SHORT COMMUNICATION

Factors associated with diagnosis and treatment of osteoporosis in older adults

S. Nayak · M. S. Roberts · S. L. Greenspan

Abstract

Summary Osteoporosis is often undiagnosed and untreated. We surveyed 1,830 adults and identified factors associated with osteoporosis diagnosis and treatment. Individuals with several risk factors, including older age, were not more likely to be diagnosed or treated. Measures should be taken to improve osteoporosis identification and treatment in high-risk patients.

Introduction We aimed to identify patient characteristics associated with osteoporosis diagnosis and treatment.

Methods Survey was mailed to 1,830 women and men ≥60 years old in Pennsylvania. Multivariable logistic regression analyses were performed to determine odds ratios for osteoporosis diagnosis and treatment for individuals with established osteoporosis risk factors.

Results Surveys were completed by 1,268 adults (69.3%). Osteoporosis diagnosis was more commonly reported by participants with risk factors of female sex (OR, 3.60; 95% CI 2.31–5.61), prolonged oral steroid use (OR, 3.76, 95% CI 2.06–6.84), low-trauma fracture (OR, 2.14, 95% CI 1.44–3.17), height loss (OR, 1.83, 95% CI 1.28–2.64), and lower weight (OR, 1.35 per 11.4 kg decrease in weight; 95% CI, 1.16–1.56). Age and family history of osteoporosis were not predictive of osteoporosis diagnosis, when adjusting for other risk factors. Osteoporosis treatment was more commonly reported by participants with risk factors of female sex (OR, 5.19; 95% CI, 3.31–8.13), family history (OR, 2.18; 95% CI, 1.55–3.06), height loss (OR, 1.79; 95% CI 1.29–2.49), low-trauma fracture (OR, 1.66; 95% CI, 1.14–2.42), and lower weight (OR, 1.45 per 11.4 kg decrease in weight; 95% CI, 1.27–1.67). Osteoporosis treatment was not significantly associated with age or prolonged oral steroid use.

Conclusions Individuals with several established osteoporosis risk factors are more likely to be underdiagnosed or undertreated.

Keywords Diagnosis · Geriatrics · Osteoporosis · Survey research

Introduction

Osteoporosis is common and costly, affecting 10 million women and men in the United States, with direct costs of $17 billion in 2005 [1–3]. Approximately one-half of all postmenopausal women and one-quarter of white men over 60 years of age will sustain an osteoporotic fracture in their lifetime [4, 5]. The 1-year mortality of elderly patients with hip fracture is approximately 24%, and long-term morbidity of osteoporotic fractures can include chronic pain, loss of ability to ambulate, and nursing home placement [6–9].

Although the US Preventive Services Task Force, the National Osteoporosis Foundation, and the American College of Physicians recommend that clinicians screen older adults for osteoporosis [10–12], most individuals with osteoporosis remain undiagnosed and untreated [13–15].

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The National Ambulatory Medical Care Survey found that fewer than 2% of women older than 60 years were diagnosed as having osteoporosis by their primary care physicians, even though the expected prevalence in this population is 20% to 30%; furthermore, appropriate drug therapy was only offered to 36% of diagnosed patients [15]. Men with osteoporosis appear to be identified and treated even less often than women [13, 14].

The objective of our study was to identify patient characteristics associated with diagnosis and treatment of osteoporosis in older adults. We hypothesized that individuals with established osteoporosis risk factors would be more likely to be diagnosed with osteoporosis and receive treatment.

Materials and methods
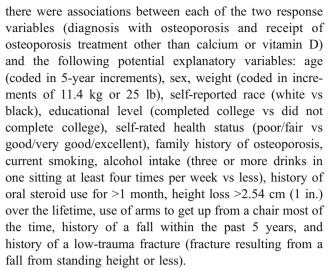
Study participants and procedures

We performed a cross-sectional survey of 1,830 women and men age 60 or older, living in or near western Pennsylvania, and enrolled in the University of Pittsburgh's Claude D. Pepper Registry for studies on mobility and balance in older adults. Individuals were recruited for registry participation through mailings to university alumni, faculty, and staff, other ongoing clinical studies at the university, community events at senior citizens centers and a continuing care community, and newspaper advertisements. Nearly all of the registry participants were community dwelling. The study was approved by the University of Pittsburgh Institutional Review Board.

In November 2007, all registry participants were sent a 44-item survey, an informational script describing the purpose of the research study, and a pre-paid, return envelope. Participants were assured that survey responses would remain anonymous and encouraged not to write their names on their returned surveys or return envelope. Payment was not provided for participation. The completed surveys were collected over a 6-month period. Survey data was independently dual-entered into a database by two individuals and validated to ensure integrity.

The survey asked respondents about sociodemographics, osteoporosis risk factors, mobility, falls, prior fractures, prior osteoporosis testing, health beliefs about osteoporosis, and preferences for osteoporosis screening tests. It also asked whether respondents had ever been diagnosed with osteoporosis and whether they had ever taken any medications for osteoporosis other than calcium and vitamin D.

Statistical analyses

We computed descriptive statistics for each survey item. We also performed logistic regression analyses to determine if there were associations between each of the two response variables (diagnosis with osteoporosis and receipt of osteoporosis treatment other than calcium or vitamin D) and the following potential explanatory variables: age (coded in 5-year increments), sex, weight (coded in increments of 11.4 kg or 25 lb), self-reported race (white vs black), educational level (completed college vs did not complete college), self-rated health status (poor/fair vs good/very good/excellent), family history of osteoporosis, current smoking, alcohol intake (three or more drinks in one sitting at least four times per week vs less), history of oral steroid use for >1 month, height loss >2.54 cm (1 in.) over the lifetime, use of arms to get up from a chair most of the time, history of a fall within the past 5 years, and history of a low-trauma fracture (fracture resulting from a fall from standing height or less).

We included individual explanatory variables that showed a significant association with each response variable ($P \leq 0.10$) as variable candidates in stepwise, backward selection, multivariable logistic regression models. We checked for evidence of interactions between variables and multicollinearity. We considered variables and interaction terms with P values of ≤ 0.05 to be significant in the final multivariable models. We used Stata version 10.0 (StataCorp, College Station, TX, USA) to perform all analyses.

Results

Characteristics of survey respondents

Of the 1,830 individuals to whom surveys were sent, 1,268 (69.3%) responded (Table 1). Respondents had a mean age of 73.3 years (range, 60–93; SD, 7.3) and a mean weight of 76.9 kg (range, 42.6–147.4; SD 16.9). Most respondents were white (92.9%), female (58.7%), believed that they were in good to excellent health (88.2%), and had completed college (75.0%); 62.6% of survey respondents reported being tested for osteoporosis, 22.6% reported being diagnosed with osteoporosis, and 24.4% reported osteoporosis treatment other than calcium and vitamin D.

Multivariable models

Diagnosis with osteoporosis

Respondents were more likely to report osteoporosis diagnosis if they were female (OR, 3.60; 95% CI 2.31–5.61), had a history of oral steroid use >1 month (OR 3.76, 95% CI 2.06–6.84), had a personal history of low-trauma fracture (OR 2.14, 95% CI 1.44–3.17), had lost >2.54 cm of height over their lifetime (OR 1.83, 95% CI 1.28–2.64),

Table 1 Characteristics of the survey respondents

Characteristics	Number (%)
Sociodemographic characteristics	
Female sex	664 (58.7)
White race	1,148 (92.9)
Completed college	926 (75.0)
Osteoporosis-related characteristics	
Has heard of osteoporosis	1,215 (96.1)
Has been screened or tested for osteoporosis	783 (62.6)
Has been diagnosed with osteoporosis	283 (22.6)
Has been treated for osteoporosis (other than calcium/vitamin D)	307 (24.4)
Has had a low-trauma fracture (fracture resulting from a fall from standing height or less)	236 (18.8)
Has a family history of osteoporosis	292 (23.8)
Other health-related characteristics	
Has a high self-rated health status (rated as good, very good, or excellent)	1,114 (88.2)
Is a nonsmoker	1,248 (98.7)
Has a history of alcohol use ≥4 times per week, ≥3 drinks at a time	32 (2.6)
Has a history of oral steroid use for more than 1 month	103 (8.2)
Has experienced a height loss >2.54 cm (1 in.) over the lifetime	435 (35.3)
Uses arms to get up from a chair most of the time	460 (36.8)
Has fallen within the past 5 years	609 (48.6)
Is ambulatory without the use of an assistive device	1,152 (91.3)

There were 1,268 survey respondents. However, there were missing data for each of the characteristics listed in this table. The percentage of missing data for sex was 10.8%, but percentages of missing data for other characteristics were below 4%. The percentages shown here reflect the percentages of individuals who responded to the question about the characteristic listed. Mean age of respondents was 73.3 years (range, 60–93; SD, 7.3). Mean weight was 76.9 kg (range, 42.6–147.4; SD 16.9)

or had a lower weight (OR, 1.35 per 11.4 kg decrease in weight; 95% CI, 1.16–1.56). There was a significant positive interaction between age and family history of osteoporosis (OR 1.44; 95% CI 1.11–1.86) and a significant negative interaction between family history of osteoporosis and oral steroid use >1 month (OR 0.26, 95% CI 0.07–0.88). When we included these interactions in the model, age and family history of osteoporosis by themselves were not significant predictors of osteoporosis diagnosis. There was no evidence of multicollinearity in this model. Osteoporosis diagnosis was not significantly associated with race, alcohol intake, smoking status, educational level, self-rated health status, use of arms to get up from a chair, or history of a fall within the past 5 years.

Receipt of osteoporosis treatment

Respondents were more likely to report osteoporosis treatment if they were female (OR, 5.19; 95% CI, 3.31–8.13), had

a family history of osteoporosis (OR, 2.18; 95% CI, 1.55–3.06), had lost >2.54 cm of height over their lifetime (OR, 1.79; 95% CI 1.29–2.49), had a history of low-trauma fracture (OR, 1.66; 95% CI, 1.14–2.42), or had a lower weight (OR, 1.45 per 11.4 kg decrease in weight; 95% CI, 1.27–1.67). There was no evidence of multicollinearity or significant interactions between the variables included in this model. Receipt of osteoporosis treatment was not significantly associated with age, history of oral steroid use for >1 month, race, alcohol intake, smoking status, educational level, self-rated health status, use of arms to get up from a chair, or history of a fall within the past 5 years.

Discussion

Our survey of 1,268 women and men aged 60 and older suggests that individuals with several established osteoporosis risk factors may be underdiagnosed and undertreated. Most notably, older respondents were no more likely than younger respondents to be diagnosed with osteoporosis or receive treatment other than calcium and vitamin D, when adjusting for other osteoporosis risk factors. This finding is remarkable because age is the strongest individual risk factor for osteoporosis, with older individuals having the highest prevalences of osteoporosis in epidemiological studies [16, 17]. Other surprising findings included that individuals with several other established osteoporosis risk factors—such as family history, prolonged oral steroid use, white race, smoking, and heavy alcohol consumption—were either no more likely to be diagnosed with osteoporosis or no more likely to be treated for osteoporosis, after adjusting for other risk factors. However, we did find that individuals with osteoporosis risk factors of female sex, lower body weight, height loss, and history of low-trauma fracture were more likely to be diagnosed and treated than individuals without these risk factors. Thus, our results were mixed with respect to our hypothesis that individuals with established osteoporosis risk factors would be more likely to be diagnosed with osteoporosis and receive treatment.

Several of our findings are consistent with results of earlier studies. Multiple previous studies suggest that older individuals are either less likely or no more likely than younger individuals to be treated for osteoporosis [18–21]. A few studies have found that younger patients are less likely to receive pharmacologic treatment for osteoporosis than older patients, but this discrepancy may be secondary to the use of younger age cutoffs to distinguish older from younger patients in these particular studies (e.g., postmenopausal vs premenopausal) [22–24]; our study focused on an older population of individuals, those age 60 and older. Our finding that individuals with prolonged oral steroid use may not be receiving sufficient osteoporosis treatment

concurs with that of other studies [22, 25, 26], as does our finding that osteoporosis treatment was more likely in women than men [18, 21–23]. We also observed that osteoporosis treatment was no more likely in white adults than black adults, when adjusting for other osteoporosis risk factors; this finding is different from that of previous studies and warrants further study [18].

Our findings further advance the understanding of current patterns of osteoporosis diagnosis and treatment by suggesting that individuals with particular osteoporosis risk factors may be overlooked for diagnosis and treatment. Most significant is the observation that older individuals are not more likely to be diagnosed and treated than younger individuals. Older individuals are at highest risk for osteoporotic fractures, particularly hip fracture, which is associated with significant morbidity, mortality, and costs. If older adults are underdiagnosed and undertreated, this represents an important opportunity to change clinical practice to improve osteoporosis outcomes. Likewise, our results also suggest that individuals with other risk factors, such as prolonged oral steroid treatment and family history of osteoporosis, may need to be better targeted for osteoporosis identification and treatment to improve outcomes.

To our knowledge, our study is the largest patient survey of characteristics associated with osteoporosis diagnosis and treatment. However, the study had several limitations. First, because the survey was based on self-report, there may have been recall bias concerning osteoporosis diagnosis and treatment. Second, the survey population consisted of individuals who lived in or near western Pennsylvania, volunteered for a research registry, and were disproportionately white, healthy, and highly educated, which may limit the generalizability of our results. However, it is possible that if even in this survey population individuals with several known risk factors for osteoporosis were not more likely to receive osteoporosis diagnosis or treatment, this may be an even larger problem in the general population of older adults. Third, our study had small numbers of individuals with certain osteoporosis risk factors, such as smokers and heavy alcohol drinkers, which may have limited our ability to detect an association between these characteristics and osteoporosis diagnosis or treatment. Our study also had several notable strengths, including a large sample size, nearly 70% response rate, and inclusion of both female and male participants.

In conclusion, we found that individuals with several key osteoporosis risk factors, such as advanced age, prolonged oral steroid use, and family history of osteoporosis, were either not more likely to receive osteoporosis diagnosis or not more likely to obtain treatment, when adjusting for other osteoporosis risk factors. Our results suggest that individuals with these risk factors are more likely to be underdiagnosed or undertreated. Future investigations should confirm our findings in other study populations and investigate interventions to improve osteoporosis diagnosis and treatment rates in individuals at highest risk.

Conflicts of interest None.

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