Osteoporosis Care Following Incidental Vertebral Fractures: a Retrospective Cohort Study

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INTRODUCTION

Osteoporosis is a worldwide disease with an increasing incidence that affects a large number of older adults. Vertebral compression fractures are the most common type of osteoporotic fracture, accounting for 700,000 of the 1.5 million osteoporotic fractures per year in the USA.¹ Only one-third of vertebral compression fractures are symptomatic.² After an initial vertebral fracture, a patient is at increased risk for hip fracture and is five times more likely to have another vertebral compression fracture in their lifetime.³ Unfortunately, even when a patient experiences a symptomatic fracture, rates of treatment with guideline-concordant therapy are very low (3.3–45%).^{4–6} For the patients with asymptomatic, incidentally found fractures, we hypothesized that a formal diagnosis of osteoporosis as evidenced by appropriate follow-up care was unlikely. To explore this hypothesis, we reviewed the subsequent osteoporosis care of patients found to have incidental vertebral fractures.

METHODS

We performed a retrospective cohort study among patients with vertebral fractures noted on computed tomography (CT) scans or X-rays of the chest, abdomen, or pelvis over a 5-year period (2013–2018) at a single Veterans Affairs academically affiliated hospital and evaluated subsequent osteoporosis care. Inclusion criteria were age ≥ 50 and the word “compression” related to vertebral fractures in their imaging report. Patients were excluded if they had a previous history of osteoporosis or osteopenia, previous osteoporosis treatment, or an imaging indication of back pain or high level of trauma. Data was obtained from the VA Corporate Data Warehouse and manually extracted through algorithmic chart review by four reviewers. The primary outcome was occurrence of at least one of three osteoporosis-related care actions within 6 months: bone mineral density testing, endocrinology referral, or prescription of osteoporosis treatment medications.

RESULTS

A total of 3181 imaging reports containing the word “compression” were reviewed, and after exclusions, 1839 reports were included in the final evaluation. Inter-rater reliability among reviewers using Fleiss’ kappa was 0.83 for identifying inclusion and exclusion criteria and 0.74 for identifying subsequent osteoporosis care. Among eligible imaging reports, 99.02% of patients were male and the mean age was 70.61 years (Table 1). A total of 210 cases (11.42%) received at least one intervention of the composite outcome; 7.61% received a DEXA scan; 5.98% received an endocrinology referral; and 7.72% received an osteoporosis medication prescription (Table 1). Among reports with vertebral compression in the impression section, adjusted frequency of follow-up intervention was 14.47% versus 10.07% for compression noted only in the body of the report section (odds ratio = 1.51 [95% CI 1.07–2.12], $p = 0.02$, Table 2).

DISCUSSION

Our analysis demonstrates that most patients with an incidentally found vertebral compression fracture do not receive evaluation or treatment for osteoporosis in the following 6 months. The rates of subsequent osteoporosis care overall in this cohort were 11.42%. For patients in whom the finding of compression is noted in the impression section of the

Table 1 Demographics, Imaging Report Characteristics, and Subsequent Osteoporosis-Related Care

Variable	Description
Eligible imaging reports, <i>n</i>	1839
Patients, <i>n</i>	1185
Male gender	1821 (99.02)
Age, mean (SD)	70.61 (9.63)
70 years old or older	865 (47.04)
Imaging type	
CT	1011 (54.98)
X-ray	828 (45.02)
Anatomic location of imaging	
Abdomen/pelvis	608 (33.06)
Chest	1231 (66.94)
Ordering service	
ED	549 (29.85)
Inpatient	243 (13.21)
Outpatient	1047 (56.93)
Compression finding highlighted in impression section	455 (24.74)
Subsequent osteoporosis-related care	210 (11.42)
DEXA scan	140 (7.61)
Endocrinology referral	110 (5.98)
Osteoporosis medication prescription	142 (7.72)

Values expressed as *n* (%) unless otherwise specified

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Table 2 Treatment Rates Based on Presence or Absence of Imaging Reports Characteristics

Imaging report characteristic	Osteoporosis-related care provided, % (95% CI)		Odds ratio (95% CI)	p
	Reference category	Imaging report characteristic present		
70 years old or older (reference = younger than 70 years old)	9.82 (7.73–12.42)	16.13 (13.38–19.32)	1.77 (1.28–2.44)	< 0.001
CT imaging type (reference = X-ray)	11.06 (8.98–13.55)	11.37 (9.32–13.8)	1.03 (0.77–1.38)	0.84
Chest anatomic location of imaging (reference = abdomen/pelvis)	11.53 (9.05–14.58)	11.09 (9.3–13.16)	0.96 (0.71–1.29)	0.77
Outpatient ordering service (reference = ED or inpatient)	10.92 (8.76–13.54)	11.45 (9.47–13.79)	1.05 (0.78–1.42)	.73
Compression finding highlighted in impression section (reference = not highlighted)	10.07 (8.4–12.04)	14.47 (11.2–18.51)	1.51 (1.07–2.12)	0.02

Values expressed as estimated marginal means (95% CI) based on logistic regression models adjusted for remaining image report characteristics and using generalized estimation equations to account for correlation within subjects

imaging report, evaluation and treatment are significantly higher at 14.47%, but still low overall.

To our knowledge, this is the largest evaluation of patients with incidental vertebral compression fractures and serves as a baseline for an opportunity to improve care. Strengths of the study include broad inclusion criteria, large data set, and reliable data collection through chart review with strong inter-rater reliability. There are several limitations to this study. First, it is possible that patients had previous trauma resulting in vertebral fractures, and therefore, we are overestimating the diagnosis of osteoporosis. Second, the electronic health record problem lists require manual entry of conditions and its use can be variable. Finally, the study population is predominantly male and could account for part of the low subsequent care rates seen in this cohort.

Despite these limitations, we believe that this analysis demonstrates a significant contribution to the osteoporosis literature and identifies a meaningful opportunity to diagnose and treat clinically “silent” osteoporosis. This study serves a robust

baseline analysis that can inform health system interventions going forward. At a minimum, locating the finding of vertebral fracture in the impression section of the imaging report could have some impact on our patients.

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Compliance with Ethical Standards:

Conflict of Interest: The authors declare that they do not have a conflict of interest.

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