Health Care Disparities in Postmenopausal Women Referred for DXA Screening

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Background: Racial disparities have been identified in a number of areas in clinical medicine. Limited data are available on osteoporosis screening rates between races. We assessed the racial distribution in Dual Energy X-ray Absorptiometry (DXA) screening rates among African American and Caucasian women referred from our primary care clinics. Methods: We obtained DXA results during the years 1998–2002 for all 546 women ages ≥50 years referred for bone mineral density (BMD) testing from a primary care population. We compared the DXA screening rates between African American and Caucasian women with the racial demographics of the referring primary care clinic population. Results: African American women represented 45.9% and Caucasian women 51.7% of our primary care clinic population. Yet, only 14.5% (n = 79) of the DXA screened women were African American, while 82.8% (n = 452) were Caucasian. Age and recognized risk factors only explained a small portion of this difference. In women 65 years and older with universal screening recommendations, 19.4% (n = 46) of the screened women were African American, and 80.6% (n = 191) were Caucasian. The prevalence of osteoporosis was similar in both populations, 21.5% and 20.1% for African American and Caucasian women, respectively. Conclusions: Significantly fewer African American women had BMD screening even though national guidelines do not differentiate by race. The large disparity between the proportion of African American and Caucasian women screened calls for more equitable BMD screening among races.

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The recent report of the Institute of Medicine, “Unequal Treatment: Confronting Racial and Ethnic Disparities in Health Care,” documented consistent research findings showing that minorities are less likely than whites to receive needed services, including clinically necessary procedures. These disparities existed in a number of areas and included cancer, cardiovascular disease, HIV/AIDS, diabetes, and mental illness. Racial and ethnic disparities in health care exist and are unacceptable because they are often associated with worse outcomes.

A companion report, “Unequal Treatment: What Health Care Providers Need to Know About Racial and Ethnic Disparities in Health Care,” calls for health care providers to be made aware of racial and ethnic disparities in the care they give. This report calls for standardized data collection to understand and eliminate these disparities. Despite this report, little research has addressed the potential for disparity in osteoporosis screening.

Osteoporosis is a significant problem in the United States that affects 29 million Americans, with 1.5 million osteoporotic fractures a year and a financial burden of $17 billion in 2001. Acknowledged risk factors for osteoporosis and fracture are age, steroid use, endocrine or metabolic disorders, family history of osteoporosis, weight loss, history of adult fracture, caffeine, tobacco, and excessive alcohol use.

There is limited evidence that the prevalence of reduced bone mineral density (BMD) and osteoporosis is lower in African American women than in Caucasian women of the same age. African American women start off with higher bone density and lose bone at a slower rate. Nonetheless, the vast majority of recommendations, including those of the National Osteoporosis Foundation (NOF), the American College of Obstetricians and Gynecologists (ACOG), the American College of Rheumatologists, and the United States Preventive Services Task Force (USPSTF) do not include race as a factor that should influence...
screening practices. The USPSTF recommends screening of all women over 65 years and high-risk women over 60 years, including those of low body weight, admitting that risk factors are difficult to specify. The NOF recommendation adds to the USPSTF guideline, recommending that postmenopausal women under age 65 years with fracture or one or more risk factors be screened.\textsuperscript{13} ACOG and the American College of Rheumatologists have similar screening recommendations. This suggests that screening should be comparable by race for women of similar profiles, and indeed, no specific protocols for screening of nonwhite women have been developed, and the BMD of nonwhite women has not been adequately studied.\textsuperscript{15}

Therefore, BMD screening recommendations remain the same for all races at this time. The objective of the present study was to examine possible racial disparities in the current Dual Energy X-ray Absorptiometry (DXA) screening practices of the primary care clinics at our academic medical center in the southeastern United States.

Methods
Subjects
Between the years 1998 and 2002, 739 women ages 50 years or older completed a screening BMD test using DXA. To focus on screening, we eliminated women referred from subspecialists who may have had secondary osteoporosis and women previously started on medications for treatment of osteoporosis. Thus, we excluded women taking bisphosphonates, selective estrogen receptor modulators, and calcitonin, but we included women on estrogen since they may have been on hormone replacement for other reasons. We included women who were patients of the primary care clinics (family medicine, general internal medicine, gynecology) at the medical school (n= 546). Because of their small numbers (n=15), we eliminated women who were of other races, leaving 531 African American or Caucasian women for our analysis.

Data Collected
Prior to DXA testing, all women were required to complete a questionnaire that collected basic demographic information to include race, weight and height, past and present medication use, family history of osteoporosis, history of endocrine disorders, menstrual and gynecologic surgery history, history of fractures, smoking, caffeine use, exercise history, dairy intake, and use of calcium and vitamin D supplements. A trained assistant obtained information from the DXA screening questionnaire and abstracted the medical records. Information that was incomplete on the questionnaire was gathered from our electronic medical record (Logician, General Electric) and paper records. Insurance information was not documented and could not reliably be obtained retrospectively.

We examined DXA screening rates and the prevalence of osteoporosis risk factors by age and race. Variables examined included prior medications affecting bone density (such as calcium and steroids), age, race, weight, height, family history of osteoporosis, personal history of fracture, smoking history, and consumption of caffeine and alcohol. Body mass index (BMI) was calculated as weight in kilograms divided by height in meters squared.\textsuperscript{16}

The Institutional Review Board of the Brody School of Medicine at East Carolina University approved our study.

DXA Procedure
The DXA machine used in this study was a General Electric LUNAR DPXIQ Model 2288. We used the T-score from each DXA report for analysis of BMD, which compares the patient’s BMD to a normative database. Patients whose DXA showed a T-score of \(<-2.5\) were considered to have osteoporosis, and those with scores \(>-2.5\) but \(<-1.0\) were considered to have osteopenia.\textsuperscript{17} Based on previous data,\textsuperscript{18} DXA scans of the hip and lumbar spine were obtained in patients younger than age 70, and DXA scans of the wrist and hip were obtained in patients 70 years and over.

Statistical Analysis
Age, BMI, and T-scores were compared by race using independent samples t tests. Risk factors and the prevalence of osteoporosis were compared by race using chi squared tests. All analyses were conducted using SPSS (Statistical Package for the Social Sciences) version 12 (SPSS, Inc, Chicago).

To evaluate referral patterns for DXA testing, we compared the age and race distributions among screened women to that of all women ages 50 years and older in the primary care practice population at the medical school during the referral period (Figure 1). To explore the effect of insurance coverage at age 65 years (Medicare), and considering the USPSTF recommendation for screening all women over 65 years, we performed a subanalysis by two age groups of 50–64 years and 65 years and older.

Results
African Americans comprised 45.0% and Caucasians 51.7% of our primary care clinic population of 13,856 women 50 years and older, with the balance being small numbers of Hispanics and other races. The age distributions of the 13,516 African American and Caucasian women in these clinics are displayed in Figure 1 and are similar by race. Clinic utilization by age and race was also similar. During our study period, African American women in our clinic population made 76,684 visits and Caucasian women 67,962 visits.
Of the 546 DXA scans performed for screening during this time period, 531 were completed on African Americans and Caucasians. Only 79 were African American women (14.9%), compared to 452 Caucasian women (85.1%).

Differences in screening rates persisted in those age 65 years and older who had universal screening recommendations based on age alone and who were covered by Medicare. Of the 237 women in this age group, 46 were African American (19.4%), and 191 were Caucasian (80.6%).

To eliminate the influence of risk factors, we analyzed the DXA screening results after removing from the database those women with one or more of the following osteoporosis risk factors: family history of osteoporosis, adult fracture, smoking history, steroid use, and weight <127 pounds. Of the original 531 African American and Caucasian women studied over this period of time, only 136, or slightly more than 25%, did not have any identified risk factors (38/79 or 48% of African American women and 98/452 or 22% of Caucasian women). A large racial disparity in DXA screening remained when only those without risk factors were included in the analysis (African American 27.9% and Caucasian 72.1%).

Table 1 displays disease and risk factor prevalence and DXA screening results first as a total group and then between ages 50 to 64 years and those age 65 years and older. The prevalence of osteoporosis in all screened women was 21.5% and 20.1% ($P=.778$), and of osteopenia 36.7% and 39.4% ($P=.653$) for African American and Caucasian women respectively.

Table 1 summarizes the risk factor data that might have prompted a referral for scanning and the bone density results from the 531 African American and Caucasian women by race and age categories. African American women who were screened were significantly older than Caucasian women (4.5 years, $P<.001$). The difference in mean age between the races at the time of screening was nonsignificant when women with risk factors were removed from the analysis. There was no statistically significant age difference in screening between races in women 65 years and over.

**Discussion**

Our study shows a racial disparity in osteoporosis screening, with Caucasian women from the same clinics being six times more likely to have had a screening DXA scan than their African American counterparts. Although higher risk factor levels in Caucasian women appear to account for part of the difference in screening, a significant difference by race in screening rates was present even when patients with risk factors were removed from the analysis. In women age 65 years and older, for whom routine screening is recommended regardless of risk factors and among whom virtually all patients have insurance, the disparity in screening rates persisted to a significant degree. Our study therefore demonstrates consistent racial disparity in DXA screening between African American women and Caucasian women even after taking into consideration the medical risk and economic factors.

There are a number of possible explanations for the racial disparities in our DXA scanning, especially in women over the age of 65. The authors of the Institute of Medicine report attribute disparities to three broad categories of decision making: (1) clinically appropriate differences, (2) environmental factors such as insurance coverage and lack of access, and (3) discrimination.
based on biases, stereotyping, and uncertainty. The large number of risk factors in Caucasian women in our study and the known higher BMD in African American women from NHANES data may influence provider behavior and would result in lower referral rates. This influence would mirror the first category of clinically appropriate differences. Nelson analyzed the literature, however, and found no evidence that treatment decisions based on clinical risk factors lead to better or worse fracture outcomes than BMD testing, and few studies evaluate how to use them to identify individual women at risk for fracture. Nonetheless, clinicians often base their decision to screen women on risk factors.

With regard to the second category, access to care does not seem to be an issue, since African American women had more clinic visits than Caucasian women, and the subanalysis looking at those 65 years and older eliminated insurance as an influence. Nonetheless, large unexplained differences remain after these are taken into account, suggesting the potential for disparity based on the third category of discrimination. No information on the decision-making process of providers in this area is currently available to clarify the relative importance of these three factors.

**Limitations**

Our database was derived from actual DXA testing results rather than DXA referral rates. The assumption that DXA testing reflects provider referral rates may not be correct. Factors that may reflect the difference between referrals and resultant testing are mistrust of the health care system by African Americans and insurance factors. Insurance information for women under 65 could not be systematically extracted from the electronic medical record. The influence of patient request for screening or what role risk factors played in the referral initiation were not obtainable.

While some criticize using Caucasian normative data for the calculation of the T-score of African American women, fracture data and guidelines for non-Caucasian women of all ages are published, and we used this as our reference point. However, these guidelines were developed for White women, and it is possible that they may not be appropriate for African American women. Additionally, we did not adjust for the fact that African American women may have lower BMD than Caucasian women, which could lead to a bias in our results.

<table>
<thead>
<tr>
<th>Table 1</th>
<th>DXA Screening by Age, Race, and Risk Factors</th>
</tr>
</thead>
<tbody>
<tr>
<td><strong>Diagnosis</strong></td>
<td><strong>Women of All Ages</strong></td>
</tr>
<tr>
<td></td>
<td>African American (n=79)</td>
</tr>
<tr>
<td>Osteoporosis</td>
<td>21.5%</td>
</tr>
<tr>
<td>Osteopenia</td>
<td>36.7%</td>
</tr>
<tr>
<td><strong>Risk Factor</strong></td>
<td></td>
</tr>
<tr>
<td>Mean age</td>
<td>67.7***</td>
</tr>
<tr>
<td>BMI</td>
<td>31.4***</td>
</tr>
<tr>
<td>Estrogen</td>
<td>13.9%</td>
</tr>
<tr>
<td>Calcium use</td>
<td>57.7%</td>
</tr>
<tr>
<td>Family history of osteoporosis</td>
<td>7.7%***</td>
</tr>
<tr>
<td>Adult fracture</td>
<td>25.3%</td>
</tr>
<tr>
<td>Smoking—current or past</td>
<td>29.1%*</td>
</tr>
<tr>
<td>Steroid use</td>
<td>3.8%</td>
</tr>
<tr>
<td>Weight &lt; 127 pounds</td>
<td>7.6%</td>
</tr>
<tr>
<td><strong>Parameter</strong></td>
<td></td>
</tr>
<tr>
<td>Femur BMD (g/cm2)</td>
<td>0.92 ± 0.19</td>
</tr>
<tr>
<td>Femur T-score</td>
<td>-0.67 ± 1.56</td>
</tr>
<tr>
<td>Lumbar BMD (g/cm2)</td>
<td>1.16 ± 0.24</td>
</tr>
<tr>
<td>Lumbar T-score</td>
<td>-0.37 ± 1.96</td>
</tr>
</tbody>
</table>

† Incomplete data for some variables.

* P<.05, ** P<.01, *** P<.001

DXA—Dual Energy X-ray Absorptiometry
BMI—body mass index
BMD—bone mineral density
women do not exist. Because of this, the International Society for Clinical Densitometry, in its position statement in July 2001, recommended a uniform Caucasian normative database for DXA diagnosis of osteoporosis without adjusting for race. Cauley et al have recently shown the relative risk of fracture per 1 standard deviation (SD) decrease in total hip BMD to be 1.44 (95% confidence interval [CI]=1.12–1.86) in African American women and 1.47 (95% CI=1.39–1.56) in Caucasian women, suggesting similar hip fracture risk.

Information on alcohol and caffeine use was not quantified and therefore was not included in our analysis, since their osteoporosis risk is dose dependent. We included women on estrogen replacement therapy in our analysis since most women before the publication of the Women's Health Initiative trial were placed on estrogen for other reasons than treatment of osteoporosis. Finally, our findings pertain to African American and Caucasian women in the southeastern United States and cannot be extrapolated to other groups or other parts of the country.

Conclusions

In our primary care population, significant unexplained disparities appear to exist in BMD screening between African American and Caucasian women 50 years of age and older. Higher levels of risk factors for osteoporosis in Caucasian women explain some of this difference in younger women. In women 65 years of age and older, however, for whom universal screening is recommended and insurance readily available, unexplained DXA screening disparity based on race is still evident. Further research is indicated to better understand the low DXA screening in African American women, especially those with universal recommendations for screening.

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