

BMJ Open Medical service use and usual care of common shoulder disorders in Korea: a cross-sectional study using the Health Insurance Review and Assessment Service National Patient Sample

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ABSTRACT

Objectives This study examined National Health Insurance claims data to investigate the epidemiology of shoulder disorders in Korea. Detailed information on medical services and related costs was assessed by major shoulder disorder category.

Design and setting The 2014 National Patient Sample dataset provided by the Health Insurance Review and Assessment Service was analysed. Among shoulder-related diagnosis codes, adhesive capsulitis of the shoulder (ACS), rotator cuff syndrome (RCS) and shoulder impingement syndrome (SIS) categories were of highest prevalence. Sociodemographic characteristics and medical service use, frequency and medical costs regarding common shoulder disorders were evaluated.

Results The majority of patients with shoulder disorder received ambulatory care (97%). Total and per-patient expenses were highest in patients with RCS. The number of inpatients with RCS was more than twice that of the other two groups, and patients with RCS were more likely to receive surgical management compared with patients with ACS and SIS. Prevalence of shoulder disorders was highest among subjects in their 50s for all three groups. Primary care physicians treated 75.80% of patients with ACS, 56.99% of patients with RCS and 48.06% of patients with SIS, respectively, outlining the difference in medical institution usage patterns. In all three groups, the highest proportion of patients visited orthopaedic surgeons out of medical departments. In the ACS and SIS groups, cost of visits (consultations) took up the largest part of total expenses at 32.30% and 18.88%, respectively, while cost of procedure/surgery constituted the largest portion in patients with RCS (37.77%). The usage proportion of subcutaneous or intramuscular and intra-articular injections ranged between 20% and 30% for outpatients in all three groups.

Conclusions Medical service use, frequency and cost distributions relating to major shoulder disorders in Korea were assessed using nationwide claims data. These findings are expected to aid policy-makers as well as researchers and practitioners as basic healthcare data.

Strengths and limitations of this study

- Approximately 97% of the South Korean population is covered by National Health Insurance Service, and this study effectively uses the claims database to examine and compare medical use and costs of high-frequency shoulder disorders in a nationally representative sample.
- This study employs national healthcare data to provide a detailed and current perspective of prevalence, medical expenditure and usual care in surgery, injections, physiotherapy and medication use of major shoulder lesions and to provide basic usage data relevant for health policy implementation and budget appropriation.
- While data are efficiently collected and managed by the Korean Health Insurance Review and Assessment Service through the claims review process, items not covered by National Health Insurance such as over-the-counter drugs and out-of-pocket expenditures could not be assessed.
- In addition, due to the fact that analysis was performed based on administrative codes of frequent shoulder disorders as opposed to clinical conditions or symptoms, the possibility of mismatched coding cannot be ruled out.
- Still, the authors attempted to enhance internal validity by collecting data from patients with X-ray results.

INTRODUCTION

Shoulder pain is commonly seen in primary healthcare and incurs significant pain and disability, healthcare costs and work loss.¹ The annual prevalence and incidence of patients with shoulder disorder in UK primary care were 2.36% and 1.47%, respectively,² and its annual prevalence in Dutch primary care was estimated to be about 11 per 1000 patients.³ A 2004 systematic review reported point prevalence of 6.9%–26% and lifetime prevalence

of 6.7%–66.7% with higher estimates gauged from older study populations (65+ years).⁴ Meanwhile, 2011 Korean National Health Insurance Service statistics showed that a total 4.3% of the Korean population was diagnosed with shoulder pain (Korean Standard Classification of Diseases (KCD) diagnosis code M75) with an average annual increase of 8.9% over the past 6 years, indicating that the importance of shoulder pain diagnosis and treatment is growing in primary and national healthcare settings.⁵

Shoulder pain is the third most common cause of primary care consultation in musculoskeletal conditions, and approximately 1% of UK adults annually consult a general practitioner for new shoulder pain according to a 1998 population survey of 6000 UK clinic patients.⁶ Annual prevalence estimates of shoulder pain and medical consultations in Australian general practice have also been put at 1%–1.5%.⁷ While chronic shoulder pain is a common manifestation, its pathogenesis is often diverse and complex, incurring substantial medical costs in diagnosis and treatment, and shoulder problems are a significant cause of morbidity and disability in the general population.⁸ In 1995 alone, musculoskeletal disorders accounted for 9.9 million days of sick leaves in the UK of which 4.2 million (42%) were related to the upper limb and neck area,⁹ showing that musculoskeletal complaints place a heavy burden on primary care services in general² and that the economic burden of upper limb disorders is substantial.⁸ Direct medical expenses for shoulder disability reached US\$7 billion in the USA in 2000.¹⁰ Similarly, in Korea, 1 954 642 patients were diagnosed with shoulder disorders (KCD, sixth revision (KCD-6) diagnosis code M75) with an annual health expenditure of approximately US\$39.8 million according to the 2014 National Health Insurance Statistical Yearbook.¹¹

Chronic shoulder pain has been linked with various pathologies ranging from bursitis, tendinitis, rotator cuff tear, adhesive capsulitis, impingement syndrome, avascular necrosis and glenohumeral osteoarthritis (OA) to joint degeneration and injury, which can occur either singularly or in combination. Rotator cuff injury and adhesive capsulitis hold high prevalence of chronic disorders, comprising 10% and 6% of all shoulder-related disorders, respectively.¹⁰ Shoulder impingement syndrome is also common with 5 out of 1000 individuals annually diagnosed as new clinical cases.³ However, disproportionate to the high prevalence and associated costs of adhesive capsulitis, rotator cuff syndrome and shoulder impingement syndrome, comprehensive studies detailing specific components of usual care and related medical expenses have been found lacking.

The Korean healthcare system is implemented under the National Health Insurance programme, which enforces legal obligation and authority as a universal social insurance programme covering approximately 97% of the South Korean population. The National Health Insurance Service (NHIS) operates the healthcare system under government supervision and promotes public health by providing basic healthcare services.¹² This study

aimed to assess the prevalence, associated healthcare use and related costs of common shoulder disorders in Korea through analysis of National Health Insurance claims data provided by the Health Insurance Review and Assessment Service (HIRA), which reviews and assesses all NHIS claims data. This dataset includes nationally representative data of 1.4 million patients, covering approximately 3% of 47 million Koreans covered by National Health Insurance out of the total South Korean population (51 million).

METHODS

Participants

The 2014 National Patient Sample (NPS) dataset analysed in this study was provided by HIRA. Details on specific medical services and prescription history for the past year, as well as the demographic characteristics from a 3% sample randomly extracted after stratification by age (in 5-year intervals) and sex, are provided by HIRA on an annual basis for the aim of enhancing data accessibility and convenience of researchers. This secondary dataset is systematically sampled through stratification after removing identifying personal and institutional information from the raw claims data of all provided medical services compiled from all patients with medical service use for the past year as of the medical care commencement date of the corresponding year. The NPS sample dataset contains information on approximately 1.4 million patients.¹³

Shoulder disorders

Data were collected from all patients who were diagnosed with subcategory codes M75 (collective referral to all subcategory codes under basic KCD-6 code 'M75,' for shoulder disorders) as the primary diagnosis and had shoulder X-ray results taken within the corresponding year. Adhesive capsulitis of the shoulder (ACS; KCD-6 code M750), rotator cuff tear or rupture (RCS; KCD-6 code M751) and shoulder impingement syndrome (SIS; KCD-6 code M754) were included as the major categories of shoulder disorders based on prevalence. A total of 10 336, 9387 and 7135 outpatients and 464, 1432 and 695 inpatients were diagnosed with ACS (total n=10 447), RCS (total n=9689) and SIS (total n=7328), respectively. The total number of patients in each subset may be smaller than the numerical sum of corresponding inpatients and outpatients as some patients received both ambulatory and hospitalised care, and tallies allowed for duplicates. All shoulder-related diagnostic codes and numbers of patients are summarised in online supplementary table S1.

Analysis

Sociodemographic characteristics of patients investigated in this study included age, sex, insurance eligibility, type of medical institution visited for medical service and speciality of consulting physicians. Medical institutions were classified into primary care clinics, hospitals, general

hospitals, tertiary hospitals, long-term care hospitals and public health centres. Hospitals hold ≥ 30 inpatient beds, while general hospitals operate ≥ 300 beds for inpatient care and at least three outpatient departments out of internal medicine, surgery, paediatrics, and obstetrics and gynaecology with corresponding full-time specialists. Tertiary hospitals provide specialised, advanced medical care for serious medical disorders out of general hospitals with ≥ 20 departments designated by order of the Korean Ministry of Health and Welfare with corresponding full-time specialists for each specialty.¹⁴

Medical service costs covering costs for visit (consultation), hospitalisation, medication, injection, anaesthesia, physiotherapy, psychotherapy, procedure/surgery, examination and radiologic evaluation/intervention were calculated from corresponding codes as designated according to Ministry of Health and Welfare notification. Total medical expense was determined as the sum of co-payment paid by the patient and insurance benefit covered by the National Health Insurance, of which the benefit amount is determined through HIRA review. Frequency of medical service use, including surgery, injection, physiotherapy and analgesics, was investigated in inpatients and outpatients separately and totalled for each diagnosis category. The codes for surgery, injection and physiotherapy are given in online supplementary table S2, and detailed information on each code is available online as a guidebook in PDF format from the HIRA website.¹⁵ Only service codes that were verified to be relevant to shoulder disorders were analysed. Physiotherapy and rehabilitation therapy types prescribed to at least 500 cases were assessed for frequency. Drugs prescribed in inpatient or outpatient departments were classified according to Anatomical Therapeutic Chemical (ATC) Classification System fourth-level classifications and were organised in order of usage proportion by non-narcotic and narcotic categories. The non-narcotic and narcotic drug classifications were adopted from analgesics categories in a previous report from the Korean National Evidence-based Healthcare Collaborating Agency.¹⁶ Although most drug substance names are identical with ATC fifth-level classifications, which indicate chemical names, a few exceptions do not have matching classifications. A drug was considered to be prescribed following medication code records, regardless of dose.

Statistical analysis

All statistical analyses were performed using SAS version 9.3 (SAS Institute, Cary, North Carolina, USA). The sociodemographic characteristics and medical services provided to inpatients and outpatients were analysed through frequency analysis for each shoulder disorder category. Descriptive analysis results are presented as frequencies and percentages. Percentages were calculated with total number of patients or total expense in the corresponding disease group set as the denominator. Total expense and per-patient expenses for each disease group were also calculated.

Ethics statement

This study was reviewed and approved by the Institutional Review Board of Jaseng Hospital of Korean Medicine (JASENG 2016-11-002).

RESULTS

Medical service use for ACS, RCS and SIS

While the ACS group contained the highest total number of patients ($n=10\,447$), total expense, per-patient expense, average days of care and average numbers of visits were highest in the RCS group. Outpatient values were highest in the ACS group, followed by RCS and SIS groups in number of patients, total expense, per-patient expense, average days of care and average numbers of visits, while inpatient values were highest in the RCS group, followed by the SIS and ACS groups. Total medical expenditure was 56.84% in inpatients (9.43%) compared with 43.16% in outpatients (90.57%), even though the majority of patients were outpatients (table 1).

Characteristics of ACS, RCS and SIS patients

The prevalence of ACS, RCS and SIS was highest among patients in their 50s, and women were more likely to be affected than men. About 97% of all patients received medical care in the ambulatory department and 96% were National Health Insurance-eligible. The most frequently visited medical institution types were primary care clinics, followed by hospitals and general hospitals. The proportion of visits to primary care clinics in ACS cases was 75.80%, which was higher than in the other diagnosis groups (56.99% in RCS and 48.06% in SIS, respectively). Patients were treated by orthopaedic surgeons in 80%–90% of all cases regardless of shoulder disorder type (table 2).

Distribution of ACS, RCS and SIS-related costs

All medical expenses were assessed according to the type of medical service provided (ie, visit (consultation), hospitalisation, injection, anaesthesia, physiotherapy, psychotherapy, procedure/surgery, examination and radiologic evaluation/intervention). Costs of visit (consultation), anaesthesia and physiotherapy took up a significant portion of ACS costs, whereas costs of procedure/surgery, hospitalisation and visits (consultations) were dominant for patients with RCS, and costs of procedure/surgery, visits (consultations) and hospitalisation for patients with SIS. The sum of costs for procedure/surgery and hospitalisation were 53.17% and 37.24% of total expenses for patients with RCS and SIS, respectively, while the sum was low at 6.46% in patients with ACS. In contrast, the cost of injections was higher accounting for 11.46% of the total expense in patients with ACS, compared with those of 6.94% and 8.60% in patients with RCS and SIS, respectively. More than 10% of all patients were prescribed drugs, but the cost of medication amounted to less than 2% of total medical expense in all three groups. Percentages of physiotherapy cost out of total medical expense were 61.79%, 53.72% and

Table 1 General medical service use for adhesive capsulitis of the shoulder, rotator cuff syndrome and shoulder impingement syndrome in Korea

Visit type	Disorder groups	Patients (n)	Total expense*	Per-patient expense*	Days of treatment†	Visits (n)‡
Total	ACS	10447	1817540220 (1588758.9)	173977.2 (152.1)	6.3	5.7
	RCS	9689	4147531010 (3625464.2)	428066.0 (374.2)	8.4	6.1
	SIS	7328	1621638960 (1417516.6)	221293.5 (193.4)	5.8	4.6
Outpatient	ACS	10336	1415669040 (1237472.9)	136964.9 (119.7)	5.7	5.4
	RCS	9387	1144119540 (1000104.5)	121883.4 (106.5)	5.4	4.7
	SIS	7135	714434250 (624505.5)	100130.9 (87.5)	4.2	3.9
Inpatient	ACS	464	401871180 (351286.0)	866101.7 (757.1)	15.2	6.6
	RCS	1432	3003411470 (2625359.7)	2097354.4 (1833.4)	21.4	10.7
	SIS	695	907204710 (793011.1)	1305330.5 (1141.0)	17.5	8.5

*Displayed in KRW; US\$1=1144 KRW (as of October 31, 2016); approximate US\$ equivalents are given beneath in parentheses.

†Total days of treatment per patient as indicated in the claims statement, which includes drug prescription days without medical treatment.

‡Total number of visits or number of hospitalised days per patient as indicated in the claims statement.

ACS, adhesive capsulitis of the shoulder; RCS, rotator cuff syndrome; SIS, shoulder impingement syndrome.

52.46% in the ACS, RCS and SIS groups, respectively, and more than half of all patients received physiotherapy in each disease category. The cost of radiologic evaluation/intervention totalled to less than 10% of total expense, and the proportion of injection use was higher than that of drug prescription for all the three groups (table 3).

Usual care for ACS, RCS and SIS

The percentage of surgically treated cases was highest in the RCS group and lowest in the ACS group. The most frequently performed surgery for shoulder disorders was acromioplasty. The proportion of subcutaneous or intramuscular and intra-articular injections in outpatients was comparable in all three groups, ranging from 20% to 30%, although the proportion was slightly higher in the ACS group. In order of decreasing frequency, superficial heat therapy, deep heat therapy, transcutaneous electrical nerve stimulation and interferential current therapy were the most commonly used physiotherapy modalities, and overall prescription proportion of physiotherapies was highest in the ACS group, followed by the RCS and SIS groups. Heat therapies including superficial and deep heat therapies were prescribed to about half of all shoulder cases. The proportions of transcutaneous electrical nerve stimulation and interferential current therapy ranged from 20% to 30% in all three groups. Meanwhile, the prescription proportion of laser therapy was less than 10%.

Simple therapeutic exercise was prescribed to 19.04% of patients with ACS, which was more than twice that of the RCS and SIS groups; however, complex therapeutic exercise was prescribed more often in the RCS group (7.05%) than in the ACS (2.90%) or SIS (4.49%) groups. Other physiotherapies were less frequently prescribed, but it is worth noting that the proportion of complex therapeutic exercise was significantly higher in inpatients than in outpatients at 23.06%, 27.58% and 29.78% in the ACS, RCS and SIS groups, respectively. Myofascial trigger point injection therapy was seldom used in both inpatients and outpatients (table 4).

Medication use in ACS, RCS and SIS

The drugs prescribed in shoulder disorders were classified according to the ATC fourth level. The absolute majority of drug prescriptions were non-narcotic (n=35021/36638; 95.38%), and narcotic analgesics, when used, were mainly prescribed in hospital settings (n=1505/1617; 93.07%). Among non-narcotic drugs, acetic acid derivatives and related substances, other opioids, propionic acid derivatives, other anti-inflammatory and anti-rheumatic agents (non-steroids), oxicams and anilide groups were frequently prescribed (listed in order of frequency). Tramadol was the only drug prescribed from the other opioids group. Of narcotic drugs, opioid anaesthetics, phenylpiperidine derivatives and natural opium alkaloids were commonly prescribed (listed in order of frequency) (table 5).

Table 2 Sociodemographic characteristics of adhesive capsulitis of patients with shoulder, rotator cuff syndrome and shoulder impingement syndrome

Characteristics	ACS		RCS		SIS		Total sample population	
	n=10447	%	n=9689	%	n=7328	%	n=1438178	%
Age (years)								
<20	21	0.20	80	0.83	70	0.96	313646	21.81
20~29	91	0.87	263	2.71	278	3.79	180111	12.52
30~39	337	3.23	679	7.01	662	9.03	217735	15.14
40~49	1838	17.59	1925	19.87	1731	23.62	242157	16.84
50~59	3761	36.00	3186	32.88	2508	34.22	228492	15.89
60~69	2465	23.60	2160	22.29	1304	17.79	131499	9.14
≥70	1934	18.51	1396	14.41	775	10.58	124538	8.66
Sex								
Male	4178	39.99	4348	44.88	3471	47.37	699035	48.61
Female	6269	60.01	5341	55.12	3857	52.63	739143	51.39
Visit type								
Inpatient	464	4.44	1432	14.78	695	9.48	193184	13.43
Outpatient	10336	98.94	9387	96.88	7135	97.37	1433858	99.70
Insurance type								
National Health Insurance	9984	95.57	9336	96.36	7092	96.78	1398282	97.23
Medicaid	470	4.50	356	3.67	235	3.21	44652	3.11
Veteran healthcare	9	0.09	32	0.33	18	0.25	3260	0.23
Medical institution								
Clinic	7919	75.80	5522	56.99	3522	48.06	1316958	91.57
Hospital	2243	21.47	2786	28.75	3020	41.21	406611	28.27
General hospital	741	7.09	1473	15.20	945	12.90	375571	26.11
Tertiary hospital	138	1.32	648	6.69	157	2.14	207937	14.46
Long-term care hospital	87	0.83	31	0.32	21	0.29	27437	1.91
Public health centre	41	0.39	18	0.19	4	0.05	81007	5.63
Medical specialty								
Orthopaedic surgery	8762	83.87	8670	89.48	6737	91.94	584569	40.65
Anaesthesiology	750	7.18	560	5.78	334	4.56	58270	4.05
Neurosurgery	490	4.69	261	2.69	142	1.94	107990	7.51
Rehabilitation medicine	483	4.62	374	3.86	181	2.47	33104	2.30
General surgery	352	3.37	100	1.03	65	0.89	222058	15.44
Internal medicine	240	2.30	81	0.84	42	0.57	966320	67.19
Family medicine	192	1.84	73	0.75	53	0.72	152569	10.61
Other*	95	0.91	24	0.25	13	0.18	875225	60.86
General physician	33	0.32	9	0.09	1	0.01	82475	5.73

*Includes neurology, radiology, emergency medicine, occupational and environmental medicine, neuropsychiatry, paediatrics, thoracic and cardiovascular surgery, obstetrics and gynaecology, and urology.

ACS, adhesive capsulitis of the shoulder; RCS, rotator cuff syndrome; SIS, shoulder impingement syndrome.

Prescription details in accordance with fifth-level ACT codes are summarised in online supplementary table S3.

DISCUSSION

The prevalence and medical service use of high-prevalence shoulder disorders in Korea were investigated

based on 2014 HIRA-NPS data, and treatment types and related costs were further analysed. In all three groups, the outpatient proportion was higher. Shoulder disorders were most prevalent in middle-aged populations. ACS cases were more often treated in primary care settings than RCS and SIS, but a high percentage of

Table 3 Distribution of medical expenses in adhesive capsulitis of the shoulder, rotator cuff syndrome and shoulder impingement syndrome

Classification	ACS				RCS				SIS				Cost per case*
	n	%	Total cost*	%	n	%	Total cost*	%	n	%	Total cost*	%	
Procedure/surgery	675	6.46	136465846 (119288.3)	7.47	1413	14.58	1564836881 (1367864.4)	37.77	682	9.31	377063209 (329600.7)	23.22	552879 (483.3)
Hospitalisation	455	4.36	114823033 (100369.8)	6.29	1430	14.76	638096201 (557776.4)	15.40	693	9.46	227699184 (199037.7)	14.02	328570 (287.2)
Visit (consultation)	10440	99.93	589812205 (515570.1)	32.30	9675	99.86	478580607 (418339.7)	11.55	7323	99.93	306608403 (268014.3)	18.88	41869 (36.6)
Anaesthesia	3403	32.57	255121953 (223008.7)	13.97	3285	33.90	377973595 (330396.5)	9.12	1885	25.72	156638479 (136921.7)	9.65	83097 (72.6)
Injection	7282	69.70	209291146 (182946.8)	11.46	5794	59.80	287469148 (251284.2)	6.94	4159	56.75	139571789 (122003.3)	8.60	33559 (29.3)
Examination	1287	12.32	67690217 (59169.8)	3.71	2112	21.80	254326395 (222313.3)	6.14	1210	16.51	112296357 (98161.2)	6.92	92807 (81.1)
Radiographic evaluation/intervention	9051	86.64	184672970 (161427.4)	10.11	8745	90.26	233913993 (204470.3)	5.65	6632	90.50	150304187 (131384.8)	9.26	22663 (19.8)
Physiotherapy	6455	61.79	248881906 (217554.1)	13.63	5205	53.72	230160138 (201188.9)	5.56	3844	52.46	124154140 (108526.3)	7.65	32298 (28.2)
Medication	1123	10.75	19056208 (16657.5)	1.04	1805	18.63	77297308 (67567.6)	1.87	931	12.70	29484743 (25773.4)	1.82	31670 (27.7)
Psychotherapy	-	-	-	-	7	0.07	158388 (138.5)	0.00	-	-	-	-	-

*Displayed in KRW; US\$1=1144 KRW (as of October 31st, 2016); approximate US\$ equivalents are given beneath in parentheses. ACS, adhesive capsulitis of the shoulder; RCS, rotator cuff syndrome; SIS, shoulder impingement syndrome.

Table 4 Usual care of adhesive capsulitis of the shoulder, rotator cuff syndrome and shoulder impingement syndrome, excluding medication

Subtype	Total						Inpatient						Outpatient					
	ACS		RCS		SIS		ACS		RCS		SIS		ACS		RCS		SIS	
	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%	n	%
Surgery	20	0.19	849	8.76	101	1.38	20	4.31	848	59.22	101	14.53	-	-	1	0.01	-	-
Acromioplasty and repair of ruptured shoulder rotator cuff																		
Acromioplasty	94	0.90	172	1.78	283	3.86	94	20.26	171	11.94	283	40.72	-	-	1	0.01	-	-
Replacement arthroplasty–Total arthroplasty	1	0.01	18	0.19	0	0.00	1	0.22	18	1.26	0	0.00	-	-	-	-	-	-
Injection	3608	34.54	3135	32.36	2014	27.48	271	58.41	1037	72.42	463	66.62	3398	32.88	2256	24.03	1623	22.75
Subcutaneous or intramuscular injection																		
Intra-articular injection	3103	29.70	1790	18.47	1630	22.24	141	30.39	143	9.99	115	16.55	3017	29.19	1677	17.87	1551	21.74
Physiotherapy	6610	63.27	5147	53.12	3698	50.46	319	68.75	657	45.88	372	53.53	6396	61.88	4696	50.03	3428	48.04
Deep heat therapy	5564	53.26	4222	43.58	3208	43.78	174	37.50	377	26.33	243	34.96	5461	52.83	4008	42.70	3057	42.85
Interferential current therapy	3286	31.45	2450	25.29	1924	26.26	149	32.11	249	17.39	166	23.88	3188	30.84	2305	24.56	1807	25.33
Transcutaneous electrical nerve stimulation	2962	28.35	2172	22.42	1484	20.25	84	18.10	289	20.18	137	19.71	2906	28.12	1994	21.24	1388	19.45
Simple therapeutic exercise*	1989	19.04	855	8.82	642	8.76	94	20.26	145	10.13	156	22.45	1920	18.58	773	8.23	523	7.33
Laser therapy*	786	7.52	841	8.68	557	7.60	33	7.11	169	11.80	100	14.39	763	7.38	719	7.66	479	6.71
Complex therapeutic exercise*	303	2.90	683	7.05	329	4.49	107	23.06	395	27.58	207	29.78	243	2.35	476	5.07	179	2.51
Myofascial trigger point injection therapy†	285	2.73	264	2.72	215	2.93	10	2.16	21	1.47	21	3.02	276	2.67	245	2.61	196	2.75
Therapeutic exercise, isokinetic*	3	0.03	8	0.08	1	0.01	1	0.22	4	0.28	1	0.14	3	0.03	7	0.07	1	0.01

*Simple rehabilitation treatments, which can be prescribed by rehabilitation medicine, orthopaedic surgery, neurosurgery, neurology, general surgery, cardiovascular surgery and anaesthesiology specialists.

†Complex rehabilitation treatment, which can only be prescribed by rehabilitation medicine specialists.

ACS, adhesive capsulitis of the shoulder; RCS, rotator cuff syndrome; SIS, shoulder impingement syndrome.

Table 5 Medication prescribed for adhesive capsulitis of the shoulder, rotator cuff syndrome and shoulder impingement syndrome as assessed at the fourth ATC level

ATC code	Total																		
	Inpatient						Outpatient												
	ACS	RCS	SIS	ACS	RCS	SIS	ACS	RCS	SIS	ACS	RCS	SIS							
	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)	n	(%)					
Non-narcotics																			
Acetic acid derivatives and related substances	M01AB	4515	43.22	4053	41.83	2751	37.54	299	64.44	1027	71.72	465	66.91	4353	42.11	3481	37.08	2602	36.47
Other opioids*	N02AX	2881	27.58	2273	23.46	1585	21.63	145	31.25	637	44.48	262	37.70	2768	26.78	1820	19.39	1434	20.10
Propionic acid derivatives	M01AE	2336	22.36	1800	18.58	1316	17.96	62	13.36	235	16.41	149	21.44	2294	22.19	1646	17.53	1218	17.07
Other anti-inflammatory and antirheumatic agents, non-steroids	M01AX	1708	16.35	1291	13.32	961	13.11	63	13.58	204	14.25	87	12.52	1665	16.11	1143	12.18	907	12.71
Oxicams	M01AC	1032	9.88	980	10.11	676	9.22	73	15.73	181	12.64	78	11.22	978	9.46	871	9.28	634	8.89
Anilides	N02BE	780	7.47	893	9.22	428	5.84	50	10.78	297	20.74	92	13.24	738	7.14	624	6.65	348	4.88
Other general anaesthetics	N01AX	104	1.00	607	6.26	221	3.02	99	21.34	607	42.39	220	31.65	5	0.05	-	-	1	0.01
Other centrally acting agents	M03BX	369	3.53	273	2.82	209	2.85	4	0.86	15	1.05	12	1.73	367	3.55	259	2.76	197	2.76
Cyclo-oxygenase-2 inhibitors	M01AH	172	1.65	464	4.79	168	2.29	7	1.51	110	7.68	8	1.15	168	1.63	401	4.27	164	2.30
Fenamates	M01AG	30	0.29	25	0.26	9	0.12	1	0.22	8	0.56	3	0.43	29	0.28	17	0.18	7	0.10
Morphinan derivatives	N02AF	2	0.02	18	0.19	14	0.19	1	0.22	18	1.26	14	2.01	1	0.01	-	-	-	-
Barbiturates, plain	N01AF	-	-	30	0.31	1	0.01	-	-	30	2.09	1	0.14	-	-	-	-	-	-
Other nervous system drugs	N07XX	4	0.04	9	0.09	8	0.11	3	0.65	9	0.63	3	0.43	1	0.01	-	-	5	0.07
Glucocorticoids	H02AB	5	0.05	5	0.05	4	0.05	1	0.22	-	-	1	0.14	4	0.04	5	0.05	3	0.04
Salicylic acid and derivatives	N02BA	2	0.02	7	0.07	2	0.03	-	-	4	0.28	2	0.29	2	0.02	3	0.03	-	-
Narcotics																			
Opioid anaesthetics	N01AH	72	0.69	614	6.34	147	2.01	72	15.52	612	42.74	147	21.15	-	-	2	0.02	-	-
Phenylpiperidine derivatives	N02AB	43	0.41	299	3.09	67	0.91	37	7.97	299	20.88	67	9.64	7	0.07	-	-	-	-
Natural opium alkaloids	N02AA	66	0.63	231	2.38	63	0.86	34	7.33	191	13.34	37	5.32	35	0.34	57	0.61	29	0.41
Opium alkaloids and derivatives	R05DA	2	0.02	8	0.08	5	0.07	-	-	5	0.35	4	0.58	2	0.02	7	0.07	1	0.01

*Although labelled 'other opioids', fourth ATC level other opioids include both narcotics and non-narcotics. No drugs other than tramadol were prescribed. ACS, adhesive capsulitis of the shoulder; ATC, anatomical therapeutic chemical; RCS, rotator cuff syndrome; SIS, shoulder impingement syndrome.

patients sought medical care from orthopaedic surgeons in all three groups, displaying marked specialty preference. The cost for visits (consultations) was largest in total medical expenses for the ACS and SIS groups, while cost for procedure/surgery was the predominant factor for patients with RCS. In all three groups, injection usage proportions were higher than those for drug prescription with a slightly higher injection percentage in patients with ACS. In physiotherapies, superficial heat therapy, deep heat therapy, transcutaneous electrical nerve stimulation and interferential current therapy were commonly used. Acetic acid derivatives and related substances were the most frequently prescribed non-narcotic analgesics out of fourth ATC levels, and opioid anaesthetics were the most frequently prescribed narcotics.

In a previous study on prevalence of shoulder disorders,⁴ supraspinatus tendinitis was the most common shoulder joint condition found in adults aged ≥ 40 years, and prevalence of rotator cuff tear without trauma and adhesive capsulitis increased steeply with age, which is consistent with current study findings. Also, a number of studies have reported gender difference in prevalence of shoulder disorders,^{2 4 17} and suggested explanations include hypotheses that women are more exposed to musculoskeletal risk factors in the form of various biological, sociological and psychological factors (eg, repetitive housework, lower accessibility to medical services and variance in sensory pain).^{6 18-20}

Medical expenses were higher in inpatients than in outpatients for all three shoulder disorders, which is suggestive of sizeable economic burden from surgery. Total per-patient medical expenses were particularly high in the RCS group at twice the amount of the other two groups and may partially be explained by the high number of inpatients and surgically treated cases in this group. In light of these findings, medical policies pertaining to RCS should focus on hospitalisation in order to effectively address its socioeconomic cost.

Steady increase in surgical interventions for rotator cuff injury has been reported in the USA,²¹⁻²³ UK,²⁴ Denmark²⁵ and Finland²⁶ in recent decades but has also been implicated with escalating medical expenditure.^{27 28} A 2008 Cochrane review failed to find conclusive evidence supporting surgical approaches for rotator cuff injuries, citing three independent trials reporting that therapeutic benefit of intensive rehabilitation programs were comparable to arthroscopic or subacromial decompression surgeries.²⁹ In light of these results, coupled with the significant costs of surgery, surgical interventions should be considered when definite indications are clearly present.³⁰

Notably, usage proportions of injection exceeded those of drug prescription in all three groups. Glenohumeral corticosteroid injection without guide imaging was previously shown to be more effective than oral non-steroidal anti-inflammatory drugs, and injections have been advocated over oral medicine with corticosteroids

recommended for management of adhesive capsulitis on the grounds of fewer complications and adverse effects.³¹

X-rays are regularly performed for diagnosis of most musculoskeletal conditions in Korea, including those of the shoulder joint. Shoulder radiographic findings are of particular use in OA, calcification (with sudden increase of pain), subacromial spurs (in clinically significant impingement), humeral head elevation and narrowing of the subacromial space.³²

This study results show that heat and electrical therapies were the most popular physiotherapies for shoulder disorders in Korea. Previous studies report that the evidence for the effect of electrical therapies in treatment of such disorders as subacromial impingement syndrome or rotator cuff tendinitis is unclear when compared with placebo.^{33 34} Although the treatment failed to accelerate recovery, it is assumed that it continues to be widely used in clinical settings because of its temporary pain-relieving effects and low adverse event occurrence. These findings are comparable and compatible with National Health Insurance claims data low back pain (LBP) analysis results where heat and electrical therapies were consistently used at similar frequencies and distribution regardless of LBP type.³⁵ It can be inferred that heat and electrical therapies are widely used as usual care of various musculoskeletal diseases relating to shoulder pain and LBP in Korea despite lack of supporting evidence. Simple therapeutic exercise tended to be prescribed more often in patients with ACS (19.04%) than in patients with RCS (8.82%) or patients with SIS (8.76%). Griggs *et al*³⁶ reported in a prospective study of four shoulder stretching exercise regimens in 75 patients with phase II shoulder impingement that exercise led to improved pain, range of motion (ROM) and functionality as measured by Disabilities of the Arm, Shoulder, and Hand in 90% of cases. Dierks *et al* also proposed gentle exercises that do not cause or exacerbate pain improve shoulder ROM.³⁷

In Korea, certain types of physiotherapy and exercise therapy can only be prescribed by rehabilitation medicine specialists. For example, laser therapy and therapeutic exercise are classified as simple rehabilitation therapy, while myofascial trigger point injection therapy is considered complex rehabilitation therapy as it is perceived to require more specific medical attention. The low prescription proportion of myofascial trigger point injection therapy, laser therapy and therapeutic exercise may be partially explained by the fact that prescription is exclusively available to select specialists.

Ninety-seven per cent of all Koreans are enrolled in National Health Insurance, and claims data are widely accepted to be representative of the Korean population at a national level. The NPS dataset, managed and maintained by HIRA, contains detailed information on diagnosis, medical history, insurance payment and patient demographics. The current study employed HIRA-NPS data to investigate current medical usage, usual care and related expenditure in management of major shoulder disorders in Korea. As the HIRA-NPS data were extracted

as a 3% sample of total claims data, number of patients and cost estimations for the total population may be gauged through multiplication by the weight value of 33.3. The present findings on medical care and costs for high prevalence shoulder conditions may be of use to physicians in building a basic structured foundation for standardised care.

The data analysed in the current study were based on nationwide medical institution diagnosis codes classified by Statistics Korea, which may lack precision in exclusively selecting shoulder symptom patients. In an attempt to overcome such limitations, only data for main diagnosis of shoulder disorders were collected, excluding subdiagnosis of shoulder lesions. However, such arbitrary exclusion of subdiagnosis groups may diminish overall representativeness of findings. Also, due to the fact that analysis was performed using administrative codes, and not actual clinical conditions or symptoms, the possibility of mismatched coding cannot be ruled out. Although clear diagnostic criteria exist in primary care for shoulder pain, SIS, supraspinatus tendonitis, biceps tendonitis and ACS,³⁸ difference arising from such factors as individual preference, working policies, proficiency and errors must be taken into account in data conformity. Park *et al* purported that diagnosis processes tended to be more accurate in hospitalised or severe patients than in ambulatory or mild cases and in tertiary hospitals compared with primary care clinics.³⁹ As the main objective of this study was to assess the current status of medical service use and usual care in patients with a main complaint of shoulder disorders, the inclusion criteria were initially set as patients with a primary diagnostic code for shoulder disorders of KCD codes. However, there was expert opinion that KCD codes are primarily an administrative coding system and that primary and secondary diagnosis KCD codes may not be clearly differentiated under current Korean healthcare conditions. Shoulder region X-ray results were included as inclusion criteria to improve precision in patient identification as X-rays are routinely conducted in clinical practice in Korea to heighten accuracy in shoulder pathology diagnosis and treatment. This selection method is in line with the inclusion of lumbar X-rays in defining patients with chronic LBP in a report using the same data source as the current study, issued by the National Evidence-based Healthcare Collaborating Agency, a government-run research entity.¹⁶ However, although the aim was to improve precision in identification of main diagnosis of shoulder disorders by including shoulder region X-rays, this also leads to exclusion of patients with shoulder disorder without X-ray results, which may be considered an additional limitation of this study.

Intrinsic limitations regarding current data exist in that information on individual patient income, educational levels, residential areas, serological findings, smoking status and drinking habits are lacking, which limits further investigation for causal relationships. Also, details on medical services including surgery, injection,

physiotherapy, medication and other data that were clearly non-associated with shoulder disorders were discarded in the process of data identification and selection. However, whether the medical services included for analysis were exclusively provided for shoulder disorders could not be verified.

Finally, the HIRA-NPS dataset only includes data on items covered by National Health Insurance, and medical treatments or medications that are not covered by national insurance and drugs or supplements that are sold over-the-counter could therefore not be included in the present analysis, limiting appreciation of the full spectrum of usual care for shoulder disorder management in Korea.

The study results may be considered to hold significance largely in the following aspects: analysis of prevalence, patient characteristics, medical expenditure and specific medical service use of high-frequency shoulder disorders in Korea from nationally representative data sources may be used in establishing healthcare policies, appropriating budgets for shoulder disorders and providing general guidelines for high-frequency treatments (usual care) and related medical expenses of high-prevalence shoulder disorders—including medication use—to practitioners. Also, from a research standpoint, these findings act as a basic guide in clinical study design as pragmatic studies on shoulder disorders often set standard care or usual care as the control. The results further offer a window into current usual care for shoulder disorders in clinical settings from a healthcare data source representative of Korea, allowing comparisons to be drawn and thus holding international implications for clinicians, researchers and healthcare policy makers.

CONCLUSION

The prevalence, medical service use and usual care employed for shoulder disorder management in Korea were investigated through analysis of National Health Insurance claims data, as extracted and provided by HIRA. As observational studies on healthcare use in patients with shoulder disorder at a national level have not been conducted, the current report on cost distribution of common medical services may be used as basic data in policy-making processes. In addition, the detailed frequency analysis data of individual medical service use may prove useful for practitioners and researchers engaging in real-world practice and related studies.

Contributors HJ, J-SS, JL, YP, YKS and J-HC conceptualised the study. YJL, M-rK, WK and I-HH acquired and analysed the data. HJ, YJL, M-rK, WK and I-HH drafted the manuscript. YJL, J-SS, JL, YP, YKS and J-HC critically revised the manuscript. YJL made valuable suggestions in the revision process. All authors gave approval of the final submitted version.

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Competing interests None declared.

Patient consent Written informed consent was not obtained from participants as the current sample dataset was extracted from Korean National Health Insurance claims data and made publicly available for research purposes by the Health Insurance Review and Assessment Service (HIRA). All data were removed of identifying personal information by HIRA prior to analysis in this study and therefore remained anonymous.

Ethics approval The present study was reviewed and approved by the Institutional Review Board of Jaseng Hospital of Korean Medicine (JASENG 201611002). Written informed consent was not obtained from participants as the current sample dataset was extracted from Korean National Health Insurance claims data and made publicly available for research purposes by the Health Insurance Review and Assessment Service (HIRA). All data were removed of identifying personal information by HIRA prior to analysis in this study and therefore remained anonymous.

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Data sharing statement HIRA data are third-party data not owned by the authors. Raw data are made available from the Health Insurance Review and Assessment Service (HIRA) in Korea through visit or mail upon direct, email or fax submission of the dataset request form and declaration of data use (<http://opendata.hira.or.kr/home.do>) and payment of the transfer of data request fee (300 000 KRW per dataset).

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