

Screening for Osteoporosis: U.S. Preventive Services Task Force Recommendation Statement

U.S. Preventive Services Task Force*

Description: Update of the 2002 U.S. Preventive Services Task Force (USPSTF) recommendation on screening for osteoporosis.

Methods: The USPSTF evaluated evidence on the diagnostic accuracy of risk assessment instruments for osteoporosis and fractures, the performance of dual-energy x-ray absorptiometry and peripheral bone measurement tests in predicting fractures, the harms of screening for osteoporosis, and the benefits and harms of drug therapy for osteoporosis in women and men.

Recommendations: The USPSTF recommends screening for osteoporosis in women aged 65 years or older and in younger women whose fracture risk is equal to or greater than that of a 65-year-old

white woman who has no additional risk factors. (Grade B recommendation)

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis in men. (I statement)

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For author affiliation, see end of text.

* For a list of the members of the USPSTF, see the **Appendix** (available at www.annals.org).

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The U.S. Preventive Services Task Force (USPSTF) makes recommendations about preventive care services for patients without recognized signs or symptoms of the target condition.

It bases its recommendations on a systematic review of the evidence of the benefits and harms and an assessment of the net benefit of the service.

The USPSTF recognizes that clinical or policy decisions involve more considerations than this body of evidence alone. Clinicians and policymakers should understand the evidence but individualize decision making to the specific patient or situation.

SUMMARY OF RECOMMENDATIONS AND EVIDENCE

The USPSTF recommends screening for osteoporosis in women aged 65 years or older and in younger women whose fracture risk is equal to or greater than that of a 65-year-old white woman who has no additional risk factors. This is a B recommendation.

See also:

Print

Summary for Patients. I-40

Web-Only

Appendix

Conversion of graphics into slides

The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis in men. This is an I statement.

See the Clinical Considerations section for additional information about risk assessment for osteoporotic fractures and suggestions for practice regarding the I statement.

See the **Figure** for a summary of the recommendation and suggestions for clinical practice.

Table 1 describes the USPSTF grades, and **Table 2** describes the USPSTF classification of levels of certainty about net benefit.

RATIONALE

Importance

By 2012, approximately 12 million Americans older than 50 years are expected to have osteoporosis. One half of all postmenopausal women will have an osteoporosis-related fracture during their lifetime; 25% of these women will develop a vertebral deformity, and 15% will experience a hip fracture. Osteoporotic fractures, particularly hip fractures, are associated with chronic pain and disability, loss of independence, decreased quality of life, and increased mortality. Although hip fractures are less common in men than in women, more than one third of men who experience a hip fracture die within 1 year.

Detection

The USPSTF found convincing evidence that bone measurement tests predict short-term risk for osteoporotic fractures in women and men. The most commonly used tests are dual-energy x-ray absorptiometry (DXA) of the



Figure. Screening for osteoporosis: clinical summary of U.S. Preventive Services Task Force Recommendation.

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SCREENING FOR OSTEOPOROSIS CLINICAL SUMMARY OF U.S. PREVENTIVE SERVICES TASK FORCE RECOMMENDATION

Population	Women aged ≥ 65 years without previous known fractures or secondary causes of osteoporosis	Women aged < 65 years whose 10-year fracture risk is equal to or greater than that of a 65-year-old white woman without additional risk factors	Men without previous known fractures or secondary causes of osteoporosis
Recommendation	Screen		No recommendation
	Grade: B		Grade: I (insufficient evidence)
Risk Assessment	As many as 1 in 2 postmenopausal women and 1 in 5 older men are at risk for an osteoporosis-related fracture. Osteoporosis is common in all racial groups but is most common in white persons. Rates of osteoporosis increase with age. Elderly people are particularly susceptible to fractures. According to the FRAX fracture risk assessment tool, available at www.shef.ac.uk/FRAX/ , the 10-year fracture risk in a 65-year-old white woman without additional risk factors is 9.3%.		
Screening Tests	Current diagnostic and treatment criteria rely on dual-energy x-ray absorptiometry of the hip and lumbar spine.		
Timing of Screening	Evidence is lacking about optimal intervals for repeated screening.		
Interventions	In addition to adequate calcium and vitamin D intake and weight-bearing exercise, multiple U.S. Food and Drug Administration–approved therapies reduce fracture risk in women with low bone mineral density and no previous fractures, including bisphosphonates, parathyroid hormone, raloxifene, and estrogen. The choice of treatment should take into account the patient's clinical situation and the tradeoff between benefits and harms. Clinicians should provide education about how to minimize drug side effects.		
Suggestions for Practice Regarding the I Statement for Men	<p>Clinicians should consider:</p> <ul style="list-style-type: none"> • Potential preventable burden: increasing because of the aging of the U.S. population • Potential harms: likely to be small, mostly opportunity costs • Current practice: routine screening of men is not widespread • Costs: additional scanners are required to screen sizeable populations. <p>Men most likely to benefit from screening have a 10-year risk for osteoporotic fracture equal to or greater than that of a 65-year-old white woman without risk factors. However, current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis in men.</p>		

For a summary of the evidence systematically reviewed in making these recommendations, the full recommendation statement, and supporting documents, go to www.uspreventiveservicestaskforce.org.

hip and lumbar spine and quantitative ultrasonography of the calcaneus. Adequate evidence indicates that clinical risk assessment instruments have only modest predictive value for low bone density or fractures.

Benefits of Detection and Early Intervention

No controlled studies have evaluated the effect of screening for osteoporosis on fracture rates or fracture-related morbidity or mortality.

In postmenopausal women who have no previous osteoporotic fractures, the USPSTF found convincing evidence that drug therapies reduce the risk for fractures. In women aged 65 years or older and in younger women whose fracture risk is equal to or greater than that of a 65-year-old white woman who has no additional risk factors, the USPSTF judged that the benefit of treating screening-detected osteoporosis is at least moderate.

Because of the lack of relevant studies, the USPSTF found inadequate evidence that drug therapies reduce the risk for fractures in men who have no previous osteoporotic fractures. The USPSTF identified the absence of randomized trials of primary fracture prevention in men who have osteoporosis as a critical gap in the evidence.

Harms of Detection and Early Intervention

The USPSTF found no new studies that described harms of screening for osteoporosis in men or women. Screening with DXA is associated with opportunity costs (time and effort required by patients and the health care system). Harms of drug therapies for osteoporosis depend on the specific medication used. The USPSTF found adequate evidence that the harms of bisphosphonates, the most commonly prescribed therapies, are no greater than small. Convincing evidence in-

Table 1. What the USPSTF Grades Mean and Suggestions for Practice

Grade	Definition	Suggestions for Practice
A	The USPSTF recommends the service. There is high certainty that the net benefit is substantial.	Offer/provide this service.
B	The USPSTF recommends the service. There is high certainty that the net benefit is moderate or there is moderate certainty that the net benefit is moderate to substantial.	Offer/provide this service.
C	The USPSTF recommends against routinely providing the service. There may be considerations that support providing the service in an individual patient. There is moderate or high certainty that the net benefit is small.	Offer/provide this service only if other considerations support offering or providing the service in an individual patient.
D	The USPSTF recommends against the service. There is moderate or high certainty that the service has no net benefit or that the harms outweigh the benefits.	Discourage the use of this service.
I Statement	The USPSTF concludes that the current evidence is insufficient to assess the balance of benefits and harms of the service. Evidence is lacking, of poor quality, or conflicting, and the balance of benefits and harms cannot be determined.	Read the Clinical Considerations section of USPSTF Recommendation Statement. If the service is offered, patients should understand the uncertainty about the balance of benefits and harms.

icates that the harms of estrogen and selective estrogen receptor modulators are small to moderate.

USPSTF Assessment

The USPSTF concludes that for women aged 65 years or older and younger women whose fracture risk is equal to or greater than that of a 65-year-old white woman who has no additional risk factors, there is moderate certainty that

the net benefit of screening for osteoporosis by using DXA is at least moderate.

The USPSTF concludes that for men, evidence of the benefits of screening for osteoporosis is lacking and the balance of benefits and harms cannot be determined.

CLINICAL CONSIDERATIONS

Patient Population Under Consideration

This recommendation applies to older adults in the general U.S. population who do not have a history of an osteoporotic fracture, osteoporosis secondary to another condition, or other specific clinical indications for bone measurement testing. The USPSTF did not define a specific upper age limit for screening in women because the risk for fractures continues to increase with age and treatment harms remain no greater than small. Clinicians should take into account the patient’s remaining lifespan when deciding whether to screen patients with significant illness. In the Fracture Intervention Trial (1), the benefit of treatment emerged 18 to 24 months after initiation of treatment.

The quantity and quality of data on osteoporotic fracture risk other than hip fracture are much lower for Asian, American Indian or Alaska Native, Hispanic, and black women than for white women. The USPSTF recommendation to screen women aged 65 years or older for osteoporosis applies to all racial and ethnic groups because the harms of the screening tests are no greater than small, the consequences of failing to identify and treat women who have low bone mineral density (BMD) are considerable, and the optimal alternative age at which to screen non-white women is uncertain.

Assessment of Risk

Multiple instruments to predict risk for low BMD and fractures have been developed and validated for use in postmenopausal women, but few have been validated for use in men. To predict fracture risk, the area under the receiver-operating characteristic curve ranges from 0.48 to 0.89 (2).

Table 2. USPSTF Levels of Certainty Regarding Net Benefit

Level of Certainty*	Description
High	The available evidence usually includes consistent results from well-designed, well-conducted studies in representative primary care populations. These studies assess the effects of the preventive service on health outcomes. This conclusion is therefore unlikely to be strongly affected by the results of future studies.
Moderate	The available evidence is sufficient to determine the effects of the preventive service on health outcomes, but confidence in the estimate is constrained by factors such as: the number, size, or quality of individual studies inconsistency of findings across individual studies limited generalizability of findings to routine primary care practice lack of coherence in the chain of evidence. As more information becomes available, the magnitude or direction of the observed effect could change, and this change may be large enough to alter the conclusion.
Low	The available evidence is insufficient to assess effects on health outcomes. Evidence is insufficient because of: the limited number or size of studies important flaws in study design or methods inconsistency of findings across individual studies gaps in the chain of evidence findings not generalizable to routine primary care practice a lack of information on important health outcomes. More information may allow an estimation of effects on health outcomes.

* Note: The USPSTF defines *certainty* as “likelihood that the USPSTF assessment of the net benefit of a preventive service is correct.” The net benefit is defined as benefit minus harm of the preventive service as implemented in a general primary care population. The USPSTF assigns a certainty level based on the nature of the overall evidence available to assess the net benefit of a preventive service.

Less complex instruments (those with fewer variables) seem to perform as well as more complex ones (3). The USPSTF found no studies that assessed the effect on patient outcomes of using risk prediction instruments alone or in combination with bone measurement tests.

The USPSTF used the FRAX (Fracture Risk Assessment) tool (World Health Organization Collaborating Centre for Metabolic Bone Diseases, Sheffield, United Kingdom; www.shf.ac.uk/FRAX/) to estimate 10-year risk for fractures because this tool relies on easily obtainable clinical information, such as age, body mass index (BMI), parental fracture history, and tobacco and alcohol use; its development was supported by a broad international collaboration and extensively validated in 2 large U.S. cohorts; and it is freely accessible to clinicians and the public. The FRAX tool includes questions about previous DXA results but does not require this information to estimate fracture risk.

On the basis of the U.S. FRAX tool, a 65-year-old white woman with no other risk factors has a 9.3% 10-year risk for any osteoporotic fracture. White women aged 50 to 64 years with equivalent or greater 10-year fracture risks based on specific risk factors include but are not limited to the following persons: 1) a 50-year-old current smoker with a BMI less than 21 kg/m², daily alcohol use, and parental fracture history; 2) a 55-year-old woman with parental fracture history; 3) a 60-year-old woman with a BMI less than 21 kg/m² and daily alcohol use; and 4) a 60-year-old current smoker with daily alcohol use. The FRAX tool also predicts 10-year fracture risks for black, Asian, and Hispanic women in the United States. In general, estimated fracture risks in nonwhite women are lower than those for white women of the same age.

Although the USPSTF recommends using a 10-year fracture risk threshold of 9.3% to screen women aged 50 to 64 years, clinicians also should consider each patient's values and preferences and use clinical judgment when discussing screening with women in this age group. Menopausal status is one factor that may affect a decision about screening in this age group.

Considerations for Practice Regarding the I Statement

When deciding whether to screen men for osteoporosis, clinicians should consider the following factors.

Potential Preventable Burden

Bone measurement tests may detect osteoporosis in a large number of men and prevent a substantial part of the burden of fractures and fracture-related illness in this population. The aging of the U.S. population is likely to increase this potentially preventable burden in future years.

Potential Harms

Potential harms of screening men are likely to be small and consist primarily of opportunity costs.

Current Practice

Routine screening of men currently is not a widespread practice.

Costs

Many additional DXA scanners may be required to screen sizeable populations of men for osteoporosis; the cost of DXA machines ranges from \$25 000 to \$85 000.

Assuming that the relative benefits and harms of therapy in men are similar to those in women, the men most likely to benefit from screening would have 10-year risks for osteoporotic fracture equal to or greater than those of 65-year-old white women who have no additional risk factors. However, current evidence is insufficient to assess the balance of benefits and harms of screening for osteoporosis in men.

Screening Tests

The most commonly used bone measurement tests used to screen for osteoporosis are DXA of the hip and lumbar spine and quantitative ultrasonography of the calcaneus. Quantitative ultrasonography is less expensive and more portable than DXA and does not expose patients to ionizing radiation. Quantitative ultrasonography of the calcaneus predicts fractures of the femoral neck, hip, and spine as effectively as DXA. However, current diagnostic and treatment criteria for osteoporosis rely on DXA measurements only, and criteria based on quantitative ultrasonography or a combination of quantitative ultrasonography and DXA have not been defined.

Screening Intervals

The potential value of rescreening women whose initial screening test did not detect osteoporosis is to improve fracture risk prediction. Evidence is leading about optimal intervals for repeated screening and whether repeated screening is necessary in a woman with normal BMD. Because of limitations in the precision of testing, a minimum of 2 years may be needed to reliably measure a change in BMD; however, longer intervals may be necessary to improve fracture risk prediction. A prospective study of 4124 women aged 65 years or older found that neither repeated BMD measurement nor the change in BMD after 8 years was more predictive of subsequent fracture risk than the original measurement (4).

Treatment

In addition to adequate calcium and vitamin D intake and weight-bearing exercise, multiple drug therapies are approved by the U.S. Food and Drug Administration to reduce fractures, including bisphosphonates, parathyroid hormone, raloxifene, and estrogen. The choice of therapy should be an individual one based on the patient's clinical situation and the tradeoff between benefits and harms. Clinicians should educate patients on how to use drug therapies to minimize adverse effects. For example, esophageal

irritation from bisphosphonate therapy can be reduced by taking the medication with a full glass of water and by not lying down for at least 30 minutes afterward.

Other Approaches to Prevention

The USPSTF has updated its evidence review on fall prevention in older adults and plans to issue an updated recommendation; in future months, the USPSTF also will issue a separate statement on the preventive effects of vitamin D and calcium supplements on osteoporotic fractures. When complete, these documents will be made available at www.uspreventiveservicestaskforce.org.

Useful Resources

The 10-year risk for osteoporotic fractures can be calculated for individuals by using the FRAX tool and could help to guide screening decisions for women younger than 65 years.

Summary guides for clinicians and patients on fracture prevention treatments for postmenopausal women who have osteoporosis are available from the Agency for Healthcare Research and Quality at <http://effectivehealthcare.ahrq.gov>. The recommendations in these guides may differ from those of the USPSTF because they were based on a systematic review that pooled data from trials that included women who had previous clinical fractures.

OTHER CONSIDERATIONS

Research Needs and Gaps

Given the absence of direct evidence that screening for osteoporosis reduces fracture-related morbidity or mortality, studies of long-term health outcomes of screened and nonscreened population groups are important. Research is needed to test the effectiveness of drug therapies for osteoporosis in men who do not have a history of fractures. The results of ongoing randomized trials of bisphosphonates for fracture prevention in men at high risk for fractures could help to assess whether these drugs are effective in men. Research to evaluate the outcome of screening women during periods of rapid bone loss (for example, menopause) also should be supported.

Further research that would inform clinical decisions about screening for osteoporosis include studies to establish parameters for treatment using quantitative ultrasonography as a primary screening test for osteoporosis, studies that ascertain the true incidence of major osteoporotic fractures in nonwhite ethnic groups in the United States, studies clarifying optimal screening intervals, and studies of the effect of clinical and subclinical vertebral fractures on health-related quality of life.

DISCUSSION

Burden of Disease

Osteoporosis is characterized by low BMD and a resultant increased risk for fractures. It is estimated that as many as 1 in 2 women and 1 in 5 men are at risk for an

osteoporosis-related fracture during their lifetime (5). Osteoporosis is more common in women than men and is more common in white persons than in any other racial group.

For all demographic groups, the rates of osteoporosis increase with age (2). Elderly patients have increased susceptibility to fractures because they commonly have additional risk factors for fractures, such as poor bone quality and an increased tendency to fall. Hip fractures in particular can result in significant morbidity and mortality. Fractures at other sites also can lead to significant illness, causing chronic pain or disability and negatively affecting functional ability and quality of life. Direct medical care costs of osteoporotic fractures were estimated to be \$12.2 to \$17.9 billion per year in 2002 U.S. dollars (5); these estimates do not include indirect costs associated with lost productivity of patients and caregivers.

The burden of osteoporosis varies according to age and other risk factors. Many different risk assessment instruments have been developed to predict risk for low BMD or fractures. Multiple studies have validated these tools; however, few of these studies have included men. Despite various risk factors and variables included in the different risk assessment tools, none of the tools has consistently superior performance (3).

The FRAX tool, developed by the World Health Organization and the National Osteoporosis Foundation, is one of the most widely used instruments to predict risk for fractures. This tool was derived from data on 9 cohorts in Europe, Canada, the United States, and Japan. Seven of these cohorts included men. The FRAX tool was validated in 11 cohorts, but only 1 of these cohorts included men (6).

Because a large and diverse sample was used to develop and validate the FRAX tool and this instrument includes a publicly available risk calculator, the USPSTF used the FRAX tool to determine which individuals would exceed the baseline risk threshold for fractures on the basis of their age or other risk factors (such as low BMI, parental history of hip fracture, smoking status, and daily alcohol use). Considering a 65-year-old white woman who has no other risk factors to be the baseline risk case (a 10-year risk for any osteoporotic fracture of 9.3%), women as young as 50 years may have a 10-year risk for any osteoporotic fracture of 9.3% or greater, depending on the type and number of risk factors present (2).

Scope of Review

This update addressed critical gaps in the evidence identified in the 2002 USPSTF recommendation and expanded the scope of the previous review by evaluating screening and treatment for osteoporosis in men as well as women. The USPSTF defined the screening population as postmenopausal women and older men who have no known previous osteoporotic fractures or secondary causes of osteoporosis. Persons who have fractures or secondary

causes of osteoporosis would undergo bone density testing as diagnostic tests, not screening tests.

Key questions in this review included how screening for osteoporosis affects fracture rates and fracture-related morbidity and mortality, the harms of screening for osteoporosis, the diagnostic accuracy of risk assessment instruments for low BMD and fractures, the performance of DXA and peripheral bone measurement tests in predicting fractures, and the benefits and harms of drug therapy to reduce fractures in women and men who have no known previous fractures.

Accuracy of Screening Tests

DXA

Measurement of bone density using DXA has become the gold standard for the diagnosis of osteoporosis and for guiding decisions about which patients to treat. Although it is not a perfect predictor of fractures, DXA of the femoral neck is considered the best predictor of hip fracture and is comparable with DXA measurements of the forearm for predicting fractures at other sites (7). Previous studies evaluating the accuracy of DXA for predicting fractures have focused mainly on women; studies have only recently assessed the predictive ability of DXA in men. A large prospective cohort study in the Netherlands that included men and women older than 55 years reported the incidence of vertebral and nonvertebral fractures approximately 6 years after baseline DXA measurements of the femoral neck were obtained. For each SD reduction in BMD at the femoral neck, the hazard ratio for vertebral and nonvertebral fractures increased to a similar degree in both men and women (6, 7). Other studies of the performance of DXA in men have reported similar findings (3).

Quantitative Ultrasonography

The most commonly used test in the United States after DXA is quantitative ultrasonography of the calcaneus. Quantitative ultrasonography is less expensive than DXA, does not involve radiation, and can feasibly be implemented in primary care settings. Recent studies demonstrate that quantitative ultrasonography of the calcaneus can predict fractures as effectively as DXA in postmenopausal women and in men.

Quantitative ultrasonography seems to be equivalent to DXA for predicting fractures and has other potential advantages, but also a few distinct disadvantages. The current diagnostic criteria for osteoporosis use DXA measurements as cutoffs, and the measurements obtained from quantitative ultrasonography are not interchangeable with those obtained from DXA. Also, all trials evaluating drug therapies for osteoporosis use DXA measurements as inclusion criteria. Thus, for quantitative ultrasonography to be relevant and clinically useful, a method for converting or adapting results of quantitative ultrasonography to the DXA scale will need to be developed.

One meta-analysis examined 25 studies to assess the accuracy of quantitative ultrasonography compared with DXA in identifying patients with osteoporosis. When various quantitative ultrasonography index parameter cutoffs were used, the results varied widely in sensitivity and specificity for identifying individuals with a T-score of -2.5 or less on DXA. No quantitative ultrasonography cutoff existed at which sensitivity and specificity were both high (8).

Effectiveness of Early Detection and Treatment

No controlled studies have evaluated the effect of screening for osteoporosis on rates of fractures or fracture-related morbidity or mortality.

Drug therapies for osteoporosis can be for primary prevention (prevention of an osteoporotic fracture in patients with low BMD who have no previous fractures) or secondary prevention (prevention of an osteoporotic fracture in patients who have a known previous osteoporotic fracture). Primary prevention trials are more applicable to the screening population addressed in this recommendation. For the purposes of the USPSTF evidence review, primary prevention studies were defined as trials that 1) excluded patients who had previous vertebral or other osteoporotic fractures; 2) admitted patients who had previous osteoporotic fractures, if the number of these patients constituted less than 20% of the overall sample; 3) reported results separately for patients who did and did not have previous fractures; or 4) did not report the proportion of patients who had previous osteoporotic fractures, if the trial did not select patients on the basis of whether they had a previous fracture and included patients whose mean BMD T-score was no worse than -3.0 (2).

Drug therapies include bisphosphonates, parathyroid hormone, raloxifene, estrogen, and calcitonin. For primary prevention in postmenopausal women, bisphosphonates, parathyroid hormone, raloxifene, and estrogen have been shown to reduce vertebral fractures. The evidence is strongest and most consistent for bisphosphonates and raloxifene (2).

In a meta-analysis of 7 trials, the relative risk (RR) for vertebral fractures for bisphosphonates compared with placebo was 0.66 (95% CI, 0.50 to 0.89). Two large placebo-controlled trials of raloxifene reported reduced vertebral fractures, with a combined RR for raloxifene of 0.61 compared with placebo (CI, 0.55 to 0.69) (9). A pooled analysis of 9 trials demonstrated a non-statistically significant trend toward a reduction in nonvertebral fractures with bisphosphonates compared with placebo (RR, 0.83 [CI, 0.64 to 1.08]) (3). In the largest trial of bisphosphonates, the Fracture Intervention Trial of alendronate, fractures were significantly reduced only in women with baseline femoral neck T-scores less than -2.5 (1).

Evidence of the effectiveness of treatment of osteoporosis in men is limited. There are no primary prevention trials of bisphosphonates in men and only 2 secondary prevention trials of alendronate. When the 2 trials were

Table 3. Osteoporosis Screening Recommendations of Other Organizations

Organization	Recommendations	
	Women	Men
National Osteoporosis Foundation	BMD testing for all women ≥65 y and postmenopausal women <65 y, based on risk factor profile	BMD testing for all men ≥70 y and men aged 50–69 y, based on risk factor profile
World Health Organization	Indirect evidence supports screening women ≥65 y, but no direct evidence supports widespread screening programs using BMD testing	
American College of Physicians		Clinicians should assess older men for osteoporosis risk factors and use DXA to screen men at increased risk who are candidates for drug therapy for osteoporosis
American Congress of Obstetricians and Gynecologists	BMD testing for all women ≥65 y and postmenopausal women <65 y who have ≥1 risk factor	

BMD = bone mineral density; DXA = dual-energy x-ray absorptiometry.

pooled, alendronate was associated with a reduced risk for vertebral fractures (odds ratio [OR], 0.35 [CI, 0.17 to 0.77]), and the effect on nonvertebral fractures was not statistically significant (OR, 0.73 [CI, 0.32 to 1.67]) (10). A single primary prevention trial of parathyroid hormone reported a non-statistically significant trend toward a reduction in vertebral and nonvertebral fractures (11). None of the other therapies for osteoporosis in men has been evaluated in randomized trials.

Potential Harms of Screening and Treatment

Potential harms of screening for osteoporosis include false-positive test results causing unnecessary treatment, false-negative test results, and patient anxiety about positive test results. No studies that addressed the potential harms of screening were identified during this review.

The harms of drug therapy for osteoporosis have been studied most extensively for bisphosphonates, raloxifene, and estrogen. For bisphosphonates, the evidence demonstrates no definitive increase in the risk for serious gastrointestinal adverse events (for example, perforations, ulcers, bleeding, esophagitis, or esophageal ulceration) in persons who use these medications appropriately. The evidence on the risk for atrial fibrillation with bisphosphonates is conflicting. One large case-control study in Denmark showed an increased risk for atrial fibrillation with any use of alendronate compared with no use of this agent (OR, 1.86 [CI, 1.09 to 3.15]) (12), but a smaller case-control study in Washington showed no increased risk for atrial fibrillation with any use of etidronate (RR, 0.95 [CI, 0.84 to 1.07]) or any use of alendronate (RR, 1.04 [CI, 0.90 to 1.21]) (13) compared with no use of either agent.

Osteonecrosis of the jaw has been associated with bisphosphonates in case reports, but this condition typically develops in patients with cancer who receive higher doses than those normally used for osteoporosis treatment or prevention. Case reports also have described severe musculoskeletal symptoms associated with all of the bisphosphonates (2). In October 2010, the U.S. Food and Drug Administration issued a warning about a possible elevated

risk for midfemur fractures in patients receiving bisphosphonates, especially for patients who have received them for more than 5 years.

Raloxifene and estrogen are associated with higher rates of thromboembolic events than placebo. Estrogen increases the risk for stroke, and estrogen with progestin increases the risk for coronary heart disease and breast cancer (2). Evidence is limited on the harms associated with use of calcitonin and parathyroid hormone for osteoporosis.

Estimate of Magnitude of Net Benefit

The USPSTF found convincing evidence that drug therapies reduce subsequent fracture rates in postmenopausal women. For women aged 65 years or older and younger women who have similar estimates of fracture risk, the benefit of treating screening-detected osteoporosis is at least moderate. The harms of treatment were found to range from no greater than small for bisphosphonates and parathyroid hormone to small to moderate for raloxifene and estrogen. Therefore, the USPSTF concludes with moderate certainty that the net benefit of screening for osteoporosis in this group of women is at least moderate.

For men, the USPSTF concludes that evidence is inadequate to assess the effectiveness of drug therapies in reducing subsequent fracture rates in men who have no previous fractures. Treatments that have been proven effective in women cannot necessarily be presumed to have similar effectiveness in men. Thus, the USPSTF could not assess the balance of benefits and harms of screening for osteoporosis in men.

How Does Evidence Fit With Biological Understanding?

Low bone density is a risk factor for fractures, especially in elderly persons. Screening and treating low BMD detected through screening can result in increased BMD and decrease the risk for subsequent fractures and fracture-related morbidity and mortality. Most evidence supports screening and treatment of osteoporosis in postmenopausal women; the evidence for primary prevention in men is lacking, and future research is needed. It cannot be as-

sumed that the bones of men and women are biologically the same, especially because bone density is affected by the differing levels and effects of testosterone and estrogen in men and women. Moreover, rapid bone loss occurs in women because of the loss of estrogen during menopause. Although this offers a plausible explanation for why women have a higher risk for osteoporosis at an earlier age than men, it raises the question of whether the benefits of treatment observed in trials of women can be directly extrapolated to men.

Response to Public Comments

A draft version of this recommendation statement was posted for public comment on the USPSTF Web site from 5 July through 4 August 2010. Many comments pointed out a lack of clarity about how clinicians can estimate 10-year fracture risks in women aged 50 to 64 years to determine whether they should receive screening for osteoporosis. Also, some comments requested specific recommendations about the age at which to begin screening in men and optimal intervals for screening. In response to these comments, the USPSTF clarified its approach to fracture risk assessment by revising and expanding the Clinical Considerations section. In the Research Needs and Gaps section, the USPSTF highlighted the types of studies that are needed to fill the evidence gaps about screening for osteoporosis in men and screening intervals.

Update of Previous USPSTF Recommendation

This recommendation replaces the 2002 recommendation. The major change in the current recommendation is that the USPSTF now recommends screening all women whose 10-year fracture risk is equal to or greater than that of a 65-year-old white woman who has no additional risk factors. In addition, the current recommendation addresses screening for osteoporosis in men.

RECOMMENDATIONS OF OTHERS

The National Osteoporosis Foundation recommends bone density testing for all women aged 65 years or older and all men aged 70 years or older. It also recommends bone density testing for postmenopausal women younger than 65 years and men aged 50 to 69 years if there is concern about osteoporosis on the basis of their risk factor profile (14). According to the World Health Organization, there is indirect evidence of the effectiveness of screening for osteoporosis in women aged 65 years or older, but no direct scientific evidence supports widespread screening for osteoporosis using BMD testing. Moreover, widespread screening programs may not be feasible or cost-effective in many countries (15).

The American College of Physicians recommends that clinicians assess older men for osteoporosis risk factors and use DXA to screen men at increased risk who are candidates for drug therapy for osteoporosis (16). Previous state-

ments by the American Academy of Family Physicians about screening for osteoporosis have been consistent with those of the USPSTF, and it is currently updating its recommendations. Finally, the American Congress of Obstetricians and Gynecologists recommends screening all women aged 65 years or older with BMD testing and screening postmenopausal women younger than 65 years who have 1 or more risk factors for osteoporosis (17). **Table 3** shows a summary of these recommendations.

From the U.S. Preventive Services Task Force, Rockville, Maryland.

Disclaimer: Recommendations made by the USPSTF are independent of the U.S. government. They should not be construed as an official position of the Agency for Healthcare Research and Quality or the U.S. Department of Health and Human Services.

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Potential Conflicts of Interest: None disclosed.

Requests for Single Reprints: Reprints are available from the USPSTF Web site (www.uspreventiveservices.org).

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APPENDIX: U.S. PREVENTIVE SERVICES TASK FORCE

Members of the U.S. Preventive Services Task Force at the time this recommendation was finalized† are Ned Calonge, MD, MPH, *Chair* (The Colorado Trust, Denver, Colorado); Kirsten Bibbins-Domingo, MD, PhD (University of California, San Francisco, San Francisco, California); Adelita Gonzales Cantu, RN, PhD (University of Texas Health Science Center, San Antonio, Texas); Susan Curry, PhD (University of Iowa, Iowa City, Iowa); Allen J. Dietrich, MD (Dartmouth Medical School, Hanover, New Hampshire); Glenn Flores, MD (University of Texas Southwestern, Dallas, Texas); David Grossman, MD (Group Health Cooperative, Seattle, Washington); George Isham, MD, MS (HealthPartners, Minneapolis, Minnesota); Michael L. LeFevre, MD, MSPH (University of Missouri School of Medicine, Columbia, Missouri); Rosanne M. Leipzig, MD, PhD

(Mount Sinai School of Medicine, New York, New York); Joy Melnikow, MD, MPH (University of California, Davis, Sacramento, California); Bernadette Melnyk, PhD, RN (Arizona State University College of Nursing & Healthcare Innovation, Phoenix, Arizona); Wanda Nicholson, MD, MPH (University of North Carolina School of Medicine, Chapel Hill, North Carolina); Carolina Reyes, MD (University of Southern California, Los Angeles, California); J. Sanford Schwartz, MD (University of Pennsylvania Medical School and the Wharton School, Philadelphia, Pennsylvania); and Timothy Wilt, MD, MPH (University of Minnesota Department of Medicine and Minneapolis Veteran Affairs Medical Center, Minneapolis, Minnesota).

† For a list of current Task Force members, go to www.uspreventiveservicestaskforce.org/about.htm#Members.