Disparities in Osteoporosis Screening Between At-Risk African-American and White Women

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BACKGROUND: Despite a lower prevalence of osteoporosis in African-American women, they remain at risk and experience a greater mortality than white women after sustaining a hip fracture. Lack of recognition of risk factors may occur in African-American women, raising the possibility that disparities in screening practices may exist.

OBJECTIVE: To determine whether there is a difference in physician screening for osteoporosis in postmenopausal, at-risk African-American and white women.

METHODS: We conducted a retrospective chart review at an urban academic hospital and a suburban community hospital. Subjects included 205 African-American and white women, age ≥ 65 years and weight ≤ 127 pounds, who were seen in Internal Medicine clinics. The main outcome was dual-energy x-ray absorptiometry (DXA) scan referral. We investigated physician and patient factors associated with referral. Secondary outcomes included evidence of discussion of osteoporosis and prescription of medications to prevent osteoporosis.

RESULTS: Significantly fewer African-American than white women were referred for a DXA scan (OR 0.39%, 95% confidence interval (CI): 0.22 to 0.68). Physicians were also less likely to mention consideration of osteoporosis in medical records (0.27, 0.15 to 0.48) and to recommend calcium and vitamin D supplementation for this population (0.21, 0.11 to 0.37). If referred, African-American women had comparable DXA completion rates when compared with white women. No physician characteristics were significantly associated with DXA referral patterns.

CONCLUSIONS: Our study found a significant disparity in the recommendation for osteoporosis screening for African-American versus white women of similar risk, as well as evidence of disparate osteoporosis prevention and treatment, confirming results of other studies. Future educational and research initiatives should target this inequality.

KEY WORDS: osteoporosis; DXA scan; screening; disparity.

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Osteoporosis is a major public health problem, with significant fracture-related morbidity and mortality. Data from the Third National Health and Nutrition Examination Survey (NHANES III) suggest that over 18 million women in the United States have low bone mineral density (BMD).¹ While public awareness of the disease is slowly increasing, it remains underdiagnosed in all populations, caused in part by a lack of recognition of risk factors. Indeed, the National Osteoporosis Risk Assessment (NORA), the largest longitudinal study of

osteoporosis in postmenopausal women regardless of racial or ethnic group, discovered previously undetected osteoporosis in 7% of its population and osteopenia in 40%.²

The prevalence of osteoporosis varies according to race. Third National Health and Nutrition Examination Survey data show that the prevalence of osteoporosis, defined by World Health Organization criteria,³ is 1.3 to 2.4 times higher in white women than African-American women.¹ Osteoporosis in African Americans, however, is not rare; the same data indicate that approximately 1 to 1.5 million women in this population have low BMD.^{1,4} Furthermore, despite a lower prevalence, African-American women who sustain a hip fracture have increased morbidity and nearly twice the mortality as white women.⁵⁻⁹

The best approach to prevention of osteoporosis-associated fractures remains early identification of patients with low BMD through dual-energy x-ray absorptiometry (DXA) screening of at-risk patients. Well-documented risk factors for low BMD include age, low body weight, smoking, maternal history of osteoporosis, and personal history of fracture, among others.^{2,10} Similar risk factors are associated with increased risk of the disease among African-American women.^{4,11-13} Moreover, The Northeast Hip Fracture Study Group found body mass index (BMI) to be the primary predictor of fracture in African Americans, with thin women having a 13-fold higher risk than heavier women.¹¹ National Osteoporosis Foundation (NOF) guidelines recommend that all women age 65, regardless of risk factors, undergo screening with DXA.¹⁴ Medicare reimburses DXA scans for women age 65 and with clinical risk factors, such as low body weight.¹⁵

Although most preventive care occurs with the primary care physician, studies suggest that only a small proportion of patients at risk for osteoporosis are currently being screened.¹⁶⁻¹⁸ Concern also exists that misperceptions about the importance and prevalence of osteoporosis in the African-American community may lead to even lower screening rates in this population.^{2,19,20} Indeed, NORA documented a high prevalence of previously undiagnosed disease among postmenopausal African-American women, finding that 32% had osteopenia and 4% had osteoporosis.² The purpose of this study was to determine whether a disparity exists in the practices of Internal Medicine physicians with regard to osteoporosis screening among postmenopausal, at-risk African-American versus white women and if so, to determine which physician or patient factors were associated with screening.

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METHODS

Design

We designed a cross-sectional, outpatient study to compare the prevalence of DXA screening for osteoporosis between at-risk African-American and white women. Secondary outcomes included prevalence of peripheral measurement of BMD; recommendations for calcium, vitamin D, hormone therapy (HT), raloxifene, calcitonin, or bisphosphonates; physician factors (physician type, hospital affiliation, and gender) and patient factors (age, weight, current HT use, additional risk factors) associated with screening; and compliance with screening. Multivitamin use alone was not considered indicative of adequate calcium or vitamin D supplementation. We obtained data through retrospective medical chart review. The study was approved by the Johns Hopkins Institutional Review Board.

Setting

The study was performed at 2 outpatient clinic sites: an urban academic hospital and a suburban community hospital. Both sites have clinically active Internists and Internal Medicine residents who see patients in the clinics. The population at both sites is diverse. At the academic site, patients included urban residents, hospital employees, and middle socioeconomic class women of both ethnicities. Patients at the community site were suburban residents and of middle socioeconomic class, also of both ethnicities.

Study Population

Patients were African-American and white women at risk for osteoporosis who visited either the faculty or resident clinic between January 1, 2000 and December 31, 2000, and who had visited the clinic on at least 1 prior occasion (a surrogate marker for continuity of care). Patients "at risk" were defined as being age ≥ 65 and weighing ≤ 127 pounds, both parameters being risk factors that meet NOF criteria for DXA screening.¹⁴ A master list of patients was electronically generated at each site by visit year and age. The master lists consisted of 1,639 patients at the academic site and 1,809 charts at the community site. Paper charts were then manually screened for weight ≤ 127 pounds (all charts contained weight data) and ethnicity. Sampling strategy consisted of systematic alphabetic sampling with a random start. Patients were excluded if they lacked a prior visit to the clinic or had evidence of a terminal illness or shortened life expectancy (including a diagnosis of cancer, heart failure with an ejection fraction $< 15\%$, chronic obstructive lung disease with a forced expiratory volume in 1 second (FEV1) < 1.0 L, or moderate to severe dementia). Charts were reviewed until approximately 100 African-American and 100 white women had been enrolled. Data were extracted by 3 chart reviewers (J.C., M.C., C.C.). For internal consistency and validation of extraction accuracy, a random sample of 10% of the charts was cross-reviewed by a second reviewer.

Data Collection

We designed a standardized data entry sheet and pilot tested the instrument for accuracy, completeness, and ease of use. Data collected for each patient included demographic information; osteoporosis risk factors including weight, smoking

history, heavy alcohol use (3 drinks/day), family history of osteoporosis, and personal history of hip or vertebral fracture; medications predisposing to osteoporosis including glucocorticoids and anticonvulsants; potential secondary causes of osteoporosis (e.g., hyperthyroidism, hyperparathyroidism); and use of calcium, vitamin D, HT, raloxifene, calcitonin, or bisphosphonates.

We defined osteoporosis screening as documentation of any current or prior referral or recommendation for DXA scan, ordered by either the current physician or a previous physician involved with the patient's care. Although not the standard of care, we also looked for evidence of screening by peripheral devices, such as heel ultrasonography. Screening compliance was assessed by chart documentation of a completed DXA scan. We recorded other "surrogate" evidence of osteoporosis screening, including documentation of osteoporosis consideration, recommendations for calcium and vitamin D supplementation, and prescription of HT, raloxifene, calcitonin, or bisphosphonates for the prevention or treatment of osteoporosis. Overall, chart data were of good quality with few missing variables.

Finally, from hospital databases, we collected physician demographic information including age, gender, race, hospital affiliation, and physician type (resident vs Internist).

Data Analysis

We used descriptive statistics to define the study population. Two-sample *t* tests and χ^2 tests were used to compare the distributions of demographic variables for the African-American and white women. Odds ratios were calculated to estimate the relative prevalence of referral for DXA screening and evidence of osteoporosis prevention or treatment comparing the 2 groups of women. Logistic regression models were used to determine physician and patient factors associated with DXA referral. We used the Stata (version 7) statistical package for all analyses.²¹

RESULTS

The study included 205 subjects, of which 103 were African American and 102 were white. The African-American patients were slightly older, had lower prevalence of spine compression fractures, and were less likely to be taking HT, calcium, or vitamin D. African-American and white subjects did not differ by weight, smoking history, heavy alcohol use, family history of osteoporosis, personal history of hip fracture, current or prior use of predisposing medications or conditions, or total number of clinic visits (Table 1).

Table 2 presents evidence of osteoporosis screening by DXA referral. Eighty-nine (43%) of the at-risk women were referred for a DXA scan. Of the 102 white women, 56 (55%) were referred for DXA, while 33 (32%) of the 103 African-American women were referred. We estimated that the odds of an at-risk African-American woman being referred for a DXA scan were 61% lower than the odds for a white woman of comparable risk (OR: 0.39%, 95% confidence interval: 0.22 to 0.68).

We examined other evidence that the possibility of osteoporosis in the at-risk patient had been considered by the physician (Table 2). At-risk African-American women were less likely to have a mention of consideration of osteoporosis in physician notes, and significantly less likely to have been rec-

Table 1. Baseline Demographic Variables

Variable	White n=102	African American n=103	P Value
Location			
Academic	52	60	.296
Community	50	43	
Age*	77.8 (7.0)	80.3 (7.4)	.014
Weight*	114.1 (10.8)	111.1 (11.0)	.057
Height*†	61.7 (5.4)	61.3 (2.7)	.533
Smoking history	33	38	.395
Heavy alcohol use‡	3	8	.107
Family history of osteoporosis	5	1	.092
History of hip fracture	6	6	.986
History of vertebral compression fracture	15	0	<.001
Oral corticosteroid use	16	14	.671
History of a predisposing disorder	16	16	
Current use of HT	23	11	.022
Current use of calcium	58	38	.004
Current use of vitamin D	47	21	<.001
Total number of clinic visits§			
1 or 2	4	3	
3 or 4	10	4	
5 or more	88	96	.217

*The table presents counts for categorical variables and means and standard deviations for continuous variables.

†Height was available for 75 white subjects and 64 African-American subjects.

‡Heavy alcohol use defined as ≥ 3 drinks per day.

§Total clinic visits prior to and including the year 2000.

HT, hormone therapy.

ommended calcium and/or vitamin D supplementation, HT, or raloxifene, and calcitonin or bisphosphonates.

As shown in Table 2, compliance with osteoporosis screening was comparable between the 2 groups. Of those who were referred for DXA scan, there was no statistically significant difference between the odds of completing the scan comparing African-American and white women.

Table 3 displays the estimated associations between DXA referral and physician and patient factors. For instance, we estimated that the odds of DXA referral for African-American women were 40% and 69% lower than the odds for white women as seen by a resident or Internist, respectively (95% confidence interval: 0.23 to 1.56 and 0.15 to 0.63, respectively).

Although the estimated odds of DXA referral were lower among African-American women for all physician factors (type of physician, hospital affiliation, or gender), none of these differences were statistically significant within the same physician factor level. There were not enough African-American physicians ($n=2$) to allow analysis of race as a physician factor.

In analyzing individual patient factors associated with DXA referral, we found evidence to suggest that African-American women not on HT, having a body weight > 115 pounds, and having 1 or more additional risk factors for osteoporosis (in addition to age and low body weight) had significantly lower odds of DXA referral when compared with odds of referral for white women (Table 3). When comparing patient factors within the level, however (column 4, Table 3), no patient factors were associated with significant differences in referral rates between the 2 ethnic populations.

DISCUSSION

Our results reveal that significantly fewer at-risk African-American women than white women were referred for osteoporosis screening in this population. All subjects were at risk given their age and low body weight. Among women who were appropriately referred for DXA, however, there was no racial difference in screening compliance. Physicians were also significantly less likely to document a discussion or consideration of osteoporosis in the charts of African-American subjects, and they were less likely to recommend pharmacologic prevention or treatment (calcium, vitamin D, and others).

At the time of this study, NOF guidelines recommended that all of the study population should have been screened with DXA because of their level of risk,¹⁴ and Medicare reimbursed such screening.¹⁵ Although the screening referral rate of 43% for our entire study population was suboptimal, it was higher than rates in previous studies, perhaps because of the academic nature of the clinics (both sites had residency training programs). In other studies of at-risk women, only 12% of women ≥ 65 years and 34% of postmenopausal women with a fracture history received DXA screening,¹⁶ fewer than 30% of primary care physicians had ever ordered a DXA,¹⁷ and documentation by family practice physicians of osteoporosis discussion occurred in only 35% of at-risk women.¹⁸ Barriers to physician screening may include limited

Table 2. Evidence of Osteoporosis Screening or Prevention by Physicians

Variable	Level	White Women (n=102)	African-American Women (n=103)	Odds Ratio (95% Confidence Interval)
DXA referral	Yes	56	33	—
	No	46	70	0.39 (0.22, 0.68)
Completed DXA, if referred	Yes	44	24	—
	No	12	9	0.73 (0.27, 1.93)
Peripheral bone density measurement referral	Yes	6	2	—
	No	96	101	0.32 (0, 1.41)
Documentation of consideration of osteoporosis in physician notes	Yes	73	41	—
	No	29	61	0.27 (0.15, 0.48)
Recommendation of calcium and/or vitamin D supplementation	Yes	71	33	—
	No	31	70	0.21 (0.11, 0.37)
Recommendation of HT or raloxifene	Yes	29	9	—
	No	65	90	0.22 (0.10, 0.50)
Recommendation of calcitonin or bisphosphonates	Yes	46	19	—
	No	56	84	0.28 (0.15, 0.52)

DXA, dual energy x-ray absorptiometry; HT, hormone therapy.

Table 3. Physician and Patient Factors Associated with Referral for DXA

Variable	Level	Odds Ratio* (95% Confidence Interval)	P Value*
<i>Physician factors</i>			
Type of physician	Resident (n=70)	0.60 (0.23, 1.56)	.28
	Internist (n=135)	0.31 (0.15, 0.63)	
Hospital affiliation	Academic (n=112)	0.29 (0.13, 0.63)	.314
	Community (n=93)	0.52 (0.22, 1.22)	
Physician gender	Female (n=130)	0.49 (0.24, 1.00)	.266
	Male (n=75)	0.25 (0.10, 0.66)	
<i>Patient factors</i>			
Current HT use	Yes	1.10 (0.26, 4.65)	.134
	No	0.33 (0.18, 0.62)	
Age	Over 80 years of age	0.39 (0.16, 0.92)	.953
	80 and under	0.38 (0.17, 0.83)	
Weight	Over 115 pounds	0.28 (0.12, 0.66)	.333
	115 and less	0.49 (0.23, 1.08)	
Additional risk factors [†]	One or more	0.24 (0.11, 0.54)	.098
	No additional risk factors	0.71 (0.27, 1.88)	

*Odds ratios are comparing the odds of referral for African-American with white women at different levels of physician and patient factors. Estimates are obtained using logistic regression models. The P values correspond to testing the null hypothesis that the odds of referral between the factors within the same physician or patient level are the same.

†Additional risk factors include: Excessive alcohol use (> 3 drinks per day), family history of osteoporosis, personal history of hip or spinal compression fracture, prior or current use of medications predisposing to osteoporosis, history of a predisposing disorder, and other metabolic bone disease. DXA, dual energy x-ray absorptiometry; HT, hormone therapy.

knowledge of guidelines, cost and availability of testing facilities, and the belief that results would not affect treatment decisions.²²

Our study further indicates that at-risk African-American women were significantly less likely to receive DXA referral than white women at similar risk. Few studies exist that address racial disparity in osteoporosis screening and treatment.^{19,20} In a survey of women 50 years or older in a managed care population, Mudano et al.¹⁹ found that self-report of BMD testing was significantly lower among African Americans (10%) when compared with whites (25%), a difference that persisted among high-risk women with a fracture history. Likewise, Wei documented a significant difference in the use of calcium supplementation and antiresorptive drugs in osteoporotic African-American women versus white women.²³ A number of other studies identify racial disparities in health care delivery and document lower screening rates for colorectal cancer, breast cancer, and diabetic retinopathy among African Americans,^{24–26} as well as lower cardiac catheterization rates following myocardial infarction.^{27,28} For osteoporosis, such a screening disparity is unjust, for the disease is as common as many other diseases for which screening is recommended, affecting at least 10% of African-American women over the age of 50 years.¹

Why might this disparity in osteoporosis screening exist? First, physicians may erroneously deem African-American women to be at low risk for osteoporosis based solely on their race, without considering other risk factors. This would be a serious oversight, given that African-American women have similar risk factors as whites.¹² In fact, hypovitaminosis D, a significant risk factor for low bone mineral density, is significantly more prevalent in African-American women than in their white counterparts.²⁹ Physicians may also assume that differences in bone biology exist between African-American and white women, thus predisposing them to fewer fractures. Alternatively, African-American women may have more comorbid diseases that consume clinic time, diminishing the time to address osteoporosis screening. Finally, African-American

women may be less likely to initiate discussion of osteoporosis because of lack of knowledge of its significance relative to other diseases, such as breast cancer. These hypotheses require further examination in future research studies.

While our study did not address specific reasons why physicians were less likely to screen African-American women for osteoporosis, we did try to correlate certain physician factors with the likelihood of DXA referral. Others have found that female physicians were more likely to discuss osteoporosis with their postmenopausal patients than were male physicians, but did not look at African-American patients in particular.¹⁸ In our study, however, we found that screening practices did not vary between type of physician, hospital affiliation, or gender.

There are several limitations to our study. First, this was a retrospective chart review; we did not directly contact patients and physicians. Study accuracy is therefore dependent on the comprehensiveness of medical chart documentation and consistency of data abstraction. While inclusion criteria were easily assessable for all patient charts, selection bias may have been introduced by inadequate documentation of exclusion criteria. Second, we were unable to match patients according to comorbid illnesses, which may play a role in physician screening practices. We did attempt, however, to exclude any patient with a terminal illness or limited life expectancy in whom screening may not be warranted. Finally, we examined records from 2 sites in Baltimore, Maryland. Results may not be generalizable to other areas of the country, although the spectrum of patient demographics in our study was diverse.

Our study documents a significant disparity in the recommendation for osteoporosis screening between African-American and white women of similar risk, as well as evidence of disparate osteoporosis prevention or treatment, confirming the results of other studies. Future educational and research efforts should target this inequality, and furthermore aim to increase public awareness of the disease, identify reasons for screening disparities, and improve osteoporosis screening rates in at-risk African-American women.

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