Evaluation of use and cost of medical care of common lumbar disorders in Korea: cross-sectional study of Korean Health Insurance Review and Assessment Service National Patient Sample data

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ABSTRACT

Objectives: To assess medical care and costs of the 3 highest prevalence lumbar disorders—non-specific low back pain (nLBP), intervertebral disc disorder (IDD) and spinal stenosis (SS)—from national billing data to provide basic information for standards of appropriate management.

Design: Retrospective analysis of National Health Insurance National Patient Sample data provided by the Korean Health Insurance Review and Assessment Service (HIRA).

Setting: 2011 claims data from all medical institutions which filed billing statements to HIRA.

Participants: A total of 135 561 patients with lumbar disorder who received medical services during 2011.

Outcome measures: Patient characteristics, medical procedures, medication, cost, injection and surgery.

Results: In the nLBP and IDD groups, the 50–59 age range had the highest prevalence, whereas prevalence increased with age in SS. All 3 groups showed a higher percentage in women. The average treatment cost was 196 552 KRW in the nLBP and 362 050 KRW in the IDD group, and highest in the SS group at 439 025 KRW. While in the nLBP group women spent more on medical expenses, in the other 2 groups men showed higher expenditure. Expenditure grew with age in the nLBP and SS groups, whereas that of the IDD group peaked in their 40s. Analgesics were used in 73.43% of patients with nLBP, 82.64% of patients with IDD and 86.46% of patients with SS, and opioids in 4.12% of patients with IDD and 5.36% of patients with SS. Surgery rates were highest in the SS group at 4.85%, with 0.9% for nLBP and 4.59% for IDD. The most frequent injection code was lumbar/caudal epidural nerve block. Expenditure and surgery rates were higher in the injection than in the non-injection subgroup in all 3 groups.

Conclusions: Patterns of medical care of most frequent lumbar disorders from HIRA data showed significant difference between groups and provide a basic standard for future usual care guidelines linked with health policy and budget appropriation.

BACKGROUND

Low back pain (LBP) is a common condition which >90% of American adults experience at least once in their lifetime,1 and its treatment takes on significance as the most frequent cause of hospital visits, sick leave and absence from work.2 Moreover, studies report increasing prevalence over the past several decades,3 together with rise in costs.4

REFERENCES

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LBP is defined as localised pain between the 12th rib and gluteal folds with or without leg pain. Non-specific LBP (nLBP) is defined as back pain of unknown pathology. The greater majority of LBP cases are non-specific, with a specific cause identified in ∼5–10% of cases, which include intervertebral disc disorder (IDD) and spinal stenosis (SS). 5

IDD is frequently associated with intervertebral disc degeneration and intervertebral disc herniation, affecting 10% of the population with low back and radiating pain over their lifetime. 6 A 2008 study using data from the Medical Expenditure Panel Survey reported that IDD was the largest specific diagnosis among patients with spinal disorder, accounting for almost 16% of the total patients. 7 Incidence of intervertebral disc herniation is highest in the 30–40 age range, and has been linked with dehydration and consequent degenerative disc change in this age group. 8 9

While it has been stated that there is no accurate diagnostic and/or classification criteria for SS, 10 it is still widely considered to refer to narrowing of the spinal canal and consequent nerve compression and ischaemia. 11 This mainly degenerative disorder is characterised by neurogenic claudication and is caused by various primary or secondary structural pathologies of the spine, intervertebral disc, facet joint and surrounding ligaments. 12 Prevalence of SS is increasing with marked growth of the ageing population over the past 20 years, and is especially prevalent in the 65+ age group. 13 Yearly SS incidence is estimated at 5 per 100,000 population, 14 and SS is the most common reason for spinal surgery in the elderly population aged 65 or older. 15

These reports are in line with benefits by frequency of disease data from the 2013 Korean National Health Insurance Statistical Yearbook, in which spine-related Korean Standard Classification of Diseases (KCD) diagnoses with highest medical expense and number of patients were nLBP, IDD and SS. The number of patients with nLBP (KCD classification: dorsalgia, KCD code: M54) was 4568 435, with ∼579.1 billion KRW spent in annual medical expenses (seventh in overall disease diagnoses), number of patients with IDD (KCD classification: other IDDs, KCD code: M51) was 1847 234, with 587 billion KRW spent in medical expenses (sixth), and that of SS (KCD classification: other spondylopathies, KCD code: M48) was 1314 954, with a yearly medical expense of 468 billion KRW (ninth), showing that these three disorders incur considerable socioeconomic expense. 16

Although medical expenditure and burden of disease of nLBP, IDD and SS are steadily increasing, reports on medical use and cost of each disease are scarce. Therefore, the objective of this study was to analyse billing data submitted to the Korean National Health Insurance and assessed by the Health Insurance Review and Assessment Service (HIRA) to compare medical care use and costs of most frequent lumbar disorders and thus provide basic information for future standards of the appropriate level of lumbar disorder management in Korea.

METHODS

Study population and sampling

National Health Insurance billing data provided by HIRA include raw data of treatment prescriptions of all patients who received medical services over the course of 1 year after removal of identifying personal or corporate information. 17 This study used the 2011 HIRA National Patient Sample (NPS) data set, which includes 3% sample data of 2011 national insurance billing data (∼1.4 million patients) stratified by gender and 5-year age intervals.

National insurance billing statements contain charges to National Health Insurance and Medical Aid, and classify medical institutions into seven categories: upper level general hospitals, general hospitals, hospitals, clinics, Korean medicine hospitals, Korean medicine clinics and long-term care hospitals. Patients with lumbar disorder included for analysis were recategorised into three most frequent lumbar disorder groups, nLBP, IDD and SS, predefined as prefix codes M54, M51 and M48 through a literature review. Diagnoses were coded by the KCD, 6th revision (KCD-6) adapted from the International Classification of Diseases, 10th revision, and billing statements of patients aged >120, those with missing cost data, those with 0 total cost, those with no record of lumbar X-ray, those with lumbar/spinal diagnoses unrelated to IDD or SS within the predefined prefix codes or those with lumbar/spinal diagnoses pertaining to non-lumbar regions were excluded. Claims information of 135 561 patients with lumbar disorder with the following prefix codes in primary or four secondary diagnoses were included for analysis through a panel discussion of four clinicians (one rehabilitation specialist and three Korean medicine rehabilitation specialists), and the flow chart of participant inclusion and exclusion is detailed in figure 1: M43, other deforming dorsopathies; M47, spondylolisthesis; M48, other spondylopathies; M51, other IDDs; M54, dorsalgia; M99, biomechanical lesions, not elsewhere classified; and S33, dislocation, sprain and strain of joints and ligaments of lumbar spine and pelvis.

Of specific disease diagnoses, M541 (lumbar neuritis or radiculitis, not otherwise specified), initially classified as nLBP, was recategorised to the IDD group in accordance with a panel opinion with reference to clinical practice. Group classification of specific disease diagnoses is given in table 1. LBP-related diagnoses, injections, physiotherapy, surgical interventions and analgesics (opioid and non-opioid) were classified according to National Evidence-based healthcare Collaborating Agency reports. 18

National Health Insurance-related terms are defined as follows. 16

Medical care institutions

Medical care institutions that treat and medicate patients include tertiary and general hospitals, hospitals, clinics, dental hospitals and clinics, midwifery clinics, admission
facility-equipped health centres, health centres, health subcentres, primary healthcare centres, Korean medicine hospitals and clinics, pharmacies. The term ‘medical institution’ is used to indicate medical care institutions with the exception of pharmacies.

**Treatment amount**

Treatment amount refers to the total medical care institution expenditure for patients who are covered by medical insurance, and comprises two kinds of costs: the amount paid by the insurer and that by the beneficiary. Generally speaking, it is the finalised total medical care cost adjusted and determined to be eligible for reimbursement through review by the HIRA from the initial non-adjusted estimate submitted by the medical care institution.

**Benefit amount**

The benefit amount is the reimbursement sum paid by the insurer (Korean National Health Insurance Service) to the medical care institution, and is determined by excluding the beneficiary-paid sum as decreed by law from the adjusted total treatment amount (or medication cost) determined to be valid through HIRA review.

**Visit (admission) days**

The number of visits (in the outpatient department) or the length of hospital stay (in the inpatient department) of patient indicated in the submitted insurance claim statement is tallied.

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**Table 1** Group classification of specific disease diagnoses of nLBP, IDD and SS groups

| KCD-6 code* | Disease diagnosis |
|-------------|-------------------|
| nLBP group  |                   |
| S33         | Dislocation, sprain and strain of joints and ligaments of the lumbar spine and pelvis |
| S335        | Sprain and strain of the lumbar spine |
| S336        | Sprain and strain of the sacroiliac joint |
| S337        | Sprain and strain of other and unspecified parts of the lumbar spine and pelvis |
| M544        | Lumbago with sciatica |
| M545        | LBP |
| IDD group   |                   |
| M541        | Lumbar neuritis or radiculitis, not otherwise specified |
| M51         | Other IDDs |
| M510        | Lumbar disorders and other IDDs with myelopathy |
| M511        | Lumbar disorders and other IDDs with radiculopathy |
| M512        | Other specified intervertebral disc displacement |
| M513        | Other specified intervertebral disc degeneration, multiple sites in the spine |
| M514        | Schmorl’s nodes |
| M518        | Other specified IDDs |
| M519        | IDD, unspecified |
| SS group    |                   |
| M480        | SS |
| M993        | Osseous stenosis of the neural canal |
| M994        | Connective tissue stenosis of the neural canal |
| M995        | Intervertebral disc stenosis of the neural canal |
| M996        | Osseous and subluxation stenosis of the intervertebral foramina |
| M997        | Connective tissue and disc stenosis of the intervertebral foramina |

*Diagnoses were coded by the KCD-6 which is the Korean version adapted from the International Classification of Diseases, 10th revision (ICD-10). IDD, intervertebral disc disorder; KCD-6, Korean Standard Classification of Diseases, 6th revision; LBP, low back pain; nLBP, non-specific low back pain; SS, spinal stenosis.

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**Days of medication**

Days of medication represent the total sum of visit days and in-care drug prescription days. Outpatient visits with drug prescription coinciding with hospitalisation and drug prescription on the same day were tallied as 1 day. Days of medication at the pharmacy indicate the number of days of receiving medication.

**Statistical analysis**

Patient sociodemographic characteristics and frequency of prescriptions (surgical or medical interventions, including prescription medicine (analgesics)) are presented for each operational definition. The average treatment amount and benefit by group, and proportion of recipients of injection and non-injection treatment...
were also calculated, and descriptive statistics are presented by age and gender. All statistical analyses were performed using SAS 9.3 (SAS Institute., Cary, North Carolina, USA).

RESULTS

While the 50–59 age range was most prevalent for the nLBP and IDD groups, prevalence increased with age in the SS group. All three groups showed a higher percentage of women than men. In use of medical institutions, clinics were most frequently visited in all three groups, followed by hospitals and general hospitals in the IDD and SS groups, and Korean medicine clinics in the nLBP group. In visits by medical specialty, visits to orthopaedics were most frequent in all three groups, followed by neurosurgery, and anaesthesiology and pain medicine specialists in the IDD and SS groups, and internal Korean medicine, and acupuncture and moxibustion specialists in the nLBP group. Visits to medical institutions located in Seoul were most common, followed by Gyeonggi-do, Busan and Gyeongsangnam-do (table 2).

The average treatment amount and the benefit per patient were 196 552 and 147 040 KRW in the nLBP group, 362 050 and 237 321 KRW in the IDD group, and highest in the SS group at 439 025 and 275 224 KRW, respectively. Women in the nLBP group spent more on medical expenses, but in the other two groups, men showed higher expenditure. While expenditure increased with age in the nLBP and SS groups, that of the IDD group peaked in patients in their 40s at 368 073 KRW. In expense by medical institution, long-term care hospitals had the highest expense in all three groups, followed by Korean medicine hospitals and upper level general hospitals. Analysis by medical specialty revealed that expense was highest in the anaesthesiology and pain medicine specialty in the nLBP group, and highest in the neurosurgery specialty in the IDD and SS groups. The average treatment amounts per patient in inpatient and outpatient care were highest in the SS group at 198 448 and 2 248 111 KRW, respectively. The average surgical treatment amount per patient was also highest in the SS group at 3 413 085 KRW (table 3).

Surgery rates were highest in the SS group at 0.9% for nLBP, 4.59% for IDD and 4.85% for SS. The most frequently used surgery code was open lumbar discectomy in the nLBP and IDD groups, and lumbar laminection closely followed by open lumbar discectomy in the SS group. The most frequent injection code for all three groups was epidural nerve block (lumbar and/or caudal), and in the IDD and SS groups, selective spinal nerve plexus, root or ganglion block and spinal nerve plexus, root or ganglion block (posterior division) followed.

Analgesics were used in 73.43% of the nLBP, 82.64% of the IDD and 86.46% of the SS group, and opioid analgesics were used in 4.12% of the IDD and 5.36% of the SS group. Of non-opioid analgesics, acetaminophen 100 mg was used most commonly in all three groups, followed by tramadol HCl 50 mg and tafelnunflumate 370 mg. Of opioid analgesics, the nLBP and SS groups showed highest use in codeine phosphate 10 mg, while in the IDD group, pethidine HCl 50 mg was most commonly used, followed by codeine phosphate 10 mg. Deep heat therapy was most frequently prescribed as physiotherapy in all three groups, followed by superficial heat therapy and transcutaneous electrical nerve stimulation (table 4).

A total 6876 (6.16%) of 111 544 patients with nLBP, 9546 (19.72%) of 48 413 patients with IDD and 7138 (24.75%) of 28 842 patients with SS received injection treatment. More women received injections compared to men in all three groups. In injections by age group, the proportion of recipients aged 60–69 was largest in the nLBP group, 50–59 in the IDD group and increased with age in the SS group. Surgery rates were higher in injection recipients than non-recipients in all groups with 1.0% in the nLBP, 7% in the IDD and 5.7% in the SS group, as was the average expenditure per patient in the injection compared to the non-injection subgroup in all three groups, at 407 083 in the nLBP, 615 312 in the IDD and 648 545 KRW in the SS group. While patients aged 70+ had highest medical expense by age in the injection and non-injection subgroups in the nLBP and SS groups, patients aged 30–39 showed highest average spending in the IDD group.

The average number of reimbursed days per injection patient was also higher than that for non-injection patients in all three groups at 15.4 days in the nLBP, 15.6 days in the IDD and highest at 16.5 days in the SS group. Similar to medical expense, patients aged 70+ spent most number of reimbursed days in medical care when categorised by age in the injection and non-injection subgroups in the nLBP and SS groups, and in patients aged 30–39 in the IDD group (table 5).

DISCUSSION

This study used 2011 HIRA NPS data, which consist of 3% age-stratified and gender-stratified random samples that appropriately reflect the South Korean population of 2011 to capture real-world medical use and cost in most frequent lumbar disorders. This study is descriptive in nature, and reports sociodemographic characteristics, procedures, medication, average cost and benefits in most frequent lumbar disorders without addressing a specific hypothesis. Difference in current usage patterns were especially marked in the injection subgroup and the SS group.

The National Health Insurance claims database is representative of the population as it is a National Health Insurance scheme that covers ~98% of the overall South Korean population. National Health Insurance was established in 1989 in South Korea and Employees’ Health Insurance was merged into the National Health Insurance service in 2000. About 54% of medical
### Table 2 Sociodemographic characteristics and medical care use by group*

| Age (years) | nLBP n | Per cent | IDD n | Per cent | SS n | Per cent |
|-------------|--------|----------|-------|----------|------|----------|
| <20         | 9069   | 8.0      | 884   | 1.8      | 53   | 0.2      |
| 20–29       | 11130  | 9.8      | 3406  | 6.9      | 270  | 0.9      |
| 30–39       | 16201  | 14.3     | 6513  | 13.2     | 771  | 2.6      |
| 40–49       | 19676  | 17.3     | 9207  | 18.7     | 2369 | 8.1      |
| 50–59       | 22984  | 20.2     | 11942 | 24.3     | 6299 | 21.5     |
| 60–69       | 17646  | 15.5     | 9353  | 19.0     | 9061 | 30.9     |
| ≥70         | 16927  | 14.9     | 7894  | 16.0     | 10472| 35.7     |
| Gender      |        |          |       |          |      |          |
| Female      | 45938  | 41.2     | 19067 | 39.4     | 9828 | 34.1     |
| Male        | 65606  | 58.8     | 29346 | 60.6     | 19014| 65.9     |
| Treatment type used | | | | | | |
| Inpatient   | 6142   | 5.3      | 6782  | 12.7     | 3163 | 10.2     |
| Outpatient  | 109305 | 94.7     | 46669 | 87.3     | 27975| 89.8     |
| Public insurance scheme | | | | | | |
| Health insurance | 105613 | 94.4     | 45458 | 93.4     | 26262| 90.1     |
| Medical aid  | 6224   | 5.6      | 3034  | 6.2      | 2665 | 9.1      |
| Veteran healthcare | 98     | 0.1      | 165   | 0.3      | 230  | 0.8      |
| Medical institution visited | | | | | | |
| Clinic      | 74988  | 47.9     | 30399 | 53.3     | 16080| 47.7     |
| Hospital    | 20605  | 13.2     | 15421 | 27.1     | 9179 | 27.2     |
| Korean medicine clinic | 41295 | 26.4     | 2521  | 4.4      | 598  | 1.8      |
| General hospital | 10345  | 6.6      | 5356  | 9.4      | 5377 | 16.0     |
| Upper level general hospital | 2351  | 1.5      | 1689  | 3.0      | 1911 | 5.7      |
| Veteran healthcare | 98     | 0.1      | 165   | 0.3      | 230  | 0.8      |
| Location of medical institution visited | | | | | | |
| Orthopaedics | 72196  | 41.6     | 29682 | 49.0     | 20082| 56.9     |
| Neurosurgery | 13685  | 7.9      | 14375 | 23.7     | 7469 | 21.2     |
| Acupuncture and moxibustion medicine | 23883  | 13.8     | 1851  | 3.1      | 359  | 1.0      |
| Internal Korean medicine | 24361  | 14.0     | 892   | 1.5      | 344  | 1.0      |
| Internal medicine | 9705   | 5.6      | 2112  | 3.5      | 1642 | 4.7      |
| Anaesthesiology and pain medicine | 4795   | 2.8      | 3090  | 5.1      | 2356 | 6.7      |
| Surgery    | 6586   | 3.8      | 1574  | 2.6      | 704  | 2.0      |
| Other      | 1346   | 0.9      | 366   | 0.6      | 219  | 0.6      |

*Patients with overlapping records tallied as separate patients.
IDD, intervertebral disc disorder; nLBP, non-specific low back pain; SS, spinal stenosis.

Ahn Y-J, et al. BMJ Open 2016;6:e012432. doi:10.1136/bmjopen-2016-012432
expenditure is covered by the National Health Insurance service, and the remaining 46% is mostly paid through out-of-pocket expenses.20

Claims were filed to HIRA for 45.8 billion patients in 2011, which accounts for 90.3% of the total registered population of 50 billion. The total number of filed claims and total health expenditures have risen steadily, and as of 2011, the total number of filed claims reached 1.3 billion and with it, the total health expenditure ∼51.5 trillion KRW. The number of registered medical care institutions has also increased from 7289 in the 1980s to 82,948 in 2011.21

The National Health Insurance claims database covers all insurance billing codes submitted by registered medical care institutions to claim reimbursable medical costs from the National Health Insurance after HIRA review. Four different random sample data sets are available by year for 2009–2011: NPS, National Inpatient

| Table 3 | Average treatment amount and benefit per patient by group* |
|---------|-----------------------------------------------------------|
|         | nLBP                                                      |
|         | Treatment amount (1000 KRW)                               |
| Gender  |                                                           |
| Male    | 171 474                                                   |
| Female  | 214 112                                                   |
| Age (years) |                                               |
| <20     | 92 295                                                    |
| 20–29   | 130 363                                                   |
| 30–39   | 145 282                                                   |
| 40–49   | 173 030                                                   |
| 50–59   | 198 927                                                   |
| 60–69   | 229 733                                                   |
| ≥70     | 310 271                                                   |
| Treatment |                                       |
| Inpatient | 937 692                                                   |
| Outpatient | 147 888                                                   |
| Treatment amount |                                           |
| Total medical cost | 196 552                                                   |
| Self-payment cost | 49 122                                                   |
| Insurer-payment cost | 147 040                                                   |
| Public insurance scheme |                                   |
| Health insurance | 190 655                                                   |
| Medical aid | 283 488                                                   |
| Veteran healthcare | 245 792                                                   |
| Medical institution |                                        |
| Clinic | 126 671                                                   |
| Hospital | 152 812                                                   |
| Korean medicine clinic | 136 645                                                   |
| General hospital | 178 256                                                   |
| Upper level general hospital | 185 901                                                   |
| Korean medicine hospital | 249 263                                                   |
| Long-term care hospital | 294 487                                                   |
| Medical specialty |                                              |
| Orthopaedics | 131 039                                                   |
| Neurosurgery | 118 663                                                   |
| Acupuncture and moxibustion medicine | 135 117                                                   |
| Internal Korean medicine | 124 159                                                   |
| Internal medicine | 95 444                                                   |
| Anaesthesiology and pain medicine | 152 421                                                   |
| Surgery | 134 784                                                   |
| No | 185 196                                                   |
| Yes | 1 320 929                                                  |
| Benefit amount (1000 KRW) |                                                         |
| nLBP | 125 838                                                   |
| IDD | 279 748                                                   |
| SS | 465 278                                                   |
| Gender  |                                                           |
| Male    | 125 838                                                   |
| Female  | 279 748                                                   |
| Age (years) |                                               |
| <20     | 260 547                                                   |
| 20–29   | 299 123                                                   |
| 30–39   | 355 044                                                   |
| 40–49   | 368 073                                                   |
| 50–59   | 360 440                                                   |
| 60–69   | 354 971                                                   |
| ≥70     | 374 094                                                   |
| Treatment |                                       |
| Inpatient | 1 343 232                                                  |
| Outpatient | 180 379                                                   |
| Treatment amount |                                           |
| Total medical cost | 362 050                                                   |
| Self-payment cost | 92 824                                                   |
| Insurer-payment cost | 267 132                                                   |
| Public insurance scheme |                                   |
| Health insurance | 351 763                                                   |
| Medical aid | 474 312                                                   |
| Veteran healthcare | 596 402                                                   |
| Medical institution |                                        |
| Clinic | 199 340                                                   |
| Hospital | 444 272                                                   |
| Korean medicine clinic | 128 753                                                   |
| General hospital | 486 909                                                   |
| Upper level general hospital | 515 959                                                   |
| Korean medicine hospital | 536 411                                                   |
| Long-term care hospital | 541 724                                                   |
| Medical specialty |                                              |
| Orthopaedics | 252 103                                                   |
| Neurosurgery | 453 336                                                   |
| Acupuncture and moxibustion medicine | 186 092                                                   |
| Internal Korean medicine | 165 971                                                   |
| Internal medicine | 178 691                                                   |
| Anaesthesiology and pain medicine | 223 162                                                   |
| Surgery | 219 405                                                   |
| No | 262 652                                                   |
| Yes | 2 194 448                                                  |
| Benefit amount (1000 KRW) |                                                         |
| nLBP | 279 748                                                   |
| IDD | 465 278                                                   |
| SS | 425 456                                                   |
| Gender  |                                                           |
| Male    | 279 748                                                   |
| Female  | 465 278                                                   |
| Age (years) |                                               |
| <20     | 189 332                                                   |
| 20–29   | 211 662                                                   |
| 30–39   | 255 253                                                   |
| 40–49   | 269 164                                                   |
| 50–59   | 263 106                                                   |
| 60–69   | 263 339                                                   |
| ≥70     | 291 192                                                   |
| Treatment |                                       |
| Inpatient | 2 145 275                                                  |
| Outpatient | 125 214                                                   |
| treatment amount |                                           |
| Total medical cost | 439 025                                                   |
| Self-payment cost | 101 551                                                   |
| Insurer-payment cost | 331 982                                                   |
| Public insurance scheme |                                   |
| Health insurance | 415 485                                                   |
| Medical aid | 458 457                                                   |
| Veteran healthcare | 596 665                                                   |
| Medical institution |                                        |
| Clinic | 150 026                                                   |
| Hospital | 327 561                                                   |
| Korean medicine clinic | 99 095                                                   |
| General hospital | 353 055                                                   |
| Upper level general hospital | 564 216                                                   |
| Korean medicine hospital | 341 424                                                   |
| Long-term care hospital | 386 986                                                   |
| Medical specialty |                                              |
| Orthopaedics | 187 903                                                   |
| Neurosurgery | 333 135                                                   |
| Acupuncture and moxibustion medicine | 141 673                                                   |
| Internal Korean medicine | 127 618                                                   |
| Internal medicine | 139 797                                                   |
| Anaesthesiology and pain medicine | 155 804                                                   |
| Surgery | 170 091                                                   |
| No | 189 166                                                   |
| Yes | 2 194 448                                                  |
| Benefit amount (1000 KRW) |                                                         |
| nLBP | 348 887                                                   |
| IDD | 425 456                                                   |
| SS | 323 244                                                   |

*A patients with overlapping records tallied as separate patients.*

IDD, intervertebral disc disorder; nLBP, non-specific low back pain; SS, spinal stenosis.
## Table 4 Use of surgery and injection procedures, physiotherapy and analgesics by group*

| Code       | nLBP | IDD | SS  |
|------------|------|-----|-----|
|            | n    | Per cent | n    | Per cent | n    | Per cent |
| Total      | 111 544 | 100.0 | 48 413 | 100.0 | 28 842 | 100.0 |
| Surgical intervention | | | | | | |
| No         | 111 194 | 99.69 | 48 178 | 99.51 | 28 641 | 99.30 |
| Yes        | 1008 | 0.90 | 2221 | 4.59 | 1399 | 4.85 |
| Surgery procedure code | | | | | | |
| Open lumbar discectomy | N1493 | 6 | 0.01 | 1667 | 3.44 | 436 | 1.51 |
| Lumbar laminectomy | N1499 | 4 | 0.00 | 121 | 0.25 | 451 | 1.56 |
| Lumbar arthrodesis (posterior technique) | N0469 | – | – | 25 | 0.05 | 103 | 0.36 |
| Endoscopic discectomy | N1494 | – | – | 53 | 0.11 | – | – |
| Lumbar arthrodesis (anterior technique) | N0466 | – | – | 6 | 0.01 | 19 | 0.07 |
| Other      | 1 | 0.00 | 10 | 0.02 | 5 | 0.02 |
| Non-surgical intervention | | | | | | |
| Epidural nerve block (lumbar and/or caudal) | LA322 | 4480 | 4.02 | 6830 | 14.11 | 5202 | 18.04 |
| Spinal nerve plexus, root or ganglion block (posterior division) | LA357 | 1149 | 1.03 | 740 | 1.53 | 494 | 1.71 |
| Selective spinal nerve plexus, root or ganglion block | LA354 | 395 | 0.35 | 968 | 2.00 | 807 | 2.80 |
| Spinal nerve plexus, root or ganglion block (posterior medial branch) | LA358 | 588 | 0.53 | 862 | 1.78 | 629 | 2.18 |
| Spinal nerve plexus, root or ganglion block (facet joint) | LA359 | 416 | 0.37 | 618 | 1.28 | 532 | 1.84 |
| Spinal nerve plexus, root or ganglion block (lumbar or sacral plexus) | LA253 | 419 | 0.38 | 447 | 0.92 | 340 | 1.18 |
| Spinal nerve plexus, root or ganglion block (dorsal root ganglion) | LA355 | 62 | 0.06 | 312 | 0.64 | 259 | 0.90 |
| Spinal nerve plexus, root or ganglion block (gray rami communicans) | LA356 | 1 | 0.00 | 3 | 0.01 | 2 | 0.01 |
| Physiotherapy | | | | | | |
| Deep heat therapy | MM020 | 56 380 | 50.55 | 25 663 | 53.01 | 12 757 | 44.23 |
| Superficial heat therapy with deep heat therapy | MM015 | 56 078 | 50.27 | 25 512 | 52.70 | 12 651 | 43.86 |
| Transcutaneous electrical nerve stimulation with interferential current therapy | MM080 | 34 326 | 30.77 | 16 913 | 34.93 | 8 228 | 28.53 |
| Transcutaneous electrical nerve stimulation | MM070 | 31 940 | 28.63 | 14 121 | 29.17 | 7 141 | 24.76 |
| Superficial heat therapy | MM010 | 13 001 | 11.66 | 7 751 | 16.01 | 3 730 | 12.93 |
| Intermittent pelvic traction therapy | MM052 | 4510 | 4.04 | 13 929 | 28.77 | 3 095 | 10.73 |
| Rehabilitation low output laser therapy | MM085 | 5281 | 4.73 | 2885 | 5.96 | 1 348 | 4.67 |
| Simple therapeutic exercise | MM101 | 3673 | 3.29 | 2401 | 4.96 | 851 | 2.95 |
| Other | 1000 | 0.90 | 701 | 1.45 | 500 | 1.73 |
| Analgesics | | | | | | |
| Non-opioid analgesics | | | | | | |
| Aceclofenac 100 mg | 100901AT | 25 102 | 22.50 | 14 044 | 29.01 | 8 036 | 27.86 |
| Tramadol HCl 50 mg | 242303BI | 24 344 | 21.82 | 9 489 | 19.60 | 5 919 | 20.52 |
| Talinflumate 370 mg | 234401AT | 20 245 | 18.15 | 8 378 | 17.31 | 3 978 | 13.79 |
| Diclofenac sodium 75 mg | 143502BI | 18 249 | 16.36 | 7 065 | 14.59 | 3 806 | 13.20 |
| Loxoprofen sodium 60 mg | 186101AT | 18 589 | 16.67 | 6 831 | 14.11 | 3 288 | 11.40 |
| Aceaminophen 162.5 mg | 480600AT | 9889 | 8.87 | 5 609 | 11.59 | 4 024 | 13.95 |

*Continued*
Sample, Aged Patient Sample and Paediatric Patient Sample. Claims statements cover extensive information on healthcare interventions (e.g., treatment, procedures, diagnostic tests and prescription drugs), diagnosis, National Health Insurance payment cost, beneficiaries’ self-payment cost, sociodemographic characteristics and medical institutions, and thus provide a useful source of nationwide epidemiological data of which the representativeness, reliability and validity have been confirmed.\(^{19}\)

The large variations in diagnostic and therapeutic management of LBP and lumbar disorders among clinicians within and between countries,\(^ {22-26}\) coupled with the significant costs of these conditions, indicate that more systematic and scientifically based approaches are needed.\(^ {27}\) This study assesses medical care and costs of most frequently used treatments in high prevalence lumbar disorders in Korea to provide a basic standard for future usual care guidelines that may reduce health expenditures and help solve National Health Insurance deficits. This study is the first to use HIRA NPS 2011 billing data to examine and compare medical use and costs associated with most frequent lumbar disorders. To date, no studies have reported national usage data on management of most frequent lumbar disorders, and this study holds significance in that it is the first report on prevalence and treatment patterns of most frequent lumbar disorders in Korea on a national level. Such national usage data on general management of most frequent lumbar disorders captures current clinical practice patterns, and surgery rates and diagnosis-related costs provide basic information for economic evaluation and health policy and budget appropriation.

An added strength of this study is that it acts as a window onto patterns of complementary and alternative medicine (CAM) treatment for LBP in Korea, which covers such CAM treatments as acupuncture and moxibustion in National Health Insurance. Of the nLBP group, 26.4% visited Korean medicine clinics for treatment and 2.2% visited Korean medicine hospitals, resulting in an approximate rate of Korean medicine use, including acupuncture, of about 30%. Korean medicine holds various medical specialties (4 years of specialist training following 6 years of undergraduate education), of which acupuncture specialists, who specialise in acupuncture and moxibustion (13.8% of nLBP), and internal Korean Medicine specialists (14.0% of nLBP) were shown to treat LBP most frequently following conventional medicine orthopaedics (41.6% of nLBP). It is also worthy of note that Korean medicine doctors are precluded from diagnosing IDD or SS independently due to regulation restrictions in imaging device use, which may be associated with the fact that Korean medicine use for IDD and SS is much lower compared to that of nLBP.

The results show that the proportion of patients in the 50–59 age range was highest in the nLBP and IDD groups, and prevalence increased with age in the SS group. Prevalence of lumbar disc degeneration has been...
| Visit days per patient† (days) | Reimbursed visit days per patient† (days) | Benefit amount per patient§ (1000 KRW) | Treatment amount per patient¶ (1000 KRW) | Surgery rate (%) |
|-------------------------------|-----------------------------------------------|---------------------------------------------|---------------------------------------------|------------------|
| Non-injection group            | Non-injection group                            | Non-injection group                          | Non-injection group                          | Non-injection group |
| nLBP                          | IDD                                           | SS                                          | nLBP                                        | SS              |
| 95                             | 199                                           | 18 769                                      | 12 10 15                                  | 9.4 12.0        | 131 670.4 216 818.0 278 164.9 177 044 294 237 366 803 888 (0.9%) 1354 (3.9%) 841 (4.5%) |
| Injection group                | Injection group                                | Injection group                             | Injection group                             | Injection group |
| nLBP                          | IDD                                           | SS                                          | nLBP                                        | SS              |
| 6876                          | 9546                                          | 7138                                        | 12 10 15                                  | 15.6 16.5       | 303 823.8 452 656.1 486 879.6 407 083 615 312 648 545 69 (1.0%) 665 (7.0%) 409 (5.7%) |
| Non-injection group            | Non-injection group                            | Non-injection group                          | Non-injection group                          | Non-injection group |
| Gender                        | Male                                          | Female                                      | Male                                        | Female          |
| 40                             | 083                                           | 14 020                                      | 6527                                        | 6.0             | 7.3 7.5 6.7 10.1 15.5 114 337.4 230 789.5 301 476.3 156 465 316 138 400 303 448 (1.1) 727 (5.2) 340 (5.2) |
| Age (years)                   | <20                                           | >20                                        | <20                                        | >20            |
| Male                          | 8933                                          | 788                                         | 44                                          | 3.2             | 5.2 2.6 3.4 6.2 3.3 64 865.7 159 638.6 146 020.9 90 731 219 760 185 001 64 (0.7) 22 (2.8) 2 (4.6) |
| Female                        | 10 527                                        | 2860                                        | 210                                         | 4.0             | 5.6 2.9 4.3 7.1 4.0 87 928.4 181 691.9 85 672.5 125 091 256 533 126 587 72 (0.7) 106 (3.7) 2 (1) |
| Injection group                | Injection group                                | Injection group                             | Injection group                             | Injection group |
| Gender                        | Male                                          | Female                                      | Male                                        | Female          |
| 40                             | 083                                           | 14 020                                      | 6527                                        | 6.0             | 7.3 7.5 6.7 10.1 15.5 114 337.4 230 789.5 301 476.3 156 465 316 138 400 303 448 (1.1) 727 (5.2) 340 (5.2) |
| Age (years)                   | <20                                           | >20                                        | <20                                        | >20            |
| Male                          | 8933                                          | 788                                         | 44                                          | 3.2             | 5.2 2.6 3.4 6.2 3.3 64 865.7 159 638.6 146 020.9 90 731 219 760 185 001 64 (0.7) 22 (2.8) 2 (4.6) |
| Female                        | 10 527                                        | 2860                                        | 210                                         | 4.0             | 5.6 2.9 4.3 7.1 4.0 87 928.4 181 691.9 85 672.5 125 091 256 533 126 587 72 (0.7) 106 (3.7) 2 (1) |

Table 5. Comparison of patient characteristics in the injection and non-injection subgroups*

| *Patients with overlapping records tallied as one patient (overlapping not allowed).
| †The number of reimbursed days includes the number of outpatient visits or hospitalised days and in-care drug prescription days. Outpatient visits or hospitalisation coinciding with drug prescription on the same day was tallied as 1 day.
| ‡The sum of self-payment cost paid by the beneficiary (patient) and benefit reimbursed by the insurer (Korean National Health Insurance Service) to the medical care institution. Total treatment amount of items determined to be eligible for reimbursement by the HIRA out of the treatment amount indicated in the submitted insurance claim statement.
| §The amount of benefit paid by the insurer (Korean National Health Insurance Service) to the medical care institution, excluding self-payment cost paid by the beneficiary (patient), out of total treatment amount (or medication cost) determined to be valid through HIRA review.

HIRA, Health Insurance Review and Assessment Service; IDD, intervertebral disc disorder; LBP, low back pain; nLBP, non-specific low back pain; SS, spinal stenosis.
reported to increase with age in men and women. Our data suggest a greater frequency of all three most common lumbar disorders in women than in men, which is consistent with reports that women present with LBP more often than men. The reason may be partly attributed to gender role differences such as occupation, hours of work and occupational activities, including housework in addition to biological factors.

While clinics were the most frequently visited medical institution type in all three groups, the fact that Korean medicine clinics were next most frequently visited in the nLBP group is a point worthy of interest. Orthopaedics was the most frequently visited medical specialty in all three groups, followed by internal Korean medicine and acupuncture and moxibustion medicine specialties in the nLBP group. The Korean medical system is characterised by a dual, mutually exclusive medical system of conventional and Korean traditional medicine, and these circumstances are reflected in the high proportion of Korean medicine use for common lumbar disorders. These results are also concordant with survey results on the perception and usage of Korean medicine reporting LBP to be the most frequent reason for Korean medicine use (12.9%).

The average treatment amounts per patient in inpatient and outpatient care were highest in the SS group, and long-term care hospitals had highest treatment amounts in all three groups, followed by Korean medicine hospitals and upper level general hospitals in medical institutions. Long-term care hospitals are defined as medical institutions that provide medical services by conventional medicine or Korean medicine doctors for ≥30 patients according to Korean medical law. However, long-term care hospitals are allowed more lenient standards in physician and nurse stationing than other hospitals through additional placement of social welfare workers or physiotherapists. As this study included billing data of patients with diagnoses for most common lumbar disorders in primary and four secondary diagnoses, billing data may have been inclusive of various diseases in elderly, end-term or palliative care patients, leading to higher costs in long-term care hospitals.

With regard to surgery rates, a proportion of 0.90% in the nLBP, 4.59% in the IDD and 4.85% in SS group received surgery, which, though slightly higher as data duplication may have occurred in the extraction process, is similar to Statistics Korea data. According to 2011 national statistics on major surgeries, of 1 702 638 patients who received medical care for M51 (other IDDs), 57 931 (3.40%) underwent surgery, which was the sixth most common reason for surgery, and of 1 087 162 M48 (other spondylopathies) patients, 31 077 (2.86%) received surgery, which was tallied as the 13th most common reason of all surgeries. In the USA, the prevalence of lumbar fusion surgery has shown a 220% increase from 1990 to 2001, and it is estimated that 250 000 laminectomies are conducted each year as of 2002.

The most frequently used injection code in all three groups was epidural nerve block (lumbar and/or caudal), and the most frequently prescribed physiotherapy was deep heat therapy in all three groups. Non-opioid analgesic use was also similar in all three groups, with aceclofenac 100 mg used most commonly, displaying high consistency in treatment procedures, especially considering that these lumbar disorders do not share a common aetiology, severity or prognosis. This high concordance may be due to personal preference or institutional policy, and though there is the added possibility of misclassification of codes or data, as patients pay a fee for service for all healthcare services, such errors should not have occurred.

A recent report on injection treatment in Korea states that 10.8–11.5% of all patients with LBP receive injection treatment, and that this number is steadily growing. Costs of injection treatment in patients with LBP were estimated to be 15.6 billion KRW in 2006, 17 billion in 2007 and 19.1 billion in 2008, which takes up ~3% of the total annual medical expenses for LBP.

A 2007 US study using 5% samples of Centers for Medicare and Medicaid Services outpatient claims data from 1994 to 2001 evaluated trends and medical expenses of lumbosacral injection treatment for patients with LBP. Participants were limited to patients aged 65 or older as the study population was from Medicare, and LBP-related lumbosacral diseases covered degenerative changes, SS, radiculopathy or sciatica, intervertebral disc displacement, osteoarthritis, spondylolisthesis and lumbosacral sprain. Considered injection treatments included epidural steroid injections, facet joint injections, sacral joint injections and current trends in fluoroscopy were also investigated. Results showed that use of epidural steroid injections increased 271% from 553 patients per 100 000 in 1994 to 2055 in 2001, and facet joint injections increased during the same period from 80 to 264. Similar trends were observed in sacral joint injections, for which codes have been used since 2000, which rose steeply from 100 in 2000 to 212 in 2001. Total Medicare costs for lumbosacral injections have increased from US$24 million in 1994 to US$175 million in 2001. In terms of total inflation-adjusted reimbursed costs per injection, costs rose from US$115 in 1994 to US$227 in 2001.

In the comparison between injection treatment recipients and non-recipients, 6876 (6.16%) of 111 544 patients with nLBP, 9546 (19.72%) of 48 413 patients with IDD and 7138 (24.75%) of 28 842 patients with SS received injection treatment. A total 1.0% in the nLBP, 7% in the IDD and 5.7% in the SS injection subgroup received surgery, which is higher in all groups than for the non-injection subgroups. The average expenditure per patient was higher in the injection compared to the non-injection subgroup in all three groups (407 085 KRW in nLBP, 615 312 KRW in IDD and 648 545 KRW in SS). This disparity in medical usage in the injection and non-injection subgroups is probably due to symptom
severity, general health (including comorbidities), accessibility to healthcare and socioeconomic differences, but clinical factors could not be comprehensively analyzed or adjusted for as with other studies retrospectively using claims databases.

This study used nationwide data records relating to common lumbar disorder diagnoses. However, the current disease classification system used at HIRA cannot identify pain specific to the lumbar area, and as most frequent lumbar disorders in up to four secondary diagnoses were selected in addition to the primary diagnosis in the current study, definitions of LBP and lumbar disorders relying solely on claims disease diagnosis have limited accuracy. We attempted to redeem this potential error by hypothesizing that patients with LBP and lumbar disorder would require plain radiography for diagnosis and treatment, and included plain lumbar radiographs as a selection criterion, but the possibility of selection bias remains. Further consideration should be given to accurate selection in future studies using claims databases. Moreover, the accuracy of disease classification has been reported to be higher in inpatients than in outpatients, in severe disorders than in common mild disorders and in general hospital levels than in clinics.34

Though HIRA patient sample data are extracted from extensive raw data in a systematic manner, these secondary data are presented by estimate and therefore the sample size needs to be sufficiently large to establish representativeness and significance. The explanatory power of samples inevitably increases with higher frequency in inpatient populations and common disease classification, and decreases with lower frequency disease classifications. While the present study secures certain representativeness and generality as the subject matter was high prevalence lumbar disorders in Korea, weighted data of samples may still show a relatively high SD or SE.

Another limitation of this study is that disease subcategories with distinct characteristics are presented together under single categories. For example, M511 (lumbar disorders and other IDDs with radiculopathy), which is diagnosed in cases with radiculopathy associated with lumbar IDD, takes up ~49.11% of the IDD group. The IDD group additionally comprises such codes as M513 (other specified intervertebral disc degeneration, multiple sites in the spine; 6.02% of the IDD group) and M519 (IDD, unspecified; 10.72% of the IDD group), and considering that radiculopathy holds significant clinical relevance as a diagnosis point, lumping of different diagnosis codes into groups for analysis may be a matter of concern. Still, in the process of designing the study, physicians in current practice were in concurrence that these codes are not clearly differentiated for diagnosis in actual clinical practice settings in Korea, and analysis was performed in primary and secondary diagnoses in accordance with the opinion that various issues may be taken into account (eg, private insurance, medical care institution characteristics, individual differences in physicians) in category division and that primary and secondary diagnoses are generally used in conjunction.

Other limitations include that these results are crude presentations of current practice as socioeconomic and, as such, clinical factors influencing patterns of practice such as income, education level, residence, height, weight, mortality and health-related risk factors (eg, alcohol consumption, smoking, exercise) could not be analyzed. Also, while fee-for-services for nationally covered healthcare services are comprehensively recorded in the claims database, non-reimbursable items and medicine such as over-the-counter drugs do not generate billing data. The short period additionally limited sample data analysis as determining incidence and disease duration (ie, acute, subacute, chronic stage) data by setting a washout period was not feasible. Future studies may compensate for these limitations through anonymous patient data sharing between medical institutions or governing bodies (eg, hospital medical records with personal information protected, National Health and Nutrition Examination Survey data and National Health Examination data).

CONCLUSIONS

In summary, the results of this study demonstrate distinct differences in patterns of medical care use and costs of most frequent lumbar disorders in national-level patient sample data, and should be considered in establishing guidelines for usual care in health policy and budget appropriation to provide a standard for the appropriate level of management and decision-making in common lumbar disorders in Korea.

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Funding This study was supported by the Korea Institute of Oriental Medicine, K16123.

Competing interests None declared.

Ethics approval The study was approved by the Institutional Review Board (IRB) of Jaseng Hospital of Korean Medicine in Seoul, Korea (IRB approval number: KNJIRB2015-55). Written informed consent was not obtained from participants for their clinical records to be used as this study used national billing data submitted to HIRA. Patient information was anonymised and de-identified by HIRA prior to analysis in this study.

Provenance and peer review Not commissioned; externally peer reviewed.

Data sharing statement 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 the data set request form and declaration of data use that is
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