Characteristics of Osteoporosis Prevalence and Management in Different Outpatient Departments of a University Affiliated Hospital in South Korea

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Abstract

Introduction:

This study have shown reported that the ratio of osteoporosis tests, test medications medication and the prevalence of osteoporosis in each clinical department departments. This study aimed to investigate the characteristics of prescription of osteoporosis prescriptions in each outpatient out-patient department departments at a University university affiliated-affiliated hospital in South Korea..

Methods:

Data were derived from the University affiliated hospital which have 600 beds and 30 different clinical departments. The participants included 700 adults patients aged 22 years or older who were prescribed prescribe by dual-energy X-ray absorptiometry (DEXA) DEXA. The Data on clinics which ordered the DEXA and prescribed the osteoporosis medications medication prescribed were analyzed. The An analysis of the prevalence of osteoporosis examinations and medications at the hospital and the medication characteristics of medication in each department clinics were was performed.

Results:

Approximately About 63% of clinicians ordered DEXA for the bone quality evaluation in at outpatient out-patient s departments. The orthopedic surgery department most commonly ordered DEXA s Orthopedic surgery was the 1st clinical department which orders DEXA. The neurosurgery department most commonly prescribed osteoporosis medications among the DEXA performing patients The neurosurgery is the 1st ranked clinic which prescribed osteoporosis medication. Gynecologists Gynecologist prescribed the is the clinic for the most versatile diverse osteoporosis medications medication. The most common medications medication used were was vitamins and calcium. The Bisphosphonate bisphosphonate was the 2nd second most commonly medicine which was prescribed medication to outpatients at out-patient department.

Conclusion :

The prevalence of osteoporosis examinations and prescriptions was high in our the university affiliated-affiliated University affiliated hospital hospital in South Korea. However, e Each department clinics had has different characteristics in medication characteristics. Calcium, and vitamin Vit D, and bisphosphonates bisphosphonate are is still frequently prescribed medication in South Korea.

Introduction

Due to the aging population, osteoporosis is becoming a growing issue worldwide. Thus, more attention has been given to the diagnosis, prevention, and treatment of osteoporosis. Osteoporosis affects the quality of life of patients and affects mortality. It is currently diagnosed and treated in all clinical departments and orthopedic areas dealing with fractures. The management of osteoporosis differs depending on the department. For example, orthopedic departments primarily prescribe osteoporosis drugs for post-fracture treatment, while internal medicine departments generally focus on early diagnosis and preventive treatment. In addition, there are many types of osteoporosis drugs and guidelines for treating osteoporosis^[1-4]. In addition, the medical society developing the treatment guidelines differs depending on the field of focus. Thus, guidelines can vary in their recommendations from calcium alone to the latest monoclonal antibody^[5]. Clinicians' preferences and patient compliance may vary depending on the treatment policy^[6, 7]. Here, we aim to present the current situation of osteoporosis treatment in a university affiliated hospital in South Korea by comparing the types of drugs prescribed in different outpatient clinics.

Methods

Study population

This study was conducted after receiving approval from the Hallym University Gangnam Sacred Heart Hospital Institutional Review Board (HKS 2021-06-019). The methodology was carried out in accordance with relevant guidelines and regulations. The informed consent was obtained from all patients. We retrospectively analyzed medical charts. The study was conducted at Gangnam Sacred Heart Hospital, an affiliated hospital of Hallym University in Seoul, which is a secondary hospital consisting of 655 beds, 30 clinical departments, and ten specialized centers. The patients were tested for bone mineral density (BMD). First, the analysis of prescription rankings in different clinics and bone density results were analyzed. Patients who visited an outpatient clinic between April 2020 and November 2020 were included. A bone density test called dual-energy X-ray absorptiometry (DEXA) was ordered for these patients. To compare the differences in each clinic, the bone density test (DEXA) and prescribed drugs for osteoporosis were analyzed. From these patients, 100 were selected that were seen between February 2018 and March 2021. Nevertheless, because each clinic has a different frequency of BMD prescriptions, the duration of outpatient analysis varied. In other words, some bias can remain when comparing the top-ranked (orthopedics) and lowest-ranked clinics (general surgery), which included patients between April 2020 to November 2020 and February 2018 to March 2021, respectively.

Bone mineral density measurements

The age, sex, diagnosis, presence of osteoporosis, T-score of the spine, T-score of the femur, the lowest T-score among the L1 to L4 spine, the lowest T-score among the femur, neck, trochanter, total, and the presence of discordance of T-score, and the medications prescribed were analyzed. Discordance was categorized by no discordance or concordance, minor discordance, and major discordance. Concordance indicates that there is no difference between the spine and femur. Minor discordance indicates normal versus osteopenia or osteopenia versus osteoporosis. Major discordance was defined as normal versus osteoporosis.

Osteoporosis treatment regimen

The osteoporosis drugs prescribed were compared by departments. All osteoporosis medications prescribed to outpatients, including oral and injectable agents, were analyzed. The drugs were divided into six groups according to the mechanism of the drug. All drug prescriptions included only patients who had DEXA ordered. Patients were excluded if their DEXA was ordered in one department and another prescribed their osteoporosis drugs. These criteria were set to assess the early diagnostic susceptibility and treatment behavior of patients with osteoporosis.

Results

1). Analysis of osteoporosis medication prescriptions by departments

From April 2020 to November 2020, the number of BMD measurements using DEXA was analyzed in each clinical department. In total, 1021 DEXAs were ordered in 19 different clinical departments. Gangnam Sacred Heart Hospital is divided into 30 different clinical departments. Therefore, 63.3% of all departments have ordered DEXA (13 surgical and six medical departments). The prevalence of osteoporosis was highest in neurosurgery (38%), followed by endocrinology (36%). The prevalence of osteoporosis was the lowest in gynecology (12%). Endocrinology had the highest number of osteoporosis medication prescriptions of the medical departments, while orthopedic surgery was the most common surgical department. In the medical departments, 36.9% were prescribed in endocrinology, and in the surgical departments, 78.9% were prescribed in orthopedic surgery. The total number of prescriptions was the highest in orthopedic surgery with 618 cases (60.5%), followed by endocrinology (88 cases), neurosurgery (86 cases), and family medicine (77 cases). Prescriptions were also prescribed in urology, plastic surgery, pediatrics, and pulmonology (Table 1).

Table 1
The number of DEXA in different clinics

Department of Clinics	Number of orders of DEXA
Orthopaedic Surgery	618
Endocrinology	88
Neurosurgery	86
Family Medicine	77
Obstetrics and Gynecology	51
Rheumatology	26
General surgery	26
Nephrology	13
Cardiology	8
Department of Infectious Disease	7
Anesthesiology	5
Neurology	4
Gastroenterology	3
Hematology and Oncology	3
Emergency Medicine	2
Urology	1
Plastic Surgery	1
Pediatrics	1
Pulmonology	1
Total: 19	1021

2) Osteoporosis drug analysis

Almost all of the different medications available have been prescribed at our hospital. Romososumab was excluded as prescriptions of this drug commenced just prior to the start of this study (July 2021). Fifty-three different types of drugs were prescribed. Six of these drugs, such as calcium carbonate (11.3%), are over-the-counter medications that can be obtained without a prescription. From recent to 2015, 20 different types of drugs (37.7% out of whole drugs) were launched to our hospital, 14 drugs from 2010 to 2015, and 19 drugs before 2010. Female hormone formulations have been used for a relatively long time, while RANKL inhibitors are relatively novel. The osteoporosis drugs approved by the Korean Food and Drug Administration include bisphosphonate, RANKL inhibitor, parathyroid hormone, tibolone/TESC/SERM, HRT (estrogen and progesterone), calcium and vitamin D, and sclerostin inhibitor (Romososumab). All osteoporosis drugs were divided into six groups, except for the most recently approved sclerostin inhibitor (Romososumab; Table 2). Group 6 (calcium and vitamin D) had 17 different codes, which accounted for 32% of all osteoporosis drugs, and group 1 (bisphosphonate) had 15 different codes (28.3%). Osteoporosis drugs were distinguished by oral and injectable drugs, with 39 types of oral drugs (73.6%) and 14 types of injectables. Oral agents were mostly female hormones (group 5), and injectables had the most bisphosphonate

(group 1). The drugs can be divided into single-agent and two or more mixed complexes. There were 12 types of mixed complexes (22.6%), such as bisphosphonate + vitamin D, calcium + vitamin D, and raloxifene + vitamin D.

Table 2
Groups of osteoporosis medication

Number	Group	Series	Code	121	5	Estrogen	ESTCJ062
11	1	Bisphosphonate +	RIS35D3	122			ESTCJ031
12		vitamin D	AL70D3D	123			ESTD1
13			AL70D3	124			ESTD2
14			RIS150D3	131		Estrogen + Progestogen	CLIM28
15			IDRO150D	132			ANGELIC
21		Bisphosphonate	RISED5	133			CLIAN
22		(oral)	RISED351	141		Progestogen	MPGA10
23			RISED150	142			MPGA51
24			ALEND701	143			PGN
25			AL70ET	61	6	vitamin D	VDHD32
26			IDRO150	62		(active)	IVDHD31
31		Bisphosphonate	IIDRO3S1	71		calcium	CACO31
32		(injection)	IPAMID	72		(single)	ICAG
33			IZDRO2	81		calcium +	VD10CA1
34			IZDRO5	82		vitamin D	VD10CA2
41	2	RANKL	IDENOS120	83			VD4CA5
42		inhibitor	IDENOSU	91		vitamin D	VD3T
51	3	Parathyroid	ITERI56	92		(oral)	VDHD2
52		hormone	ITERI1	93			VD300
53			ITERI	94			VD70
111	4	Tibolone/	BZDOX	95			VD10ZS
112		TSEC/	RALOXD	96			VD10DS
113		SERM	RALOX	97			VD250S
114			ESTBZ	101		vitamin D	IVD100K
115			BZDOXD	102		(injection)	IVD3
116			TIBO	103			IVD300K

3). Top-ranked outpatient osteoporosis examinations and prescription analyses

1 Orthopedic surgery

A total of 100 DEXA tests were ordered from October 15, 2020, to March 16, 2021. An average of 0.7 DEXA tests were ordered per day. The average age of the outpatients was 63 years (range: 22-91 years). There were 62 females and 38 males. Eight patients were seen for a fracture, while the rest had a medical condition such as arthritis. DEXA tests showed osteoporosis in 17 patients (17%) with a score of -2.5 or less. The average T-score of the spine was -0.95 (-4.4 to 3.5), and the lowest was L 1, which was 50% of the total patients. The average femoral T-score was -1.41 (-3.9 to 1.7), and the lowest area surveyed was the femoral neck in 87 patients (87%). A significant T-score difference between the spine and femur (i.e., discordance) was found in 40 patients (40%). These were major discordances in three patients and minor discordances in 37 patients.

Thirty-three codes from 23 patients (23%) were prescribed. Of these, 17 (73.9%), five (21.7%), and one patient (4.3%) were prescribed one, two, or three drugs (RANKL inhibitor + oral calcium agents + vitamin D injection), respectively. Group 6 (calcium/vitamin D) had 14 codes (42.4%), followed by nine codes (27.3%) in group 1 (bisphosphonate) and group 2 (RANKL inhibitor) as the third.

2 Endocrinology

A total of 100 DEXA tests were ordered between February 1, 2020 and April 8, 2021. An average of 0.25 osteoporosis tests (DEXA) were ordered per day. The average age of the outpatients was 62 years (range: 30-89 years). There were 88 females and 12 males. A total of 19 patients were diagnosed with osteoporosis related disease and the rest had various endocrine diseases, such as diabetes. The DEXA results showed osteoporosis in 24 patients (24%) with a T-score of -2.5 or less.

The average T-score of the spine was -1.35 (-4.6 to 4.3), and the lowest level was L1 in 41 patients (41%). On average, the femoral T-score was -1.59 (-4.2~1), and the lowest area was the femur neck in 91 patients (91%). Thirty-eight patients had discordance. Thirty-six patients had minor discordance, and two patients had major discordance.

Seventy patients (70%) were prescribed 100 codes. Of these, 32 patients (45.7%), 25 (35.7%), and three patients (4.2%) were prescribed one, two, and three medications, respectively. Group 6 (calcium/vitamin D) was the most common, with 63 codes (63%) followed by group 1 (bisphosphonate) with 30 codes (30%). The SERM series (group 4) comprised six codes (6%).

3 Neurosurgery

A total of 100 DEXA tests were ordered between February 10, 2020 and November 18, 2020. An average of 0.36 osteoporosis tests (DEXA) were ordered per day. The average age of the outpatients was 70 years (range: 29-90 years). There were 58 females and 42 males. Forty-five patients had spinal stenosis, while 22 had a vertebral fracture. DEXA tests showed osteoporosis in 35 patients (35%) with a score of -2.5 or less.

The average T-score of the spine was -1.11 (-4.7 to 5.5), with the lowest at L1 (41 patients). The average femoral T-score was -1.78 (-4.8-1.8), and the lowest area was the femoral neck in 85 patients (85%). Thirty-three patients had discordance. Thirty-three patients (39%) had minor discordance, and three patients had major discordance.

Twelve codes were prescribed in 11 patients (11%). Of these, eight (72.7%) and three patients (27.3%) were prescribed one and two medications, respectively. Of the 12 codes, eight (66.7%) were bisphosphonates (group 1), followed by calcium/vitamin D (group 6) with three codes (25%), and parathyroid hormone (group 3) with one code (9.1%).

4 Family Medicine

A total of 100 DEXA tests were ordered between December 26, 2019 and December 17, 2020. An average of 0.35 osteoporosis tests (DEXA) were ordered on an average per day. The average age of the outpatients was 60 years (range: 33-89 years), with 74 females and 26 males. As for the diagnosis, 35 (35%) of them were health check-up not otherwise specified (z000.01) and disease of the stomach and duodenum unspecified (k 319) were 14(14%). As a result of the DEXA test, 35 patients (35%) were diagnosed with osteoporosis with a T-score of -2.5 or less.

The average T-score of the spine was -1.12 (-4.7 to 1.7), and the lowest level among the vertebrates was L1 in 42 patients (42%). The average femur T-score was -1.79 (-5.1 to 1.3), and the lowest area was in the femur neck in 86 (86%) patients. A significant difference in bone density between the spine and femur, that is, discordance, was found in 44 (44%) patients. Of these, 42 were minor discordance and two major.

Twenty-six codes were prescribed to 20 patients (20%). Fourteen (70%) and six (30%) patients were prescribed one and two medications, respectively. For 26 codes, 15 codes (57.7%) were the most common with calcium/vitamin D (group 6), followed by the seven codes (26.9%) in the bisphosphonate series (group 1).

5 Gynecology

A total of 100 DEXA tests were ordered between February 22, 2019 and January 11, 2021. An average of 0.14 osteoporosis test prescriptions were ordered per day. The average age of outpatients was 53 years (range: 26 to 69). All the patients were females (100%). Uterine myoma was the most common disease, accounting for 24%. As a result of the DEXA test, osteoporosis with a T-score of -2.5 or less was diagnosed in 12 patients (12%). The average T-score of the spine was -0.66 (-3.4 to 2.1), and the lowest level among the vertebrates was L1, with a total of 47 (47%). The average femur T-score was -0.89 (-3.2 to 1.2), and the lowest area was the femur neck in 92 (92%) patients. A significant difference in bone density between the spine and femur, that is, discordance, was found in 28 (28%) patients. Of these, 26 were minor discordance and two major. A total of 120 codes were prescribed to 79 patients (79%). Thirty-nine (49.4%) and 39 patients (49.4%) had one and two prescriptions, respectively. One (1.2%) was a combination of bisphosphonate + calcium agents and tibolone. Of the 120 codes, 30 were the hormone family (group 5) with 30 codes (25%), followed by tibolone/TSCE/SERM (group 4) with 29 codes (24.2%). There were two in group 1 and two in group 2.

6 Rheumatology

A total of 100 DEXA tests were ordered between April 04, 2019 and February 09, 2021. An average of 0.14 osteoporosis tests (DEXA) were ordered per day. The average age of the outpatients was 63 years (range: 28 to 91). There were 82 (82%) females. Folate deficiency-related disease was the most common disease (22%), and generalized osteoarthritis was the second most common (13%). As a result of DEXA testing, osteoporosis with a T-score -2.5 or less was diagnosed in 20 patients (20%).

The average T-score of the spine was -1.21 (-4.9 to 2.3), and the lowest level among the vertebrates was L1, with a total of 86 (47%). The average femoral T-score was -1.82 (-3.8 to 1.3), and the lowest area was the femoral neck in 92 (92%) patients. A significant difference in bone density between the spine and femur, that is, discordance, was found in 44 patients (44%). Of these, 42 were minor discordance and two major.

Forty-seven codes were prescribed to 37 patients (37%). Among them, 25 (67.6%), one (29.7%), and one (29.7%) patient were prescribed one, two, and three medications, respectively. Of the 47 codes, 26 codes were calcium/vitamin D (group 6: 55.3%), followed by group 1 with 16 codes (34%). Group 2 had three codes.

7 General surgery

A total of 100 DEXA tests were ordered between February 05, 2018 and January 20, 2021. An average of 0.07 osteoporosis tests were ordered per day. The average age of the outpatients was 63 years (range: 28 to 91). Ninety-six were females, and four were males. A total of 78 patients were diagnosed with breast cancer. This is because screening tests are ordered for osteoporosis caused by menopause by inhibiting ovarian function by breast cancer chemotherapy. As a result of DEXA tests, osteoporosis with a T-score -2.5 or less was diagnosed in 16 patients (16%). The average T-score of the spine was -0.88 (-3.3 to 5.1), and the lowest level among the vertebrates was L1, with a total of 28 (28%). The average femoral T-score was -1.15 (-3.4 to 2.0), and the lowest area was the femoral neck in 72 (72%) patients. A significant difference in bone density between the spine and femur was found in 36 patients (44%), with only minor discordance.

Sixty-eight patients (68%) were prescribed 80 codes. Of these, 58 (85.3%), nine (13.2%), and one patient (1.4%) were prescribed one, two, and three medications, respectively. There were 72 (90%) and five codes (6.3%) in groups 6 and 2, respectively.

The characteristics of the outpatient clinics are presented in Tables 3 and 4.

Table 3
Characteristics of osteoporosis prevalence and DEXA in out-patient department

Department	Orthopadic surgery	Endocrinology	Neurosurgery	Family medicine	Gynecology	Rheumatology	General surgery
Rate of DEXA case/day	0.7	0.25	0.36	0.35	0.14	0.14	0.07
Age	63 (22~91)	62 (30~89)	70 (29~95)	60 (33~98)	53 (26~69)	63 (28~91)	63 (28~91)
Sex (M:F)	38 : 62	12 : 88	42 : 58	26 : 74	0 : 100	18 : 82	4 : 96
Diagnosis (%)	Fracture (8)	osteoporosis (19)	spinal stenosis (45)	health check up (35)	uterine myoma (24)	Folate deficiency (27)	breast cancer (78)
Osteoporosis (%)	24	36	38	16	12	28	16
T-score (Average)	-1.06	-1.46	-1.13	-0.61	-0.62	-1.18	-0.90
T-score of spine	-0.95 (-4.4~3.5)	-1.35 (-4.6~4.3)	-1.11 (-4.7~5.5)	-1.12 (-4.7~1.7)	-0.66 (-3.4 ~2.1)	-1.21 (-4.9~2.3)	-0.88 (-3.3~5.1)
lowest level of spine(%)	L1 (50%)	L1 (41%)	L1 (41%)	L1 (42%)	L1 (47%)	L1 (42%)	L1 (28%)
T-score of femur	-1.41 (-3.9~1.7)	-1.59 (-4.2~1)	-1.78 (-4.8~1.8)	-1.79 (-5.1~1.3)	-0.89 (-3.2~1.2)	-1.82 (-3.8~1.3)	-1.15 (-3.4~2)
lowest part of femur (%)	femur neck (87%)	femur neck (91%)	femur neck (85%)	femur neck (82%)	femur neck (92%)	femur neck (86%)	femur neck (72%)
Discordance (%)	40	38	33	44	28	44	30
minor : major	37 : 3	36 : 2	30 : 3	42 : 2	26 : 2	42 : 2	36 : 0

Table 4
Characteristics of osteoporosis management in out-patient department

Department	Orthopadic surgery	Endocrinology	Neurosurgery	Family medicine	Gynecology	Rheumatology	General surgery
prescription of medication (%)	23	70	11	20	79	37	68
Regimen	17	32	8	14	39	25	58
single	5	25	3	6	39	11	9
double	1	3	1	0	1	1	1
triple							
Number of code	33	100	12	26	120	47	80
Number of 1st drug (%)	14 (42.4)	63 (63)	8 (66.7)	15 (57.7)	30 (25)	26 (55.3)	72 (90)
Most common medicine	group 6	group 6	group 1	group 6	group 5	group 6	group 6
2nd common medicine	group 1	group 1	group 6	group 1	group 4	group 1	group 1
3rd common medicine	group 2	group 4	group 3	group 2	group 1,2	group 2	group 2

Discussion

Osteoporosis is characterized by a reduction in bone mass and alteration of bone architecture, resulting in increased bone fragility and fracture risk^[8]. Many studies on osteoporosis management have been published^[2, 9–12]. Among Korean adults aged ≥ 50 years, 22.4% and 47.9% had osteopenia or osteoporosis, respectively, in 2013^[13].

In the past, there have been studies on the characteristics of osteoporosis patients using national data in Korea, but no characteristics of a single university affiliated hospital have been presented^[14]. This study is meaningful as it reviews these trends by clinical department. We found that osteoporosis drugs were prescribed in 19 of the 30 clinical departments. It was found that almost all departments manage osteoporosis, except for departments such as radiology, anatomy, and clinical pathology that do not frequently contact outpatients.

The orthopedics department most commonly ordered DEXA, seven times the second most common (endocrine internal medicine). Compared to previous studies on osteoporosis drug trends in Korea, this study is meaningful as it reveals trends by department^[14, 15].

It was an interesting and significant result that the orthopedic surgery department ordered the most DEXA.

Significant results were also found in urology, plastic surgery, pediatrics, and pulmonology, which are thought to be unrelated to osteoporosis. It is also remarkable that osteoporosis prescriptions were the fourth highest in the family medicine department, which treats conditions such as gastrointestinal disorders, hypertension, and diabetes.

Osteoporosis drugs are still being developed and are used in various ways, from calcium agents to monoclonal antibodies^[16, 17]. Korea can provide many medical benefits under the National Health Insurance System and can use domestic and

international drugs because of the introduction of approved drugs relatively quickly compared to other developed countries. Therefore, the drugs used herein represent those commonly prescribed in Korea and potentially the global trend. Based on the general osteoporosis treatment guide, drugs were classified into six groups in this study. We found that group 6 (vitamin D/calcium) was the most prescribed. Moreover, it can be seen that this is the most commonly used drug because it is prescribed not only for osteoporosis but also for osteopenia, and if prescribed in combination, it can be prescribed as a secondary drug.

Group 1, which accounted for 28.3%, was bisphosphonate. We found that there were as many as 53 types of osteoporosis drug prescription codes. In addition, there are 54 drugs, including romanosumab, the newest drug, indicating that all drugs widely used around the world were identified.

It can be seen that the drugs prescribed by each clinical department depend on the characteristics of the department. The average age of patients was the highest in the neurosurgery department at 70 years old, indicating that it mainly manages geriatric spondylosis. The average age of patients in the gynecology department was 53 years and focused generally on preventive treatment.

Females were the most common in all clinical departments. The male ratio (42%) was the highest in neurosurgery, which is thought to be mainly because DEXA tests were ordered for patients with degenerative spondylosis.

Considering the major diagnosis of each clinical department, endocrinology was found to treat the most patients with osteoporosis.

A diagnosis of osteoporosis was the highest at 35% in neurosurgery and family medicine and the lowest in gynecology at 12%. The reason that the ratio of osteoporosis in this departments was different was associated with the age of the patients. Many patients who has interests in osteoporosis were seen in the family medicine department.

The average T-score of patients prescribed DEXA was the lowest at -1.35 in endocrinology and -0.66 in gynecology, perhaps because endocrinology also commonly treats osteoporosis. In all departments, the areas with the lowest bone density were the first lumbar spine and the femoral neck region. When examining multiple sites, the T-score of each bone density defines a different one as discordance, the same as concordance^[18]. In this study, family media was the highest at 44%, and the general surge was the lowest at 30%. The prevalence of other academic studies (12.9% in males) was significantly higher^[19]. Among the clinical departments that prescribed osteoporosis medications, 79% of patients that underwent DEXA by the gynecology department and 70% of patients in the endocrinology department were prescribed medications. On the other hand, orthopedics and neurosurgery had low prescription rates of 23% and 11%, respectively. It is believed that the high prescription rate of gynecology will be due to them performing bone density testing on patients who undergo hormone replacement therapy rather than pure osteoporosis treatment^[20, 21].

The endocrinology department also prescribed several medications for osteoporosis. In contrast, the neurosurgery department showed the lowest prescription rate compared to the bone density tests ordered.

All departments prescribed two or three medications. Gynecologists generally prescribed two or more drugs, covering 120 medication codes. The most common medication in the gynecology and neurosurgery departments was groups 1 and 5. The most common medication overall was group 6.

There were several limitations to this study. First, our analysis was performed only on outpatients, and the characteristics of inpatients and outpatients may vary. Second, the most recent drug, Romanosumab, was not included, so not all medications were represented. Finally, the number of patients with osteoporosis was lower than the actual prevalence, and the prescription rate was insufficient.

Conclusions

Approximately 63% of clinicians ordered DEXA for bone quality evaluation in outpatient departments. DEXA was ordered by the orthopedic surgery department the most. The prevalence of osteoporosis in different outpatient clinics ranged from 12–38%, with neurosurgery being the highest. The rate of osteoporosis medication prescriptions also varied, ranging from 11–79%. The gynecology department most commonly prescribed osteoporosis medication and also the most medications. The neurosurgery department only prescribed one drug. The most common medications used were vitamins and calcium. Bisphosphonate was the second most commonly prescribed medication to outpatients.

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