

# Who Prescribed Which Osteoporosis Medication to Whom

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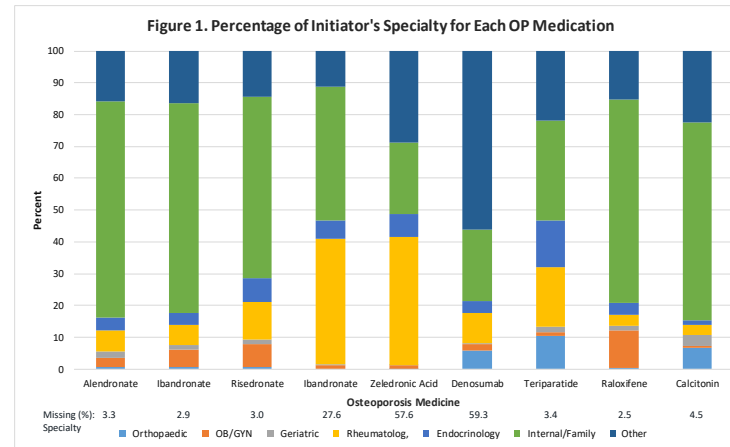
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## Introduction

- Several osteoporosis (OP) medicines (meds) came on the market in the past decades, each with its own indications.
- However, there is no clear information on how these meds are prescribed in the real world.
- Using the US Medicare database, we assessed who prescribed which OP med for what types of patients among Medicare beneficiaries.

## Methods

- The 2011-2015 Medicare 20% random sample database was used.
- Patients who initiated an OP med during the 2-year period from October 1, 2013, to September 30, 2015, were included.
- OP meds included alendronate, ibandronate (oral and IV, separately), risedronate, zoledronic acid, teriparatide, denosumab, raloxifene, and calcitonin, and were identified from physician, pharmacy, or outpatient institutional claims using NDC or HCPCS codes.
- For each OP med, initiation was defined as first use in the period and no use of the same med for at least 1 year before this use.
- For each OP med, we also required patients to be
  - age ≥65 years at initiation and
  - covered by Medicare Parts A and B for at least 2 years and by Medicare Part D for at least 1 year before initiation.
- We allowed use of other OP meds before this initiation.
- Prescriber's specialties included orthopedic, OB/GYN, geriatric, rheumatologic, endocrinologic, internal medicine or family, and "other."
- Patient characteristics assessed included demographics (age, race, sex, geographic region), history of fracture (hip, vertebral, other), comorbid conditions that may be associated with increased fracture risk, and previous OP med use.



## Results

- Of 203,305 patients who initiated an OP med in the period, 4.6% initiated more than one (sequentially, not simultaneously).
- Most used were denosumab (60.6%) and alendronate (24.9%); least used were IV ibandronate (0.3%) and teriparatide (1.9%).
- More than 50% of IV meds (zoledronic acid, IV bandronate, denosumab) were administered in the hospital outpatient setting; prescriber information is not available in outpatient institutional claims. However, prescriber specialty is on physician claims and prescriber ID is on pharmacy claims. Figure 1 shows percentages with missing initial prescriber.
- Among non-missing initial prescribers, more than 60% of oral OP meds and teriparatide were prescribed by internal medicine/family doctors; about 40% of IV bisphosphonates were prescribed by rheumatologists, and denosumab was prescribed mostly by "other" and some internal medicine/family doctors (Figure 1).
- Calcitonin users were the oldest (mean age 78.9 years) and denosumab users the youngest (72.8).
- About 1/4 of OP med initiators were male and about 80% of those male patients initiated denosumab. Percentages of men were about 10% for all meds except raloxifene (<1%) and denosumab (34.5%).
- More than 20% of calcitonin and teriparatide users had fractures (mainly vertebral) within 3 months before OP med initiation; more than 30% of calcitonin users and about 50% of teriparatide users had fractures within 12 months before OP med initiation. These numbers were much lower for users of other meds (Table 1).
- About 40% of IV ibandronate and teriparatide users switched from other OP meds, and about 30% for other OP med users, except alendronate and denosumab (<15%).

## Conclusions

- In the Medicare population, denosumab and alendronate were mostly used to treat osteoporosis.
- About half of OP meds were initiated by internal medicine/family doctors.
- OP meds were mainly prescribed to women; men mainly used denosumab.
- Teriparatide and calcitonin were prescribed to more patients at high risk of fracture than the other meds.
- More calcitonin and teriparatide use started after other OP med use; most alendronate and denosumab users were naive users.
- Study limitations:
  - Prescriber information was incomplete for IV medications.
  - Prescriber specialty was assessed only for the initial prescriber.
  - Study included only older users, may not be generalizable to non-Medicare or younger users.

Table 1. Patient Characteristics by Osteoporosis Medication

	Oral Bisphosphonates			IV Bisphosphonates		Denosumab	Teriparatide	Raloxifene	Calcitonin
	Alendronate	Ibandronate	Risedronate	Ibandronate	Zeledronic Acid				
<b>Total N</b>	50559	9449	4784	548	9837	123128	3779	3875	7118
<b>Demographic</b>									
Age (Mean years, SD)	77.1(7.11)	75.2(9.06)	75.4(9.08)	75.0(9.81)	74.7(9.34)	72.8(12.29)	74.9(10.95)	74.2(8.18)	78.9(10.43)
<b>Sex</b>									
Male	11.90	7.60	10.90	10.80	10.40	34.50	12.40	0.90	16.70
Female	88.10	92.40	89.10	89.20	89.60	65.50	87.60	99.10	83.30
<b>Race</b>									
White	83.29	84.09	83.63	81.93	91.82	85.45	87.54	81.94	91.12
Black	5.67	4.72	4.87	4.01	3.50	7.75	2.28	4.62	2.98
Asian	4.37	5.05	4.74	6.39	1.50	2.13	4.00	6.94	2.22
Other	6.67	6.14	6.75	7.66	3.18	4.67	6.19	6.50	3.68
<b>Fracture within 2 Years</b>									
<b>HIP fracture</b>									
No	96.61	97.71	97.74	98.36	97.15	98.46	90.71	97.99	95.6
Month 1-3	1.15	0.56	0.54	* (<11 Pts)	0.41	0.23	2.36	0.49	1.12
Month 4-6	0.74	0.48	0.61	*	0.70	0.30	2.75	0.46	0.89
Month 7-12	0.70	0.58	0.63	*	0.93	0.42	2.20	0.44	0.93
Month 13-24	0.81	0.67	0.48	*	0.81	0.60	1.98	0.62	1.46
<b>Vertebral fracture</b>									
No	93.45	94.08	93.42	92.15	89.33	95.69	67.77	95.77	72.60
Month 1-3	3.20	2.40	2.78	*	3.69	1.51	16.22	1.65	18.81
Month 4-6	1.13	0.92	1.19	*	2.08	0.80	8.26	0.90	3.84
Month 7-12	1.03	1.15	1.19	2.19	2.23	0.92	4.79	0.75	1.85
Month 13-24	1.19	1.44	1.42	2.37	2.67	1.08	2.96	0.93	2.89
<b>Other fracture</b>									
No	95.21	95.34	95.21	95.8	94.32	96.75	85.02	96.98	91.81
Month 1-3	1.29	1.08	0.63	*	0.60	0.62	4.39	0.72	2.66
Month 4-6	0.93	0.78	1.17	*	1.09	0.52	3.68	0.41	1.55
Month 7-12	1.06	0.97	1.40	*	1.50	0.79	3.41	0.65	1.42
Month 13-24	1.52	1.82	1.59	*	2.49	1.31	3.49	1.24	2.57
<b>Osteoporosis Medication</b>									
<b>Oral Bisphosphonate</b>									
No use within 1 year	89.94	73.82	79.31	76.46	81.15	90.85	76.40	80.52	84.41
Month 1-3	8.14	20.06	15.09	16.42	11.61	6.52	16.59	13.96	11.2
Month 4-6	0.88	2.84	2.36	2.92	3.03	1.05	3.20	2.32	1.95
Month 7-12	1.04	3.29	3.24	4.20	4.21	1.58	3.81	3.20	2.44
<b>IV Bisphosphonate</b>									
No use within 1 year	99.50	98.84	99.39	95.99	99.41	97.7	95.53	98.14	98.15
Month 1-3	0.15	0.42	*	*	0.34	0.59	1.61	0.52	0.97
Month 4-6	0.08	0.22	*	*	0.12	0.30	0.87	0.34	0.32
Month 7-12	0.28	0.52	0.42	3.47	0.13	1.40	1.98	1.01	0.56
<b>Teriparatide</b>									
No use within 1 year	99.37	99.30	98.98	98.18	98.3	99.12	100.00	98.74	99.21
Month 1-3	0.43	0.42	0.59	*	0.81	0.52	*	0.72	0.42
Month 4-6	0.10	0.13	0.25	*	0.49	0.16	*	*	*
Month 7-12	0.11	0.15	*	*	0.40	0.20	*	0.36	0.24
<b>Denosumab(Prolia)</b>									
No use within 1 year	95.77	95.18	95.17	87.59	93.32	100	88.86	93.78	92.98
Month 1-3	2.66	3.08	2.93	7.85	3.81	*	7.78	4.03	4.76
Month 4-6	0.54	0.7	0.71	2.01	1.21	*	1.24	0.77	0.91
Month 7-12	1.03	1.04	1.19	2.55	1.66	*	2.12	1.42	1.35
<b>Baseline Comorbid conditions</b>									
Myocardial infarction	4.77	3.5	4.08	4.56	4.41	7.45	6.51	2.68	8.47
Congestive Heart Failure	11.46	9.3	8.97	15.88	9.91	15.19	16.46	6.17	21.48
Chronic pulmonary disease	20.01	19.61	19.17	24.45	20.93	22.24	27.47	15.92	29.18
Chronic Kidney Disease	16.60	13.99	13.75	15.33	13.12	22.89	21.06	11.92	27.00
Rheumatoid arthritis	6.43	7.01	8.72	21.17	11.91	5.13	12.41	4.54	6.60
Osteoarthritis	37.42	38.13	40.45	54.20	41.81	37.14	53.03	35.79	45.35
Parkinson disease	1.79	1.59	1.69	2.55	1.79	1.73	3.02	1.19	3.33
Multiple sclerosis	0.40	0.77	0.69	*	0.93	0.64	1.30	0.46	0.70
Stroke	4.96	4.09	4.37	6.20	4.91	5.62	6.67	3.20	8.13
Hypertension	76.94	74.11	74.12	76.64	70.79	77.74	75.97	69.34	81.58
Depression	19.54	20.51	19.63	24.82	23.45	22.34	32.73	17.57	30.04
Anxiety	15.47	16.43	17.33	18.07	19.07	18.27	25.46	14.84	24.12
Dementia	7.51	5.81	5.96	6.02	4.95	5.85	10.08	4.21	15.82
Fall	22.53	20.85	19.86	20.44	25.19	20.74	43.74	15.82	43.35
Diabetes	26.89	25.27	25.59	27.19	21.16	33.54	25.35	23.05	27.56