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High-risk Patients' Readiness to Undergo BMD Testing for Osteoporosis Diagnosis in Pennsylvania

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Abstract

Objective—To better understand high-risk patients' readiness to engage in bone mineral density (BMD) testing to diagnose osteoporosis.

Methods—We surveyed 636 participants in an RCT for patients at high-risk for osteoporosis. BMD screening readiness was measured by a 3-item summative index based on the Transtheoretical Model. Multivariable linear regression examined the relationship between patients' scores on the index and constructs of osteoporosis and BMD testing knowledge, concern for developing osteoporosis, self-efficacy to engage in fall prevention behaviors.

Results—Participants had a mean age of 79 years, 96% were female and 80% were white. Greater concern for developing osteoporosis and better knowledge about BMD testing were significant predictors of a higher score on the index.

Conclusions—Improving high-risk patients' knowledge about osteoporosis and the importance of BMD testing may enhance patients' readiness to undergo BMD testing. We found several correlates of readiness to undergo BMD screening that may be used to design effective interventions.

Keywords

BMD testing; osteoporosis; stage of change; survey

Introduction

Osteoporosis is a costly, common, and chronic disease that is the primary underlying cause of fractures in the elderly.[1] The annual number of hip fractures is expected to at least double by 2040, and the incidence of vertebral fractures increases markedly with age.[1,2] Suboptimal

levels of osteoporosis management have been shown across a range of populations.[3,4] BMD testing is one of the 71 measures included in the National Committee for Quality Assurance's Health Plan and Employer Data Information Set (HEDIS). The BMD testing measure seeks to compare the quality of osteoporotic prevention and management among health plans.[5] HEDIS inclusion highlights the role that BMD testing, plays in the diagnosis and subsequent of osteoporosis. Despite this critical role, BMD testing is underutilized.[6-8] Further, if high-risk patients do not undergo BMD testing to identify low BMD, then subsequent treatment is unlikely.[9] Improving rates of BMD testing in high-risk populations is an important strategy to reduce the burden of fracture-related morbidity and mortality associated with osteoporosis.

Given that BMD testing plays a pivotal role in the diagnosis and treatment of osteoporosis, in this study we sought to examine the relationships between knowledge, concern for developing osteoporosis, self-efficacy to engage in fall prevention behaviors, and stage of change for three BMD testing-related behaviors among survey participants with no prior diagnosis of osteoporosis or BMD testing. A majority of the U.S. elderly population does not have a diagnosis of osteoporosis or a history of BMD testing despite their increased risk for the disease, and so this “naïve” population is most relevant for the present study.

We recently completed a randomized controlled trial of a patient- and physician-targeted intervention to improve osteoporosis management. In the current post-hoc analyses, we examined whether elderly with greater knowledge of and concern about developing osteoporosis, as well as those who were already engaging in other osteoporosis-preventive behaviors such as fall prevention, would be more likely to report having undergone or being ready to undergo BMD testing. We hypothesized a positive relationship between these factors and readiness to undergo BMD testing.

Materials and Methods

We recently completed a randomized controlled trial (RCT) among primary care physicians and their high-risk patients described elsewhere (trial registration # NCT 00073190).[10-12] In brief, the patient component of the intervention consisted of three mailings to low-income older adults at high-risk for osteoporosis in the Pharmaceutical Assistance Contract for the Elderly (PACE) in Pennsylvania. The mailings contained patient vignettes to personalize the impact of osteoporosis and to provide models of preventive behaviors, information on BMD testing and medications, and strategies for speaking with one's physician about osteoporosis (all materials available at <http://www.drugapi.org> “Resources and Activities, Osteoporosis Action”). The intervention was not effective. The high-risk adults fell into one of three categories – sustained a prior fracture, used at least 90 days of oral glucocorticoids, or women at least 65 years of age.

We undertook a subsequent survey of RCT participants that has been described previously. [13] Approximately 10 months post-RCT, we invited a sample of 1200 RCT participants to respond to a survey; they were distributed evenly between the intervention and control groups. We over-sampled men, all those taking oral glucocorticoids consecutively for at least 90 days, and all persons of African American, Hispanic, or Asian descent. The remaining survey population was randomly selected.

Survey domains and study outcome: the BMD screening readiness index

The survey examined respondents' knowledge of osteoporosis, concern for developing osteoporosis for the disease, and self-efficacy and stage of change for performing osteoporosis preventive behaviors (see Figure 1). The control and intervention groups showed no significant differences in osteoporosis-related knowledge, attitudes, or prevention behaviors. As well, they were similar with respect to age, gender, race, marital status, and comorbid conditions. Thus,

responses from the control and intervention groups are pooled for our present analyses.¹³ The intervention and survey were reviewed and approved by Partners Healthcare Human Subjects Committee.

We constructed a BMD screening readiness index to assess respondents' *stage of change* (readiness to take on a particular behavior) to undergo BMD testing. The index included three items: 1) speaking to one's physician about osteoporosis, 2) asking one's physician about having a BMD test, and 3) having a BMD test (see Figure 1). Response options were coded on a 3 point Likert scale from 0 to 2, drawn from the first four stages of the Transtheoretical Model [14] and included *pre-contemplation* (had not performed behavior, did not plan to do so), *contemplation/preparation* (had not performed behavior, but planned to do so) and *action* (currently performing behavior). Scores across the 3 items were summed and interpreted as a single, continuous variable ranging from 0 (not in action for any behaviors) to 5 (action for 2 behaviors and contemplation for BMD testing). Because respondents who had a history of BMD testing were excluded, none of the respondents had a response of "action" for having a BMD test. The internal consistency of this index was high (Cronbach's alpha=0.86).

Independent variables

Demographic factors included gender, age (66-74, 75-84, 85+), race (Caucasian vs. other), number of physician visits in the past year, admission to a nursing home in the past year, number of generic medications used in the past year, number of comorbid conditions, history of fracture (hip, wrist or humerus), history of mammogram screening (women only), history of PSA test (men only), and history of flu shot. This information was identified in Medicare and prescription claims data from the twelve month period prior to the RCT intervention. Because there is no accepted algorithm for defining a spine fracture using claims data, this type of fracture was not included.

In addition, we explored the properties of several multi-item scales, comprised of survey questions grouped according to the following constructs, "knowledge about bone mineral density testing", "knowledge about osteoporosis", "self efficacy to engage in fall prevention behaviors", and "concern for developing osteoporosis" (please see online appendix). Each multi-item scale was examined using confirmatory factor analysis using structural equation modeling with polychoric correlation coefficients and asymptotic covariance matrices, and had adequate internal consistency (Cronbach's alpha coefficient >0.8 or composite reliability >0.7 and explained variance >0.5).

Statistical Analyses

The relationship between a patient's baseline characteristics, survey responses, and score on the osteoporosis preventive behaviors index was analyzed using univariate and multivariate linear regression. In unadjusted analyses, models were run separately for men and women to allow inclusion of gender-specific variables such as prostate specific antigen testing and mammography. In adjusted models, we combined the gender-specific variables into one variable: "PSA-among men or mammogram-among women" to include both sexes. We included an indicator term for treatment assignment group, i.e., intervention or control in all models. Variables with $p < 0.2$ were included in the adjusted analysis. After adjusting for treatment assignment, only those variables with P -values < 0.05 remained in adjusted models. As a sensitivity analysis, crude and adjusted odds ratio estimates were determined using logistic regression by dichotomizing BMD screening readiness index (greater or equal to the median score, vs. less than median score). Polychoric correlation coefficients were calculated in PRELIS 2.72 and factor analysis was completed in LISREL 8.72. All other analyses were conducted in SAS Version 8.02 (SAS, Cary, NC, 1999). All analyses presented are post-hoc and should be considered as exploratory in nature.

Results

Of the 636 survey respondents, 382 were ineligible for the present study due to one or more exclusion criteria: 38 had missing outcome data, 184 a history of osteoporosis medication use, 264 had prior BMD testing, and 157 had a diagnosis of osteoporosis. The remaining 254 respondents were studied.

Respondents' mean age was 79 years (SD = 6.5, range: 65 – 97) and almost all were women and of white race (Table 1). In the year prior to the intervention, 3% had experienced a fracture, and they visited their physicians 7 times on average.

Table 2 presents respondents' stage of change for the three items on the BMD screening readiness index. Nearly one-fifth (19%) of respondents reported being in the “action” stage in talking with their physician about osteoporosis. In contrast, only 6% reported that they had asked their physician about getting a BMD test. More than half of respondents had contemplated at least one of the three behaviors: 58% contemplated talking to a physician about osteoporosis, 57% planned to ask their doctor about getting a BMD test, and 54% contemplated having a BMD test for osteoporosis.

The unadjusted and adjusted multivariate linear regression results are presented in Table 3. In unadjusted analyses, older age, female gender, and knowledge about BMD testing were significant predictors of a higher score on the BMD screening readiness index. In adjusted models, better knowledge about BMD testing (standardized $\beta = 2.07$, $p = 0.0395$) and greater concern about developing osteoporosis (standardized $\beta = 2.09$, $p = 0.0382$) were predictors of a higher score on the BMD screening readiness index. Respondents between the ages of 75 – 84, compared to respondents aged 85+, also had a statistically significant higher score on the index (standardized $\beta = 2.11$, $p = 0.0362$). Results of the logistic regressions were similar to the linear models (data not shown).

Discussion

In a population of frail older adults at high-risk for osteoporosis, knowledge regarding bone mineral density testing and greater concern about developing osteoporosis were strong predictors of higher scores on a BMD screening readiness index. Younger age (75 – 84 versus 85+) was also a significant predictor of a patient's score on the index, yet there were no differences in scores among those aged 66 – 74 versus those 85+.

In a recent study, one reliable predictor of performing a particular osteoporosis preventive behavior was the participant's perception of the difficulty of performing that behavior.[15] Consistent with these results, we found that participants who understood the BMD testing process and reimbursement for BMD testing scored higher on the BMD screening readiness index. Future interventions might train nurses or other allied health professionals to talk with patients about BMD testing, describing it as a quick, easy, and painless option to screen for osteoporosis and highlighting Medicare's reimbursement of the test. Such discussion might prompt patients to undergo the test.

Our results regarding concern for developing osteoporosis and self-efficacy for fall prevention behaviors merit comment as well. Adults who wish to adopt behaviors to reduce the risk or impact of osteoporosis (seeking care, testing, treatment, exercise, dietary modification) will need to make fundamental behavior change. Thus, our work is grounded in the Transtheoretical Model and in the key health behavior constructs of self-efficacy and perceived susceptibility. [14,16,17] Prior work suggests that a person's likelihood of adopting a health behavior is directly related to her readiness to take on a new behavior. The Transtheoretical Model of Change presents health behavior change as five serial stages.[14,16,17] The stages begin with

precontemplation, characterized by a lack of knowledge or demoralization. The next stages are *contemplation*, *preparation* to act, and *action*. During the *action* stage, a person makes specific, measurable changes to adopt a health behavior, such as starting an exercise program or taking a multivitamin daily. Finally, the *maintenance* stage involves sustaining the health behavior over time. *Perceived susceptibility*, the belief that one is personally at risk is a construct common to major health behavior theories and models such as Witte's Extended Parallel Processing Model (EPPM).[18] The health behavior construct of self-efficacy, a person's confidence in his or her ability to take action and overcome barriers, is central to Bandura's Social Cognitive Theory[19] and is also included in the EPPM, among others.

Based on the aforementioned behavioral theories that underpinned the RCT intervention,[14, 16-19] we expect that patients who have greater concern for developing osteoporosis will act to address the threat of the disease. Because greater concern for developing osteoporosis was positively correlated with higher scores on the BMD screening readiness index, further work should focus on how best to enhance this domain. In contrast, the same inferences cannot be drawn for the behavioral construct of self-efficacy to engage in fall prevention behaviors, which was not associated with higher scores on the BMD screening readiness index. Patients may not understand that fall prevention and BMD testing are different but complementary approaches to minimizing the morbidity and mortality related to osteoporosis.[20] These perceptions may help explain the lack of association between self-efficacy to engage in fall prevention behaviors and a higher score on the BMD screening readiness index. Previous studies that examined self-efficacy in the context of osteoporosis have focused on calcium and exercise,[21-24] and direct comparisons between self-efficacy in these studies and ours are not possible.

An important limitation of our study was the population, whose survey responses may reflect the underlying population of old and frail adults of low-moderate income (the PACE population). Our response rate may limit the generalizability of our findings. We also were limited to use attitudes regarding BMD testing as the endpoint and not the actual BMD test. This limitation was imposed by the timing of our survey, which post-dated the availability of BMD data. Thus, it would have been inappropriate to use the survey information to "predict" a BMD test that had actually occurred prior to the survey. All survey data were collected at one point in time and were self-report. These cross-sectional self-reported data may not reflect actual behaviors and causal inference is impossible to draw. Finally, there may be other domains, not assessed in our survey, important for predicting readiness for BMD testing.

Improving rates of BMD testing among high-risk patients has the potential to significantly reduce the fracture-related morbidity and mortality associated with osteoporosis. Theories suggest that the likelihood that a patient will engage in a health behavior is related to readiness to take on new behaviors. We find that better knowledge about BMD testing and heightened concern about osteoporosis were associated with higher scores on a BMD screening readiness index. These constructs may be important targets for future interventions. Additional research is needed to determine the most effective methods for changing participants' attitudes and beliefs and thus increasing the number of elderly who undergo BMD testing.

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APPENDIX: The survey

Please answer every question. If you are unsure about the answer to a question, please give your best answer. If you would rather complete the survey by phone, please call us toll-free at

1-800-722-5520 extension 80930, 9am-5pm, Monday-Friday, and ask for Jennifer Polinski or Andrea Licari. Thank you.

Your Health and Osteoporosis

Please check the ONE box that best describes your answer for each statement.

	True	False	Not sure
1. Osteoporosis makes your bones weak and brittle.	☐	☐	☐
2. People with osteoporosis are more likely than people with normal bones to break a bone if they fall.	☐	☐	☐
3. Only women get osteoporosis.	☐	☐	☐
4. Medicines like prednisone (steroids) can weaken your bones.	☐	☐	☐
5. Osteoporosis affects your joints, not your bones.	☐	☐	☐
6. Medicare will pay for a bone density test.	☐	☐	☐
7. Having a bone density test is a good way to find out if you have osteoporosis.	☐	☐	☐
8. Osteoporosis always causes pain.	☐	☐	☐
9. Doing exercises to strengthen your legs can prevent falls.	☐	☐	☐
10. Osteoporosis can result in a broken hip, wrist, or spine bones.	☐	☐	☐
11. No medications can treat osteoporosis.	☐	☐	☐

For each of the following items, check the ONE box that best describes how you feel about the statement. There are no right or wrong answers.

	Strongly disagree	Disagree	Neutral	Agree	Strongly agree
1. There are things I can do to prevent osteoporosis.	☐	☐	☐	☐	☐
2. The thought of having osteoporosis scares me.	☐	☐	☐	☐	☐
3. People with osteoporosis can benefit from treatment.	☐	☐	☐	☐	☐
4. It worries me that osteoporosis causes broken bones.	☐	☐	☐	☐	☐
5. I am at risk for osteoporosis.	☐	☐	☐	☐	☐
6. As long as I have no symptoms of osteoporosis, there is no reason to worry.	☐	☐	☐	☐	☐

For each of the following statements, please CIRCLE the number that corresponds with how certain you are that you can do the tasks regularly at the present time. There are no right or wrong answers.

How certain are you that you can:	Very uncertain				Very certain
1. Talk to your doctor about osteoporosis at your next visit.	1	2	3	4	5
2. Get a bone density test if your doctor wants you to.	1	2	3	4	5

How certain are you that you can:	Very uncertain				Very certain
3. Take calcium regularly.	1	2	3	4	5
4. Get your eyes checked regularly.	1	2	3	4	5
5. Make your home safe from falls.	1	2	3	4	5
6. Do exercises regularly to strengthen your legs.	1	2	3	4	5

Please read each question and check the ONE box that best describes your answer.

1. Have you talked to your doctor about osteoporosis?
 - ☐ Yes.
 - ☐ Not yet, but I plan to talk to my doctor about osteoporosis at my next appointment.
 - ☐ I do not plan to talk to my doctor about osteoporosis.
2. Have you asked your doctor about getting a bone density test for osteoporosis?
 - ☐ Yes.
 - ☐ Not yet, but I plan to ask my doctor about a bone density test at my next appointment.
 - ☐ I do not plan to ask my doctor about a bone density test for osteoporosis.
3. Have you had a bone density test for osteoporosis?
 - ☐ Yes.
 - ☐ Not yet, but I plan to have a bone density test for osteoporosis.
 - ☐ No, I do not plan to schedule a bone density test for osteoporosis.
4. Have you made changes in your home to reduce your risk of falling?
 - ☐ Yes. (please answer 4a)
 - ☐ Not yet, but I plan to make changes. (skip to question 5)
 - ☐ I do not plan to make changes. (skip to question 5)

4a. What changes have you made in your home? (check all that apply)

 - ☐ I have placed grab bars in the bathroom.
 - ☐ I have removed throw rugs.
 - ☐ I use a night light.
 - ☐ Other: _____
5. Are you doing exercises to strengthen your legs?
 - ☐ Yes.
 - ☐ Not yet, but I plan to start doing exercises to strengthen my legs.
 - ☐ I do not plan to do exercises to strengthen my legs.
6. Are you taking calcium to help strengthen your bones? **CALCIUM**
 - ☐ Yes.

- ☐ Not yet, but I plan to start taking calcium.
- ☐ I do not plan to take calcium.

Osteoporosis Materials

For each question, please check the appropriate box.

1. In the past year, have you received materials from PACE about osteoporosis and preventing broken bones?
 - ☐ Yes
 - ☐ No
 - 1a. Did you read these materials about osteoporosis?
 - ☐ Yes (please answer 1b and 1c)
 - ☐ No (skip to question 2)
 - 1b. Did you discuss these materials about osteoporosis with a friend or relative?
 - ☐ Yes
 - ☐ No
 - 1c. Did you discuss these materials about osteoporosis with your doctor?
 - ☐ Yes
 - ☐ No
2. In the past six months, have you heard about osteoporosis in the newspapers or on the news?
 - ☐ Yes
 - ☐ No

Your Health and Well Being

1. As compared with other people your same age, would you say that your health is:

Excellent	Good	Fair	Poor
1	2	3	4
☐	☐	☐	☐

- 2a. How tall are you NOW?

_____feet_____inches

- 2b. How much do you weigh NOW?

_____ pounds

3. Please check the one statement below that best describes your cigarette smoking status?
 - ☐ I never smoked.
 - ☐ I used to smoke, but I quit.
 - ☐ I smoke now.

4. Do you currently take aspirin, such as Bufferin, Anacin, baby aspirin, or Excedrin, AT LEAST TWICE PER WEEK?

☐ Yes

☐ No

5. Do you take over-the-counter medicines that you buy without a prescription for your pain, such as Advil, Motrin, Aleve, Nuprin, or ibuprofen?

☐ Yes

☐ No

6. Do you take vitamins or supplements?

☐ Yes

☐ No

7. Which of these things are you still healthy enough to do without help? Please check all that apply.

☐ *Heavy* work around the house, like shoveling snow or washing walls

☐ Walk half a mile (about eight ordinary blocks)

☐ Walk up and down stairs to the second floor

Thank you for your time.

We appreciate your help!

Please send this survey back in the enclosed envelope.

BWH/PACE OSTEOPOROSIS PROJECT, 1620 Tremont St, Suite 3030, Boston, MA 02120

If you have additional comments, please feel free to write them in the space on the next page.

Comments: _____

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Concern for developing osteoporosis

1. The thought of having osteoporosis scares me
2. It worries me that osteoporosis causes broken bones

Scale score: sum of individual items (response options: 1=strongly disagree, 2=disagree, 3=neutral, 4=agree, 5=strongly agree).

Self-efficacy to engage in fall prevention behaviors

1. Get your eyes checked regularly
2. Make your home safe from falls
3. Do exercises regularly to strengthen your legs

Scale score: sum of individual items (response option: 5-point Likert ranging from very uncertain to very certain).

Osteoporosis-related knowledge

1. Osteoporosis makes your bones weak and brittle
2. People with osteoporosis are more likely than people with normal bones to break a bone if they fall
3. Osteoporosis affects your joints, not your bones (reverse coded)
4. Osteoporosis can result in a broken hip, wrist, or spine bones.

Scale score: sum of correct items (response options: true, false, not sure; not sure coded as incorrect).

Knowledge about bone mineral density (BMD) testing

1. Medicare will pay for a bone density test.
2. Having a bone density test is a good way to find out if you have osteoporosis.

Scale score: sum of correct items (response options: true, false, not sure; not sure coded as incorrect).

Figure 1.

Legend: Items contained in multi-item scales used to examine association with higher scores on the BMD screening readiness index.

Table 1
Baseline characteristics of 254 survey respondents

	N (%) or mean $\pm$ SD
Gender-male	11 (4.3)
Age group (years)	
66-74	54 (21.3)
75-84	144 (56.7)
85-97	56 (22.0)
Race-white	204 (80.3)
Marital status-widowed or single	227 (90.1)
Smoking status	
Never	160 (64.3)
Past	74 (29.7)
Current	15 (6.0)
Self-reported health status	
Excellent	15 (6.0)
Good	101 (40.1)
Fair	120 (47.6)
Poor	16 (6.3)
Number of co-morbid conditions	1.6 $\pm$ 1.7
Participated in intervention	123 (48.4)
Heard of osteoporosis in news/newspaper past 6 months	179 (77.5)
Use of preventive services	
Flu shot	116 (45.7)
Mammogram (women only)	47 (19.3)
PSA test (men only)	1 (9.1)
Health care use in past year	
Number of physician visits	7.4 $\pm$ 5.7
Number of generic medications	1.5 $\pm$ 1.7
Admitted to a nursing home	9 (3.5)
History of hip, wrist, or humerus fracture	7 (2.8)
Survey multi-item scale response scores*	
Concern about developing osteoporosis [†]	7.55 $\pm$ 1.54
SE to engage in fall prevention behaviors[‡]	12.72 $\pm$ 2.51
Osteoporosis-related knowledge [§]	3.28 $\pm$ 0.98
Knowledge about BMD testing [□]	1.29 $\pm$ 0.62

* For individual items that comprise each scale, please see appendix

[†] The range of scores was between 0 – 10, with 10 = highest perceived susceptibility

[‡] The range of scores was between 0 – 15 with 15 = highest self-efficacy

[§] The range of scores was between 0 – 4 with 4 = all items correct

□ The range of scores was between 0 – 2 with 2 = all items correct

SE, self-efficacy; BMD, bone mineral density

Table 2

Participants' reported stage of change for three behaviors on the BMD screening readiness index.

Stage: Score:	Precontemplation			Contemplation/Preparation			Action		
	0			1			2		
	N	%*		N	%		N	%	
Have you talked to your doctor about osteoporosis?	58	22.8		147	57.9		49	19.3	
Have you asked your doctor about getting a bone density test for osteoporosis?	93	36.6		145	57.1		16	6.3	
Have you had a bone density test for osteoporosis?	116	45.7		138	54.3		7	7	

Precontemplation: patient does not plan to engage in behavior; response: "I do not plan to...."

Contemplation/preparation: patient considers making a change and begins to make a plan to do so; response: "Not yet, but I plan to..."

Action: Patient reports having talked to his/her doctor about osteoporosis and/or asked his/her doctor about a bone density test for osteoporosis

* Row percents may sum to > 100 due to rounding.

† We excluded those patients who self-reported a BMD test or who had a history of BMD testing. For this reason, these cells are empty.

Table 3
Predictors of BMD screening readiness

	Unadjusted analyses, N=254		Adjusted analysis, N=217	
	Beta [†]	p	Beta [†]	p
Patient characteristics				
Age, per year				
65-74	-0.20	0.8408	-0.01	0.9928
75-84	1.67	0.0954	2.11	0.0362
85-97	Reference	Reference	Reference	Reference
Male gender	-2.18	0.0298		
Race-white	-1.28	0.2034		
Number of comorbid conditions	0.10	0.9178		
Intervention group	-0.24	0.8087	-0.33	0.7425
Health care use in the past year				
Number of physician visits	0.92	0.3608		
Number of generic medications used	0.38	0.7029		
Number of nursing home admissions	-0.65	0.5152		
History of fracture	1.47	0.1435		
Use of preventive services				
Mammogram or PSA test	0.17	0.8613		
Flu shot	-0.24	0.8128		
Self-reported survey responses				
Knowledge about osteoporosis	1.48	0.1392		
Knowledge about BMD testing	2.14	0.0331	2.07	0.0395
SE to engage in fall prevention behaviors	1.49	0.1386		
Concern for developing osteoporosis	1.62	0.1076	2.09	0.0382

The model included all predictors in the table as well as an indicator variable for intervention or control group membership.

* The adjusted model included the covariates age, intervention or control group membership, knowledge regarding BMD testing, and perceived susceptibility. In unadjusted analyses, separate models were run for men and women to allow for appropriate entry of PSA testing and mammography. In adjusted analyses, PSA testing and mammography were combined to allow conclusion of both sexes.

[†] Standardized betas are presented. Standardized beta = beta/standard error.

PSA, prostate specific antigen; SE, self-efficacy; BMD, bone mineral density