Medical Policy

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Populations	Interventions	Comparators	Outcomes
Individuals: • Who are eligible for screening of bone mineral density based on risk factor assessment	Interventions of interest are: • Initial dual x-ray absorptiometry analysis of central sites (hip or spine)	Comparators of interest are: • Clinical risk assessment without bone mineral density testing	Relevant outcomes include: • Morbid events • Functional outcomes • Quality of life • Hospitalizations • Medication use
Individuals: • Without osteoporosis on initial screen	Interventions of interest are: • Repeat dual x-ray absorptiometry analysis of central sites (hip or spine)	Comparators of interest are: • Clinical risk assessment without bone mineral density testing	Relevant outcomes include: • Morbid events • Functional outcomes • Quality of life • Hospitalizations • Medication use
Individuals: • Who are receiving pharmacologic treatment for osteoporosis	Interventions of interest are: • Repeat dual x-ray absorptiometry analysis of central sites (hip or spine)	Comparators of interest are: • Clinical risk assessment without bone mineral density testing	Relevant outcomes include: • Morbid events • Functional outcomes • Quality of life • Hospitalizations • Medication use
Individuals: • Who are eligible for screening of bone mineral density based on risk factor assessment	Interventions of interest are: • Ultrasound densitometry • Quantitative computed tomography • Dual x-ray absorptiometry analysis of peripheral sites	Comparators of interest are: • Dual x-ray absorptiometry analysis of central sites	Relevant outcomes include: • Morbid events • Functional outcomes • Quality of life • Hospitalizations • Medication use

DESCRIPTION

Bone mineral density (BMD) 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 available.

Objective

The objective of this evidence review is to examine whether bone mineral density studies improve health outcomes in individuals at risk of osteoporotic fracture.

Background

Osteoporosis

Osteoporosis is determined using the World Health Organization diagnostic thresholds for osteoporosis based on bone mineral density measurement (BMD) compared with a calculated T-score.

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. The World Health Organization has diagnostic thresholds for osteoporosis based on BMD measurements compared with a T-score, which is the standard deviation difference between an individual's BMD and that of a young adult reference population. 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.

BMD can be measured either centrally (i.e., hip or spine) or peripherally (i.e., wrist, finger, 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 (i.e., vertebral fractures) are also considered to be the most clinically relevant. BMD is typically expressed as a T-score.

The utility of screening BMD measurements can be established by demonstrating that screening identifies a population at increased risk of fracture and that, by treating those at-risk individuals, the rate of fractures is reduced thereby lowering fracture-related morbidity and mortality. These potential benefits of screening should outweigh the risks of screening (radiation exposure) or false-positives (initiation of unnecessary treatment).

Bone Mineral Density

The decision to perform a bone density assessment should be based on an individual's fracture risk profile and skeletal health assessment. In addition to age, sex, and BMD, risk factors included in the World Health Organization Fracture Risk Assessment Tool[1,] are:

- Low body mass index;
- Parental history of hip fracture;
- Previous fragility fracture in adult life (i.e., occurring spontaneously or a fracture arising from trauma, which, in a healthy individual, would not have resulted in a fracture);
- Current smoking or 3 or more units of alcohol daily, 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, which includes 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 exposure to oral glucocorticoids for more than 3 months at a dose of prednisolone 5 mg daily or more (or equivalent doses of other glucocorticoids).

Dual x-ray absorptiometry (DXA) is 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 generates 2 x-ray beams of different energy levels to scan the region of interest and measures 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 difference in attenuation between the 2 beams allows for correction for the irregular masses of soft tissue, which surrounds the spine and hip, and therefore the measurement of bone density at those sites.

A T-score is the standard deviation difference between an individual's BMD and that of a young adult reference population.

Table 1. WHO Classification of Bone Mineral Density T-Scores

Assessment	BMD Definition
Normal	Bone density is within 1 SD (+1 or −1) of the young adult mean.
Osteopenia (low bone mass)	Bone density is between 1 and 2.5 SD below the young adult mean (−1 to −2.5 SD).
Osteoporosis	Bone density is 2.5 SD or more below the young adult mean (−2.5 SD or lower).
Severe (established) osteoporosis	Bone density is more than 2.5 SD below the young adult mean, and there have been one or more osteoporotic fractures.

BMD: bone mineral density; SD: standard deviation; WHO: World Health Organization.

Other Measurement Tools
Available diagnostic tools use either X-rays or ultrasound. X-ray based methods measure BMD. However, studies suggest that in addition to measuring structural aspects of the bone by assessing BMD, other mechanical features and elastic properties of the bone are also important to predict the risk of fractures. X-ray based methods cannot assess these properties and therefore use of alternative methodologies such as ultrasound densitometry and quantitative computed tomography (CT) have been explored.

Quantitative Computed Tomography
Quantitative CT depends on the differential absorption of ionizing radiation by calcified tissue and is used for central measurements only. Compared with DXA, quantitative CT is less readily available and associated with relatively high radiation exposure and relatively high cost. Analysis of previously obtained clinical CT scans of the pelvis might provide an alternative method of assessing biomechanical bone strength.

Ultrasound Densitometry
Ultrasound densitometry is a technique for measuring BMD at peripheral sites, typically the heel but also the tibia and phalanges. Compared with 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.

Single- and dual-photon absorptiometry and radiographic absorptiometry are now rarely used and may be considered obsolete.

Osteoporosis Treatment
Treatment of osteoporosis includes both lifestyle measures (e.g., increased intake of calcium and vitamin D, exercise, smoking cessation) and pharmacologic measures. Current pharmacologic options include bisphosphonates such as alendronate (i.e., Fosamax), selective estrogen receptor modulators such as raloxifene (i.e., Evista), the recombinant human parathyroid hormone teriparatide (i.e., Forteo), and calcitonin. An updated 2014 systematic review funded by the Agency for Healthcare Research and Quality found good-quality evidence that bisphosphonates, denosumab, teriparatide, and raloxifene reduce fracture risk in postmenopausal women with BMD in the osteoporotic range and/or preexisting hip or vertebral fracture.[2,]

REGULATORY STATUS

Devices that measure bone density have been cleared for marketing by the U.S. Food and Drug Administration (FDA) through the 510(k) process. Some examples are described in Table 2:

Table 2. FDA Cleared Devices to Measure Bone Density

Device Name	Company	510(k) number
Aria	GE Medical Systems	K180782
Ge Lunar Dxa Bone Densitometers With Enc	GE Medical Systems	K161682
Tbs Insight	Medimaps Group Sa	K152299
Single Energy (Se) Femur Exams	Hologic, Inc.	K130277
Tbs Insight	Medimaps Group Sa	K121716
Virtuost	O.N. Diagnostics	K113725
Accudxa2	Lone Oak Medical Technologies, Llc	K113616
Ultrascan 650	Cyberlogic, Inc.	K161919
Bindex Bi-2	Bone Index Finland, Ltd.	K161971
Bindex Bi-100	Bone Index Finland, Ltd.	K152020
Achilles	GE Medical Systems	K123238
Beammed Sunlight Miniomni Bone Sonometer	Beam-Med Ltd	K110646
Achilles	GE Medical Systems	K103633

FDA product codes: KGI, MUA.

In addition, some ultrasound bone sonometers have been approved by the FDA through the premarket approval process. One example is the Sahara® Clinical Bone Sonometer (Hologic), which received approval in March 1998. Its intended use is for quantitative ultrasound measurement of the calcaneus (heel bone), the results of which can be used in conjunction with other clinical risk factors as an aid in the diagnosis of osteoporosis and medical conditions leading to reduced bone density, and ultimately in the determination of fracture risk.

POLICY

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

A. An initial measurement of central (hip/spine) BMD using dual x-ray absorptiometry 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:

1. Women age 65 and older, regardless of other risk factors;
2. Men age 70 and older, regardless of other risk factors;
3. Younger postmenopausal women about whom there is a concern based on their risk factors (see risk factors);
4. Men age 50-70 about whom there is a concern based on their risk factors (see risk factors);
5. Adults with a condition or taking a medication associated with low bone mass or bone loss, to include:
   a) Anorexia Nervosa
   b) Chronic Renal Failure
   c) Hyperparathyroidism
   d) Prolonged immobilization
   e) Radiographic evidence of Osteopenia
   f) Malignancies
   g) Organ Transplantation
   h) Cystic Fibrosis
   i) Aluminum-Containing Antacids
   j) Anti-Seizure Medications (only some), such as Dilantin or Phenobarbital
   k) Aromatase Inhibitors such as Arimidex, Aromasin, and Femara
   l) Cancer Chemotherapeutic Drugs
   m) Cyclosporine A and FK506 (Tacrolimus)
   n) Gonadotropin-Releasing Hormone (GnRH), such as Lupron or Zoladex
   o) Heparin, chronic use
   p) Loop Diuretics such as Bumetanide and Furosemide
   q) Methotrexate
   r) Proton Pump Inhibitors (PPIs), prescription strength (not OTC), taken chronically
   s) Selective Serotonin Reuptake Inhibitors (SSRIs), such as Lexapro, Prozac, or Zoloft
   t) Tamoxifen (premenopausal use)
   u) Thyroid Hormone in excess
   v) Warfarin

Risk Factors (applies to A3 and A4)

In addition to age, sex, and BMD, risk factors included in the World Health Organization Fracture Risk Assessment (FRAX) Tool[1] are:

1. Low body mass index (BMI of 20 or less);
2. Parental history of hip fracture;
3. Previous fragility fracture in adult life (i.e., occurring spontaneously or a fracture arising from trauma which, in a healthy individual, would not have resulted in a fracture);

4. Current smoking or alcohol 3 or more units per 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);
5. 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;
6. 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).

B. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry may be considered **medically necessary** at an interval not more frequent than every 1-3 years in individuals who are receiving pharmacologic treatment for osteoporosis when the information will affect treatment decisions (continuation, change in drug therapy, cessation or resumption of drug therapy).

C. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry for individuals who previously tested normal may be considered **medically necessary** at an interval not more frequent than every 3 to 5 years; the interval depends on an updated patient fracture risk assessment.

D. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry may be considered **medically necessary** at an interval of not more frequent that every 1-2 years in individuals:
   1. With a baseline evaluation of osteopenia (BMD T- score -1.0 to -2.5)
   2. Adults with a pathologic condition associated with low bone mass or increased bone loss;
   3. Adults taking a medication associated with increased bone loss.

E. Ultrasound densitometry is considered **not medically necessary**. As discussed further in the Rationale section, it is unknown whether this technology can be used to predict response to pharmacologic therapy (i.e., reduce fractures).

F. Quantitative Computed Tomography (QCT) is considered **not medically necessary.**

G. 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 is considered **not medically necessary** except:
   1. when the hip/spine or hip/hip cannot be done or the patient is over the table limit for weight;
   2. for hyperparathyroidism, where the forearm is essential for diagnosis

Policy Guidelines

Bone Mineral Density Technologies

1. Ultrasound densitometry is an office-based technology. Compared with 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. It is unknown whether this technology can be used to predict response to pharmacologic therapy (i.e., reduce fractures).
2. Dual x-ray absorptiometry (DXA) of axial central sites (i.e., hip and spine) is the most commonly used technique. Central DXA (hip/spine) is required for both the initial diagnosis and repeat bone mineral density (BMD) assessments.
3. In pediatric patients, total body calcium is preferred because it helps reduce following patients with growing bones. This applies to pediatric patients who are not skeletally mature as documented by nonclosure of growth plates (e.g., 15 years of age or younger).
4. When indicated; repeat dual x-ray absorptiometry (DXA) of axial central sites should ideally be conducted in the same facility with the same machine. Differences between BMD results may simply reflect the inherent variability of the test measurement; thus, testing facilities must calculate the least significant change (LSC) for relevant measurement sites to determine the magnitude of difference that represents a real change. This is determined using a facility's regular technologist(s), patients, and device.
5. Quantitative computed tomography depends on the differential absorption of ionizing radiation by calcified tissue and is used for central measurements only. Compared with DXA, quantitative computed tomography is less readily available and associated with relatively high radiation exposure and relatively high cost. Analysis of previously obtained clinical computed tomography scans of the pelvis might provide an alternative method of assessing biomechanical bone strength.
6. Single- and dual-photon absorptiometry and radiographic absorptiometry are now rarely used and may be considered obsolete.

RATIONALE

The evidence review has been updated regularly with searches of the PubMed database. The most recent literature review was performed through December 3, 2020. Following is a summary of key literature to date.

Evidence reviews assess the clinical evidence to determine whether the use of technology improves the net health outcome. Broadly defined, health outcomes are the length of life, quality of life (QOL), and ability to function including benefits and harms. Every clinical condition has specific outcomes that are important to patients and managing the course of that condition. Validated outcome measures are necessary to ascertain whether a condition improves or worsens; and whether the magnitude of that change is clinically significant. The net health outcome is a balance of benefits and harms.

To assess whether the evidence is sufficient to draw conclusions about the net health outcome of technology, 2 domains are examined: the relevance, and quality and credibility. To be relevant, studies must represent one or more intended clinical use of the technology in the intended population and compare an effective and appropriate alternative at a comparable intensity. For

some conditions, the alternative will be supportive care or surveillance. The quality and credibility of the evidence depend on study design and conduct, minimizing bias and confounding that can generate incorrect findings. The RCT is preferred to assess efficacy; however, in some circumstances, nonrandomized studies may be adequate. RCTs are rarely large enough or long enough to capture less common adverse events and long-term effects. Other types of studies can be used for these purposes and to assess generalizability to broader clinical populations and settings of clinical practice.

INITIAL MEASUREMENT OF BONE MINERAL DENSITY

Clinical Context and Therapy Purpose

The purpose of BMD measurement in patients who have risk factors for osteoporosis is to assess bone health and guide treatment.

The question addressed in this evidence review is: Does BMD testing with dual x-ray absorptiometry (DXA) improve the net health outcome in individuals with risk factors for osteoporosis?

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals with risk factors for osteoporosis.

In addition to age-related bone loss, conditions that can cause or contribute to osteoporosis include lifestyle factors such as low dietary 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 use of certain classes of pharmacologic agents such as corticosteroids.

Interventions

The test being considered is BMD testing with central DXA performed in the outpatient primary care setting.

The decision to perform a bone density assessment should be based on an individual's fracture risk profile assessment

Comparators

The following practices are currently being used to make treatment decisions: clinical risk factor assessment.

Outcomes

The general outcomes of interest are the occurrence of fractures and effects on QOL.

BMD measurements, using DXA, of central sites (hip or spine), are most predictive of fragility fractures at hip and spine. Fractures of the hip and spine (i.e., vertebral fractures) are considered the most clinically relevant.

Study Selection Criteria
To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs and systematic reviews of these studies.

In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.

To assess longer-term outcomes and adverse effects, single-arm studies that captured longer periods of follow-up and/or larger populations.

To supplement the review of evidence for indications where evidence was extremely limited, clinical practice guidelines were included. Primary guidelines were selected based on the following criteria:

- Established, recognized professional organization
- Published guideline process that included conflict of interest, agreed-upon process including grading of recommendations and disclosure of when consensus or expert opinion was used
- Existence of an associated evidence appraisal (systematic review, comprehensive references, etc.)
- Guideline is accessible (PubMed indexed or freely available through the organizational website)

Other relevant guidelines are summarized in the Supplemental Information Section.

Review of Evidence
A 2018 systematic review for the U.S. Preventive Services Task Force (USPSTF) evaluated the evidence on screening for osteoporosis.[6,] The review considered centrally measured DXA to be the reference standard against which other screening measures were evaluated. RCTs included in the systematic review have shown that osteoporosis medications are effective at reducing fracture risk in postmenopausal women with BMD in the osteoporotic range identified by central DXA. A noted limitation of the review was that treatment studies relied on DXA BMD scores to enroll participants into trials and that risk factors beyond bone density, such as bone quality, contribute to osteoporotic fractures. Therefore, "approaches that rely on BMD measurement wholly or in part may not be the most accurate approaches for identifying patients at highest risk for osteoporotic fractures."

Clinical Practice Guidelines
The 2018 systematic review formed the basis for the USPSTF recommendations for screening for osteoporosis in women aged 65 years or older and in postmenopausal women younger than 65 years at increased risk of osteoporosis.[6,] The supporting document refers to multiple instruments to predict risk for low BMD, including the Fracture Risk Assessment Tool.[1,] The USPSTF recommendations stated that the scientific evidence is "insufficient" to assess the balance of benefits and harms of screening for osteoporosis in men.

In 2020, the American Association of Clinical Endocrinologists and the American College of Endocrinology issued updated joint guidelines on the diagnosis and treatment of postmenopausal osteoporosis.[7,] The guidelines listed the potential uses for BMD measurements in postmenopausal women as:

- "Screening for osteoporosis
- Establishing the severity of osteoporosis or bone loss in patients with suspected osteoporosis (for example, patients with fractures or radiographic evidence of osteopenia)
- Determining fracture risk - especially when combined with other risk factors for fractures
- Identifying candidates for pharmacologic intervention
- Assessing changes in bone density over time in treated and untreated patients
- Enhancing acceptance of, and perhaps adherence with, treatment
- Assessing skeletal consequences of diseases, conditions, or medications known to cause bone loss"

The Endocrine Society published clinical practice guidelines on osteoporosis in men.[8,] The guidelines recommend BMD testing in men at increased risk of osteoporosis, including those aged 70 or older, and younger men (ages 50-69) with pathologic conditions associated with low bone mass or increased bone loss, or those taking medications associated with bone loss. The guideline recommends the use of the Fracture Risk Assessment Tool or another fracture risk calculator to assess fracture risk and select patients for treatment.

Section Summary: Initial Measurement of Bone Mineral Density
Central DXA is the most widely accepted method for measuring BMD. BMD measurements with central DXA identify individuals at increased risk of fracture, and osteoporosis medications reduce fracture risk in the population identified as osteoporotic by central DXA. Therefore, test results with initial central DXA have been successfully used to make decisions about initiation of fracture intervention pharmacologic therapy.

REPEAT MEASUREMENT OF BONE MINERAL DENSITY FOR INDIVIDUALS WITHOUT OSTEOPOROSIS ON INITIAL SCREEN

Clinical Context and Therapy Purpose
The purpose of BMD measurement in patients without osteoporosis on the initial screen is to assess changes in bone health and guide treatment.

The question addressed in this evidence review is: Does repeat BMD testing with central DXA improve the net health outcome in individuals with risk factors for osteoporosis?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is individuals without osteoporosis as defined by the initial BMD measurement screen.

Interventions
The test being considered is repeat BMD testing with central DXA performed in the outpatient primary care setting.

Comparators
The following practices are currently being used to make treatment decisions: clinical risk factor assessment without BMD testing.

Outcomes
The general outcomes of interest are the occurrence of fractures and effects of fractures on QOL.

Monitoring of fractures may occur until the end of life; these are typically measured within 10 years after screening.

Study Selection Criteria
To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs and systematic reviews of these studies.

In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.

To assess longer-term outcomes and adverse effects, single-arm studies that captured longer periods of follow-up and/or larger populations.

To supplement the review of evidence for indications where evidence was extremely limited, clinical practice guidelines were included. Primary guidelines were selected based on the following criteria:

- Established, recognized professional organization
- Published guideline process that included conflict of interest, agreed-upon process including grading of recommendations and disclosure of when consensus or expert opinion was used
- Existence of an associated evidence appraisal (systematic review, comprehensive references, etc.)
- Guideline is accessible (PubMed indexed or freely available through the organizational website)

Other relevant guidelines are summarized in the Supplemental Information Section.

The USPSTF concluded the evidence base is sparse on screening intervals in asymptomatic women. While 2 studies showed no advantage to repeated testing, other evidence suggested that the optimal screening interval may vary by baseline BMD, age, and use of hormone replacement therapy.[6,] The 2018 USPSTF systematic review of the evidence on screening interval identified 2 studies with variable BMD that suggested no advantage to repeated bone measurement testing.[9,10,] However, prognostic modeling from other studies suggested that the optimal screening interval varies by baseline BMD, and that age and use of hormone replacement therapy might also influence optimal screening intervals.[11,12,13,]

A review of evidence by the Agency for Healthcare Research and Quality Southern California Evidence-Based Practice Center for the American College of Physicians identified moderate-quality evidence that women do not require frequent monitoring, with 10% of women with normal or mildly osteopenic DXA scores progressing to osteopenia within 15 years.[14,15,]

Clinical Practice Guidelines
The USPSTF did not make a specific recommendation on repeat screening in asymptomatic individuals.

The American Association of Clinical Endocrinologists and the American College of Endocrinology joint guidelines on the diagnosis and treatment of postmenopausal osteoporosis (2020) state that repeat BMD testing may be done to determine if or when to initiate treatment.[7,] The frequency of testing should be individualized based on results of initial testing and on risk assessment. BMD testing every 1 to 2 years may be appropriate for those close to an intervention threshold on the initial test or with a high likelihood of future fracture based on risk factors.

The guidelines also note: "Differences between BMD results may simply reflect the inherent variability of the test measurement; thus, testing facilities must calculate the least significant change for relevant measurement sites to determine the magnitude of difference that represents a real change. This is determined using a facility's regular technologist(s), patients, and device."

The Endocrine Society Guidelines for Osteoporosis in Men did not make a specific recommendation on repeat BMD testing in asymptomatic men.[8,] However, the supporting document notes that the least significant change approach can be used to identify significant bone loss in men who are untreated. Because the expected rate of bone loss is slower in untreated men than the expected gains during treatment, less frequent measurements (e.g., 2-3 years) in untreated men may be a more appropriate screening interval.

Section Summary: Repeat Measurement of Bone Mineral Density for Individuals Without Osteoporosis on Initial Screen

Little research has been done on the frequency of BMD monitoring for osteoporosis. The available research has evaluated repeat measurement with central DXA. Evidence on whether repeat measurements add to risk prediction compared with a single measurement is mixed. Current evidence does not support frequent monitoring, but the optimal interval may differ depending on risk factors. Although the optimal interval may differ depending on risk factors, current evidence does not support frequent monitoring. Although the evidence is limited, clinical practice guidelines from the American Association of Clinical Endocrinologists, the American College of Endocrinology, and the Endocrine Society recommend repeat DXA in 3-5 years in patients at low-risk. BMD testing every 1 to 2 years is often appropriate, depending on patient risk factors including age, baseline BMD T-score, and use of medications that adversely affect bone.

REPEAT MEASUREMENT OF CENTRAL BMD TO MONITOR RESPONSE TO PHARMACOLOGIC TREATMENT

Clinical Context and Therapy Purpose

The purpose of BMD measurement in patients who are being evaluated for osteoporosis is to guide treatment.

The question addressed in this evidence review is: Does repeat BMD testing with central DXA improve the net health outcome in individuals who are being treated for osteoporosis?

The following PICO was used to select literature to inform this review.

Populations

The relevant population of interest is individuals who are being treated for osteoporosis. Multiple classes of pharmacologic agents are available to treat patient with osteoporosis.

Interventions
The test being considered is repeat BMD testing with central DXA performed in the outpatient primary care setting.

Comparators
The following practices are currently being used to make treatment decisions: clinical risk assessment without BMD testing.

Outcomes
The general outcomes of interest are the occurrence of fractures and effects on QOL.

Monitoring of fractures may occur until the end of life; these are typically measured within 10 years after screening.

Study Selection Criteria
To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs and systematic reviews of these studies.

In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.

To assess longer-term outcomes and adverse effects, single-arm studies that captured longer periods of follow-up and/or larger populations.

To supplement the review of evidence for indications where evidence was extremely limited, clinical practice guidelines were included. Primary guidelines were selected based on the following criteria:

- Established, recognized professional organization
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- Existence of an associated evidence appraisal (systematic review, comprehensive references, etc.)
- Guideline is accessible (PubMed indexed or freely available through the organizational website)

Other relevant guidelines are summarized in the Supplemental Information Section.

Several moderate quality studies included in the Agency for Healthcare Research and Quality report showed that fracture risk may be reduced with pharmacologic treatment even when BMD does not increase.[14,15,] In the Fracture Intervention Trial, 6459 women randomized to bisphosphonates or to placebo underwent annual bone density scans. A secondary analysis found an average within-person variation in BMD measurement of 0.013 g/cm^2, which was substantially higher than the average annual increase in BMD (0.0085 g/cm^2) in the alendronate group.[16,]

Clinical Practice Guidelines
In 2019, the Endocrine Society published clinical practice guidelines on the pharmacological management of osteoporosis in postmenopausal women.[17,] Recommendations on these

guidelines were based on systematic reviews and meta-analyses, and application of the GRADE methodological framework, including quality of evidence assessments and strength of recommendation designations. When evidence was extremely limited, recommendations were based on expert review.

For women who are being treated for osteoporosis, the guidelines recommended BMD testing with central DXA every 1 to 3 years to assess response to treatment. In women who are taking bisphosphonates, the guideline authors recommended reassessment of fracture risk after 3 to 5 years (5 years for oral, 3 for IV) with clinical risk assessment and BMD testing. Women who remain at high-risk of fractures should continue therapy, whereas those who are at low- to moderate-risk of fractures should be considered for a "bisphosphonate holiday." Once a bisphosphonate holiday is initiated, fracture risk should be reassessed every 2 to 4 years. Clinicians should consider reinitiating osteoporosis therapy earlier than the 5-year suggested maximum if there is a significant decline in BMD, a fracture, or other factors that alter the clinical risk status. For women taking denosumab, the guideline authors recommended reassessment of fracture risk with BMD and clinical risk assessment after 5 to 10 years. Women who remain at high-risk of fractures should either continue denosumab or be treated with other osteoporosis therapies.

The American Association of Clinical Endocrinologists and the American College of Endocrinology published joint guidelines on the diagnosis and treatment of postmenopausal osteoporosis.[18,]

For patients on osteoporosis pharmacotherapy, the guidelines recommended obtaining a baseline DXA and repeating DXA every 1 to 2 years until findings are stable. Successful treatment of osteoporosis was defined as stable or increasing BMD with no evidence of new fractures or vertebral fracture progression. The guidelines recommended continued follow-up every 1-2 years or at a less-frequent interval, depending on clinical circumstances. They also noted that follow-up of patients should ideally be conducted in the same facility with the same machine Recommendations on length of treatment were as follows:

- "Limit treatment with abaloparatide and teriparatide to 2 years and follow abaloparatide or teriparatide therapy with a bisphosphonate or denosumab
- Limit treatment with romosozumab to 1 year and follow with a drug intended for long-term use, such as a bisphosphonate or denosumab
- For oral bisphosphonates, consider a bisphosphonate holiday after 5 years of treatment if fracture risk is no longer high (such as when the T score is greater than -2.5, or the patient has remained fracture free), but continue treatment up to an additional 5 years if fracture risk remains high
- For oral bisphosphonates, consider a bisphosphonate holiday after 6 to 10 years of stability in patients with very high fracture risk
- For zoledronate, consider a bisphosphonate holiday after 3 years in high-risk patients or until fracture risk is no longer high, and continue for up to 6 years in very-high risk patients
- The ending of a bisphosphonate holiday should be based on individual patient circumstances such as an increase in fracture risk, a decrease in bone mineral density beyond the least significant change (LSC) of the dual-energy X-ray absorptiometry (DXA) machine, or an increase in bone turnover markers

- A holiday is not recommended for non-bisphosphonate antiresorptive drugs (Grade A; BEL 1), and treatment with such agents should be continued for as long as clinically appropriate
- If denosumab therapy is discontinued, patients should be transitioned to another antiresorptive"

The Endocrine Society Guidelines on Osteoporosis in Men recommended measuring BMD with central DXA every 1 to 2 years to monitor response to treatment, with less frequent monitoring once BMD appears to reach a plateau.[8,]

Section Summary: Repeat Measurement of Central Bone Mineral Density to Monitor Response to Pharmacologic Treatment
There is no high-quality evidence to guide how often to monitor BMD during osteoporosis treatment. Within-person variation in measurement may exceed treatment effects, and fracture risk may be reduced in the absence of changes in BMD. Although the evidence is limited, multiple professional organizations have published guidelines recommending repeat DXA to monitor treatment response in patients who are receiving pharmacological treatment for osteoporosis. Guidelines from the American Association of Clinical Endocrinologists, the American College of Endocrinology, and the Endocrine Society recommend repeating DXA every 1-3 years after initiation or change in treatment, with longer intervals once therapeutic effect is established.

ULTRASOUND DENSITOMETRY, QUANTITATIVE COMPUTED TOMOGRAPHY, OR DXA ANALYSIS OF PERIPHERAL SITES

Clinical Context and Therapy Purpose
The purpose of bone density measurement with methods other than central DXA in patients who have risk factors for osteoporosis is guide treatment.

The question addressed in this evidence review is: Does BMD testing with tests other than central DXA improve the net health outcome in individuals with risk factors for osteoporosis?

The following PICO was used to select literature to inform this review.

Populations
The relevant population of interest is individuals with risk factors for osteoporosis.

Interventions
The test being considered are bone tests other than central DXA performed in the outpatient primary care setting.

Comparators
The following practices are currently being used to make treatment decisions: clinical risk factor assessment following DXA analysis of central sites.

Outcomes
The general outcomes of interest are the occurrence of fractures and effects on QOL.

Monitoring of fractures may occur until the end of life; these are typically measured within 10 years after screening.

To assess efficacy outcomes, comparative controlled prospective trials were sought, with a preference for RCTs and systematic reviews of these studies.

In the absence of such trials, comparative observational studies were sought, with a preference for prospective studies.

To assess longer-term outcomes and adverse effects, single-arm studies that captured longer periods of follow-up and/or larger populations.

In the review of evidence for the USPSTF, 10 studies were identified that compared calcaneal quantitative ultrasound to central DXA.[6,] Pooled estimates of area under the curves were 0.77 (95% confidence interval, 0.72-0.81; 1969 participants) in women and 0.80 (95% confidence interval, 0.67-0.94; 5142 participants) in men. Similar findings were observed for digital x-ray radiogrammetry, peripheral DXA, and radiographic absorptiometry. For predicting osteoporotic fractures, no meaningful differences in accuracy by type of bone test were observed. A study by Adams et al (2018) is consistent with the results of the USPSTF systematic review, showing the prediction of fracture with a "biomechanical" computed tomography (CT) analyzed on previously taken clinical CT scans that were at least as good as DXA.[19,] No studies were identified that guided treatment based on CT scan results.

Clinical Practice Guidelines
The USPSTF did not recommend specific screening tests but said the most commonly used test is central DXA.

Section Summary: Ultrasound Densitometry, or Quantitative CT, or DXA Analysis of Peripheral Sites
In comparison with central DXA, other measures of bone health showed area under the curves around 0.80 for the identification of osteoporosis. No studies have shown that they can select patients who benefit from treatment for osteoporosis. There is little to no evidence on the usefulness of repeat measurement of BMD using these techniques.

Summary of Evidence
For individuals who are eligible for screening of BMD based on risk factor assessment who receive DXA analysis of central sites (hip or spine), the evidence includes systematic reviews of RCTs controlled trials and cohort studies. Relevant outcomes are morbid events, functional outcomes, quality of life (QOL), hospitalizations, and medication use. Central DXA is the most widely accepted method for measuring BMD and is the reference standard against which other screening tests are evaluated. BMD measurements with central DXA identify individuals at increased risk of fracture, and osteoporosis medications reduce fracture risk in the population identified as osteoporotic by central DXA. Therefore, test results with initial central DXA can be used to guide therapy. The evidence is sufficient to determine that the technology results in an improvement in the net health outcome.

For individuals without osteoporosis on initial screen who receive repeat DXA analysis of central sites (hip or spine), the evidence includes systematic reviews of large cohort and observational

studies. Relevant outcomes are morbid events, functional outcomes, QOL, hospitalizations, and medication use. Little research has been done on the frequency of BMD monitoring for osteoporosis. The available research has evaluated repeat measurement with central DXA. Evidence on whether repeat measurements add to risk prediction compared with a single measurement is mixed. Although the optimal interval may differ depending on risk factors, current evidence does not support repeat monitoring in patients with BMD on DXA in the normal range. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome. Although the evidence is limited, multiple clinical practice guidelines recommend repeat DXA in 3-5 years in patients at low-risk using risk factor assessment. Similarly, multiple guidelines recommend a repeat screening interval of 1-2 years for high-risk individuals and in individuals with a baseline evaluation near a fracture intervention threshold (osteopenia).

For individuals who are receiving pharmacologic treatment for osteoporosis who receive repeat DXA analysis of central sites (hip or spine), the evidence includes systematic reviews of RCTs and observational studies. Relevant outcomes are morbid events, functional outcomes, QOL, hospitalizations, and medication use. There is no high-quality evidence to guide how often to monitor BMD during osteoporosis treatment. Within-person variation in measurement may exceed treatment effects, and fracture risk has been shown to be reduced in some treatment studies in the absence of changes in BMD. Together, these results suggest that frequent (i.e., every 2 years) repeat monitoring has low value. It is unclear whether DXA at the end of the initial 5 years of therapy is sufficiently accurate to guide subsequent therapy. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome. Although the evidence is limited, multiple clinical practice guidelines recommend repeat DXA at intervals of 1-3 years to monitor treatment response in patients who are receiving pharmacological treatment for osteoporosis or after a change in or cessation of treatment.

For individuals who are eligible for screening of BMD based on risk factor assessment who receive ultrasound densitometry, or quantitative computed tomography, or DXA analysis of peripheral sites, the evidence includes observational studies and systematic reviews. Relevant outcomes are morbid events, functional outcomes, QOL, hospitalizations, and medication use. In comparison with central DXA, other measures of bone health showed area under the curves around 0.80 for the identification of osteoporosis. These technologies are not commonly used for BMD measurements in practice, and no studies have shown that they can select patients who benefit from treatment for osteoporosis. There is little to no evidence on the usefulness of repeat measurement of BMD using these techniques. The evidence is insufficient to determine that the technology results in an improvement in the net health outcome.

SUPPLEMENTAL INFORMATION

Practice Guidelines and Position Statements

American College of Obstetricians and Gynecologists

In 2012 (reaffirmed 2016), the American College of Obstetricians and Gynecologists (ACOG) updated its guidelines on managing osteoporosis in women.[20,] The guidelines recommended that bone mineral density (BMD) screening should begin for all women at age 65 years. In addition, the ACOG recommended screening for women younger than 65 years in whom the Fracture Risk Assessment Tool indicates a 10-year risk of osteoporotic fracture of at least 9.3%. Alternatively,

ACOG recommended BMD screening women younger than 65 or with any of the following risk factors (they are similar, but not identical to risk factors in the Fracture Risk Assessment Tool):

- 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 to 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.

American Society for Bone and Mineral Research

The 2016 guidelines from an American Society for Bone and Mineral Research task force included the following statement on managing osteoporosis in patients on long-term bisphosphonate treatment:[21,]

"Reassessment includes clinical evaluation, risk assessment including risk factors, and may include bone density measurement by DXA. The monitoring interval with DXA should be based upon changes that are detectable and clinically significant. Reassessment may be necessary at less than 2 years in patients with a new fracture, or in light of anticipated accelerated bone loss (e.g. institution of aromatase inhibitor or glucocorticoid therapy)."

National Osteoporosis Foundation

In 2014, the National Osteoporosis Foundation (NOF) updated its practice guidelines.[22,] The NOF guidelines recommended that all postmenopausal women and men ages 50 and older be evaluated clinically for osteoporosis risk to determine the need for BMD testing.

Indications for BMD testing included:

- "Women age 65 and older and men age 70 and older" regardless of clinical risk factors
- "Postmenopausal women and men above age 50-69, based on risk factors profile"
- "Postmenopausal women and men age 50 and older who have had an adult age fracture…"
- "Adults with a condition … or taking a medication … associated with low bone mass or bone loss"

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

The NOF also indicated that:
"Central DXA [dual x-ray absorptiometry] 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 % at the hip and 2-4 % at the spine from test to test may be due to the precision error of the testing itself."

American College of Physicians
The 2017 guidelines from the American College of Physicians on the treatment of osteoporosis recommended against bone density monitoring during the 5-year pharmacologic treatment period of osteoporosis in women (weak recommendation, low-quality evidence).[14,] The American College of Physicians noted that data from several studies showed a reduction in fractures with pharmacologic treatment, even when BMD did not increase. In addition, current evidence "does not support frequent monitoring of women with normal bone density for osteoporosis, because data showed that most women with normal CSA scores did not progress to osteoporosis within 5 years."

American College of Radiology
The 2017 update of appropriateness criteria from the American College of Radiology,[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 of the lumbar spine and hip included but were not limited to the following patient populations:

- 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:
    - Estrogen deficiency
    - A history of maternal hip fracture that occurred after the age of 50 years
    - Low body mass (less than 127 lb or 57.6 kg)
    - History of amenorrhea (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:
    - Current use of cigarettes
    - Loss of height, thoracic kyphosis
- Individuals of any age with bone mass osteopenia, or fragility fractures on imaging studies such as radiographs, CT [computed tomography], or MRI [magnetic resonance imaging]
- 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 one or more insufficiency fractures
- Individuals being considered for pharmacologic therapy for osteoporosis.
- Individuals being monitored to:
    - Assess the effectiveness of osteoporosis drug therapy.
    - Follow-up medical conditions associated with abnormal BMD.

International Society for Clinical Densitometry
The 2019 update of the International Society for Clinical Densitometry guidelines recommended bone density testing in the following patients[24,]:

- "Women age 65 and older
- For post-menopausal women younger than age 65 a bone density test is indicated if they have a risk factor for low bone mass fracture such as;
    - Low body weight
    - Prior fracture
    - High-risk medication use
    - Disease or condition associated with bone loss.
- Women during the menopausal transition with clinical risk factors for fracture, such as low bone weight, prior fracture or high-risk medication use.
- Men aged 70 and older.
- Men under < 70 years … if they have risk factors for low bone mass such as;
    - Low body weight
    - Prior fracture
    - High-risk medication use
    - 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 whom evidence of bone loss would lead to treatment."

The 2019 position statement makes the following recommendations on serial BMD measurements:

- Serial BMD testing in combination with clinical assessment of fracture risk, bone turnover markers, and other factors including height loss and trabecular bone score, can be used to determine whether treatment should be initiated in untreated patients, according to locally applicable guidelines.
- Serial BMD testing can monitor response to therapy by finding an increase or stability of bone density.
- Serial BMD testing should be used to monitor individuals following cessation of osteoporosis pharmacologic therapy.
- Serial BMD testing can detect loss of bone density, indicating the need for assessment of treatment adherence, evaluation of secondary causes of osteoporosis, and re-evaluation of treatment options.
- Follow-up BMD testing should be done when the results are likely to influence patient management.
- Intervals between BMD testing should be determined according to each patient's clinical status: typically, one year after initiation or change of therapy is appropriate, with longer intervals once therapeutic effect is established.
- In conditions associated with rapid bone loss, such as glucocorticoid therapy, testing more frequently is appropriate.

Ongoing and Unpublished Clinical Trials
A search of ClinicalTrials.gov in December 2020 did not identify any ongoing or unpublished trials that would likely influence this review.

CODING

The following codes for treatment and procedures applicable to this policy are included below for informational purposes. Inclusion or exclusion of a procedure, diagnosis or device code(s) does not constitute or imply member coverage or provider reimbursement. Please refer to the member's contract benefits in effect at the time of service to determine coverage or non-coverage of these services as it applies to an individual member.

CPT/HCPCS

76977	Ultrasound bone density measurement and interpretation, peripheral site(s), any method
77078	Computed tomography, bone mineral density study, 1 or more sites; axial skeleton (e.g., hips, pelvis, spine)
77080	Dual-energy X-ray absorptiometry (DXA), bone density study, 1 or more sites; axial skeleton (e.g., hips, pelvis, spine)
77081	Dual-energy X-ray absorptiometry (DXA), bone density study, 1 or more sites; appendicular skeleton (peripheral) (e.g., radius, wrist, heel)
77085	Dual-energy X-ray absorptiometry (DXA), bone density study, 1 or more sites; axial skeleton (e.g., hips, pelvis, spine), including vertebral fracture assessment
78350	Bone density (bone mineral content) study, 1 or more sites; single photon absorptiometry
78351	Bone density (bone mineral content) study, 1 or more sites; dual photon absorptiometry, 1 or more sites
0508T	Pulse-echo ultrasound bone density measurement resulting in indicator of axial bone mineral density, tibia
0554T	Bone strength and fracture risk using finite element analysis of functional data, and bone-mineral density, utilizing data from a computed tomography scan; retrieval and transmission of the scan data, assessment of bone strength and fracture risk and bone mineral density, interpretation and report
0555T	Bone strength and fracture risk using finite element analysis of functional data, and bone-mineral density, utilizing data from a computed tomography scan; retrieval and transmission of the scan data
0556T	Bone strength and fracture risk using finite element analysis of functional data, and bone-mineral density, utilizing data from a computed tomography scan; assessment of bone strength and fracture risk and bone mineral density
0557T	Bone strength and fracture risk using finite element analysis of functional data, and bone-mineral density, utilizing data from a computed tomography scan; interpretation and report
0558T	Computed tomography scan taken for the purpose of biomechanical computed tomography analysis
0691T	Automated analysis of an existing computed tomography study for vertebral fracture(s), including assessment of bone density when performed, data preparation, interpretation, and report (Effective 10-01-20210)
G0130	Single energy x-ray absorptiometry (SEXA) bone density study, one or more sites; appendicular skeleton (peripheral) (e.g., radius, wrist, heel)

ICD-10 Diagnoses

C90.00	Multiple myeloma not having achieved remission
C90.01	Multiple myeloma in remission

E05.00	Thyrotoxicosis with diffuse goiter without thyrotoxic crisis or storm
E05.01	Thyrotoxicosis with diffuse goiter with thyrotoxic crisis or storm
E05.10	Thyrotoxicosis with toxic single thyroid nodule without thyrotoxic crisis or storm
E05.11	Thyrotoxicosis with toxic single thyroid nodule with thyrotoxic crisis or storm
E05.20	Thyrotoxicosis with toxic multinodular goiter without thyrotoxic crisis or storm
E05.21	Thyrotoxicosis with toxic multinodular goiter with thyrotoxic crisis or storm
E05.30	Thyrotoxicosis from ectopic thyroid tissue without thyrotoxic crisis or storm
E05.31	Thyrotoxicosis from ectopic thyroid tissue with thyrotoxic crisis or storm
E05.40	Thyrotoxicosis factitia without thyrotoxic crisis or storm
E05.41	Thyrotoxicosis factitia with thyrotoxic crisis or storm
E05.80	Other thyrotoxicosis without thyrotoxic crisis or storm
E05.81	Other thyrotoxicosis with thyrotoxic crisis or storm
E05.90	Thyrotoxicosis, unspecified without thyrotoxic crisis or storm
E21.0	Primary hyperparathyroidism
E21.1	Secondary hyperparathyroidism, not elsewhere classified
E21.2	Other hyperparathyroidism
E21.3	Hyperparathyroidism, unspecified
E23.6	Other disorders of pituitary gland
E24.0	Pituitary-dependent Cushing's disease
E24.2	Drug-induced Cushing's syndrome
E24.3	Ectopic ACTH syndrome
E24.8	Other Cushing's syndrome
E28.310	Symptomatic premature menopause
E28.319	Asymptomatic premature menopause
E29.1	Testicular hypofunction
E34.51	Complete androgen insensitivity syndrome
E34.52	Partial androgen insensitivity syndrome
E46	Unspecified protein-calorie malnutrition
E64.0	Sequelae of protein-calorie malnutrition
E89.40	Asymptomatic postprocedural ovarian failure
E89.41	Symptomatic postprocedural ovarian failure
F10.20	Alcohol dependence, uncomplicated
F10.21	Alcohol dependence, in remission
F17.201	Nicotine dependence, unspecified, in remission
F17.210	Nicotine dependence, cigarettes, uncomplicated
F17.211	Nicotine dependence, cigarettes, in remission
F17.220	Nicotine dependence, chewing tobacco, uncomplicated
F17.221	Nicotine dependence, chewing tobacco, in remission
F17.290	Nicotine dependence, other tobacco product, uncomplicated
F17.291	Nicotine dependence, other tobacco product, in remission
F50.01	Anorexia nervosa, restricting type
F50.02	Anorexia nervosa, binge eating/purging type
G40.001	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, not intractable, with status epilepticus
G40.009	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, not intractable, without status epilepticus
G40.011	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, intractable, with status epilepticus

G40.019	Localization-related (focal) (partial) idiopathic epilepsy and epileptic syndromes with seizures of localized onset, intractable, without status epilepticus
G40.101	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not intractable, with status epilepticus
G40.109	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, not intractable, without status epilepticus
G40.111	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, intractable, with status epilepticus
G40.119	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with simple partial seizures, intractable, without status epilepticus
G40.201	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, with status epilepticus
G40.209	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, not intractable, without status epilepticus
G40.211	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable, with status epilepticus
G40.219	Localization-related (focal) (partial) symptomatic epilepsy and epileptic syndromes with complex partial seizures, intractable, without status epilepticus
G40.301	Generalized idiopathic epilepsy and epileptic syndromes, not intractable, with status epilepticus
G40.309	Generalized idiopathic epilepsy and epileptic syndromes, not intractable, without status epilepticus
G40.311	Generalized idiopathic epilepsy and epileptic syndromes, intractable, with status epilepticus
G40.319	Generalized idiopathic epilepsy and epileptic syndromes, intractable, without status epilepticus
G40.401	Other generalized epilepsy and epileptic syndromes, not intractable, with status epilepticus
G40.409	Other generalized epilepsy and epileptic syndromes, not intractable, without status epilepticus
G40.411	Other generalized epilepsy and epileptic syndromes, intractable, with status epilepticus
G40.419	Other generalized epilepsy and epileptic syndromes, intractable, without status epilepticus
G40.501	Epileptic seizures related to external causes, not intractable, with status epilepticus
G40.509	Epileptic seizures related to external causes, not intractable, without status epilepticus
G40.801	Other epilepsy, not intractable, with status epilepticus
G40.802	Other epilepsy, not intractable, without status epilepticus
G40.803	Other epilepsy, intractable, with status epilepticus
G40.804	Other epilepsy, intractable, without status epilepticus
G40.811	Lennox-Gastaut syndrome, not intractable, with status epilepticus
G40.812	Lennox-Gastaut syndrome, not intractable, without status epilepticus
G40.813	Lennox-Gastaut syndrome, intractable, with status epilepticus
G40.814	Lennox-Gastaut syndrome, intractable, without status epilepticus
G40.821	Epileptic spasms, not intractable, with status epilepticus
G40.822	Epileptic spasms, not intractable, without status epilepticus
G40.823	Epileptic spasms, intractable, with status epilepticus

G40.824	Epileptic spasms, intractable, without status epilepticus
G40.833	Dravet syndrome, intractable, with status epilepticus
G40.834	Dravet syndrome, intractable, without status epilepticus
G40.901	Epilepsy, unspecified, not intractable, with status epilepticus
G40.909	Epilepsy, unspecified, not intractable, without status epilepticus
G40.911	Epilepsy, unspecified, intractable, with status epilepticus
G40.919	Epilepsy, unspecified, intractable, without status epilepticus
G40.A01	Absence epileptic syndrome, not intractable, with status epilepticus
G40.A09	Absence epileptic syndrome, not intractable, without status epilepticus
G40.A11	Absence epileptic syndrome, intractable, with status epilepticus
G40.A19	Absence epileptic syndrome, intractable, without status epilepticus
G40.B01	Juvenile myoclonic epilepsy, not intractable, with status epilepticus
G40.B09	Juvenile myoclonic epilepsy, not intractable, without status epilepticus
G40.B11	Juvenile myoclonic epilepsy, intractable, with status epilepticus
G40.B19	Juvenile myoclonic epilepsy, intractable, without status epilepticus
K86.0	Alcohol-induced chronic pancreatitis
K86.1	Other chronic pancreatitis
K90.0	Celiac disease
K90.49	Malabsorption due to intolerance, not elsewhere classified
K90.89	Other intestinal malabsorption
M05.411	Rheumatoid myopathy with rheumatoid arthritis of right shoulder
M05.412	Rheumatoid myopathy with rheumatoid arthritis of left shoulder
M05.421	Rheumatoid myopathy with rheumatoid arthritis of right elbow
M05.422	Rheumatoid myopathy with rheumatoid arthritis of left elbow
M05.431	Rheumatoid myopathy with rheumatoid arthritis of right wrist
M05.432	Rheumatoid myopathy with rheumatoid arthritis of left wrist
M05.441	Rheumatoid myopathy with rheumatoid arthritis of right hand
M05.442	Rheumatoid myopathy with rheumatoid arthritis of left hand
M05.451	Rheumatoid myopathy with rheumatoid arthritis of right hip
M05.452	Rheumatoid myopathy with rheumatoid arthritis of left hip
M05.461	Rheumatoid myopathy with rheumatoid arthritis of right knee
M05.462	Rheumatoid myopathy with rheumatoid arthritis of left knee
M05.471	Rheumatoid myopathy with rheumatoid arthritis of right ankle and foot
M05.472	Rheumatoid myopathy with rheumatoid arthritis of left ankle and foot
M05.49	Rheumatoid myopathy with rheumatoid arthritis of multiple sites
M05.511	Rheumatoid polyneuropathy with rheumatoid arthritis of right shoulder
M05.512	Rheumatoid polyneuropathy with rheumatoid arthritis of left shoulder
M05.521	Rheumatoid polyneuropathy with rheumatoid arthritis of right elbow
M05.522	Rheumatoid polyneuropathy with rheumatoid arthritis of left elbow
M05.531	Rheumatoid polyneuropathy with rheumatoid arthritis of right wrist
M05.532	Rheumatoid polyneuropathy with rheumatoid arthritis of left wrist
M05.541	Rheumatoid polyneuropathy with rheumatoid arthritis of right hand
M05.542	Rheumatoid polyneuropathy with rheumatoid arthritis of left hand
M05.551	Rheumatoid polyneuropathy with rheumatoid arthritis of right hip
M05.552	Rheumatoid polyneuropathy with rheumatoid arthritis of left hip
M05.559	Rheumatoid polyneuropathy with rheumatoid arthritis of unspecified hip
M05.561	Rheumatoid polyneuropathy with rheumatoid arthritis of right knee
M05.562	Rheumatoid polyneuropathy with rheumatoid arthritis of left knee

M05.571	Rheumatoid polyneuropathy with rheumatoid arthritis of right ankle and foot
M05.572	Rheumatoid polyneuropathy with rheumatoid arthritis of left ankle and foot
M05.59	Rheumatoid polyneuropathy with rheumatoid arthritis of multiple sites
M05.711	Rheumatoid arthritis with rheumatoid factor of right shoulder without organ or systems involvement
M05.712	Rheumatoid arthritis with rheumatoid factor of left shoulder without organ or systems involvement
M05.721	Rheumatoid arthritis with rheumatoid factor of right elbow without organ or systems involvement
M05.722	Rheumatoid arthritis with rheumatoid factor of left elbow without organ or systems involvement
M05.731	Rheumatoid arthritis with rheumatoid factor of right wrist without organ or systems involvement
M05.732	Rheumatoid arthritis with rheumatoid factor of left wrist without organ or systems involvement
M05.741	Rheumatoid arthritis with rheumatoid factor of right hand without organ or systems involvement
M05.742	Rheumatoid arthritis with rheumatoid factor of left hand without organ or systems involvement
M05.751	Rheumatoid arthritis with rheumatoid factor of right hip without organ or systems involvement
M05.752	Rheumatoid arthritis with rheumatoid factor of left hip without organ or systems involvement
M05.761	Rheumatoid arthritis with rheumatoid factor of right knee without organ or systems involvement
M05.762	Rheumatoid arthritis with rheumatoid factor of left knee without organ or systems involvement
M05.771	Rheumatoid arthritis with rheumatoid factor of right ankle and foot without organ or systems involvement
M05.772	Rheumatoid arthritis with rheumatoid factor of left ankle and foot without organ or systems involvement
M05.79	Rheumatoid arthritis with rheumatoid factor of multiple sites without organ or systems involvement
M05.811	Other rheumatoid arthritis with rheumatoid factor of right shoulder
M05.812	Other rheumatoid arthritis with rheumatoid factor of left shoulder
M05.821	Other rheumatoid arthritis with rheumatoid factor of right elbow
M05.822	Other rheumatoid arthritis with rheumatoid factor of left elbow
M05.831	Other rheumatoid arthritis with rheumatoid factor of right wrist
M05.832	Other rheumatoid arthritis with rheumatoid factor of left wrist
M05.841	Other rheumatoid arthritis with rheumatoid factor of right hand
M05.842	Other rheumatoid arthritis with rheumatoid factor of left hand
M05.851	Other rheumatoid arthritis with rheumatoid factor of right hip
M05.852	Other rheumatoid arthritis with rheumatoid factor of left hip
M05.861	Other rheumatoid arthritis with rheumatoid factor of right knee
M05.862	Other rheumatoid arthritis with rheumatoid factor of left knee
M05.871	Other rheumatoid arthritis with rheumatoid factor of right ankle and foot
M05.872	Other rheumatoid arthritis with rheumatoid factor of left ankle and foot
M05.89	Other rheumatoid arthritis with rheumatoid factor of multiple sites

M06.011 Rheumatoid arthritis without rheumatoid factor, right shoulder
M06.012 Rheumatoid arthritis without rheumatoid factor, left shoulder
M06.021 Rheumatoid arthritis without rheumatoid factor, right elbow
M06.022 Rheumatoid arthritis without rheumatoid factor, left elbow
M06.031 Rheumatoid arthritis without rheumatoid factor, right wrist
M06.032 Rheumatoid arthritis without rheumatoid factor, left wrist
M06.041 Rheumatoid arthritis without rheumatoid factor, right hand
M06.042 Rheumatoid arthritis without rheumatoid factor, left hand
M06.051 Rheumatoid arthritis without rheumatoid factor, right hip
M06.052 Rheumatoid arthritis without rheumatoid factor, left hip
M06.061 Rheumatoid arthritis without rheumatoid factor, right knee
M06.062 Rheumatoid arthritis without rheumatoid factor, left knee
M06.071 Rheumatoid arthritis without rheumatoid factor, right ankle and foot
M06.072 Rheumatoid arthritis without rheumatoid factor, left ankle and foot
M06.08 Rheumatoid arthritis without rheumatoid factor, vertebrae
M06.09 Rheumatoid arthritis without rheumatoid factor, multiple sites
M06.211 Rheumatoid bursitis, right shoulder
M06.212 Rheumatoid bursitis, left shoulder
M06.221 Rheumatoid bursitis, right elbow
M06.222 Rheumatoid bursitis, left elbow
M06.231 Rheumatoid bursitis, right wrist
M06.232 Rheumatoid bursitis, left wrist
M06.241 Rheumatoid bursitis, right hand
M06.242 Rheumatoid bursitis, left hand
M06.251 Rheumatoid bursitis, right hip
M06.252 Rheumatoid bursitis, left hip
M06.261 Rheumatoid bursitis, right knee
M06.262 Rheumatoid bursitis, left knee
M06.271 Rheumatoid bursitis, right ankle and foot
M06.272 Rheumatoid bursitis, left ankle and foot
M06.28 Rheumatoid bursitis, vertebrae
M06.29 Rheumatoid bursitis, multiple sites
M06.311 Rheumatoid nodule, right shoulder
M06.312 Rheumatoid nodule, left shoulder
M06.321 Rheumatoid nodule, right elbow
M06.322 Rheumatoid nodule, left elbow
M06.331 Rheumatoid nodule, right wrist
M06.332 Rheumatoid nodule, left wrist
M06.341 Rheumatoid nodule, right hand
M06.342 Rheumatoid nodule, left hand
M06.351 Rheumatoid nodule, right hip
M06.352 Rheumatoid nodule, left hip
M06.361 Rheumatoid nodule, right knee
M06.362 Rheumatoid nodule, left knee
M06.371 Rheumatoid nodule, right ankle and foot
M06.372 Rheumatoid nodule, left ankle and foot
M06.38 Rheumatoid nodule, vertebrae
M06.39 Rheumatoid nodule, multiple sites

M06.811	Other specified rheumatoid arthritis, right shoulder
M06.812	Other specified rheumatoid arthritis, left shoulder
M06.821	Other specified rheumatoid arthritis, right elbow
M06.822	Other specified rheumatoid arthritis, left elbow
M06.831	Other specified rheumatoid arthritis, right wrist
M06.832	Other specified rheumatoid arthritis, left wrist
M06.841	Other specified rheumatoid arthritis, right hand
M06.842	Other specified rheumatoid arthritis, left hand
M06.851	Other specified rheumatoid arthritis, right hip
M06.852	Other specified rheumatoid arthritis, left hip
M06.861	Other specified rheumatoid arthritis, right knee
M06.862	Other specified rheumatoid arthritis, left knee
M06.871	Other specified rheumatoid arthritis, right ankle and foot
M06.872	Other specified rheumatoid arthritis, left ankle and foot
M06.88	Other specified rheumatoid arthritis, vertebrae
M06.89	Other specified rheumatoid arthritis, multiple sites
M81.0	Age-related osteoporosis without current pathological fracture
M81.6	Localized osteoporosis [Lequesne]
M81.8	Other osteoporosis without current pathological fracture
M85.812	Other specified disorders of bone density and structure, left shoulder
M85.811	Other specified disorders of bone density and structure, right shoulder
M85.821	Other specified disorders of bone density and structure, right upper arm
M85.822	Other specified disorders of bone density and structure, left upper arm
M85.831	Other specified disorders of bone density and structure, right forearm
M85.832	Other specified disorders of bone density and structure, left forearm
M85.841	Other specified disorders of bone density and structure, right hand
M85.842	Other specified disorders of bone density and structure, left hand
M85.851	Other specified disorders of bone density and structure, right thigh
M85.852	Other specified disorders of bone density and structure, left thigh
M85.861	Other specified disorders of bone density and structure, right lower leg
M85.862	Other specified disorders of bone density and structure, left lower leg
M85.871	Other specified disorders of bone density and structure, right ankle and foot
M85.872	Other specified disorders of bone density and structure, left ankle and foot
M85.88	Other specified disorders of bone density and structure, other site
M85.89	Other specified disorders of bone density and structure, multiple sites
M85.9	Disorder of bone density and structure, unspecified
N18.31	Chronic kidney disease, stage 3a
N18.32	Chronic kidney disease, stage 3b
N18.4	Chronic kidney disease, stage 4 (severe)
N18.5	Chronic kidney disease, stage 5
N18.6	End stage renal disease
N18.9	Chronic kidney disease, unspecified
N95.8	Other specified menopausal and perimenopausal disorders
Q78.0	Osteogenesis imperfecta
R56.1	Post traumatic seizures
S22.000A	Wedge compression fracture of unspecified thoracic vertebra, initial encounter for closed fracture

S22.000B Wedge compression fracture of unspecified thoracic vertebra, initial encounter for open fracture
S22.000D Wedge compression fracture of unspecified thoracic vertebra, subsequent encounter for fracture with routine healing.
S22.000G Wedge compression fracture of unspecified thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.000K Wedge compression fracture of unspecified thoracic vertebra, subsequent encounter for fracture with nonunion
S22.000S Wedge compression fracture of unspecified thoracic vertebra, sequela
S22.001A Stable burst fracture of unspecified thoracic vertebra, initial encounter for closed fracture
S22.001B Stable burst fracture of unspecified thoracic vertebra, initial encounter for open fracture
S22.001D Stable burst fracture of unspecified thoracic vertebra, subsequent encounter for fracture with routine healing
S22.001G Stable burst fracture of unspecified thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.001K Stable burst fracture of unspecified thoracic vertebra, subsequent encounter for fracture with nonunion
S22.001S Stable burst fracture of unspecified thoracic vertebra, sequela
S22.002A Unstable burst fracture of unspecified thoracic vertebra, initial encounter for closed fracture
S22.002B Unstable fracture of unspecified thoracic vertebra, initial encounter for open fracture
S22.002D Unstable burst fracture of unspecified thoracic vertebra, subsequent encounter for fracture with routine healing
S22.002G Unstable burst fracture of unspecified thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.002K Unstable burst fracture of unspecified thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.002S Unstable burst fracture of unspecified thoracic vertebra, sequela
S22.008A Other fracture of unspecified thoracic vertebra, initial encounter for closed fracture
S22.008B Other fracture of unspecified thoracic vertebra, initial encounter for open fracture
S22.008D Other fracture of unspecified thoracic vertebra, subsequent encounter for fracture with routine healing
S22.008G Other fracture of unspecified thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.008K Other fracture of unspecified thoracic vertebra, subsequent encounter for fracture with nonunion
S22.008S Other fracture of unspecified thoracic vertebra, sequela
S22.010A Wedge compression fracture of first thoracic vertebra, initial encounter for closed fracture
S22.010B Wedge compression fracture of first thoracic vertebra, initial encounter for open fracture
S22.010D Wedge compression fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.010G Wedge compression fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing

S22.010K Wedge compression fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.010S Wedge compression fracture of first thoracic vertebra, sequela
S22.011A Stable burst fracture of first thoracic vertebra, initial encounter for closed fracture
S22.011B Stable burst fracture of first thoracic vertebra, initial encounter for open fracture
S22.011D Stable burst fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.011G Stable burst fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.011K Stable burst fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.011S Stable burst fracture of first thoracic vertebra, sequela
S22.012A Unstable burst fracture of first thoracic vertebra, initial encounter for closed fracture
S22.012B Unstable burst fracture of first thoracic vertebra, initial encounter for open fracture
S22.012D Unstable burst fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.012G Unstable burst fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.012K Unstable burst fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.012S Unstable burst fracture of first thoracic vertebra, sequela
S22.018A Other fracture of first thoracic vertebra, initial encounter for closed fracture
S22.018B Other fracture of first thoracic vertebra, initial encounter for open fracture
S22.018D Other fracture of first thoracic vertebra, subsequent encounter for fracture with routine healing
S22.018G Other fracture of first thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.018K Other fracture of first thoracic vertebra, subsequent encounter for fracture with nonunion
S22.018S Other fracture of first thoracic vertebra, sequela
S22.020A Wedge compression fracture of second thoracic vertebra, initial encounter for closed fracture
S22.020B Wedge compression fracture of second thoracic vertebra, initial encounter for open fracture
S22.020D Wedge compression fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.020G Wedge compression fracture of second thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.020K Wedge compression fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion
S22.020S Wedge compression fracture of second thoracic vertebra, sequela
S22.021A Stable burst fracture of second thoracic vertebra, initial encounter for closed fracture
S22.021B Stable burst fracture of second thoracic vertebra, initial encounter for open fracture
S22.021D Stable burst fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.021G Stable burst fracture of second thoracic vertebra, subsequent encounter for fracture with delayed healing

S22.021K Stable burst fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion
S22.021S Stable burst fracture of second thoracic vertebra, sequela
S22.022A Unstable burst fracture of second thoracic vertebra, initial encounter for closed fracture
S22.022B Unstable burst fracture of second thoracic vertebra, initial encounter for open fracture
S22.022D Unstable burst fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.022G Unstable burst fracture of second thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.022K Unstable burst fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion
S22.022S Unstable burst fracture of second thoracic vertebra, sequela
S22.028A Other fracture of second thoracic vertebra, initial encounter for closed fracture
S22.028B Other fracture of second thoracic vertebra, initial encounter for open fracture
S22.028D Other fracture of second thoracic vertebra, subsequent encounter for fracture with routine healing
S22.028G Other fracture of second thoracic vertebra, subsequent encounter for facture with delayed healing
S22.028K Other fracture of second thoracic vertebra, subsequent encounter for fracture with nonunion
S22.028S Other fracture of second thoracic vertebra, sequela
S22.030A Wedge compression fracture of third thoracic vertebra, initial encounter for closed fracture
S22.030B Wedge compression fracture of third thoracic vertebra, initial encounter for open fracture
S22.030D Wedge compression fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.030G Wedge compression fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.030K Wedge compression fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.030S Wedge compression fracture of third thoracic vertebra, sequela
S22.031A Stable burst fracture of third thoracic vertebra, initial encounter for closed fracture
S22.031B Stable burst fracture of third thoracic vertebra, initial encounter for open fracture
S22.031D Stable burst fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.031G Stable burst fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.031K Stable burst fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.031S Stable burst fracture of third thoracic vertebra, sequela
S22.032A Unstable burst fracture of third thoracic vertebra, initial encounter for closed fracture
S22.032B Unstable burst fracture of third thoracic vertebra, initial encounter for open fracture
S22.032D Unstable burst fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.032G Unstable burst fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing

S22.032K Unstable burst fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.032S Unstable burst fracture of third thoracic vertebra, sequela
S22.038A Other fracture of third thoracic vertebra, initial encounter for closed fracture
S22.038B Other fracture of third thoracic vertebra, initial encounter for open fracture
S22.038D Other fracture of third thoracic vertebra, subsequent encounter for fracture with routine healing
S22.038G Other fracture of third thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.038K Other fracture of third thoracic vertebra, subsequent encounter for fracture with nonunion
S22.038S Other fracture of third thoracic vertebra, sequela
S22.040A Wedge compression fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.040B Wedge compression fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.040D Wedge compression fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.040G Wedge compression fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.040K Wedge compression fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.040S Wedge compression fracture of fourth thoracic vertebra, sequela
S22.041A Stable burst fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.041B Stable burst fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.041D Stable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.041G Stable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.041K Stable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.041S Stable burst fracture of fourth thoracic vertebra, sequela
S22.042A Unstable burst fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.042B Unstable burst fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.042D Unstable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.042G Unstable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.042K Unstable burst fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.042S Unstable burst fracture of fourth thoracic vertebra, sequela
S22.048A Other fracture of fourth thoracic vertebra, initial encounter for closed fracture
S22.048B Other fracture of fourth thoracic vertebra, initial encounter for open fracture
S22.048D Other fracture of fourth thoracic vertebra, subsequent encounter for fracture with routine healing
S22.048G Other fracture of fourth thoracic vertebra, subsequent encounter for fracture with delayed healing

S22.048K Other fracture of fourth thoracic vertebra, subsequent encounter for fracture with nonunion
S22.048S Other fracture of fourth thoracic vertebra, sequela
S22.050A Wedge compression fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.050B Wedge compression fracture of T5-T6 vertebra, initial encounter for open fracture
S22.050D Wedge compression fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.050G Wedge compression fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing
S22.050K Wedge compression fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.050S Wedge compression fracture of T5-T6 vertebra, sequela
S22.051A Stable burst fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.051B Stable burst fracture of T5-T6 vertebra, initial encounter for open fracture
S22.051D Stable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.051G Stable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing
S22.051K Stable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.051S Stable burst fracture of T5-T6 vertebra, sequela
S22.052A Unstable burst fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.052B Unstable burst fracture of T5-T6 vertebra, initial encounter for open fracture
S22.052D Unstable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.052G Unstable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing
S22.052K Unstable burst fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.052S Unstable burst fracture of T5-T6 vertebra, sequela
S22.058A Other fracture of T5-T6 vertebra, initial encounter for closed fracture
S22.058B Other fracture of T5-T6 vertebra, initial encounter for open fracture
S22.058D Other fracture of T5-T6 vertebra, subsequent encounter for fracture with routine healing
S22.058G Other fracture of T5-T6 vertebra, subsequent encounter for fracture with delayed healing
S22.058K Other fracture of T5-T6 vertebra, subsequent encounter for fracture with nonunion
S22.058S Other fracture of T5-T6 vertebra, sequela
S22.060A Wedge compression fracture of T7-T8 vertebra, initial encounter for closed fracture
S22.060B Wedge compression fracture of T7-T8 vertebra, initial encounter for open fracture
S22.060D Wedge compression fracture of T7-T8 vertebra, subsequent encounter for fracture with routine healing
S22.060G Wedge compression fracture of T7-T8 vertebra, subsequent encounter for fracture with delayed healing
S22.060K Wedge compression fracture of T7-T8 vertebra, subsequent encounter for fracture with nonunion
S22.060S Wedge compression fracture of T7-T8 vertebra, sequela
S22.061A Stable burst fracture of T7-T8 vertebra, initial encounter for closed fracture

S22.061B Stable burst fracture of T7-T8 vertebra, initial encounter for open fracture
S22.061D Stable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with routine healing
S22.061G Stable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with delayed healing
S22.061K Stable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with nonunion
S22.061S Stable burst fracture of T7-T8 vertebra, sequela
S22.062A Unstable burst fracture of T7-T8 vertebra, initial encounter for closed fracture
S22.062B Unstable burst fracture of T7-T8 vertebra, initial encounter for open fracture
S22.062D Unstable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with routine healing
S22.062G Unstable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with delayed healing
S22.062K Unstable burst fracture of T7-T8 vertebra, subsequent encounter for fracture with nonunion
S22.062S Unstable burst fracture of T7-T8 vertebra, sequela
S22.068A Other fracture of T7-T8 thoracic vertebra, initial encounter for closed fracture
S22.068B Other fracture of T7-T8 thoracic vertebra, initial encounter for open fracture
S22.068D Other fracture of T7-T8 thoracic vertebra, subsequent encounter for fracture with routine healing
S22.068G Other fracture of T7-T8 thoracic vertebra, subsequent encounter for fracture with delayed healing
S22.068K Other fracture of T7-T8 thoracic vertebra, subsequent encounter for fracture with nonunion
S22.068S Other fracture of T7-T8 thoracic vertebra, sequela
S22.070A Wedge compression fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.070B Wedge compression fracture of T9-T10 vertebra, initial encounter for open fracture
S22.070D Wedge compression fracture of T9-T10 vertebra, subsequent encounter for fracture with routine healing
S22.070G Wedge compression fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.070K Wedge compression fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.070S Wedge compression fracture of T9-T10 vertebra, sequela
S22.071A Stable burst fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.071B Stable burst fracture of T9-T10 vertebra, initial encounter for open fracture
S22.071D Stable burst fracture of T9-T10 vertebra, subsequent encounter for facture with routine healing
S22.071G Stable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.071K Stable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.071S Stable burst fracture of T9-T10 vertebra, sequela
S22.072A Unstable burst fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.072B Unstable burst fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.072D Unstable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with routine healing

S22.072G Unstable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.072K Unstable burst fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.072S Unstable burst fracture of T9-T10 vertebra, sequela
S22.078A Other fracture of T9-T10 vertebra, initial encounter for closed fracture
S22.078B Other fracture of T9-T10 vertebra, initial encounter for open fracture
S22.078D Other fracture of T9-T10 vertebra, subsequent encounter for fracture with routine healing
S22.078G Other fracture of T9-T10 vertebra, subsequent encounter for fracture with delayed healing
S22.078K Other fracture of T9-T10 vertebra, subsequent encounter for fracture with nonunion
S22.080A Wedge compression fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.080B Wedge compression fracture of T11-T12 vertebra, initial encounter for open fracture
S22.080D Wedge compression fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing
S22.080G Wedge compression fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.080K Wedge compression fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.080S Wedge compression fracture of T11-T12 vertebra, sequela
S22.081A Stable burst fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.081B Stable burst fracture of T11-T12 vertebra, initial encounter for open fracture
S22.081D Stable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing
S22.081G Stable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.081K Stable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.081S Stable burst fracture of T11-T12 vertebra, sequela
S22.082A Unstable burst fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.082B Unstable burst fracture of T11-T12 vertebra, initial encounter for open fracture
S22.082D Unstable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing
S22.082G Unstable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.082K Unstable burst fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.082S Unstable burst fracture of T11-T12 vertebra, sequela
S22.088A Other fracture of T11-T12 vertebra, initial encounter for closed fracture
S22.088B Other fracture of T11-T12 vertebra, initial encounter for open fracture
S22.088D Other fracture of T11-T12 vertebra, subsequent encounter for fracture with routine healing
S22.088G Other fracture of T11-T12 vertebra, subsequent encounter for fracture with delayed healing
S22.088K Other fracture of T11-T12 vertebra, subsequent encounter for fracture with nonunion
S22.088S Other fracture of T11-T12 vertebra, sequela

S32.000A Wedge compression fracture of unspecified lumbar vertebra, initial encounter for closed fracture
S32.000B Wedge compression fracture of unspecified lumbar vertebra, initial encounter for open fracture
S32.000D Wedge compression fracture of unspecified lumbar vertebra, subsequent encounter for fracture with routine healing
S32.000G Wedge compression fracture of unspecified lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.000K Wedge compression fracture of unspecified lumbar vertebra, subsequent encounter for fracture with nonunion
S32.000S Wedge compression fracture of unspecified lumbar vertebra, sequela
S32.001A Stable burst fracture of unspecified lumbar vertebra, initial encounter for closed fracture
S32.001B Stable burst fracture of unspecified lumbar vertebra, initial encounter for open fracture
S32.001D Stable burst fracture of unspecified lumbar vertebra, subsequent encounter for fracture with routine healing
S32.001G Stable burst fracture of unspecified lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.001K Stable burst fracture of unspecified lumbar vertebra, subsequent encounter for fracture with nonunion
S32.001S Stable burst fracture of unspecified lumbar vertebra, sequela
S32.002A Unstable burst fracture of unspecified lumbar vertebra, initial encounter for closed fracture
S32.002B Unstable burst fracture of unspecified lumbar vertebra, initial encounter for open fracture
S32.002D Unstable burst fracture of unspecified lumbar vertebra, subsequent encounter for fracture with routine healing
S32.002G Unstable burst fracture of unspecified lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.002K Unstable burst fracture of unspecified lumbar vertebra, subsequent encounter for fracture with nonunion
S32.002S Unstable burst fracture of unspecified lumbar vertebra, sequela
S32.008A Other fracture of unspecified lumbar vertebra, initial encounter for closed fracture
S32.008B Other fracture of unspecified lumbar vertebra, initial encounter for open fracture
S32.008D Other fracture of unspecified lumbar vertebra, subsequent encounter for fracture with routine healing
S32.008G Other fracture of unspecified lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.008K Other fracture of unspecified lumbar vertebra, subsequent encounter for fracture with nonunion
S32.008S Other fracture of unspecified lumbar vertebra, sequela
S32.009A Unspecified fracture of unspecified lumbar vertebra, initial encounter for closed fracture
S32.009B Unspecified fracture of unspecified lumbar vertebra, initial encounter for open fracture
S32.009D Unspecified fracture of unspecified lumbar vertebra, subsequent encounter for fracture with routine healing

S32.009G Unspecified fracture of unspecified lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.009K Unspecified fracture of unspecified lumbar vertebra, subsequent encounter for fracture with nonunion
S32.009S Unspecified fracture of unspecified lumbar vertebra, sequela
S32.010A Wedge compression fracture of first lumbar vertebra, initial encounter for closed fracture
S32.010B Wedge compression fracture of first lumbar vertebra, initial encounter for open fracture
S32.010D Wedge compression fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.010G Wedge compression fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.010K Wedge compression fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.010S Wedge compression fracture of first lumbar vertebra, sequela
S32.011A Stable burst fracture of first lumbar vertebra, initial encounter for closed fracture
S32.011B Stable burst fracture of first lumbar vertebra, initial encounter for open fracture
S32.011D Stable burst fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.011G Stable burst fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.011K Stable burst fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.011S Stable burst fracture of first lumbar vertebra, sequela
S32.012A Unstable burst fracture of first lumbar vertebra, initial encounter for closed fracture
S32.012B Unstable burst fracture of first lumbar vertebra, initial encounter for open fracture
S32.012D Unstable burst fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.012G Unstable burst fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.012K Unstable burst fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.012S Unstable burst fracture of first lumbar vertebra, sequela
S32.018A Other fracture of first lumbar vertebra, initial encounter for closed fracture
S32.018B Other fracture of first lumbar vertebra, initial encounter for open fracture
S32.018D Other fracture of first lumbar vertebra, subsequent encounter for fracture with routine healing
S32.018G Other fracture of first lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.018K Other fracture of first lumbar vertebra, subsequent encounter for fracture with nonunion
S32.018S Other fracture of first lumbar vertebra, sequela
S32.020A Wedge compression fracture of second lumbar vertebra, initial encounter for closed fracture
S32.020B Wedge compression fracture of second lumbar vertebra, initial encounter for open fracture

S32.020D Wedge compression fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.020G Wedge compression fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.020K Wedge compression fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.020S Wedge compression fracture of second lumbar vertebra, sequela
S32.021A Stable burst fracture of second lumbar vertebra, initial encounter for closed fracture
S32.021B Stable burst fracture of second lumbar vertebra, initial encounter for open fracture
S32.021D Stable burst fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.021G Stable burst fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.021K Stable burst fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.021S Stable burst fracture of second lumbar vertebra, sequela
S32.022A Unstable burst fracture of second lumbar vertebra, initial encounter for closed fracture
S32.022B Unstable burst fracture of second lumbar vertebra, initial encounter for open fracture
S32.022D Unstable burst fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.022G Unstable burst fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.022K Unstable burst fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.022S Unstable burst fracture of second lumbar vertebra, sequela
S32.028A Other fracture of second lumbar vertebra, initial encounter for closed fracture
S32.028B Other fracture of second lumbar vertebra, initial encounter for open fracture
S32.028D Other fracture of second lumbar vertebra, subsequent encounter for fracture with routine healing
S32.028G Other fracture of second lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.028K Other fracture of second lumbar vertebra, subsequent encounter for fracture with nonunion
S32.028S Other fracture of second lumbar vertebra, sequela
S32.030A Wedge compression fracture of third lumbar vertebra, initial encounter for closed fracture
S32.030B Wedge compression fracture of third lumbar vertebra, initial encounter for open fracture
S32.030D Wedge compression fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.030G Wedge compression fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.030K Wedge compression fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.030S Wedge compression fracture of third lumbar vertebra, sequela
S32.031A Stable burst fracture of third lumbar vertebra, initial encounter for closed fracture
S32.031B Stable burst fracture of third lumbar vertebra, initial encounter for open fracture

S32.031D Stable burst fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.031G Stable burst fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.031K Stable burst fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.031S Stable burst fracture of third lumbar vertebra, sequela
S32.032A Unstable burst fracture of third lumbar vertebra, initial encounter for closed fracture
S32.032B Unstable burst fracture of third lumbar vertebra, initial encounter for open fracture
S32.032D Unstable burst fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.032G Unstable burst fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.032K Unstable burst fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.032S Unstable burst fracture of third lumbar vertebra, sequela
S32.038A Other fracture of third lumbar vertebra, initial encounter for closed fracture
S32.038B Other fracture of third lumbar vertebra, initial encounter for open fracture
S32.038D Other fracture of third lumbar vertebra, subsequent encounter for fracture with routine healing
S32.038G Other fracture of third lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.038K Other fracture of third lumbar vertebra, subsequent encounter for fracture with nonunion
S32.038S Other fracture of third lumbar vertebra, sequela
S32.040A Wedge compression fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.040B Wedge compression fracture of fourth lumbar vertebra, initial encounter for open fracture
S32.040D Wedge compression fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.040G Wedge compression fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.040K Wedge compression fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.040S Wedge compression fracture of fourth lumbar vertebra, sequela
S32.041A Stable burst fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.041B Stable burst fracture of fourth lumbar vertebra, initial encounter for open fracture
S32.041D Stable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.041G Stable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.041K Stable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.041S Stable burst fracture of fourth lumbar vertebra, sequela
S32.042A Unstable burst fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.042B Unstable burst fracture of fourth lumbar vertebra, initial encounter for open fracture

S32.042D Unstable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.042G Unstable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.042K Unstable burst fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.042S Unstable burst fracture of fourth lumbar vertebra, sequela
S32.048A Other fracture of fourth lumbar vertebra, initial encounter for closed fracture
S32.048B Other fracture of fourth lumbar vertebra, initial encounter for open fracture
S32.048D Other fracture of fourth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.048G Other fracture of fourth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.048K Other fracture of fourth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.048S Other fracture of fourth lumbar vertebra, sequel
S32.050A Wedge compression fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.050B Wedge compression fracture of fifth lumbar vertebra, initial encounter for open fracture
S32.050D Wedge compression fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.050G Wedge compression fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.050K Wedge compression fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.050S Wedge compression fracture of fifth lumbar vertebra, sequela
S32.051A Stable burst fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.051B Stable burst fracture of fifth lumbar vertebra, initial encounter for open fracture
S32.051D Stable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.051G Stable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.051K Stable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.051S Stable burst fracture of fifth lumbar vertebra, sequela
S32.052A Unstable burst fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.052B Unstable burst fracture of fifth lumbar vertebra, initial encounter for open fracture
S32.052D Unstable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.052G Unstable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.052K Unstable burst fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.052S Unstable burst fracture of fifth lumbar vertebra, sequela
S32.058A Other fracture of fifth lumbar vertebra, initial encounter for closed fracture
S32.058B Other fracture of fifth lumbar vertebra, initial encounter for open fracture

S32.058D	Other fracture of fifth lumbar vertebra, subsequent encounter for fracture with routine healing
S32.058G	Other fracture of fifth lumbar vertebra, subsequent encounter for fracture with delayed healing
S32.058K	Other fracture of fifth lumbar vertebra, subsequent encounter for fracture with nonunion
S32.058S	Other fracture of fifth lumbar vertebra, sequela
S32.110A	Nondisplaced Zone I fracture of sacrum, initial encounter for closed fracture
S32.110B	Nondisplaced Zone I fracture of sacrum, initial encounter for open fracture
S32.110D	Nondisplaced Zone I fracture of sacrum, subsequent encounter for fracture with routine healing
S32.110G	Nondisplaced Zone I fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.110K	Nondisplaced Zone I fracture of sacrum, subsequent encounter for fracture with nonunion
S32.110S	Nondisplaced Zone I fracture of sacrum, sequela
S32.111A	Minimally displaced Zone I fracture of sacrum, initial encounter for closed fracture
S32.111B	Minimally displaced Zone I fracture of sacrum, initial encounter for open fracture
S32.111D	Minimally displaced Zone I fracture of sacrum, subsequent encounter for fracture with routine healing
S32.111G	Minimally displaced Zone I fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.111K	Minimally displaced Zone I fracture of sacrum, subsequent encounter for fracture with nonunion
S32.111S	Minimally displaced Zone I fracture of sacrum, sequela
S32.112A	Severely displaced Zone I fracture of sacrum, initial encounter for closed fracture
S32.112B	Severely displaced Zone I fracture of sacrum, initial encounter for open fracture
S32.112D	Severely displaced Zone I fracture of sacrum, subsequent encounter for fracture with routine healing
S32.112G	Severely displaced Zone I fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.112K	Severely displaced Zone I fracture of sacrum, subsequent encounter for fracture with nonunion
S32.112S	Severely displaced Zone I fracture of sacrum, sequela
S32.120A	Nondisplaced Zone II fracture of sacrum, initial encounter for closed fracture
S32.120B	Nondisplaced Zone II fracture of sacrum,, initial encounter for open fracture
S32.120D	Nondisplaced Zone II fracture of sacrum, subsequent encounter for fracture with routine healing
S32.120G	Nondisplaced Zone II fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.120K	Nondisplaced Zone II fracture of sacrum, subsequent encounter for fracture with nonunion
S32.120S	Nondisplaced Zone II fracture of sacrum, sequela
S32.121A	Minimally displaced Zone II fracture of sacrum, initial encounter for closed fracture
S32.121B	Minimally displaced Zone II fracture of sacrum, initial encounter for open fracture
S32.121D	Minimally displaced Zone II fracture of sacrum, subsequent encounter for fracture with routine healing

S32.121G Minimally displaced Zone II fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.121K Minimally displaced Zone II fracture of sacrum, subsequent encounter for fracture with nonunion
S32.121S Minimally displaced Zone II fracture of sacrum, sequela
S32.122A Severely displaced Zone II fracture of sacrum, initial encounter for closed fracture
S32.122B Severely displaced Zone II fracture of sacrum, initial encounter for open fracture
S32.122D Severely displaced Zone II fracture of sacrum, subsequent encounter for fracture with routine healing
S32.122G Severely displaced Zone II fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.122K Severely displaced Zone II fracture of sacrum, subsequent encounter for fracture with nonunion
S32.122S Severely displaced Zone II fracture of sacrum, sequela
S32.130A Nondisplaced Zone III fracture of sacrum, initial encounter for closed fracture
S32.130B Nondisplaced Zone III fracture of sacrum, initial encounter for open fracture
S32.130D Nondisplaced Zone III fracture of sacrum, subsequent encounter for fracture with routine healing
S32.130G Nondisplaced Zone III fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.130K Nondisplaced Zone III fracture of sacrum, subsequent encounter for fracture with nonunion
S32.130S Nondisplaced Zone III fracture of sacrum, sequela
S32.131A Minimally displaced Zone III fracture of sacrum, initial encounter for closed fracture
S32.131B Minimally displaced Zone III fracture of sacrum, initial encounter for open fracture
S32.131D Minimally displaced Zone III fracture of sacrum, subsequent encounter for fracture with routine healing
S32.131G Minimally displaced Zone III fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.131K Minimally displaced Zone III fracture of sacrum, subsequent encounter for fracture with nonunion
S32.131S Minimally displaced Zone III fracture of sacrum, sequela
S32.132A Severely displaced Zone III fracture of sacrum, initial encounter for closed fracture
S32.132B Severely displaced Zone III fracture of sacrum, initial encounter for open fracture
S32.132D Severely displaced Zone III fracture of sacrum, subsequent encounter for fracture with routine healing
S32.132G Severely displaced Zone III fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.132K Severely displaced Zone III fracture of sacrum, subsequent encounter for fracture with nonunion
S32.132S Severely displaced Zone III fracture of sacrum, sequela
S32.14XA Type 1 fracture of sacrum, initial encounter for closed fracture
S32.14XB Type 1 fracture of sacrum, initial encounter for open fracture
S32.14XD Type 1 fracture of sacrum, subsequent encounter for fracture with routine healing
S32.14XG Type 1 fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.14XK Type 1 fracture of sacrum, subsequent encounter for fracture with nonunion
S32.14XS Type 1 fracture of sacrum, sequela
S32.15XA Type 2 fracture of sacrum, initial encounter for closed fracture

S32.15XB	Type 2 fracture of sacrum, initial encounter for open fracture
S32.15XD	Type 2 fracture of sacrum, subsequent encounter for fracture with routine healing
S32.15XG	Type 2 fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.15XK	Type 2 fracture of sacrum, subsequent encounter for fracture with nonunion
S32.15XS	Type 2 fracture of sacrum, sequela
S32.16XA	Type 3 fracture of sacrum, initial encounter for closed fracture
S32.16XB	Type 3 fracture of sacrum, initial encounter for open fracture
S32.16XD	Type 3 fracture of sacrum, subsequent encounter for fracture with routine healing
S32.16XG	Type 3 fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.16XK	Type 3 fracture of sacrum, subsequent encounter for fracture with nonunion
S32.16XS	Type 3 fracture of sacrum, sequela
S32.17XA	Type 4 fracture of sacrum, initial encounter for closed fracture
S32.17XB	Type 4 fracture of sacrum, initial encounter for open fracture
S32.17XD	Type 4 fracture of sacrum, subsequent encounter for fracture with routine healing
S32.17XG	Type 4 fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.17XK	Type 4 fracture of sacrum, subsequent encounter for fracture with nonunion
S32.17XS	Type 4 fracture of sacrum, sequela
S32.19XA	Other fracture of sacrum, initial encounter for closed fracture
S32.19XB	Other fracture of sacrum, initial encounter for open fracture
S32.19XD	Other fracture of sacrum, subsequent encounter for fracture with routine healing
S32.19XG	Other fracture of sacrum, subsequent encounter for fracture with delayed healing
S32.19XK	Other fracture of sacrum, subsequent encounter for fracture with nonunion
S32.19XS	Other fracture of sacrum, sequela
S32.2XXA	Fracture of coccyx, initial encounter for closed fracture
S32.2XXB	Fracture of coccyx, initial encounter for open fracture
S32.2XXD	Fracture of coccyx, subsequent encounter for fracture with routine healing
S32.2XXG	Fracture of coccyx, subsequent encounter for fracture with delayed healing
S32.2XXK	Fracture of coccyx, subsequent encounter for fracture with nonunion
S32.2XXS	Fracture of coccyx, sequela
Z48.21	Encounter for aftercare following heart transplant
Z48.22	Encounter for aftercare following kidney transplant
Z48.23	Encounter for aftercare following liver transplant
Z48.24	Encounter for aftercare following lung transplant
Z48.280	Encounter for aftercare following heart-lung transplant
Z79.3	Long term (current) use of hormonal contraceptives
Z79.51	Long term (current) use of inhaled steroids
Z79.52	Long term (current) use of systemic steroids
Z79.891	Long term (current) use of opiate analgesic
Z79.899	Other long term (current) drug therapy
Z94.0	Kidney transplant status
Z94.1	Heart transplant status
Z94.2	Lung transplant status
Z94.3	Heart and lungs transplant status
Z94.4	Liver transplant status
Z94.5	Skin transplant status
Z94.6	Bone transplant status

REVISIONS

10-19-2009	The Description section updated.
	The Policy section was updated. The previous policy language was: 1. A baseline, central (not peripheral) bone density measurement is considered medically necessary if ONE of the following criteria (a. through g.) is met: a. ALL Postmenopausal (amenorrheic for longer than six (6) months) women under age 65 who have one or more risk factors for osteoporotic fracture (besides menopause) listed below: 1) Personal history of recent fracture 2) First degree relative with history of osteoporosis 3) Currently smokes tobacco 4) Excessive alcohol intake (history of or current use) b. All women aged 65 and older, regardless of additional risk factors c. Postmenopausal women (amenorrheic for longer than six (6) months) who are considering therapy for osteoporosis when results will facilitate treatment decisions. d. Repeat or follow-up central bone density measurement will be considered medically necessary if at least 23 months have passed since last bone density measurements. e. Primary hyperparathyroidism (male or female) f. Receiving long-term glucocorticoid therapy equivalent to or greater than 7.5 mg/day of prednisone, for three months or longer (male or female). g. Bone density measurement will be considered for the following conditions (male or female): 1) Anorexia nervosa 2) Calcitonin deficiency 3) Chemotherapeutic agents which affect bone density 4) Chronic renal failure 5) Chronic use of anti-convulsants (particularly Dilantin) 6) Chronic use of heparin 7) Cushing's Syndrome 8) Fragility fracture 9) Hypersecretion of calcitonin 10) Hyperthyroidism or Hypothyroidism 11) Hypogonadism 12) Lupron therapy in men 13) Malabsorption Syndromes 14) Malignancies (multiple myeloma) 15) Organ transplantation 16) Prolonged amenorrhea (six (6) months duration or longer 17) Prolonged immobilization 18) Radiologic evidence of osteopenia 19) Rheumatoid arthritis 20) Untreated premature menopause 2. Bone density measurement is considered NOT medically necessary in the following: a. Routine screening for osteoporosis or osteoporosis risk when criteria above are not met. b. Individuals who do not intend to use hormonal or non-hormonal therapy c. When the results obtained will not influence treatment decisions. d. Peripheral bone density studies (77079, 77081, 76977 and G0130) e. Bone density measurements done at peripheral sites with tests such as peripheral dual-energy x-ray absorptiometry (pDEXA) of the forearm, radiographic absorptiometry of the phalanges, or ultrasound of the heel may not change reliably with treatment.

	Central measurements of the hip and spine are more predictive of fracture than peripheral sites. 3. Osteopenia - Bone density Testing will be allowed if the doctor indicates osteopenia in the records or on the claim. 4. Sahara Ultrasound System - Sahara Ultrasound System Bone density Testing system will be allowed once per year, based on the same criteria as the DEXA, utilizing Procedure Code 76977 (ultrasound bone density measurement and interpretation, peripheral site(s), any method). The procedure is applicable for the above Diagnosis Code. Procedure code 77080 is to be processed as preventive care. Categories of qualified individuals include ONE of the following: • An estrogen-deficient woman at clinical risk for osteoporosis • An individual with vertebral abnormalities • An individual receiving long-term glucocorticoids (steroid) therapy • An individual with primary hyperparathyroidism, or • An individual being monitored to assess the response to or efficacy of an approved osteoporosis drug therapy. <u>UTILIZATION</u> 1. Coverage for follow-up bone mass measurements will be limited to only one measurement every two (2) years for members who receive coverage of bone mass measurements. 2. Follow-up bone mass measurements performed more frequently for pathological diagnosis may be covered when medically necessary. The policy updates primarily pertained to the following: ▪ More clearly identified men as eligible for BMD measurement and added criteria. ▪ Liberalized the risk factor criteria for which younger postmenopausal women are eligible for BMD measurement. ▪ Provides peripheral measurement of BMD in two situations, when the hip/spine or hip/hip cannot be done or the patient is over the table limit for weight and for hyperparathyroidism, where the forearm is essential for diagnosis ▪ Increased the repeat measurement time frame from "at least 23 months" to "(not more frequent than every 2-3 years)…when the information will affect treatment decisions such as duration of therapy" and "not more frequent than every 3-5 years, depending on patient risk factors…for individuals who previously tested normal". ▪ Removed indication of "Sahara Ultrasound System Bone Density Testing system will be allowed once per year, based on the same criteria as the DEXA…", on the 2003 decision of the Family Practice, OB/GYN, and Internal Medicine Liaison Committees to eliminate eligibility of peripheral bone density studies.
	In the Coding section: ▪ Added CPT/HCPCS codes: 77079, 77081, 77083, 78350, G0130 ▪ Added Diagnoses codes: 244.8, 244.9, 627.2, 627.3, 627.8, 627.9, V07.4, V49.81, V58.69
05-13-2011	Rationale section updated.
	Reference section updated.
12-09-2011	In the Coding section: ▪ Added Diagnoses code: 250.1, 259.5, 263.9, 303.9, 305.1, 345.00-345.91, 577.0, 577.1, 579.0, 579.8, 756.51 ▪ Removed CPT code: 77082. ▪ Removed Diagnosis code: V82.81.
	Updated the Reference section.
04-13-2012	Updated the Description section.
	In the Policy section: ▪ In Item A, Risk Factors, #7, inserted the following:

	"o. chronic use of medications that can cause bone loss • Aluminum-containing antacids • Anti-seizure medications (only some) such as Dilantin or Phenobarbital • Aromatase inhibitors such as Arimidex, Aromasin, and Femara • Cancer chemotherapeutic drugs • Cyclosporine A and FK506 (Tacrolimus) • Glucocorticoids such as cortisone and prednisone • Gonadotropin releasing hormone (GnRH) such as Lupron, Zoladex • Heparin (chronic use) • Proton pump inhibitors (PPIs) prescription strength (not OTC) taken chronically • Selective Serotonin reuptake inhibitors (SSRIs) such as Lexapro, Prozac, Zoloft • Tamoxifen (premenopausal use) ▪ Thyroid hormone in excess" ▪ In Item A, Risk Factors, #7, moved "chronic use of anti-convulsants (particularly Dilantin)" and "chronic use of heparin" to Item A, Risk Factors, #7, o, "Chronic use of medications that can cause bone loss." ▪ In Item A, Risk Factors, #8 "Current exposure to oral glucocorticoids, or the patient has been exposed to oral glucocorticoids for more than 3 months at a dose of prednisone of 5 mg daily or more (or equivalent doses of other glucocorticoids)." has been included in #7, o. ▪ In Item A, Risk Factors, #7, added "p. pediatric patients with malabsorption disorders" ▪ Removed Item G, "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 (e.g., 15 years of age or younger)." ▪ Added "E. Quantitative Computed Tomography (QCT) is considered not medically necessary." ▪ Added "G. For Medroxyprogesterone acetate, the package insert contains a box warning about osteoporosis. However, Up to Date notes that while use of Medroxyprogesterone acetate is associated with decreased mineral density in current users, the effect is mostly reversed after Medroxyprogesterone acetate is stopped. Studies have not shown an increase risk of bone fractures in women who have used Medroxyprogesterone acetate in the past, therefore BMD is considered not medically necessary."
	In the Coding section: ▪ Removed CPT codes: 77079, 77083 ▪ Removed Dx codes: 244.1, 244.2, 244.3, 244.8, 244.9, 250.1, 256.39, 259.5, 303.9, 577.0, 585.1, 627.2, 627.3, 627.8, 627.9, 733.10-733.16, 733.19, 733.90, V07.4, V42.2, V42.5, V49.81 ▪ Added Dx codes: 259.50-259.52, 577.9, 303.90-303.93, 780.33, 805.2, 805.4, 805.6,
	Reference section updated.
10-04-2013	Updated Description section.
	In Policy section: ▪ In Item A, Risk Factors, #7m, removed "(multiple myeloma)". ▪ In Item A, Risk Factors, #7o, added "methotrexate"
	In Coding section: ▪ Added ICD-10 Diagnosis codes *(Effective October 1, 2014)*
	Updated Rationale section.
	Updated Reference section.
05-13-2015	Updated Description section.
	In Policy section: ▪ Added "Policy Guidelines, 1. A 2011 joint position statement from the International Society for Clinical Densitometry and the International Osteoporosis Foundation 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. 2. 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. 3. 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 nonclosure of growth plates (e.g., 15 years of age or younger)."
	Updated Rationale section.
	Updated References section.
07-08-2015	In Coding section: ▪ Added ICD-9 code 733.90. ▪ Added ICD-10 codes M85.812, M85.811, M85.821, M85.822, M85.831, M85.832, M85.841, M85.842, M85.851, M85.852, M85.861, M85.862, M85.871, M85.872, M85.88, M85.89, M85.9
	In Revision section: ▪ Revised 10-04-2013, changed 2nd table row, "In Coding section" to "In Policy section".
12-08-2015	Updated Description section.
	In Policy section: ▪ In Item A, removed previous "Risk Factors" and added current FRAX information. ▪ In Item A 5, previous "Risk Factors" not noted in current FRAX information have been added. ▪ In Item C, removed "previously tested normal" and "does", and added "do" to read, "Repeat measurement of central (hip/spine) BMD for individuals who do 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." ▪ Removed Item G. ▪ In Policy Guidelines, removed previous Items 1 and 2.
	Updated Rationale section.
	Updated References section.
05-25-2016	Under title of policy, removed *"See also: Vertebral Fracture Assessment with Densitometry"*
	In Coding section: ▪ Added CPT code: 77085
10-01-2016	In Coding section: ▪ Added ICD-10 code effective 10-01-2016: K90.49 ▪ Termed ICD-10 code effective 09-30-2016: K90.4
04-12-2017	Updated Description section.
	In Policy section: ▪ In Item A, added "central" and "using dual x-ray absorptiometry" and removed "at the" to read, "An initial measurement of central (hip/spine) BMD using dual x-ray absorptiometry 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:" ▪ In Item B, added "(hip/spine)" and "using dual x-ray absorptiometry" to read, "Regular (not more frequent than every 2-3 years) serial measurements of central (hip/spine) BMD using dual x-ray absorptiometry to monitor treatment response may be considered medically necessary when the information will affect treatment decisions such as duration of therapy." ▪ In Item C, added "using dual x-ray absorptiometry" to read, "Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry for individuals who do 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." ▪ Added new Item D, "An initial measurement of central (hip/spine) BMD using dual x-ray absorptiometry may be considered medically necessary in patients who are to undergo hip resurfacing procedures." ▪ In Policy Guidelines, added new Items 1 and 2 (previous Item 1 now Item 3).
	Updated Rationale section.
	Updated References section.
03-04-2019	Policy published 02-01-2019 with an effective date of 03-04-2019.
	Updated Description section.
	Updated Rationale section.
	In Coding section: ▪ Added CPT code: 0508T. ▪ Removed ICD-9 codes.
	Updated References section.
07-01-2019	In Coding section: ▪ Added new CPT codes: 0554T, 0555T, 0556T, 0557T.
10-01-2020	In Coding Section: ▪ Added new ICD-10 codes: G40.833, G40.834, N18.31, N18.32 ▪ Removed ICD-10 code N18.3
04-16-2021	Updated Description section
	In the Policy section • Added Items A.5.h., A.5.p, and A.5.v. • In Items B, C, and D, added the underlined section and removed the strike through section: ~~B. Regular (not more frequent than every 2–3 years) serial measurements of central (hip/spine) BMD using dual x-ray absorptiometry to monitor treatment response may be considered **medically necessary** when the information will affect treatment decisions such as duration of therapy.~~ B. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry may be considered **medically necessary** at an interval not more frequent than every 1-3 years in individuals who are receiving pharmacologic treatment for osteoporosis when the information will affect treatment decisions (continuation, change in drug therapy, cessation or resumption of drug therapy). ~~C. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry for individuals who do 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.~~ C. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry for individuals who previously tested normal may be considered **medically necessary** at an interval not more frequent than every 3 to 5 years; the interval depends on an updated patient fracture risk assessment. ~~D. An initial measurement of central (hip/spine) BMD using dual x-ray absorptiometry may be considered **medically necessary** in patients who are to undergo hip resurfacing procedures.~~ D. Repeat measurement of central (hip/spine) BMD using dual x-ray absorptiometry may be considered **medically necessary** at an interval of not more frequent that every 1-2 years in individuals: 3. With a baseline evaluation of osteopenia (BMD T- score -1.0 to -2.5) 4. Adults with a pathologic condition associated with low bone mass or increased bone loss; 5. Adults taking a medication associated with increased bone loss. • In the policy guidelines one and two, added the underlined section and removed the strike through section:

	Bone Mineral Density Technologies 1. Ultrasound densitometry is an office-based technology. Compared with 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 ~~As discussed further in the Rationale section,~~ it is unknown whether this technology can be used to predict response to pharmacologic therapy (i.e., reduce fractures). 2. Dual x-ray absorptiometry (DXA) of axial central sites (i.e., hip and spine) is the most commonly used technique~~, but peripheral (appendicular) DXA and quantitative computed tomography 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,~~ • Added policy guidelines 4, 5, and 6.
	Updated Rational section
	In the Coding section: • Added Code 0558T
	Updated the Reference section
10-08-2021	In the Coding section • Added CPT code 0691T (Effective 10-01-2021)

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4. Blue Cross and Blue Shield Association Technology Evaluation Center (TEC). Ultrasonography of the heel for diagnosing osteoporosis and selecting patients for pharmacologic treatment. TEC Assessments. 1999;Volume 14:Tab 19.
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