary Hospital           | 11        | 4.12                  | 13   | 7.25 | 342,630   | 3.73 |
|      |                  | General Hospital            | 50        | 18.73                 | 47   | 26.27| 156,802   | 6.76 |
|      |                  | Hospital                    | 111       | 41.57                 | 85   | 46.85| 130,977   | 6.95 |
|      |                  | Long-term care hospital     | 44        | 16.48                 | 4    | 1.98 | 80,871    | 1.09 |
|      |                  | Western Clinic              | 47        | 17.60                 | 30   | 16.67| 88,549    | 10.30 |
|      |                  | Total                       | 263       | 98.50                 | 179  | 99.03| 128,774   | 6.40 |
|      | Traditional      | Traditional Hospital        | 4         | 1.50                  | 2    | 0.97 | 53,481    | 8.00 |
|      |                  | Total                       | 4         | 1.50                  | 2    | 0.97 | 53,481    | 8.00 |
|      |                  | Total                       | 267       | 100.00                | 180  | 100.00| 127,646   | 6.42 |
| 2014 | Western          | Tertiary Hospital           | 13        | 5.06                  | 12   | 5.82 | 210,379   | 4.00 |
|      |                  | General Hospital            | 65        | 25.29                 | 71   | 33.81| 167,548   | 8.48 |
|      |                  | Hospital                    | 118       | 45.91                 | 97   | 46.30| 137,949   | 6.69 |
|      |                  | Long-term care hospital     | 14        | 5.45                  | 1    | 0.54 | 81,609    | 1.00 |
|      |                  | Western Clinic              | 43        | 16.73                 | 27   | 12.62| 88,134    | 8.91 |
|      |                  | Total                       | 253       | 98.44                 | 208  | 99.08| 137,691   | 7.08 |
|      | Traditional      | Traditional Hospital        | 3         | 1.17                  | 1    | 0.59 | 64,672    | 8.00 |
|      |                  | Total                       | 4         | 1.56                  | 2    | 0.92 | 57,546    | 10.75 |
|      |                  | Total                       | 257       | 100.00                | 210  | 100.00| 136,444   | 7.13 |

* Patients with overlapping records were tallied as one patient (overlap was not allowed). † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of hospitalized days divided by the total number of hospitalizations.
Table 15: Number of outpatients for wrist and hand level lesions [S63] by hospital type.

| Year | Type of medicine | Hospital type | Frequency | Outpatient costs | LOS |
|------|------------------|---------------|-----------|------------------|-----|
|      |                  |               | N*        | Cost†            | Days per episode§ |
|      |                  |               | %         | %                |                 |
| 2011 | Western          | Tertiary Hospital | 251 | 0.18 | 19 | 0.60 | 58,745 | 1.58 |
|      |                  | General Hospital | 2,612 | 1.91 | 155 | 4.95 | 44,742 | 1.62 |
|      |                  | Hospital | 7,082 | 5.18 | 319 | 10.18 | 29,974 | 1.58 |
|      |                  | Long-term care hospital | 321 | 0.23 | 12 | 0.37 | 18,678 | 1.99 |
|      |                  | Clinic | 73,276 | 53.59 | 1,618 | 51.67 | 22,082 | 1.00 |
|      |                  | Public Health Center | 39 | 0.03 | 0 | 0.01 | 5,699 | 1.00 |
|      |                  | Local Public Health Clinic | 13 | 0.01 | 0 | 0.01 | 18,520 | 2.18 |
|      |                  | Public Health Hospital | 30 | 0.02 | 1 | 0.02 | 18,767 | 1.23 |
|      |                  | Total | 83,624 | 61.16 | 2,124 | 67.81 | 23,546 | 1.08 |
|      | Traditional      | Tertiary Hospital | 306 | 0.21 | 16 | 0.48 | 51,987 | 2.18 |
|      |                  | General Hospital | 3,404 | 2.37 | 146 | 4.41 | 42,810 | 1.09 |
|      |                  | Hospital | 11,477 | 78.97 | 357 | 10.80 | 31,071 | 1.04 |
|      |                  | Long-term care hospital | 667 | 0.46 | 13 | 0.40 | 19,954 | 1.10 |
|      |                  | Clinic | 72,525 | 50.42 | 1,680 | 50.86 | 23,163 | 1.01 |
|      |                  | Public Health Center | 1 | 0.00 | 0 | 0.00 | 5,790 | 1.00 |
|      |                  | Local Public Health Clinic | 13 | 0.01 | 0 | 0.00 | 8,726 | 4.00 |
|      |                  | Public Health Hospital | 46 | 0.03 | 1 | 0.04 | 25,292 | 1.43 |
|      |                  | Total | 88,439 | 61.49 | 2,213 | 66.99 | 25,022 | 1.02 |
| 2012 | Traditional      | Tertiary Hospital | 838 | 0.58 | 18 | 0.53 | 20,947 | 1.05 |
|      |                  | General Hospital | 3,512 | 2.34 | 163 | 4.58 | 46,354 | 1.32 |
|      |                  | Hospital | 10,971 | 73.00 | 360 | 10.13 | 32,801 | 1.07 |
|      |                  | Long-term care hospital | 667 | 0.46 | 13 | 0.40 | 19,954 | 1.10 |
|      |                  | Clinic | 72,525 | 50.42 | 1,680 | 50.86 | 23,163 | 1.01 |
|      |                  | Public Health Center | 1 | 0.00 | 0 | 0.00 | 5,790 | 1.00 |
|      |                  | Local Public Health Clinic | 13 | 0.01 | 0 | 0.00 | 8,726 | 4.00 |
|      |                  | Public Health Hospital | 46 | 0.03 | 1 | 0.04 | 25,292 | 1.43 |
|      |                  | Total | 143,833 | 100.00 | 3,303 | 100.00 | 22,966 | 1.02 |
| 2013 | Traditional      | Tertiary Hospital | 297 | 0.20 | 19 | 0.54 | 65,123 | 1.40 |
|      |                  | General Hospital | 3,512 | 2.34 | 163 | 4.58 | 46,354 | 1.32 |
|      |                  | Hospital | 10,971 | 73.00 | 360 | 10.13 | 32,801 | 1.07 |
|      |                  | Long-term care hospital | 667 | 0.46 | 13 | 0.40 | 19,954 | 1.10 |
|      |                  | Clinic | 72,525 | 50.42 | 1,680 | 50.86 | 23,163 | 1.01 |
|      |                  | Public Health Center | 1 | 0.00 | 0 | 0.00 | 5,790 | 1.00 |
|      |                  | Local Public Health Clinic | 13 | 0.01 | 0 | 0.00 | 8,726 | 4.00 |
|      |                  | Public Health Hospital | 46 | 0.03 | 1 | 0.04 | 25,292 | 1.43 |
|      |                  | Dental Hospital | 1 | 0.03 | 0 | 0.04 | 24,540 | 1.00 |
|      |                  | Total | 89,546 | 59.56 | 2,311 | 65.99 | 25,808 | 1.02 |
|      | Traditional      | Tertiary Hospital | 956 | 0.64 | 22 | 0.62 | 22,853 | 1.05 |
|      |                  | General Hospital | 3,512 | 2.34 | 163 | 4.58 | 46,354 | 1.32 |
|      |                  | Hospital | 10,971 | 73.00 | 360 | 10.13 | 32,801 | 1.07 |
|      |                  | Long-term care hospital | 667 | 0.46 | 13 | 0.40 | 19,954 | 1.10 |
|      |                  | Clinic | 72,525 | 50.42 | 1,680 | 50.86 | 23,163 | 1.01 |
|      |                  | Public Health Center | 1 | 0.00 | 0 | 0.00 | 5,790 | 1.00 |
|      |                  | Local Public Health Clinic | 13 | 0.01 | 0 | 0.00 | 8,726 | 4.00 |
|      |                  | Public Health Hospital | 46 | 0.03 | 1 | 0.04 | 25,292 | 1.43 |
|      |                  | Dental Hospital | 1 | 0.03 | 0 | 0.04 | 24,540 | 1.00 |
|      |                  | Total | 60,801 | 40.44 | 1,240 | 34.91 | 20,390 | 1.02 |
|      |                  | Tertiary Hospital | 150,347 | 100.00 | 3,551 | 100.00 | 23,617 | 1.02 |
|      |                  | General Hospital | 3,512 | 2.34 | 163 | 4.58 | 46,354 | 1.32 |
|      |                  | Hospital | 10,971 | 73.00 | 360 | 10.13 | 32,801 | 1.07 |
|      |                  | Long-term care hospital | 667 | 0.46 | 13 | 0.40 | 19,954 | 1.10 |
|      |                  | Clinic | 72,525 | 50.42 | 1,680 | 50.86 | 23,163 | 1.01 |
|      |                  | Public Health Center | 1 | 0.00 | 0 | 0.00 | 5,790 | 1.00 |
|      |                  | Local Public Health Clinic | 13 | 0.01 | 0 | 0.00 | 8,726 | 4.00 |
|      |                  | Public Health Hospital | 46 | 0.03 | 1 | 0.04 | 25,292 | 1.43 |
|      |                  | Dental Hospital | 1 | 0.03 | 0 | 0.04 | 24,540 | 1.00 |
|      |                  | Total | 81,843 | 53.96 | 2,121 | 66.99 | 25,808 | 1.02 |

* Patients with overlapping records were tallied as one patient (overlap was not allowed). † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of outpatient visit days including drug prescription days divided by the total number of outpatient visits.
Table 16: Number of hospitalizations for ankle and foot level lesions [S93] by hospital type.

| Year | Type of medicine | Hospital type          | Frequency | Hospitalization costs | LOS |
|------|------------------|------------------------|-----------|-----------------------|-----|
|      |                  |                        | N*        |                       |     |
|      |                  |                        | %         |                      |     |
|      |                  |                        | Cost†     |                      |     |
|      |                  |                        | %         |                      |     |
|      |                  |                        | Per diem‡ |                      |     |
|      |                  |                        | Days per episode§ |                      |     |
| 2011 | Western          | Tertiary Hospital      | 5         | 0.55                  | 8   | 1.24 | 173,270 | 10.40 |
|      |                  | General Hospital       | 108       | 11.91                 | 123 | 18.23 | 98,380  | 12.77 |
|      |                  | Hospital               | 345       | 38.04                 | 280 | 41.41 | 84,468  | 10.59 |
|      |                  | Long-term care hospital| 34        | 3.75                  | 6   | 0.96  | 65,373  | 3.26  |
|      |                  | Western Clinic         | 368       | 40.57                 | 241 | 35.54 | 56,559  | 12.45 |
|      |                  | Total                  | 860       | 94.82                 | 659 | 97.38 | 74,034  | 11.37 |
|      | Traditional      | Hospital               | 42        | 4.63                  | 17  | 2.47  | 49,012  | 9.38  |
|      |                  | Total                  | 47        | 5.18                  | 18  | 2.62  | 47,462  | 9.11  |
|      |                  | Total                  | 907       | 100.00                | 677 | 100.00| 72,657  | 11.25 |
| 2012 | Western          | Tertiary Hospital      | 10        | 0.99                  | 12  | 1.61  | 193,439 | 6.00  |
|      |                  | General Hospital       | 148       | 14.70                 | 156 | 20.70 | 108,791 | 11.49 |
|      |                  | Hospital               | 391       | 38.83                 | 305 | 40.51 | 88,346  | 9.74  |
|      |                  | Long-term care hospital| 38        | 3.77                  | 12  | 1.61  | 82,398  | 5.34  |
|      |                  | Western Clinic         | 383       | 38.03                 | 250 | 33.20 | 59,570  | 11.50 |
|      |                  | Total                  | 970       | 96.33                 | 734 | 97.63 | 80,954  | 10.49 |
|      | Traditional      | Hospital               | 32        | 3.18                  | 16  | 2.17  | 46,740  | 12.50 |
|      |                  | Total                  | 37        | 3.67                  | 18  | 2.37  | 44,761  | 12.14 |
|      |                  | Total                  | 1,007     | 100.00                | 752 | 100.00| 79,624  | 10.55 |
| 2013 | Western          | Tertiary Hospital      | 8         | 0.68                  | 13  | 1.41  | 206,721 | 7.75  |
|      |                  | General Hospital       | 186       | 15.74                 | 192 | 21.49 | 117,806 | 9.83  |
|      |                  | Hospital               | 465       | 39.34                 | 390 | 43.78 | 104,115 | 8.94  |
|      |                  | Long-term care hospital| 61        | 5.16                  | 14  | 1.57  | 93,890  | 3.52  |
|      |                  | Western Clinic         | 398       | 33.67                 | 262 | 29.42 | 64,569  | 11.39 |
|      |                  | Total                  | 1,118     | 94.59                 | 871 | 97.67 | 92,491  | 9.65  |
|      | Traditional      | Hospital               | 60        | 5.08                  | 20  | 2.23  | 66,044  | 6.93  |
|      |                  | Total                  | 4         | 0.34                  | 1   | 0.11  | 22,968  | 11.50 |
|      |                  | Total                  | 64        | 5.41                  | 21  | 2.33  | 63,352  | 7.22  |
|      |                  | Total                  | 1,182     | 100.00                | 891 | 100.00| 90,913  | 9.52  |
| 2014 | Western          | Tertiary Hospital      | 9         | 0.66                  | 10  | 0.92  | 200,250 | 6.00  |
|      |                  | General Hospital       | 214       | 15.65                 | 234 | 22.08 | 127,396 | 10.31 |
|      |                  | Hospital               | 625       | 45.72                 | 533 | 50.31 | 105,591 | 8.72  |
|      |                  | Long-term care hospital| 72        | 5.27                  | 24  | 2.27  | 92,879  | 5.67  |
|      |                  | Western Clinic         | 376       | 27.51                 | 235 | 22.22 | 63,569  | 10.69 |
|      |                  | Total                  | 1,296     | 94.81                 | 1,036| 97.81 | 96,951  | 9.36  |
|      | Traditional      | Hospital               | 61        | 4.46                  | 20  | 1.90  | 58,725  | 7.28  |
|      |                  | Total                  | 10        | 0.73                  | 3   | 0.29  | 25,945  | 12.80 |
|      |                  | Total                  | 71        | 5.19                  | 23  | 2.19  | 54,108  | 8.06  |
|      |                  | Total                  | 1,367     | 100.00                | 1,059| 100.00| 94,726  | 9.30  |

* Patients with overlapping records were tallied as one patient (overlap not allowed). † Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW). ‡ Per diem is the average daily cost of services covered by National Health Insurance. § Days per episode are the total number of hospitalized days divided by the total number of hospitalizations.
### Table 17: Number of outpatient visits for ankle and foot level lesions [S93] by hospital type.

| Year | Type of medicine | Hospital type                  | Frequency | Outpatient costs | LOS |
|------|------------------|--------------------------------|-----------|-----------------|-----|
|      |                  |                                | N*        | %               | Cost† | %     | Per diem‡ | Days per episode§ |
| 2011 | Western          | Tertiary Hospital              | 559       | 0.23            | 46    | 0.79  | 71,456     | 1.84             |
|      |                  | General Hospital               | 4,204     | 1.69            | 285   | 4.88  | 54,910     | 1.60             |
|      |                  | Hospital                       | 10,466    | 4.22            | 571   | 9.77  | 35,586     | 1.69             |
|      |                  | Long-term care hospital        | 465       | 0.19            | 18    | 0.31  | 23,088     | 1.90             |
|      |                  | Clinic                         | 107,340   | 43.28           | 2,471 | 42.30 | 23,025     | 1.00             |
|      |                  | Dental Hospital                | 6         | 0.00            | 0     | 0.01  | 16,350     | 2.67             |
|      |                  | Public Health Center           | 10        | 0.00            | 0     | 0.00  | 3,012      | 1.00             |
|      |                  | Local Public Health Clinic     | 18        | 0.01            | 0     | 0.00  | 7,036      | 2.56             |
|      |                  | Public Health Hospital         | 79        | 0.03            | 2     | 0.04  | 31,605     | 1.52             |
|      |                  | Total                          | 123,147   | 49.65           | 3,395 | 58.10 | 25,402     | 1.09             |
|      | Traditional      | Traditional Clinic             | 123,750   | 49.89           | 2,403 | 41.12 | 19,416     | 1.03             |
|      |                  | Total                          | 248,038   | 100.00          | 5,843 | 100.00| 22,886     | 1.06             |
| 2012 | Western          | Tertiary Hospital              | 769       | 0.30            | 50    | 0.80  | 64,899     | 1.51             |
|      |                  | General Hospital               | 5,806     | 2.23            | 310   | 5.00  | 53,426     | 1.27             |
|      |                  | Hospital                       | 17,632    | 6.76            | 625   | 10.07 | 35,586     | 1.06             |
|      |                  | Long-term care hospital        | 903       | 0.35            | 19    | 0.31  | 21,587     | 1.12             |
|      |                  | Clinic                         | 107,284   | 41.16           | 2,589 | 42.30 | 24,132     | 1.00             |
|      |                  | Dental Hospital                | 31        | 0.01            | 1     | 0.01  | 26,883     | 1.00             |
|      |                  | Public Health Center           | 14        | 0.01            | 0     | 0.00  | 4,781      | 1.00             |
|      |                  | Local Public Health Clinic     | 23        | 0.01            | 0     | 0.00  | 9,318      | 4.30             |
|      |                  | Public Health Hospital         | 82        | 0.03            | 3     | 0.04  | 31,415     | 1.39             |
|      |                  | Total                          | 132,544   | 50.85           | 3,597 | 57.96 | 27,142     | 1.03             |
|      | Traditional      | Traditional Clinic             | 125,678   | 48.22           | 2,556 | 41.12 | 20,336     | 1.03             |
|      |                  | Total                          | 260,636   | 100.00          | 6,207 | 100.00| 23,814     | 1.03             |
| 2013 | Western          | Tertiary Hospital              | 752       | 0.28            | 50    | 0.80  | 66,703     | 1.68             |
|      |                  | General Hospital               | 6,417     | 2.39            | 357   | 5.40  | 55,586     | 1.22             |
|      |                  | Hospital                       | 18,960    | 7.05            | 675   | 10.22 | 35,603     | 1.05             |
|      |                  | Long-term care hospital        | 773       | 0.29            | 17    | 0.25  | 21,454     | 1.10             |
|      |                  | Clinic                         | 109,956   | 40.91           | 2,731 | 41.35 | 24,835     | 1.00             |
|      |                  | Dental Hospital                | 4         | 0.00            | 0     | 0.00  | 25,545     | 1.00             |
|      |                  | Public Health Center           | 28        | 0.01            | 0     | 0.00  | 2,908      | 1.00             |
|      |                  | Local Public Health Clinic     | 23        | 0.01            | 0     | 0.00  | 6,697      | 2.83             |
|      |                  | Public Health Hospital         | 70        | 0.03            | 2     | 0.03  | 30,855     | 1.23             |
|      |                  | Total                          | 136,983   | 50.96           | 3,832 | 58.02 | 27,972     | 1.02             |
|      | Traditional      | Traditional Clinic             | 129,546   | 48.20           | 2,720 | 41.18 | 20,994     | 1.02             |
|      |                  | Total                          | 268,784   | 100.00          | 6,604 | 100.00| 25,656     | 1.02             |
| 2014 | Western          | Tertiary Hospital              | 634       | 0.23            | 53    | 0.76  | 83,468     | 1.66             |
|      |                  | General Hospital               | 7,410     | 2.72            | 415   | 5.95  | 56,052     | 1.27             |
|      |                  | Hospital                       | 19,690    | 7.24            | 715   | 10.25 | 36,321     | 1.05             |
|      |                  | Long-term care hospital        | 747       | 0.27            | 17    | 0.25  | 23,249     | 1.08             |
|      |                  | Clinic                         | 111,528   | 41.01           | 2,884 | 41.34 | 25,857     | 1.00             |
|      |                  | Dental Hospital                | 3         | 0.00            | 0     | 0.00  | 19,330     | 1.00             |
|      |                  | Public Health Center           | 12        | 0.00            | 0     | 0.00  | 4,125      | 1.00             |
|      |                  | Local Public Health Clinic     | 16        | 0.01            | 0     | 0.00  | 10,259     | 4.63             |
|      |                  | Public Health Hospital         | 67        | 0.02            | 2     | 0.03  | 28,492     | 1.03             |
|      |                  | Total                          | 140,107   | 51.52           | 4,087 | 58.58 | 29,169     | 1.03             |
|      | Traditional      | Traditional Clinic             | 129,744   | 47.71           | 2,839 | 40.69 | 21,880     | 1.02             |
|      |                  | Total                          | 131,824   | 49.48           | 2,890 | 41.42 | 21,922     | 1.02             |
|      |                  | Total                          | 271,931   | 100.00          | 6,977 | 100.00| 25,656     | 1.03             |

* Patients with overlapping records were tallied as one patient (overlap not allowed).
† Costs determined to be eligible for reimbursement by the HIRA (Health Insurance Review and Assessment Service) out of the total treatment amount were indicated in the submitted insurance claim statement. They are expressed as means and are in Korean Won (1,000,000 KRW).
‡ Per diem is the average daily cost of services covered by National Health Insurance.
§ Days per episode are the total number of outpatient visit days including drug prescription days divided by the total number of outpatient visits.
Table 18: Distribution of nonsurgical interventions in Western medicine and traditional Korean medicine.

| Nonsurgical intervention | Total | Year 2011 | 2012 | 2013 | 2014 |
|--------------------------|-------|-----------|------|------|------|
|                          |       | N         |      |      |      |
|                          | WM    | Basic physical therapy† |       |      |      |
|                          |       | N         | 1,481,969 | 1,560,032 | 1,594,949 | 1,600,774 |
|                          |       | %         | (63.97) | (64.16) | (64.83) | (64.57) |
|                          | WM    | Simple rehabilitation‡ |       |      |      |
|                          |       | N         | 947,982  | 1,000,863 | 1,034,024 | 1,040,774 |
|                          |       | %         | (63.97) | (64.16) | (64.83) | (64.57) |
|                          | WM    | Professional rehabilitation§ |       |      |      |
|                          |       | N         | 1,481,873 | 1,560,008 | 1,594,914 | 1,600,736 |
|                          |       | %         | (99.99) | (100.00) | (100.00) | (100.00) |
|                          | WM    | Rehabilitation of CNS |       |      |      |
|                          |       | N         | 1,481,962 | 1,560,029 | 1,594,942 | 1,600,773 |
|                          |       | %         | (100.00) | (100.00) | (100.00) | (100.00) |
|                          | TM    | Acupuncture |       |      |      |
|                          |       | N         | 982,471  | 1,062,109 | 1,085,224 | 1,102,972 |
|                          |       | %         | (66.29) | (68.08) | (68.04) | (68.90) |
|                          | TM    | Moxibustion |       |      |      |
|                          |       | N         | 458,820  | 452,939  | 454,601  | 447,355  |
|                          |       | %         | (30.96) | (29.03) | (28.50) | (27.95) |
|                          | TM    | Cupping |       |      |      |
|                          |       | N         | 1,481,712 | 1,559,844 | 1,594,897 | 1,600,518 |
|                          |       | %         | (99.98) | (99.99) | (100.00) | (99.98) |
|                          | TM    | Heat & cold therapy |       |      |      |
|                          |       | N         | 1,481,856 | 1,559,858 | 1,594,897 | 1,600,734 |
|                          |       | %         | (99.99) | (100.00) | (100.00) | (100.00) |

A patient could be hospitalized more than once during the study period, resulting in more than one claim per patient. Thus, the number of claims in the study was higher than the number of patients. †Basic physical therapy included superficial heat therapy, cold therapy, deep heat therapy, ultraviolet irradiation, transcutaneous electrical nerve stimulation, massage therapy, and simple therapeutic exercise. ‡Simple rehabilitation included paraffin bath, hydrotherapy, intermittent traction therapy, electrical stimulation therapy, laser therapy, therapeutic exercise, motor point block, pneumatic compression, complex decongestive physical therapy, and iontophoresis. §Professional rehabilitation included pool therapy, occupational therapy, activities of daily living training, neurogenic bladder training, functional electrical stimulation therapy, myofascial trigger point injection, rehabilitative social work, rehabilitative breathing therapy, rehabilitative functional training, and rehabilitative dysphagia therapy. WM, Western medicine; TM, traditional Korean medicine.

Despite the high demand for traditional Korean medicine for musculoskeletal diseases, traditional Korean medical practitioners are precluded from diagnosing joint disorders independently due to regulatory restrictions in imaging device use. We confirmed this fact again by comparing subgroup costs related to the type of medicine in total treatment cost. Apart from procedures such as acupuncture, moxibustion, and cupping, many treatments were not covered by the NH1 (Table 7). Large variations in diagnostic and therapeutic management between Western medicine...
and traditional Korean medicine indicate that more items in Korean medicine need to be covered and developed. Among the hospitalized patients, the number of claims for all years after 2011 increased mostly for shoulder joints (78.43%) compared to 2011, followed by knees (61.93%), foot (50.72%), and hands (16.29%). While the rate of use of traditional Korean medicine for the shoulder region slightly decreased in outpatient care, the number of hospitalizations increased sharply (Table 9). It is interesting that the proportion of traditional hospitalization increase for the knee and shoulder regions: shoulder: 105.00%, knee: 250.00%) was higher than that of Western medicine clinic hospitalization (shoulder: 77.99%, knee: 58.04%). In Korea, the medical delivery system of traditional medicine is not strict. Individuals can choose to visit primary medical institutions (Traditional Clinic) and higher medical institutions (Traditional Hospital). Shoulder and knee joint diseases are common musculoskeletal diseases. They are usually treated in primary care settings. However, if there is no response or a lack of effectiveness in primary care, a Traditional Hospital is attended for a more accurate diagnosis and evaluation. This might be the reason why there is increase in hospitalization in Traditional Hospitals that hire orthodox medical practitioners who can use X-rays and magnetic resonance imaging. Besides, because traditional medical practitioners cannot use these examination devices in a Traditional Clinic, outpatient care in Traditional Clinics was much lower compared to that in Western Clinics. Although simple radiology is helpful in the diagnosis of joint disease [28], patient might suffer the inconvenience of going to both Western and Traditional Clinics for accurate diagnosis due to legal restrictions [29].

Traditional Korean medicine had lower medical expenditures than Western medicine (inpatient care cost: Western medicine clinic, 160,000 KRW; traditional Korean medicine clinic, 50,000 KRW; outpatient care cost: Western medicine, 22,000 KRW; traditional Korean medicine, 18,000 KRW). The average treatment cost for traditional Korean medicine was lower compared to that for Western medicine. RPE ranged from 181,225 KRW to 198,661 KRW for Western medicine and 82,019 KRW to 96,325 KRW for traditional Korean medicine. In addition, out-of-pocket expenses for Western medicine (44,240 KRW to 49,621 KRW) were higher than those of traditional Korean medicine (20,154 KRW to 22966 KRW). Although expenditures for traditional Korean medicine were significantly lower compared to those for Western medicine, daily cost amount showed no significant difference between the two depending on the year. These results are similar to those of a previous study [6].

Most patients had mild joint diseases (more than 70%) with CCI scores of 0 and underwent nonsurgical treatment. Regardless of disease type, the proportion of surgery was less than 1%. Therefore, traditional medical care can serve as an alternative to Western medical care. We found that the proportion of acupuncture was slightly higher than basic physical therapy (Table 18). However, further research is needed to confirm that traditional Korean medicine is cost-effective for managing joint diseases.

This study has several limitations. First, the study was descriptive in nature. It reported sociodemographic characteristics, procedures, medication, and average cost for treating joint disorders without addressing a specific hypothesis. Recently, research results have been utilized as basis for policies by utilizing health-related big data. However, there is a lack of data analyzing various patterns of traditional medical services [30]. Although there are studies that use NHI claims data, they are limited to a single year or disease range [8, 13]. This study is novel in that it compared the utilization of Western medicine and traditional Korean medicine for the treatment of joint disorders in Korea. We believe the current study would serve as a good reference for countries with similar medical systems as that of Korea and would be able to contribute to international literature. Further research is required, such as analysis of factors influencing the use or frequency of Korean traditional medicine using multivariate statistics.

Second, while fee-for-service for nationally covered health care service was comprehensively recorded in the claim database, nonreimbursable items such as traditional drugs did not generate billing data. In addition, we only calculated direct medical costs based on information in the claim database. In general, there are nonmedical costs such as transportation costs and lost productivity due to morbidity because joint diseases tend to be chronic. In addition, the costs did not uncover items based on claims data that only contained information about medical services provided under the NHI. If uncovered items were included, the costs for traditional Korean medicine might be higher than that of Western medicine. In a previous study [31] comparing Western and traditional Korean medicine users, it was found that the traditional Korean medicine user group paid significantly more medical expenses than the Western medicine user group. In a study on the determinants of traditional Korean medicine use based on panel data [32], the number of patients using traditional Korean medicine was significantly higher than those using Western medicine. This is because the insurance benefit for traditional Korean medicine is lower than that for Western medicine.

Third, we did not include essential factors influencing choice of medical practice, such as education level, income, residence, severity, and health-related risk factors (e.g., alcohol consumption, smoking, and exercise) [33]. Previous studies have shown that factors affecting the use of traditional Korean medicine are not related to education level or income level [34, 35], high education level [14], low education level [36, 37], and low or high-income level [32]. In previous studies, factors such as the use of a therapist [33], confidence in oriental medical institution [32], recognition of therapeutic effect [38], and coping attitude of the oriental medical treatment [39] have been found to be significant factors. Although these essential variables are important parameters in choosing hospitals, they were missed due to the nature of the claims data. To overcome the omission of disturbance variables, medical insurance type (NHI or Medicaid) and region of hospital were used as surrogates of income and residence in this study. In addition, we considered disease severity by using CCI because severity of disease might greatly affect hospital choice. The remaining factors have been judged due to their impacts on health care utilization. We believe that the direction of the analysis of this study will not change. Due to the limitation in data characteristics, these elements were
not included in this study. Future studies considering these factors are needed to confirm our findings.

Finally, the accuracy of diagnoses has been an issue due to the nature of claims data collected with the purpose of reimbursing health care services and not for clinical purposes [18]. The accuracy of diagnosis in the KNHI claims data has been reported to be about 70% [40]. Moreover, the accuracy of disease classification has been reported to be higher for inpatients than for outpatients. It is higher for severe disorders than for common mild disorders. It is also higher in General Hospitals than in clinics [41]. Nonetheless, in the process of designing this study, physicians in current practice concurred that these codes were not clearly differentiated for diagnosis in actual clinical practice settings in Korea. Therefore, analysis was performed in primary and secondary diagnoses in accordance with the opinion that various issues should be taken into account (e.g., private insurance, medical care institution characteristics, and individual differences in physicians) in category division. In addition, primary and secondary diagnoses are generally used in conjunction [14]. Therefore, in defining medical care usage due to joint disease, we reviewed not only the major diagnosis code, but also secondary diagnosis code. Despite our efforts, the diagnosis accuracy for joint diseases in this study might be challenged.

Despite these limitations, our study has several strengths. First, we analyzed age-stratified and gender-stratified random samples of the KNHI claims database representing 98% of the South Korean population. Claims statements covered extensive information on health care interventions (e.g., treatment, procedures, diagnostic tests, and prescription drugs), diagnosis, NHI payment cost, beneficiaries’ out-of-pocket expenses, sociodemographic characteristics, and medical institutions, thus providing useful nationwide epidemiological data. Its representativeness, reliability, and validity have been confirmed previously [41]. However, there is a lack of data necessary to understand various consumption patterns and supply patterns of traditional medical services [30].

Second, there are studies in other countries that analyze the status of traditional Korean medicine utilization by using representative data source [30, 42–44]. Unlike most previous clinical studies whose duration was less than one year, we attempted to analyze the change over four years for joint diseases based on the type of medicine used (Western or traditional Korean medicine). Until now, no studies have reported national data on the management of joint disorders for 2011 to 2014. This study holds significance in that it is the first study that reports distinct differences in patterns of medical care use and costs between Western medicine and traditional Korean medicine.

An added strength of this study was that it provided patterns of complementary and alternative medicine treatment for joint disorders in Korea by covering traditional Korean medicine treatments as acupuncture, moxibustion, and cupping in the NHI.

Third, we constructed pilot medical episode data considering characteristics of health claim data for joint diseases. This can be used as a data processing technique to calculate basic dynamics information. Health insurance claim data were produced by physicians based on diagnosis at the first visit to the hospital. Related claim data were then produced, including the diagnosis code, the date of initiation of treatment (hospitalization or outpatient), and personal information (age, sex). To use epidemiological data, it is necessary to link the billing statement classified for administrative purposes to the same hospitalization case [45]. In this study, the same patient filed a billing statement with the same hospital in the same medical institution for inpatient care. The date was connected to one hospitalization case.

Our study has several policy implications. As disease structure can change from acute to chronic degenerative disease, interest in traditional medicine is increasing with aging. The main purpose of traditional medicine use in South Korea is to prevent disease and promote general health [10]. Though traditional medicine plays a substantial role in the Korean health care system, the annual number of health insurance claims from traditional Korean medicine institutions has stagnated and decreased since 2012 [46]. Medical use is affected by demographic, socioeconomic, and psychocultural factors. It has been reported that these factors can affect health care utilization by interactions between factors rather than independent factors [47, 48]. Therefore, it is important to grasp the current position of traditional Korean medicine in order to prepare policy and directives. Currently, difference in standards of practice underlies mistrust for traditional Korean medicine among Western medical practitioners [6]. To overcome conflicts among orthodox and traditional practitioners, we need an effective health care delivery system that encourages consultation for both Western and traditional Korean medicine with accessibility. Further discussion must be considered by providing consultation programs for other chronic diseases and joint diseases.

5. Conclusions

This study provided objective information about epidemiologic characteristics of patients with joint disorders treated with Western medicine and traditional Korean medicine. It provided an understanding about the recent status and trends. It will provide a basis for further expansion of traditional Korean medicine for patients with muscular disorders. Based on HIRA data, medical use for joint disorders showed significant difference between the groups. It provides basic information for future usual care guidelines linked to health policy and budget appropriation. Timely and accurate information is essential for policy-makers to make decisions. The results of our study will contribute to management decisions for musculoskeletal diseases involving joint disorders.

Abbreviations

HIRA: Health Insurance Review & Assessment Services
NHIS: National Health Insurance Sample
WM: Western medicine
TM: Traditional Korean medicine.
**Additional Points**

*Availability of Data and Material.* Datasets generated and/or analyzed in the current study are available from the HIRA-NPS repository. HIRA data are third-party data not owned by the authors. HIRA data are available upon visit or by mail upon direct, email, or fax submission of dataset request form and declaration of data use downloadable from the “HIRA” website: [http://opendata.hira.or.kr/op/opc/selectPatDataApplInView.do] and upon payment of the transfer of data request fee (300,000 KRW per dataset).

**Ethical Approval**

The HIRA Research Ethics Committee of South Korea approved the protocol of this study.

**Disclosure**

Written informed consent was not obtained from participants because only clinical records were used in this study based on national billing data submitted to HIRA. Patient information was anonymized and deidentified by HIRA prior to analysis in this study.

**Conflicts of Interest**

The authors declare that there are no conflicts of interest regarding the publication of this article.

**Authors’ Contributions**

Soyoon Kim constructed study design, Sukjin Bae analyzed the data, and Boyoung Jung interpreted the results. Soyoon Kim was scientific advisor and directed this study. Boyoung Jung wrote the manuscript and performed the statistical analysis. All authors read and approved the final manuscript.

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