Clinical Use of Bone Densitometry

Clinical Applications

Osteoporosis is complex. It is clinically silent until fractures occur, making it easy to ignore. There are now several relatively complicated guidelines regarding screening. Furthermore, results of the many types of bone densitometry can be difficult to translate into risk of fracture and potential benefit of treatment. There are also several treatment choices whose magnitude and profile of protection against fractures differ; some (in particular, raloxifene and hormone replacement therapy) also have important effects on other systems besides the skeleton. However, the benefits of treating patients with osteoporosis are substantial, and identifying these patients need not be difficult.

In the simplest terms, the goal of screening is to find patients who have osteoporosis and offer them effective treatment to reduce their risk of fractures, which means making measurement of bone mass a routine part of preventive care for appropriate patients.

WHO SHOULD BE TESTED?

Patient 1

A 68-year-old Hispanic woman weighing 49.5 kg asks whether she should have a bone mineral density (BMD) screening.

The National Osteoporosis Foundation and the US Preventive Services Task Force recommend that all white women aged 65 years or older and not already receiving an effective treatment for osteoporosis be offered a screening test. Osteoporosis represents a difficult problem for physicians because, although many diagnostic tests are available, interpreting their results is not straightforward. As a result, many patients, even those with clear indications such as long-term steroid therapy or vertebral fractures on radiography, do not get screened or treated. Current evidence-based guidelines recommend screening for all white women older than 65 years and not already receiving an osteoporosis treatment and for many nonwhite women. For postmenopausal women who are younger than 65 years and have strong risk factors for osteoporosis, screening may also be beneficial. The optimal testing strategy depends on what is available locally. The best role for follow-up testing is still being defined, and interpretation of such testing is tricky. Reports of results can be hard to understand; a randomized controlled trial of clearer reports increased testing and decreased confusion about the meaning of test results. Densitometry might be more effectively used in practice if strategies such as having patients fill out a short questionnaire to assess for risk factors or creating a nurse-based system were used to identify patients. Clinicians need better approaches for identifying patients most likely to benefit from screening, systems that facilitate their application, and test results that are easy to interpret.

See also p 1889.
about to start long-term (≥3 months) oral corticosteroid treatment, and those who have other strong risk factors for fracture (parental history of hip fracture, current smoking, body weight <56.3 kg, or serious long-term illness known to substantially increase fracture risk). In men and nonwhite women younger than 65 years, testing those who have had fractures as adults and those who are already receiving or about to start long-term oral corticosteroid therapy is also probably worthwhile.

**Patient 2**
A 49-year-old sedentary white woman whose menses have become irregular but who has no risk factors for fractures requests a measurement of bone density.

Patients commonly request a measurement of bone density even if they are not at high risk of osteoporosis. In general, tests are useful only if they lead to changes in treatment or behavior. Women whose bone density is reported as low are more likely to make changes in behaviors that might decrease fracture risk. On the other hand, some become unnecessarily anxious about a low result. It is often helpful to tell women that osteopenia is not a disease and show them an estimate of their risk of fracture. Women who have osteoporosis can be reassured that there are effective treatments to reduce their risk.

**WHAT TEST SHOULD BE DONE?**

**Patient 3**
You suspect osteoporosis in a 77-year-old white woman and want to screen—but which test to choose?

Hip BMD is generally considered the best test for osteoporosis screening, especially in patients 65 years or older, although all the tests help assess a patient’s risk of fracture. The optimal testing approach will depend on what modalities are available locally. If a patient has osteoporosis according to forearm, heel, or finger densitometry, it may be worthwhile to confirm this diagnosis with hip densitometry before starting long-term treatment with drugs. Drug therapy reduces the risk of fractures in women with osteoporosis or low BMD at dual-energy x-ray absorptiometry at the hip or spine; the value of treatments in women with low BMD at other sites is less certain. For this reason, patient 3 should have a hip BMD. Generally, this measurement also includes a measurement of spine BMD at no extra cost. If the T score at the spine is higher, it should usually be ignored because spine BMD is often artifically increased in elderly patients by spinal degenerative changes.

**Patient 4**
A 65-year-old white woman with no risk factors for osteoporosis has a T score of −1.8 on an ultrasound heel measurement that was done at a local health fair. Bone density of the hip or spine cannot be reliably predicted from measurements made at peripheral sites. There is substantial variability in such results, and the best approach to using peripheral densitometry tests has not been established or adequately studied. If the patient’s BMD as measured by a peripheral device is below a T score of −1.0, the patient should generally have a follow-up test using hip or spine BMD, if it is available. Even if the T score is less than −2.5 on the peripheral test, bone density of the hip or spine may be quite different, and densitometry should generally be recommended before the decision to start drug therapy is made. Women with values above a T score of −1.0 on a peripheral test are unlikely to have osteoporosis (T score ≤−2.5) at the hip or spine, and they probably do not need additional testing or pharmacological treatment. For technical reasons, T scores tend to be higher for ultrasound than other types of densitometry, so it may be worthwhile obtaining hip and spine densitometry results on women who, as in this case, have a T score below 0 on ultrasound.

**WHAT ABOUT FOLLOW-UP TESTING?**

**Patient 5**
A 66-year-old woman has been receiving alendronate for a year for documented osteoporosis, and you repeat a densitometry, which shows a decrease of 3% from her baseline measurement.

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Box. Established Risk Factors for Osteoporotic Fracture in Postmenopausal Women*

<table>
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<th>Age</th>
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<table>
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<tr>
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The algorithm was modified from an approach developed by the National Osteoporosis Foundation. Reprinted with permission.
without the medication. Sometimes, a decrease indicates that the patient has not been receiving treatment or, in the case of bisphosphonates, may be taking it with food or medications that interfere with absorption of the drug. Therefore, it is important to make certain that the patient is adhering to treatment and taking her bisphosphonate properly, to ensure that the test was done on the same machine, since changes in brands or models can cause artifactual differences in bone density, and to realize that densitometry cannot reliably detect small (<5%) changes in bone density in individual patients. Even large changes between 2 tests are often due to variability in the test rather than a real change in the patient’s bone density; when the test is repeated, these changes are often smaller and the measurements more similar to the first test result (“regression to the mean”). Therefore, if a patient is adhering to her treatment, it is reasonable to simply continue it.

**Patient 6**

A 58-year-old woman weighing 51.8 kg but who has no other risk factors for osteoporosis has a femoral neck bone density T score of −0.8. She asks when she needs to have another measurement.

Few data are available regarding how frequently osteoporosis patients should be followed up; it depends on the expected change over time and the precision of the test. Medicare and some insurance plans pay for follow-up measurement of bone density every 2 years, but spine densitometry tests should be repeated earlier (within 3 to 6 months) after patients start oral corticosteroid treatment because they can lose bone rapidly. In patients who are not taking corticosteroids, do not lose weight, do not have other severe illnesses, are not receiving treatment, and reached the end of menopause at least 3 years earlier, the average rate of bone loss is less than 0.1 T score units annually. In this case, the patient has normal bone density (T score ≥−1.0), and if her health and weight remain unchanged, it is highly unlikely that her bone density will fall below a T score of −2.5 for at least 10 years. It would be reasonable for her to wait 5 years or longer to have a repeat BMD.

**HOW IS TESTING BEING USED?**

At a quality meeting, you realize that only a small proportion of elderly women with hip fractures in your organization have received densitometry or been treated for osteoporosis.

In one study of US primary care practitioners, 72% never used densitometry. Barriers to use included cost, unfamiliarity with guidelines, uncertainty regarding clinical applicability, minimal impact on treatment decisions, and limited availability. Yet another issue has been that the reports of densitometry results are not readily comprehensible to primary care physicians. A randomized trial assessing the impact of providing longer clinical reports to physicians showed that the longer reports nearly doubled the use of testing and resulted in much less confusion about reports (confusion fell from 36% to 1%).

Patients with fractures often do not get screened; for example, a study of patients with vertebral fractures found incidentally on chest radiography showed that this group rarely got screened or received appropriate therapy. Even many patients receiving long-term steroid therapy have not been screened.

**WHAT CHANGES WILL INCREASE SCREENING RATES?**

You come to your group’s quality circle, excited about doing more screening, but find that your group does not want the so-called burden.

Most primary care physicians feel enormous time pressure and need to meet productivity standards. There are many ways to deal with screening. One approach is to have patients fill out a questionnaire to assess risk factors for fracture, which can be done before or at the beginning of a visit. Although this questionnaire can be paper-based, patients with Internet access can readily complete it online, which in the future will likely represent an important time-saver. Another approach is to shift some of this assessment to a nurse in the practice. To achieve substantial improvement in osteoporosis detection and care, most practices will need to develop better systems.

These data point to a number of clinician needs, including tools to identify patients most likely to benefit from screening and systems that facilitate routine application of such tools. In particular, orthopedists and internists should develop routine systems for regularly conducting densitometry in postmenopausal patients and older men who present with fractures. Physicians and patients need more informative densitometry reports that include an estimate of a patient’s fracture risk. Better evidence is needed about the potential value of monitoring bone density, and better guidelines about testing frequency that take into account the bone density, treatment, age, and clinical conditions of each patient are needed. As these needs are met, the gaps between evidence and practice for this important clinical problem will narrow.

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**REFERENCES**