Bone Mineral Density Studies

Description

Bone density studies can be used to identify individuals with osteoporosis and monitor response to osteoporosis treatment, with the goal of reducing the risk of fracture. Bone density is most commonly evaluated with dual x-ray absorptiometry (DXA); other technologies are also available.

Background

Risk factors for fracture include low bone mass, low bone strength, a personal history of fracture as an adult, or a history of fracture in a first-degree relative. Osteoporosis, defined as low bone mass leading to an increased risk of fragility fractures, is an extremely common disease in the elderly population due to age-related bone loss in both sexes and menopause-related bone loss in women. Conditions that can cause or contribute to osteoporosis include lifestyle factors such as low intake of calcium, high intake of alcohol or cigarette smoking, and thinness. Other risk factors for osteoporosis include certain endocrine, hematologic, gastrointestinal tract and genetic disorders, hypogonadal states, and medications. Low bone mineral density (BMD) is a primary indication for pharmacologic therapy. Current pharmacologic options include bisphosphonates such as alendronate (ie, Fosamax), selective estrogen receptor modulators (SERMs) such as raloxifene (ie, Evista), the recombinant human parathyroid hormone teriparatide (Forteo), calcitonin and denosumab (Prolia).

BMD can be measured with a variety of techniques in a variety of central (ie, hip or spine) or peripheral (ie, wrist, finger, and heel) sites. While BMD measurements are predictive of fragility fractures at all sites, central measurements of the hip and spine are the most predictive. Fractures of the hip and spine (ie, vertebral fractures) are also considered to be the most clinically relevant. BMD is typically expressed in terms of the number of standard deviations (SD) the BMD falls below the mean for young healthy adults. This number is termed the T score.

The following technologies are most commonly used:

Dual X-Ray Absorptiometry (DXA)

DXA is probably the most commonly used technique to measure BMD because of its ease of use, low radiation exposure, and its ability to measure BMD at both the hip and spine. DXA can also be used to measure peripheral sites, such as the wrist and finger. DXA generates 2 x-ray beams of different energy levels to scan the region of interest and measure the difference in attenuation as the low- and high-energy beams pass through the bone and soft tissue. The low-energy beam is preferentially
attenuated by bone, while the high-energy beam is attenuated by both bone and soft tissue. This differential attenuation between the two beams allows for correction for the irregular masses of soft tissue, which surround the spine and hip, and therefore the measurement of bone density at those sites.

**Quantitative Computed Tomography (QCT)**

QCT depends on the differential absorption of ionizing radiation by calcified tissue and is used for central measurements only. Compared to DXA, QCT is less readily available and associated with relatively high radiation exposure and relatively high cost.

**Ultrasound Densitometry**

Ultrasound densitometry is a technique for measuring BMD at peripheral sites, typically the heel but also the tibia and phalanges. Compared to osteoporotic bone, normal bone demonstrates higher attenuation of the ultrasound wave and is associated with a greater velocity of the wave passing through bone. Ultrasound densitometry has no radiation exposure, and machines may be purchased for use in an office setting.

These techniques dominate BMD testing. Single and dual photon absorptiometry and radiographic absorptiometry are now rarely used and may be considered obsolete.

Note: This policy does not address vertebral fracture assessment (VFA) with DXA.

**Regulatory Status**

Various devices are commercially available.

In October 2003, the Hologic QDR®-3000 Explorer™ X-Ray Bone Densitometer (Hologic, Bedford, MA) was cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. FDA determined that this device was substantially equivalent to existing devices for use in measurement of bone mineral content (BMC), estimation of BMD, comparison of measurements with reference databases, estimation of fracture risk, body composition analysis, and measurement of periprosthetic BMD. FDA product code: KGI

**Related Policies**

2.04.15 Bone Turnover Markers for Diagnosis and Management of Osteoporosis

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**Policy**

*This policy statement applies to clinical review performed for pre-service (Prior Approval, Precertification, Advanced Benefit Determination, etc.) and/or post-service claims.*

Initial or repeat bone mineral density (BMD) measurement is not indicated unless the results will influence treatment decisions.

An initial measurement of BMD at the hip or spine may be considered **medically necessary** to assess fracture risk and the need for pharmacologic therapy in both women and men who are considered at risk for osteoporosis. BMD testing may be indicated under the following conditions:

- Women age 65 and older, regardless of other risk factors;
• Men age 70 and older, regardless of other risk factors;
• Younger postmenopausal women about whom there is a concern based on their risk factors;
• Men age 50-70 about whom there is a concern based on their risk factors;
• Adults with a condition or taking a medication associated with low bone mass or bone loss.

Repeat measurement of central (hip/spine) BMD for individuals who previously tested normal (does not require pharmacologic treatment) may be considered medically necessary at an interval not more frequent than every 3–5 years; the interval depends on patient risk factors.

Regular (not more frequent than every 2–3 years) serial measurements of central BMD to monitor treatment response may be considered medically necessary when the information will affect treatment decisions such as duration of therapy.

Policy Guidelines

The decision to perform bone density assessment should be based on an individual’s fracture risk profile and skeletal health assessment. (1) In addition to age, gender, and bone mineral density (BMD), risk factors included in the World Health Organization (WHO) Fracture Risk Assessment Model (FRAX) are:

• Low body mass index;
• Parental history of hip fracture;
• Previous fragility fracture in adult life (ie, occurring spontaneously or a fracture arising from trauma which, in a healthy individual, would not have resulted in a fracture);
• Current smoking or alcohol 3 or more units/day, where a unit is equivalent to a standard glass of beer (285 mL), a single measure of spirits (30 mL), a medium-sized glass of wine (120 mL), or 1 measure of an aperitif (60 mL);
• A disorder strongly associated with osteoporosis. These include rheumatoid arthritis, type I (insulin dependent) diabetes, osteogenesis imperfecta in adults, untreated long-standing hyperthyroidism, hypogonadism or premature menopause (<45 years), chronic malnutrition or malabsorption, and chronic liver disease;
• Current exposure to oral glucocorticoids or the patient has been exposed to oral glucocorticoids for more than 3 months at a dose of prednisolone of 5 mg daily or more (or equivalent doses of other glucocorticoids).

A 2011 joint position statement from the International Society for Clinical Densitometry (ISCD) and the International Osteoporosis Foundation (IOF) includes the official position that FRAX with BMD predicts risk of fracture better than clinical risk factors or BMD alone. (2) In addition, the joint position statement states that measurements other than BMD or T score at the femoral neck by DXA are not recommended for use with FRAX.

The FRAX tool does not include a recommendation about which patients to further assess or treat. The FRAX website (1) states that this is a matter of clinical judgment and recommendations may vary by country.
Bone Mineral Density Technologies

Ultrasound densitometry is an office-based technology. As discussed further in the Rationale section, it is unknown whether this technology can be used to predict response to pharmacologic therapy (ie, reduce fractures).

Dual x-ray absorptiometry (DXA) of axial central sites (ie, hip and spine) is the most commonly used technique, but peripheral (appendicular) DXA and quantitative computed tomography (QCT) scanning are sometimes used, based on local availability. Peripheral measurement can identify patients with low bone mass but does not predict response to pharmacologic therapy and is not a substitute for central DXA measurements. Therefore, central DXA (hip/spine) is required for both the initial diagnosis and repeat BMD assessments.

Peripheral measurement of BMD may be appropriate:

- If the hip/spine or hip/hip cannot be done or the patient is over the table limit for weight;
- Hyperparathyroidism, where the forearm is essential for diagnosis

In pediatric patients, total body calcium is preferred because it helps reduce the issue of following patients with growing bones. This applies to pediatric patients who are not skeletally mature as documented by non-closure of growth plates (eg, 15 years of age or younger).

Rationale

Initial measurement of BMD (type of technology, sites to measure, patient populations)

Guidelines in 1998 from the National Osteoporosis Foundation (NOF) and Technology Evaluation Center (TEC) Assessments from 1999 and 2002 were the basis for this policy. (3-5) As no data were available from randomized screening trials, the TEC Assessments focused on the evaluating the utility of BMD measurement in selecting patients for pharmacologic treatment to reduce risk of fracture. The TEC Assessments concluded that while both dual x-ray absorptiometry (DXA) and ultrasound densitometry were equivalent in predicting fracture risk, the 2 techniques appeared to identify different populations of at-risk patients. In addition, calcaneal ultrasound densitometry did not meet the TEC criteria as a technique to predict response to pharmacologic therapy. Updates have identified additional data supporting the conclusion that BMD predicts fracture risk. For example, a 2005 meta-analysis of data from 9891 men and 29,082 women (from 12 cohort studies in Europe and Canada) found that BMD measurement at the femoral neck was a strong predictor of hip fractures for both genders. (6) At age 65 years, the risk ratio increased by 2.94 in men and by 2.88 in women for each standard deviation (SD) decrease in BMD.

A systematic review of the evidence to update U.S. Preventive Services Task Force (USPSTF) recommendations on screening for osteoporosis was published in 2010. (7) The authors state that most DXA testing includes central DXA ie, measurements at the hip and lumbar spine, and that most randomized controlled trials (RCTs) of osteoporosis medications have had study inclusion criteria based on the findings of central DXA. The authors found that calcaneal quantitative ultrasound (QUS) measurement can also predict fracture but has a low correlation with DXA. Consequently, the clinical relevance of calcaneal QUS findings is unclear because medication studies have not selected patients
based on QUS findings. In addition, the investigators reviewed large population-based cohorts on DXA screening and concluded that the predictive performance of DXA is similar for women and men.

NOF guidelines, last updated in 2014, recommend initial measurement of BMD using DXA of the hip and spine in women age 65 and older and men 70 and older, regardless of risk factors, and in younger individuals with selected risk factors. (8) (For details on risk factors in the NOF guidelines and information on statements from other national organizations, see section on Practice Guidelines and Position Statements next).

In 2014, Gadam et al performed a cross-sectional analysis of data to evaluate the incremental predictive ability of BMD when added to the FRAX model. The study included 151 subjects (145 women and 6 men) older than 50 years of age without a prior osteoporosis diagnosis and who were not being treated with U.S. Food and Drug Administration (FDA)-approved medications for treating osteoporosis. (9) Of the 151 individuals, predictions of 10-year fracture risk were identical for 127 patients (84%) when BMD was added to the FRAX model compared with the FRAX model without BMD. Of the subjects who had different risk estimates, the difference in risk prediction resulted in an additional 2 patients meeting the NOF threshold for treatment when BMD was added to the FRAX model. Age was the only risk factor that differed significantly between participants with identical versus different recommendations (p<0.001). Subjects who were younger (mean age, 64 years) were more likely to receive identical predictions than older subjects (mean age, 76 years). The study had a relatively small sample size and lacked longitudinal data on fracture. It provides some initial evidence that BMD may not add substantially to the predictive ability of the FRAX models, but these findings need to be corroborated in prospective studies with larger sample sizes.

**Section summary:** Studies have found a statistically significant association between baseline DXA in appropriately selected patients and subsequent risk of fracture. An initial DXA is recommended in national guidelines for older women and men, as well as younger individuals with risk factors; exact recommendations vary. The clinical significance of other techniques for assessing bone mineral density is uncertain.

**Repeat Measurement of Central BMD for Individuals Without Osteoporosis on the Initial Screen**

Recommendations from the USPSTF issued January 2011 state that there is a lack of evidence on the optimal interval for repeat screening and a lack of evidence on whether repeat screening is necessary in women found to have normal BMD during initial screening. (10)

In 2007, Frost et al published a prognostic model to determine the optimal screening interval for a subject without osteoporosis (defined as T score >-2.5). (11) They used prospective population-based data collected from 1008 women and 750 men who were nonosteoporotic at baseline; participants received BMD screening every 2 years and received a median follow-up of 7.1 years. The prognostic model included the variables of age and initial BMD score; results were presented in complex tables stratified by these 2 variables. In the table of estimated time to reach 20% risk of sustaining a fracture or osteoporosis, most of the time estimates were 3 years or longer. The shortest time to reach a 20% risk was estimated at 2.4 years; this was for women 80 years and older with a baseline T score of -2.2. For a typical screening candidate, a 65-year-old woman with a baseline T score of –1.0, the estimated time to reach a 10% risk of fracture was 3.8 years and to reach a 20% risk of fracture was 6.5 years.
Overall, the study suggests that the 3- to 5-year time interval included in the policy for repeat measurement of BMD in people who tested normal is reasonable but that an individualized model could result in longer or shorter recommended retesting intervals.

Findings of other studies suggest that a longer time interval may be reasonable. Most notably, a 2012 multicenter prospective study by Gourlay et al provided data on the optimal bone density screening interval in a large cohort of women with normal BMD or osteopenia at an initial screen. (12) The investigators included a total of 4957 women age 67 years or older who had BMD data at 2 or more examinations or at 1 examination before a competing risk event (hip or clinical vertebral fracture). More than 99% of the sample reported they were white. The study only included women who were candidates for osteoporosis screening. Other individuals, such as those with osteoporosis at baseline or with a history of a hip or clinical vertebral fracture were excluded, as they would already be candidates for pharmacological treatment. (13) The primary study outcome was the estimated time interval for 10% of participants to make the transition from normal BMD or osteopenia at baseline to osteoporosis before a hip or clinical vertebral fracture occurred and before starting osteoporosis treatment. For women with normal BMD at baseline, the estimated BMD testing interval was 16.8 years (95% confidence interval [CI], 11.5 to 24.6). The study found that the estimated BMD testing interval was 17.3 years (95% CI, 13.9 to 21.5) for women with mild osteopenia at baseline, 4.7 years (95% CI, 4.2 to 5.2) with moderate osteopenia, and 1.1 years (95% CI, 1.0 to 1.3) for women with advanced osteopenia.

Other studies suggesting that a longer time interval may be used or that repeat BMD measurements may not be critical include a 2007 study by Hillier et al. (14) The study did not find that follow-up BMD measurements 8 years after a baseline screen provided substantial value in terms of predicting risk of fracture. The study included 4124 women age 65 years and older and assessed total hip BMD at initial and follow-up screening examinations. In analyses adjusted for age and weight change, the initial and repeat BMD measurements had similar associations with fracture risk; this included risk of vertebral fractures, non-vertebral fractures and hip fractures. Stratifying the analysis by initial BMD T scores (ie, normal, osteopenic or osteoporotic) did not alter findings. Moreover, a 2013 study by Berry et al did not find that changes in BMD 4 years after initial measurement added substantially to the prediction of fracture risk in untreated subjects. (15) The authors conducted a population-based cohort study including 210 women and 492 men (mean age, 75 years) who had 2 BMD measurements a mean of 3.7 years apart and did not have a hip fracture before the second test. Median follow-up was 9.6 years after the second BMD test. During this time, 76 individuals experienced a hip fracture and 113 had a major osteoporotic fracture (fracture of the hip, spine, forearm or shoulder). In receiver operating curve (ROC) analyses, adding repeat BMD to a model containing baseline BMD did not meaningfully improve the model’s ability to predict hip fracture (area under the curve [AUC], 0.72 (95% CI, 0.66 to 0.79). When percent change in BMD was used, the AUC was 0.71 (95% CI, 0.65 to 0.78) in a model including only baseline BMD and 0.68 (95% CI, 0.62 to 0.75) in a model including percent change in BMD.

In other research, longitudinal changes in BMD, as a function of age and antiresorptive agents, were reported in 2008 by the Canadian Multicentre Osteoporosis Study Research Group. (16) Of a random selection of 9423 men and women from 9 major Canadian cities, 4433 women and 1935 men (70%) were included for analysis. The subjects were 25 years of age or older with BMD measurements repeated 3 or 5 years apart; they tended to have better health than the 30% who did not have longitudinal data and who were excluded from analysis. Results showed that annual rates of bone loss,
measured at the hip or femoral neck, increased between 25 to 85 years of age in women who were not on antiresorptive therapy, with accelerated periods of bone loss around menopausal transition (40–54 years of age) and after 70 years of age. Antiresorptive therapy, which primarily consisted of hormone replacement when the study began in 1995, was associated with attenuated bone loss across all age ranges. In women 50–79 years of age, the average loss in BMD over a 5-year period was 3.2% in nonusers of antiresorptive therapy and 0.2% in women who used antiresorptive therapy. The pattern in men was generally similar to that of women with two exceptions, BMD loss began earlier in men, and the rate of change remained relatively constant between 40 and 70 years of age. Notably, BMD at the lumbar spine did not parallel measurements at the hip and femoral neck, suggesting that vertebral bone density assessment may be obscured by degenerative changes in the spine or other artifact. The report concluded that "although current guidelines recommend that measurements of bone density be repeated once every 2–3 years, our data suggest that, at this rate of testing, the average person would exhibit change well below the margin of error, especially since only 25% of women experienced a loss of bone density that exceeded 5% over 5 years."

**Section summary:** There is sparse evidence on the optimal screening interval with DXA and the optimal patient population that might benefit from repeat screening. The available evidence suggests that, for most patients, longer intervals than those currently recommended in national guidelines might be sufficient.

**Serial Measurement of Central BMD to Monitor Treatment Response**

In 2009, Bell et al conducted a secondary analysis of data from the Fracture Intervention Trial (FIT), which randomly assigned 6459 post-menopausal women with low BMD to receive treatment with bisphosphonates or placebo; women underwent annual bone density scans. (17) In their analysis, the investigators estimated between-person (treatment-related) variation and within-person (measurement-related) variation in hip and spine BMD over time to assess the value of repeat BMD scans for monitoring response to treatment. After 3 years, the mean cumulative increase in hip BMD was 0.030 g/cm² in the alendronate group compared with a mean decrease of 0.012 g/cm² in the placebo group. Moreover, 97.5% of patients treated with alendronate had increases in hip bone mineral density of at least 0.019 g/cm², suggesting there was a clinically significant response. However, the study also found large within-person variability in year-to-year bone density measurements. The average within-person variation in BMD measurement was 0.013 g/cm², which was substantially higher than the average annual increase in BMD in the alendronate group, 0.0085 g/cm². This finding suggests that the precision of BMD measurement is not reliable from year to year, and thus annual re-testing is not useful. Additional studies are needed to determine the optimal time interval for re-screening after starting bisphosphonate treatment.

**Section summary:** There is little evidence on the clinical benefit of serial measurement of BMD for patients receiving pharmacologic osteoporosis treatment. A 2009 analysis of RCT data found substantial year-to-year variation in BMD measurement suggesting that a longer testing interval might be preferable to annual screening.
Serial Measurement of Central BMD to Monitor Discontinuation of Treatment

In 2014, Bauer et al reported fracture risk prediction among women who discontinued alendronate after 4 to 5 years of treatment in the FLEX (Fracture Intervention Trial Long-term Extension) study. Women aged 61 to 86 years who had previously been treated with alendronate were randomized to 5 more years of alendronate or to placebo. A prior report of this study found that although hip BMD decreased in the placebo group, rates of fracture were similar between the group randomized to placebo and the group that continued on bisphosphonate therapy. It should be noted that alendronate has a half-life in humans that is estimated to exceed 10 years. During the 5 years of placebo, 94 of 437 women (22%) experienced 1 or more symptomatic fractures; most of these (87%) occurred after 1 year. Post-hoc analysis found that older age and lower hip (but not spine) DXA at time of discontinuation were significantly related to increased fracture risk; however, changes in BMD between the beginning of discontinuation to years 1 and 3 were not.

Section Summary: There is a lack of evidence of a clinical benefit of serial measurement of BMD for patients who have discontinued pharmacologic osteoporosis treatment.

Practice Guidelines and Position Statements

American College of Obstetricians and Gynecologists

In 2012, the American College of Obstetricians and Gynecologists (ACOG) issued updated guidelines on managing osteoporosis in women. The guidelines recommend that BMD screening should begin for all women at age 65 years. In addition, they recommend screening for women younger than 65 years in whom the Fracture Risk Assessment (FRAX) Tool indicates a 10-year risk of osteoporotic fracture of at least 9.3%. Alternatively, they recommend BMD screening women in younger than 65 or with any of the following risk factors (these are similar, but not identical to risk factors in FRAX):

- Personal medical history of a fragility fracture
- Parental medical history of hip fracture
- Weight less than 127 lb.
- Medical causes of bone loss (i.e., medications or disease)
- Current smoker
- Alcoholism
- Rheumatoid arthritis

For women who begin medication treatment for osteoporosis, a repeat BMD is recommended 1 to 2 years later to assess effectiveness. If BMD is improved or stable, additional BMD testing (in the absence of new risk factors) is not recommended. The guideline notes that it generally takes 18-24 months to document a clinically meaningful change in BMD and thus a 2-year interval after treatment initiation is preferred to 1 year.

The guidelines do not specifically discuss repeat BMD screening for women who have a normal finding on the initial test.

Routine BMD screening is not recommended for newly menopausal women as a “baseline” screen.
National Osteoporosis Foundation

The National Osteoporosis Foundation (NOF) updated its practice guidelines in 2014. (8) NOF guidelines recommend that all postmenopausal women and men age 50 and older should be evaluated clinically for osteoporosis risk to determine the need for BMD testing. Indications for BMD testing are:

- Women age 65 and older and men age 70 and older, regardless of other risk factors
- Younger postmenopausal women and men aged 50–69 with clinical risk factors for fracture
- Adults who have a fracture after age 50
- Adults with a condition or taking a medication associated with low bone mass or bone loss

NOF states that measurements for monitoring patients should be performed in accordance with medical necessity, expected response and in consideration of local regulatory requirements. NOF recommends that repeat BMD assessments generally agree with Medicare guidelines of every 2 years, but recognizes that testing more frequently may be warranted in certain clinical situations.

NOF also indicates that “Central DXA assessment of the hip or lumbar spine is the “gold standard” for serial assessment of BMD. Biological changes in bone density are small compared to the inherent error in the test itself, and interpretation of serial bone density studies depends on appreciation of the smallest change in BMD that is beyond the range of error of the test. This least significant change (LSC) varies with the specific instrument used, patient population being assessed, measurement site, technologist’s skill with patient positioning and test analysis, and the confidence intervals used. Changes in the BMD of less than 3-6 percent at the hip and 2-4 percent at the spine from test to test may be due to the precision error of the testing itself.”

American College of Physicians

2008 guidelines from the American College of Physicians (ACP) recommend that clinicians periodically perform individualized assessment of risk factors for osteoporosis in men older than 50 years (Grade: strong recommendation; moderate-quality evidence). (22) Factors that increase the risk for osteoporosis in men include age (>70 years), low BMI, weight loss, physical inactivity, corticosteroid use, androgen deprivation therapy, and previous fragility fracture. ACP recommends that clinicians obtain DXA for men who are at increased risk for osteoporosis and are candidates for drug therapy (Grade: strong recommendation; moderate-quality evidence). The guidelines indicate that bone density measurement with DXA is the accepted reference standard for diagnosing osteoporosis in men; because treatment trials have not measured the effectiveness of therapy for osteoporosis diagnosed by ultrasound densitometry rather than DXA, the role of ultrasound in diagnosis remains uncertain. This evidence review found no studies that evaluated the optimal intervals for repeated screening by using BMD measurement with DXA in men.

American College of Radiology

Practice guidelines from the American College of Radiology (ACR), last amended in 2014 (23) state that BMD measurement is indicated whenever a clinical decision is likely to be directly influenced by the result of the test. Indications for DXA include but are not to the following patient population:

- All women age 65 years and older and men age 70 years and older (asymptomatic screening).
• Women younger than age 65 years who have additional risk for osteoporosis, based on medical history and other findings. Additional risk factors for osteoporosis include:
  o Estrogen deficiency
  o A history of maternal hip fracture that occurred after the age of 50 years.
  o Low body mass (less than 127 lbs or 57.6 kg).
  o History ofamenorrhea (more than 1 year before age 42 years).
• Women younger than age 65 years or men younger than age 70 years who have additional risk factors, including:
  o Current use of cigarettes
  o Loss of height, thoracic kyphosis.
• Individuals of any age with bone mass osteopenia, or fragility fractures on imaging studies such as radiographs, computed tomography (CT, of magnetic resonance imaging [MRI])
• Individuals age 50 years and older who develop a wrist, hip, spine, or proximal humerus fracture with minimal or no trauma, excluding pathologic fractures.
• Individuals of any age who develop 1 or more insufficiency fractures.
• Individuals receiving (or expected to receive) glucocorticoid therapy for more than 3 months.
• Individuals beginning or receiving long-term therapy with medications known to adversely affect BMD (e.g., anticonvulsant drugs, androgen deprivation therapy, aromatase inhibitor therapy, or chronic heparin.
• Individuals with an endocrine disorder known to adversely affect BMD (e.g., hyperparathyroidism, hyperthyroidism, or Cushing’s syndrome).
• Hypogonadal men older than 18 years and men with surgically or chemotherapeutically induced castration
• Women younger than age 65 years who have additional risk for osteoporosis, based on individuals with medical conditions that could alter BMD, such as:
  a. Chronic renal failure.
  b. Rheumatoid arthritis and other inflammatory arthritis.
  c. Eating disorders, including anorexia nervosa and bulimia.
  d. Organ transplantation.
  e. Prolonged immobilization.
  f. Conditions associated with secondary osteoporosis, such as gastrointestinal malabsorption or malnutrition, sprue, osteomalacia, vitamin D deficiency, acromegaly, chronic alcoholism chronic alcoholism or established cirrhosis, and multiple myeloma
  g. Individuals who have had gastric bypass for obesity. The accuracy of DXA in these patients might be affected by obesity.
• Individuals being considered for pharmacologic therapy for osteoporosis.
• Individuals being monitored to:
  o Assess the effectiveness of osteoporosis drug therapy.
  o Follow-up medical conditions associated with abnormal BMD.

International Society for Clinical Densitometry

The 2013 update of the International Society for Clinical Densitometry guidelines recommend bone density testing in the following patients (24):

• Women age 65 and older;
• Postmenopausal women under age 65 with risk factors for fracture such as:
  low bone weight, prior fracture, high-risk medication use or disease or condition associated with bone loss
• Women during the menopausal transition with clinical risk factors for fracture, such as low body weight, prior fracture or high-risk medication use.
• Men age 70 and older;
• Men under age 70 with clinical risk factors for low bone mass or bone loss such as:
  Low body weight, prior fracture, high risk medication use, or disease or condition associated with bone loss.
• Adults with a fragility fracture;
• Adults with a disease or condition associated with low bone mass or bone loss
• Anyone being considered for pharmacologic therapy;
• Anyone being treated, to monitor treatment effect.
• Anyone not receiving therapy in who evidence of bone loss would lead to treatment.

In 2010, the American Association of Clinical Endocrinologists issued guidelines for the diagnosis and treatment of postmenopausal osteoporosis.25 The guidelines list the potential uses for BMD measurements in postmenopausal women as:

Screening for osteoporosis
Establishing the severity of osteoporosis or bone loss
Determining fracture risk
Identifying candidates for pharmacologic intervention
Assessing changes in bone mass over time
Enhancing acceptance of and perhaps adherence with treatment
Assessing skeletal consequences of disease, conditions, or medications known to cause bone loss

The North American Menopause Society issued a 2010 position statement, (26) which states that fracture is the most significant risk of low bone density. The statement also conclude that BMD is an important determinant of fracture risk, especially in women 65 years and older.
U.S. Preventive Services Task Force Recommendations

The U.S. Preventive Services Task Force (USPSTF) updated recommendations on screening for osteoporosis with bone density measurements in January 2011. (10) USPSTF recommends routine osteoporosis screening in women age 65 years or older and in younger women whose risk of fracture is at least equal to that of a 65-year-old average-risk white woman. This represents a change from the previous (2002) version in which there was no specific recommendation regarding screening in women younger than 65 years-old. The supporting document notes that there are multiple instruments to predict risk for low BMD and that the USPSTF used FRAX. (1) The updated USPSTF recommendations state that the scientific evidence is insufficient to recommend for or against routine osteoporosis screening in men. The Task Force did not recommend specific screening tests but said that the most commonly used tests are DXA of the hip and lumbar spine and quantitative ultrasound of the calcaneus.

USPSTF recommendations state the following on BMD screening intervals: “...A lack of evidence exists about the optimal intervals for repeat 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.”

Summary

There is evidence that bone mineral density measurements predict fracture risk and may be useful for individuals at increased risk of fracture who are considering pharmacologic therapy. The greatest amount of support is for central BMD measurements using dual x-ray absorptiometry (DXA). There is less evidence on serial or repeat measurement of BMD. The available evidence and the consensus of clinical opinion support at least a 2-year interval in BMD measurement to monitor response to treatment. In addition, the available evidence suggests that at least a 3- to 5-year timeframe is reasonable for repeat measurement of BMD in individuals who initially tested normal. Therefore, an initial measurement of BMD at the hip or spine may be considered medically necessary to assess fracture risk and the need for pharmacologic therapy in both women and men who are considered at risk for osteoporosis.

Repeat measurement of central (hip/spine) bone mineral density (BMD) for individuals who previously tested normal (does not require pharmacologic treatment) may be considered medically necessary at an interval not more frequent than every 3–5 years; the interval depends on patient risk factors.

Regular serial measurements of central bone mineral density (BMD) to monitor treatment response may be considered medically necessary when the information will affect treatment decisions such as duration of therapy.

Medicare National Coverage

Medicare pays for a screening Bone Mass Measurement (BMM) once every 2 years (at least 23 months have passed since the month the last covered BMM was performed). (27) When medically necessary, Medicare may pay for more frequent BMMs. Examples include, but are not limited to,
monitoring beneficiaries on long-term glucocorticoid (steroid) therapy of more than 3 months, and confirming baseline BMMs to permit monitoring of beneficiaries in the future.

Conditions for coverage of BMM can be found in chapter 15, section 80.5 of Pub. 100-02, Medicare Benefit Policy Manual. Medicare covers BMM under the following conditions:

1. Is ordered by the physician or qualified nonphysician practitioner who is treating the beneficiary following an evaluation of the need for a BMM and determination of the appropriate BMM to be used.
2. Is performed under the appropriate level of physician supervision as defined in 42 CFR 410.32(b).
3. Is reasonable and necessary for diagnosing and treating the condition of a beneficiary who meets the conditions described in §80.5.6.
4. In the case of an individual being monitored to assess the response to or efficacy of an FDA-approved osteoporosis drug therapy, is performed with a dual-energy x-ray absorptiometry system (axial skeleton).
5. In the case of any individual who meets the conditions of 80.5.6 and who has a confirmatory BMM, is performed by a dual-energy x-ray absorptiometry system (axial skeleton) if the initial BMM was not performed by a dual-energy x-ray absorptiometry system (axial skeleton). A confirmatory baseline BMM is not covered if the initial BMM was performed by a dual-energy x-ray absorptiometry system (axial skeleton).

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Signature on File

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