



Preventing Osteoporosis Within the Community Setting

by Stacey Schneider, PharmD; and Thomas Towers, PharmD

Upon successful completion of this activity the pharmacist will be able to:

1. Discuss the most recent National Osteoporosis Foundation Guidelines for the Prevention and Treatment of Osteoporosis.

2. Counsel a woman on proper methods to prevent the risks of developing osteoporosis.
3. Understand the available treatment options for the prevention and treatment of osteoporosis.
4. Discuss current practice trends in the community pharmacy to establish patient programs to educate women about osteoporosis.
5. Apply clinical knowledge of osteoporosis to a specific clinical case.

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2. Understand the available treatment options for the prevention and treatment of osteoporosis.
3. Discuss current trends in the patient education programs.
4. Identify patients who are at-risk for osteoporosis or fractures and refer them to the pharmacist for counseling

An estimated 10 million Americans have osteoporosis. An additional 34 million people in the United States have osteopenia, which increases their risk for osteoporosis. It is estimated that one in two women and one in four men older than 50 years of age will experience an osteo-

porosis-related fracture in their lifetime. Although osteoporosis is less frequent in African Americans, those with osteoporosis have the same fracture risk as Caucasians. The prevalence of osteoporosis is expected to increase as the population increases.

With increasing demands to reduce health care spending and improve patient outcomes, the intent of this article is to review the current practice recommendations for the treatment and prevention of osteoporosis. This will enhance pharmacists' knowledge and increase their confidence when treating this patient population.

OVERVIEW OF THE NOF CLINICIANS GUIDE ON OSTEOPOROSIS

The National Osteoporosis Foundation (NOF) guidelines are a source of information for determining risk factors, diagnosing and evaluating the treatment of osteoporosis in men age 50 and older and postmenopausal women

Achieving optimal levels of bone mass at a young age would account for a logical approach to building stronger bones later in life; peak bone mass occurs at 18-25 years of age. Bone mass is influenced by factors such as genetics, nutrition, endocrine status, and physical activity. Bone growth and bone resorption are always in some form of continuous balance, thus routine screening of individuals at high risk for osteoporosis may reduce incidence of osteoporosis-related fracture. Osteoporosis occurs when the rate of bone resorption is greater than the rate of bone formation and is defined as bone that is 2.5 standard deviations less dense (T-score -2.5) than a young adult reference population.

There are a wide variety of factors that influence the risk of osteoporosis (Table 1 and 1A). The patient's lifestyle choices, family history, disease states, and use of certain medications are part of the risk assessment process.

Table 1. Conditions, Diseases and Medications That Cause or Contribute to Osteoporosis and Fractures

| | |
|---|--|
| Lifestyle Factors | Low calcium intake Vitamin D insufficiency Falling Excess vitamin A Aluminum (in antacids) High salt intake High caffeine intake Alcohol (3 or more drinks/day) Smoking (active or passive) Inadequate physical activity Immobilization Decreased physical activity Thinness |
| Genetics Factors | Cystic fibrosis Homocystinuria Parental history of hip fracture Porphyria Idiopathic hypercalciuria Glycogen storage disease |
| Hypogonadal States | Androgen insensitivity Anorexia nervosa and bulimia Premature ovarian failure Athletic amenorrhea Hyperprolactinemia Panhypopituitarism Turner's & Klinefelter's syndromes |
| Endocrine Disorders | Adrenal insufficiency Cushing's syndrome Diabetes mellitus Thyrotoxicosis Hyperparathyroidism |
| Gastrointestinal Factors | Celiac disease Gastric bypass GI surgery Inflammatory bowel disease Malabsorption Pancreatic disease |
| Hematologic Disorders | Hemophilia Leukemia and lymphomas Multiple myeloma Sickle cell disease |
| Rheumatic and Autoimmune Disease | Rheumatoid arthritis Ankylosing spondylitis Lupus |

Table 1A. Medications Associated With Osteoporosis

| | |
|--------------------|--|
| Medications | <ul style="list-style-type: none"> • Anticoagulants (heparin) • Anticonvulsants • Aromatase inhibitors • Barbiturates • Cancer chemotherapeutic drugs • Cyclosporine A and tacrolimus • Depo-dedroxyprogesterone • Glucocorticoids (\geq mg/d of prednisone or equivalent for \geq 3 mo) • Gonadotrophin releasing hormone agonist • Lithium |
|--------------------|--|

A large number of osteoporotic fractures are attributed to falls. Therefore, it is important to determine an individual's risk for falls. Table 2 lists factors that can increase an individual's risk for falling. Helping patients understand their personal risk factors is an excellent way to begin counseling individuals on ways to reduce their risks for developing osteoporosis. Several of these risk factors have been included in the World Health Organization (WHO) 10-year fracture risk model (Table 3). These risk factors put patients at an increased risk for fracture regardless of bone mineral density (BMD). These risk factors can be combined with BMD measurements and used to assess an individuals' risk of future fractures.

UNIVERSAL RECOMMENDATIONS FOR ALL PATIENTS

Appropriate Calcium Intake

In public lay media, there are conflicting reports of the benefits and risks of calcium and vitamin D supplementation. However, according to the Institute of Medicine of the National Academies Practices, most reports in the media that showed negative benefits from increased

Table 2: Risk Factors for Falls

| | |
|----------------------------------|---|
| Environmental | Lack of assistive devices in the bathrooms Loose throw rugs Low level lighting Obstacles in the walking path Slippery outdoor conditions |
| Medical | Age Anxiety and agitation Arrhythmias Dehydration Depression Female gender Impaired transfer and mobility Malnutrition Medication causing oversedation Orthostatic hypotension Poor vision and use of bifocals Previous falls Reduced problem solving or mental acuity Urgent urinary incontinence |
| Neuro and musculoskeletal | Kyphosis Poor balance Weak muscles |
| Other risk factors | Fear of falling |

Table 3: Risk Factors Included in the WHO Fracture Risk Assessment Model

| | |
|----------------------------------|--|
| Uncontrolled risk factors | Current age Gender Current smoking status Alcohol intake (3 or more drinks/day) Low body mass index (kg/m ²) |
| Disease states | Rheumatoid arthritis Secondary osteoporosis A prior osteoporosis risk factor (including morphometric vertebral fractures) |
| Diagnostic | Parental history of hip fracture Femoral neck BMD |
| Medications | Oral glucocorticoids ≥ 5mg/day of prednisone for ≥ 3 months (ever) |

calcium intake are considered inconclusive. The NOF recommends intake of at least 1,000 mg to 1,200 mg per day of dietary calcium, which may include the elemental intake from supplemental nutrients. Intake in excess of 1,200 to 1,500 mg per day may increase the risk of developing kidney stones, cardiovascular disease, and stroke, and has limited benefits. Consequently, there is no benefit to increasing intake above the maximum recommended dose.

The average person consumes approxi-

mately 600 to 700 mg of dietary calcium daily. Patients may be advised to increase their dietary calcium intake by increasing the consumption of milk, cheese, yogurt, or fortified cereals before beginning dietary calcium supplements. Tables 4 and 4A include some non-dairy and dairy food sources and their calcium and caloric contents, respectively. This becomes useful for patients trying to determine how to obtain additional calcium in their diet. Health care providers should help patients evaluate what their current daily intake is before seeking supplements. When diet is not sufficient alone for meeting the body's needs of calcium intake, supplements may be administered. The amount of elemental calcium in over-the-counter supplements varies by the salt form; Table 4B lists calcium salts and elemental calcium found in each type. Pharmacists should know their calcium supplement inventory and be a knowledgeable resource for patients who may require assistance selecting an appropriate supplement. Price and bioavailability are important factors.

Appropriate Vitamin D Intake

The NOF now recommends an intake of 800 to 1000 international units (IU) of vitamin D (dietary or combined dietary and supplement) per day for adults age 50 or older.

Table 4: Amount of Elemental Calcium

| Calcium Product | Calcium Content | Approximate Elemental Calcium |
|-------------------|-------------------------|-------------------------------|
| Calcium carbonate | 400 mg (20 mEq) per g | 40% |
| Calcium chloride | 270 mg (13.5 mEq) per g | 27% |
| Calcium acetate | 253 mg (12.7 mEq) per g | 25% |
| Calcium citrate | 211 mg (10.6 mEq) per g | 21% |
| Calcium lactate | 130 mg (6.5 mEq) per g | 13% |
| Calcium gluconate | 90 mg (4.5 mEq) per g | 9% |

Table 4a: Non-Dairy Food Sources of Calcium

| Food, Standard Amount | Calcium (mg) | Calories |
|--|--------------|----------|
| Fortified ready-to-eat cereals (various), 1 oz | 236-1043 | 88-106 |
| Soy beverage, calcium fortified, 1 cup | 368 | 98 |
| Sardines, Atlantic, in oil, drained, 3 oz | 325 | 177 |
| Pink salmon, canned, with bone, 3 oz | 181 | 118 |
| Soybeans, green, cooked, ½ cup | 130 | 127 |
| Turnip greens, cooked from frozen, ½ cup | 124 | 24 |

Table 4B: Dairy Food Sources of Calcium

| Food, Standard Amount | Per serving (mg) |
|---|------------------|
| Yogurt, plain, low fat, 8 ounces | 415 |
| Orange juice, calcium-fortified, 6 ounces | 378 |
| Mozzarella, part skim, 1.5 ounces | 333 |
| Cheddar cheese, 1.5 ounces | 306 |
| Cottage cheese, 1% milk fat, 1 cup unpacked | 138 |

The previous recommendation of 400 IU/day has been shown to produce insufficient vitamin D levels in individuals at risk for developing osteoporosis. Without vitamin D, only 10–15 percent of dietary calcium is absorbed. Studies have shown that elderly women, who received 1,200 mg of calcium with 800 IU/day of vitamin D, had fewer vertebral and nonvertebral fractures. Fracture occurrence has been shown to decrease when serum vitamin D levels are maintained at a level of at least 30 ng/ml.

Falling has also been shown to correlate with an insufficient vitamin D level. A study conducted by Broe et al showed that higher doses of vitamin D reduced the risk of falls in nursing home residents. This study was conducted in 124 patients and gave doses of vitamin D ranging from 200 IU/day to 800 IU/day compared to placebo. The participants who were given the 800 IU/day dose of vitamin D were shown to have a 72 percent reduction in fall rate as compared to the other groups.

A safe upper limit for vitamin D intake was determined to be 2,000 IU per day in 1997 and no longer coincides with current guidelines. New evidence indicates higher intakes are safe in elderly patients and may be required especially in those patients who are vitamin D deficient, due to malabsorption or renal insufficiency. Patients who are housebound with limited sun exposure are also at risk of vitamin D deficiency. In practice, pharmacists may see off-label prescriptions for high-dose ergocalciferol once weekly. The goal of therapy is to obtain the average adult's serum vitamin D concentration of 30 ng/ml or higher and should be monitored periodically until adequate levels are reached. Patients may be counseled to increase their intake of food sources with vitamin D to aid in reaching their target serum level of vitamin D. These would include foods such as vitamin D-fortified milk, cereals, liver, egg yolks, and salmon.

Many patients may wonder about the difference between vitamin D2 and vitamin D3. Vitamin D2, also

known as ergocalciferol, is derived from diet and supplements. Vitamin D3, also known as cholecalciferol, is synthesized in the skin and is also present in foods. Both ergocalciferol and cholecalciferol must be converted in the liver to calcidiol, where it is delivered to the kidney to be converted to calcitriol, the active metabolite of vitamin D. Those who have hepatic or renal disease will face challenges with conversion to the active metabolite. Pharmacists preparing a therapy recommendation should review the patient's past medical history for cues to determine if one of the vitamin D analogues (ergocalciferol or cholecalciferol) appropriate. Patients requiring calcium supplements in addition to vitamin D supplements may find useful combination products sold over the counter.

Lifestyle Changes

Along with educating patients on the adequate intake of calcium and vitamin D, pharmacists should make recommendations to decrease the risk for developing osteoporosis. These would include encouraging regular weight-bearing and muscle-strengthening exercises such as walking, stair climbing, dancing, or T'ai chi. Water aerobics and swimming, while low-impact, are not considered weight-bearing. Strength building exercises combined with cardiovascular activity produce the best results. Regular weight-bearing and muscle-strengthening exercises also decrease a patient's risk for falls, thereby lessening a patient's risk for fractures. Advise patients to seek physician evaluation prior to starting a new exercise regimen. Excessive alcohol intake should be avoided because it can prevent proper absorption of calcium and vitamin D and inhibit osteoblast activity. Additionally, excessive alcohol intake should be avoided because it impairs judgment and coordination which could lead to falls. Pharmacists should encourage smoking cessation as it is valuable not only to bone health but also to overall health. Smoking decreases the production of new estrogen and decreases circulating amounts of estrogen already present in the

body. Because estrogen works with calcium and vitamin D to build bone mass, smoking one pack per day can lead to a loss of bone mass. Identifying individuals with impaired vision and ensuring patient's homes are safe are additional key factors in eliminating the risk for falls.

Pharmacologic Therapy

Patients requiring pharmacologic therapy for osteoporosis have several options available. Those products with a Food and Drug Administration (FDA) indication to treat osteoporosis include bisphosphonates, calcitonin, estrogen and hormone therapy (ET/HT), estrogen agonist and antagonist, a parathyroid hormone analog and a receptor activator of nuclear factor kappa-B ligand (RANKL) inhibitor. These medications have mainly been studied in women with postmenopausal osteoporosis. Consequently, there is limited to nonexistent data to support applicability with glucocorticoid-induced osteoporosis. There have likewise been few studies conducted in men. The NOF guidelines also state that pharmacotherapy may decrease fractures in patients with osteopenia, but the evidence is not as compelling.

Bisphosphonates include alendronate (Fosamax, Binosto or Fosamax Plus D), ibandronate (Boniva), risedronate (Actonel, Atelvia, or Actonel with Calcium), and zoledronic acid (Reclast). These prescription medications work by inhibiting osteoclast-mediated bone resorption. Side effects of alendronate, ibandronate, and risedronate include swallowing difficulties, gastric ulcers, and osteonecrosis of the jaw (especially with intravenous administration). Zoledronic acid, only available in an injectable formulation, is administered intravenously every one to two years. Administration generally takes place in the clinic to monitor and manage an acute phase reaction which includes headache, joint pain, muscle pain, and fever; acetaminophen may be used as pretreatment to avoid reduce the risk of this reaction. Since bisphosphonates are the cornerstone of pharmacologic treatment, pharmacists in a community phar-

macy setting should be aware of the correct counseling points. Oral tablet formulations of both alendronate and risedronate are required to be taken on an empty stomach, first thing in the morning with eight ounces of water.

These drugs should not be administered at the same time as other medications. Patients should wait at least 30 minutes before other food, drink or medication. The patient should remain upright during this time period. Ibandronate follows the same principles except patients must wait 60 minutes before eating or taking other medications. Patients who receive zoledronic acid will do so in a clinic setting. Patients who ask questions about zoledronic acid because they have trouble remembering to take oral bisphosphonates should be made aware of the risk of the possibility of an acute phase reaction and know that the incidences decreases with each administration. To avoid this reaction, pre-medication with acetaminophen as well as during the 72 hours following the infusion helps. While each bisphosphonate has slightly different indications, comparative effectiveness research finds they are all effective treatment for reducing the risk of hip and vertebral fractures in postmenopausal women with osteoporosis.

Another option for treatment is calcitonin (Miacalcin) which is a naturally occurring hormone whose function is to regulate serum calcium levels in the body. Similar to bisphosphonates, calcitonin directly inhibits osteoclast activity, decreases bone resorption, and lowers serum calcium levels. Adequate calcium and vitamin D intake is still recommended with calcitonin therapy. It is approved for the treatment of osteoporosis in women who are five or more years postmenopausal. Since given daily as an intranasal spray, side effects can include local irritation, rhinitis and nausea. This drug should not be used in patients with an allergy to salmon.

Various estrogen and estrogen receptor-mediated therapies are available for patients. When a woman enters menopause, a decline in serum estrogen levels leads to an overproduction of RANKL, causing an activation of osteoclasts leading to decreasing bone mass. Although extensive research has been done on hormone replacement therapy in women showing positive benefits, several concerns arose from the Women's Health Initiative trial. Early data found that there was an increase in myocardial infarction, stroke, pulmonary embolism, deep vein thrombosis and breast cancer in women taking estrogen

and progesterone. Subsequent analysis of the Women's Health Initiative trial showed that cardiovascular disease did not increase in women starting treatment within 10 years of menopause. However, the FDA recommends that for the prevention of osteoporosis approved non-estrogen treatments should be considered first.

Raloxifene (Evista) is an estrogen agonist and antagonist, and is formerly known as a selective estrogen receptor modulator (SERM). The FDA has approved its use for prevention and for treatment in postmenopausal women who have osteoporosis. Raloxifene also has an indication for reducing the risk of breast cancer; however, it does not reduce the risk of coronary heart disease. Patients should be advised of the side effects of increased possible hot flashes, leg cramps and/or muscle spasms.

Teriparatide (Forteo) is a recombinant human parathyroid hormone derivative and was the first drug that has been shown to cause new bone formation. It is FDA approved to treat osteoporosis in patients at high risk for fracture and who meet one of the following three criteria: postmenopausal women, men with hypogonadal or idiopathic osteoporosis, and patients with glucocorticoid induced osteoporosis. Safety and efficacy have not been shown beyond two years of treatment. As such, NOF guidelines recommend against its use after a two year time period. After two years alternate therapy to maintain bone mineral density should be initiated. Patients should be advised of the side effects which include leg cramps and dizziness. Teriperatide comes with a black box warning for osteosarcoma; benefits of treatment must outweigh the risk.

Denosumab (Prolia) is a RANKL inhibitor approved for treatment of postmenopausal women with osteoporosis who have a high risk of fractures. Other indications are for men with osteoporosis, men receiving anti-androgen therapy for prostate cancer, and women receiving aromatase inhibitor therapy for breast cancer. It is the first biologic drug to treat bone loss caused by osteoporosis. It is a monoclonal antibody that binds to the RANKL protein preventing it from binding to the osteoclast-activating RANK receptor. The most commonly reported side effects associated with the drug include pain in the back, arms and legs, muscle and bone pain, high cholesterol levels, and urinary tract infections. A medication guide explains the risks for hypocalcemia, infection, skin problems, jaw bone problems and atypical femur fracture. This medica-

tion is given in a physician's office once every six months as a subcutaneous injection.

Lifestyle modifications should be initiated before beginning any pharmacotherapy regimen. When pharmacotherapy is indicated, selection of the agent should be patient-specific and take into consideration FDA-approved indications and the severity of the patient's condition.

Practitioners need to evaluate various factors for each medication, including side effect profiles, administration, associated fracture risk, efficacy, and other safety concerns to determine which medication is best for each patient. In very severe osteoporosis, patients may use two agents to increase BMD. Sequential therapy of a bone-building agent followed by one that inhibits resorption is preferred to concomitant use. The NOF Clinician's Guide cites active bone loss in women on hormone replacement therapy or raloxifene as possible situations, but studies that study specific combinations and support concomitant therapy are lacking.

THE PHARMACIST'S ROLE

Clinical Impact

Why should osteoporosis be a concern in the community setting? Osteoporosis is a silent disease with symptoms that are usually unrecognized until a fracture occurs. These fractures are common and place an enormous economic and personal burden on society. Osteoporosis-related fractures cause more than 432,000 hospital admissions, almost 2.6 million medical office visits and about 180,000 nursing home admissions annually in the United States. The cost to the health care system associated with osteoporosis-related fractures was estimated at \$17 billion in 2005. Due to the aging population, the Surgeon General estimates that the number of hip fractures and their associated cost could double or triple by 2040.

The most common fractures are those of the spine, hip, and wrists. It has been estimated that approximately one in five patients 50 years of age or older with a hip fracture will die within one year following the fracture. Approximately

Table 5: Classification of Osteoporosis by T-scores

| | |
|----------------------------|--|
| Normal | BMD is within 1 standard deviation of a young normal adult ($t \geq -1$) |
| Low bone mass (Osteopenia) | BMD is between 1 and 2.5 standard deviation below that of a young normal adult ($-2.5 \leq t \leq -1$) |
| Osteoporosis | BMD is 2.5 standard deviations or more below that of a normal adult ($t \leq -2.5$) |

20 percent of hip fracture patients will require long-term nursing home care, and only 40 percent will fully regain their pre-fracture level of independence. Fractures may be followed by complications such as chronic pain, disability or even death. Psychological symptoms are also common after a fracture; these include depression and loss of self-esteem due in part to physical limitation and lifestyle changes. Pharmacists in the community can aid in decreasing this economic burden on society and are a key resource to help patients understand the pharmacologic and non-pharmacologic treatment of osteoporosis. Pharmacists can also help increase patient awareness of their risks by performing community screenings and educating patients about their risk factors for developing osteoporosis.

Pharmacists may be better able to recognize medications which increase the risk of developing osteoporosis. As highlighted in Table 1A, there are several medications that can increase the risk of osteoporosis. For example, the use of corticosteroids can decrease intestinal absorption of calcium and phosphorus, leading to increased urinary excretion and inhibition of osteoblast activity. Other examples include agents such as loop diuretics, aluminum containing antacids, and tetracycline, which can decrease calcium absorption. Anticonvulsants, which increase catabolism of vitamin D, can lead to decreased calcium absorption. Discussing medications that can potentially affect a patients' risk of osteoporosis with the patient or health care provider can decrease the risk of osteoporosis. Table 1A includes additional medications that can increase a patient's risk for osteoporosis. The Beers Criteria lists medications that have been determined to be potentially inappropriate for use in the elderly. Health

care providers are encouraged to use this list to identify patients using a drug on the list and suggest more appropriate options; this may decrease a patients risk for fractures due to falls. Included on this list are some long and short-acting benzodiazepines, tricyclic antidepressants, and barbiturates.

Screening for Osteoporosis

At this point, we have reviewed the basis of prevention, risk assessment and treatment as recommended by the NOF guidelines for osteoporosis. The next step would be recognizing how to evaluate patients and determine the need to refer for medical follow-up. Patients who have risk factors and conditions predisposing them to osteoporosis should be considered for screening; refer to tables 1, 1A, 2, and 3. Once their individual risk has been established, a referral to a physician may be required. A physician may then determine the next appropriate steps.

Diagnosis of osteoporosis is based on clinical evaluation and BMD measurement obtained from a bone scan or the occurrence of an adult hip or vertebral fracture without major trauma. A BMD is expressed in terms of two norms. The first being the patient's Z-score, which compares their BMD to peers of the same age, sex, and ethnicity. The second norm is the patient's T-score, which compares their BMD to that of a same sex, younger "normal" individual. The T-score can be a valuable predictor of fracture risk. The WHO has defined osteoporosis based on BMD using T-scores for a bone scan of the spine, hip, or forearm. The classifications of bone density based on the T-score can be found in Table 5. Dual-energy x-ray absorptiometry (DEXA) of the hip and spine can provide the confirmatory diagnosis and can predict the likelihood of future fracture risk. Thus, patient awareness of their BMD can decrease the likelihood of a fracture if steps are taken to alleviate risk factors.

Several technologies have been developed to estimate a T-score without using a DEXA scan. These densitometers are capable of predicting both site-specific and overall fracture risk and can be used as a guide to help

patients know when they should seek further information about osteoporosis from their physician. Quantitative ultrasound densitometry and may be useful to a community pharmacist for screening purposes; other technologies include peripheral energy x-ray absorptiometry and quantitative computed tomography. Any abnormal findings should be reported to a primary care physician and confirmed with an axial DEXA scan.

The peripheral DXA (pDEXA) scan can be performed on the forearm, finger, or heel. This is used to predict vertebral and overall fracture risk in postmenopausal women. Although peripheral scans are convenient, they are not recommended for monitoring BMD once a diagnosis of osteoporosis has been established.

The quantitative computed tomography (QCT) measures bone density, bone strength and bone structure at the spine and the hip. It also includes a peripheral measurement of the tibia, hip, and spine. One drawback of the QCT is that it is associated with higher amounts of radiation exposure than DEXA scan and pDEXA.

Finally, the quantitative ultrasound densitometry (QUS) can be used to measure BMD indirectly based on a bone's ability to deaden sound waves. Measurements are made at the heel, tibia, patella, and other peripheral sites. QUS does not expose individuals to radiation because it uses ultrasound technology.

BMD testing is recommended by the NOF for the following populations:

- Women age 65 and older and men age 70 and older, regardless of clinical risk factors.
- Adults who have a fracture after the age of 50.
- Younger postmenopausal women, women in the menopausal transition and men age 50 to 69 with clinical risk factors for fracture (e.g. low body weight, previous fracture, high-risk medications).
- Adults with a condition (e.g., rheumatoid arthritis) or taking a medication (e.g., glucocorticoids in a daily dose equal to, or greater than 5 mg prednisone or equivalent for three or more months) associated with low bone mass or bone loss.

In much the same way that a pharmacist might calculate a Framingham Score to determine a patient's long-term risk for cardiovascular disease, the WHO and the Foundation for Osteoporosis Research and Education (FORE) offer 10-year fracture risk calculators to determine the 10-year probability of a hip fracture and/or the 10-year

probability of a major osteoporotic fracture. These calculators take into consideration other risk factors that traditional BMD tests don't consider, such as weight, height, age, sex, previous fracture, smoking status, corticosteroid use, and secondary osteoporosis. Secondary osteoporosis may be iatrogenic or a complication of certain medical conditions. Medical conditions may include rheumatoid arthritis, some cancers, hormone imbalances, or kidney failure. In this case, both the underlying issue causing the osteoporosis and the osteoporosis itself need to be addressed. Using the FRAX or FORE tool will allow the clinician to get a more complete picture of the patients' fracture risk and decide if there are any underlying conditions that need to be treated. FRAX is intended for postmenopausal women and men age 50 and older. This tool is not intended to be used in younger adults and children, however it has been validated in men and women from age 40-90 years of age.

LITERATURE REVIEW

Assessment of Women's Knowledge of Osteoporosis

There seems to be a lack of knowledge about the risk factors associated with developing osteoporosis and preventing fractures in women who are at risk. There may not be enough information or access to this information to ensure women are properly educated on ways to decrease their risks for developing this disease.

Alinger et al. performed a study to assess women's knowledge of osteoporosis. The researchers developed a 25-question quiz known as the Facts on Osteoporosis Quiz (FOOQ) where higher scores correlated to an established knowledge of osteoporosis. Questions included assessing women's knowledge of osteoporosis based on exercise, caffeine intake, risk factors, and epidemiologic factors. On average, participants scored a 16 (standard deviation 4.87; range of 1 to 25). Only half of the 24 participants responded to 64 percent or more of the questions correctly. A qualitative analysis re-

vealed that the women participating in the study had insufficient knowledge of proper calcium intake, alcohol use, caffeine intake, and those specific populations who are at risk for developing osteoporosis. Also, there was no difference found based on women's knowledge of osteoporosis as related to their current menopausal status or their age. The authors concluded that the majority of women they surveyed did not have the adequate knowledge about osteoporosis and the associated risk factors.

Peters et al. evaluated how pharmacists could deliver osteoporosis education and screening outside of the pharmacy and in the workplace. The authors had three objectives for this study. They set out to determine if participants would make lifestyle changes if they were educated on how to decrease the risk of osteoporosis, what influenced their decision to discuss osteoporosis risks with their primary care provider, and their perception of pharmacist services relating to osteoporosis. The study involved 38 teachers between the ages of 28–65 (mean age 47.5 years) at six different schools. Pharmacists provided a 20-minute presentation on osteoporosis and discussed prevention strategies. Using ultrasound densitometry, participants were provided with T-scores. Those found to be at an increased risk for developing osteoporosis were encouraged to discuss their findings with their primary care provider. A survey via electronic mail or telephone follow-up was conducted at six weeks following the initial presentation to assess lifestyle changes, the perception of pharmacist's services, and if communication was conducted with their health care provider after the screening. Results showed that 65.8 percent of participants made one or more lifestyle changes. The most significant change was the number of participants who increased their calcium intake. Of the respondents, 36.8 percent showed an increase in dietary calcium, and 42.1 percent reported an increase in supplemental calcium. Those who were found to be at an increased risk, discussed treatment options with their

pharmacists and some made follow up appointments with their physician. Overall, 61 percent of participants reported a positive change in perception of the services provided by the pharmacist in the workplace. This small study demonstrates that pharmacists are able to have a positive impact on disease risk reduction.

Screening of Osteoporosis in the Underserved Communities

Summers et al. evaluated the impact pharmacists have on osteoporosis counseling after a BMD screening and assessed patient perception of community health screenings for osteoporosis performed by a pharmacist. A screening took place at urban retail pharmacies for three days and was offered to any woman who requested a scan. Subjects were given a verbally administered risk factor assessment that documented age, race, menopausal status, family history, personal history, calcium intake, current medications, and assessed for symptoms associated with osteoporosis or osteoporosis related fractures. After assessing subjects, a peripheral DEXA scan was performed on those subjects that consented for enrollment in the study. Following the scan, a 10-minute counseling session was conducted with a pharmacist or supervised pharmacist interns to discuss the scan results and answer any questions. Although studied subjects received their T-scores, diagnosis was not established. At three and six months, the patients were telephoned to assess if contact with their primary care physician had occurred, if they had obtained primary care physician recommendations, if suggested lifestyle changes had occurred, or if there was any change in previous reported behavior or medications.

By the six-month point, 52 of 102 patients discussed their findings with their primary care physician. It was found that of the subjects who discussed their results with their primary care providers; 14.8 percent increased calcium through supplements or diet, 9.2 percent continued their current osteoporosis regimen, 7.4 percent of subjects obtained prescription treatment, and 11.1 percent received an additional BMD scan. Most of the subjects (90.2 percent) reported an increased understanding of the risk factors associated with osteoporosis and found the session with the pharmacist or supervised pharmacist intern(s) useful. Similarly, 87.2 percent of patients responded that the conveniences of the commu-

nity location increased their likelihood of having a bone scan performed. This study, which took place in an urban retail community pharmacy, helps individuals with access challenges. By using community-based screening in their local pharmacy, patients were able to increase awareness of osteoporosis risk factors, allowing physicians to suggest and implement treatments.

Nauton et al. performed a study in six rural community pharmacies attempting to assess the impact of providing osteoporosis screenings for patients who were at least 65 years of age and had limited access to BMD testing. Limited access was defined as those subjects who resided at a distance of greater than approximately 27 miles from an axial DEXA unit for osteoporosis testing. The authors assessed women's knowledge of osteoporosis by administering a questionnaire that focused on risk factors that contribute to osteoporosis. The pharmacist assessed each subject's risk factors for osteoporosis, including smoking status, alcohol intake, medical history, medication history, and demographic information. Subjects were further assessed to estimate their calcium intake. Upon completion of the questionnaires, subjects were provided with educational material on osteoporosis, BMD interpretations, risk factors, diet, and the importance of physical activity. After completion of a BMD scan using an ultrasound densitometer, subjects were referred to their practitioner for further evaluation if the estimated T-score was less than or equal to -1.0 or were greater than -1 with risk factors. As a result of the bone scans, 58 percent of women were referred to their primary care physician for further assessment, of which 34 percent started drug therapy for osteoporosis (6 percent indicated starting an oral bisphosphonates, 30 percent began taking calcium supplements, and 6 percent began taking vitamin D supplements). Lifestyle changes were reported to have been made by 67 percent of women who received the screening, and 46 percent responded they were willing to pay a median of \$16 (range \$4–\$80) for the services provided by a pharmacist. The authors concluded that screening provided by a pharmacist in rural areas is a useful method for identifying and discussing measures to prevent osteoporosis.

As in the previous study, this study showed particular benefits to patients in rural locales which are less likely to obtain preventive health services than urban residents. Further analysis on the cost/benefit ratio of

community pharmacy screenings in these settings would be beneficial.

Value of Osteoporosis Screening in the Community

It's important that patients recognize a need for osteoporosis screening in the community. Screening services such as blood pressure monitoring, blood glucose testing, hemoglobin A1c testing, and immunization administration have become valued services within a community pharmacy. Each service has demonstrated a benefit to everyone involved. Implementation of osteoporosis screening by a community pharmacy must ensure that there is value associated with service. Some key questions need to be answered: Is the out-of-pocket fee to the individual reasonable? What research is available to suggest what people will pay? Will insurance companies reimburse the patient or the pharmacy for screenings in this environment? Will other medical professionals support the screenings done by a pharmacist in this setting? Lata et al. looked at evaluating women's information sources about osteoporosis screening, what monetary value they would place on services, and how clinician's would respond to peripheral bone mass measurement results. In four rural Midwestern independent community pharmacies, 194 women age 50 or older completed a questionnaire to assess their knowledge about osteoporosis, frequency of visits to her primary care physician, knowledge about BMD testing, and the monetary value they would equate with receiving a BMD scan. After the questionnaire was completed, subjects received a bone density scan using a peripheral instantaneous x-ray imager (PIXI), and their results were sent to their primary care provider. In addition, local area physicians were surveyed to determine if they had received bone density testing from these patients and if the information was useful. This was done as a means to assess if patients were discussing their results with their practitioners. These practitioners were also asked if they would

consider having their patients screened in a community pharmacy using a bone density testing method. Of the participants, 93 percent of women stated they were willing to pay an average of \$25 for the screening, with 31 percent willing to pay up to \$50 for the session. Of the clinicians surveyed, 72 percent stated that the screening data was useful. Approximately 51 percent of those health care providers went on to state that they would support a pharmacy-based bone density testing for patients in their practice. This would be helpful to increase participants in the screening since a majority of those who were involved found out about the screening either through in-store advertisement or through a family member or friend and not through referral by their physician. This study suggests community pharmacy can play a more active role in increasing women's knowledge of osteoporosis screening and provide valuable data to physicians. By providing this service, community pharmacies can increase physician and patient awareness about the benefits of screening for osteoporosis.

Cerulli et al. conducted a study that involved a group of women with a mean age of 61 to determine economic feasibility of providing BMD screenings and education programs to women to reduce the likelihood of osteoporosis. The study took place at four chain and two independent pharmacies. Women who were at least 18 years of age were encouraged to participate in the study and were provided their bone density using ultrasound densitometry. Patients were given their T-score and their potential risk factors were reviewed with the pharmacist. Each participant was encouraged to discuss their results with their primary care provider and it was reinforced that the test results did not constitute a diagnosis. After the study, participants received a 13-item questionnaire to evaluate their opinion of the value of services provided, their willingness to pay, and if they planned to discuss the results with their doctor. The results showed that 82 percent of women found the screening

“very useful” for making health care decisions and 91 percent planned speak with their primary provider about the results. A second survey was sent three months later to determine if they had in fact spoken to their primary care provider, made any lifestyle changes, or any changes to their medication had occurred. The results of this second questionnaire showed that 42 percent of women did speak to their health care provider. Other positive results indicated that 11 percent increased their exercise, 25 percent increased calcium and vitamin D intake, and six subjects started taking osteoporosis medication. Overall, 41 percent of patients agreed that they would pay \$20 for the services provided. To put it in perspective, it is important to determine if such an event is actually feasible in a pharmacy. To cover the cost of an ultrasound densitometer, it could take a pharmacy 50 weeks and they would need to do 21 scans at \$25 per week, or 15 scans at \$30 per week.

Implementation of Services

Although the need for osteoporosis screening is evident, community pharmacists may have concerns about how to design and implement such a process. Johnson et al. conducted a study in northwest Iowa in an attempt to create a model for community pharmacies to implement an osteoporosis screening program. Letters were sent to regional pharmacies in 17 counties outlining project details and request their participation. Five pharmacies responded and entered the study. Each site was required to select a project leader who would attend or watch a videotape of a grant-sponsored continuing education program on osteoporosis. Pharmacists received training on how to operate an ultrasound densitometer. Pharmacists were also required to participate in a continuing education program that covered an overview of diagnosis, preventative and treatment strategies, and to heighten awareness about osteoporosis. Advanced pharmacy practice experience rotation (APPE) students assisted in screening and educating patients on risk factors associated with osteoporosis.

On the screening day, background information obtained for each patient included, age, height, weight, ethnicity, medication history, calcium, and alcohol intake. Based on this information a risk factors analysis was performed for each patient. Subjects were also asked how they were made aware of the screening program.

CASE STUDY

A 67-year-old patient comes to your pharmacy and tells you she just came from her physician and has been diagnosed with osteopenia. She is very disturbed by this diagnosis and tells you she takes no other medication and has been very healthy her entire life. The only medication she takes is Tylenol PM on a nightly basis to help her sleep. Her physician has recommended she buy OTC calcium supplementation to begin taking to prevent the development of osteoporosis. Upon further conversation, you learn she is lactose intolerant and refuses to use supplements and would prefer to obtain the required amount of calcium in her diet. She is asking for your recommendation on a dietary plan.

Case Questions:

1. What is the proper amount of calcium this patient should receive on a daily basis?
2. Recommend a diet that would allow her to obtain this amount of calcium?
3. Are there any other recommendations you could make that would help delay the onset of osteoporosis in this patient?

Answers:

1. This patient should receive at least 1,200 mg/day of calcium.
2. A diet may consist of a combination of foods but here is one example:
Two ounces of fortified cereals would provide approximately 500 mg of calcium. Soy milk could be used on cereal. One cup of a soy beverage would provide approximately 360 mg of calcium. One cup of cooked green soy beans would provide approximately 250 mg of calcium. Three ounces of canned pink salmon would provide approximately 180 mg of calcium per day. This would be an example of some foods to add to her diet with on a daily basis to ensure the minimum of 1,200 mg/day.
3. Other recommendations would be to discontinue the use of Tylenol PM. Diphenhydramine in the elderly is known to increase the risk of falling. If she is having difficulties falling asleep she should be referred to her physician for another recommendation. Also, it would be advisable to begin weight bearing exercises which may include Tai- Chi, dancing, walking, or other aerobic activity. It is also necessary to ensure the patient is taking the proper amount of Vitamin D (800-1000 IU per day)

After completing all forms, the patients were given a bone scan. A printed report of the T-score was proved to the pharmacist to discuss with the patient. Each participant also received a copy of their informed consent and a copy of their risk score to share with their health-care provider. It was made clear to the patient that the screening was not a diagnostic test for osteoporosis and further assessments from their primary care provider would be required. Screening took a total of 15 minutes per participant. In total, pharmacists were paid \$20 from grant funded money and \$10 from each patient who participated in the osteoporosis screening.

As a follow-up, participants were telephoned at three and six months to see if they had discussed the results with their primary care provider and if lifestyle

modifications were initiated. Overall, results of the study showed that at three months, 37 percent of participants contacted their health care provider about the results and 5 percent received an additional DEXA scan. Of the participants, 50 percent began increasing calcium intake and 21 percent increased the amount of weight bearing activity. At the six-month survey interval, 24 percent of patients spoke to primary care providers and 7 percent received a DEXA scan. Lifestyle modifications at six months showed that 56 percent of patients starting calcium and 43 percent of patients began weight bearing exercises. Based on the positive impact they made, participating phar-

macists wanted to continue to offer the screenings, but they were limited by personal support and screening equipment. However, this study did make efficient use of pharmacist interns and showed they may be a useful resource for those pharmacies hosting students.

Some studies have been able to illustrate that a pharmacist and physician agreement can increase awareness of osteoporosis in the community. In one study known as Project IMPACT (Improve Persistence and Compliance and Therapy): Osteoporosis, the researchers aimed to identify at-risk patients in the community and refer these patients to their respective physician(s). This study was conducted at a supermarket chain that involved 22 local area pharmacies and was done during women's health month. Prior to initiation of the study, pharmacists received a training certificate in osteoporosis and received education on operation of a ultrasound densitometer. Promotion was conducted via marketing in local newspapers, the supermarket website, in-store signs and shelf talkers, printouts on the store receipt, direct mail and live segments on the local news networks. Study participants were targeted if they had at least one risk factor for osteoporosis, not including the fact that they were female. The screening process was offered for a \$25 fee. Screening occurred at five sites on a weekly basis for almost 1.5 years. Local physicians were recruited to provide training to area pharmacists about different diagnosis and treatments associated with osteoporosis. Additionally, the physician performed a DEXA scan on each of the pharmacists who participated. In exchange for the educational experience, the pharmacist referred some of the high-risk patients to this specialist. Risk stratification was predetermined based on the reported T-scores from the Densitometer. Those participants who were considered at moderate or high risk was defined as T-scores between -1 to 0 and less than or equal to -1, respectively. All participants who were within this range received

either a verbal or written referral to a physician for confirmation and diagnosis. All participants, regardless of risk stratification, received follow-up phone calls three to six months after the screening to assess the outcomes of the referral.

The study found that 78 percent of participants had no prior knowledge of their risk factors. Of the 532 participants screened, 29 percent of them contacted a primary care provider and 16 percent of them received a DEXA scan. Follow-ups showed that 19 percent of participants started a prescription medication for osteoporosis, 30 percent made lifestyle changes (including calcium supplementation), 26 percent were initiated on vitamin D, and 26 percent of patients were initiated on weight bearing exercises. Researchers stated that all participants were willing to pay the screening fee out of pocket. The authors estimated that 500 patients would require screening to account for the cost of the screening device used in the study.

This study showed that there can be collaboration between pharmacists and physicians to promote the awareness and screening of osteoporosis in the community setting by pharmacists. The authors concluded that when pharmacists become involved in a collaborative screening and education program, although at times it may be difficult to initiate, at-risk patients can be identified and referred for appropriate treatments to minimize negative outcomes associated with osteoporosis.

SUGGESTIONS FOR FURTHER OUTREACH

Establishing the need and benefit for screening in community pharmacy is evident by the trials discussed previously. It is clear that pharmacists can make an impact in delaying the onset of osteoporosis either through education of their patients or through an actual referral to a physician. Even if doing a screening in your pharmacy setting is not feasible, some counseling points can be discussed with your patients to decrease osteoporosis risk factors. Pharmacist counseling should not only identify risk factors, it should help patients understand which risk factors are modifiable and make plans to manage risks for developing osteoporosis, falls and fractures.

As previously stated, NOF guidelines do not recommend hormone replacement as a monotherapy (estrogen or progestin replacement) for the treatment or

prevention of osteoporosis. Patients should be advised to discuss the risks and benefits for hormone replacement therapy with their physicians. Many factors are involved in assessing the risk versus benefit of being initiated on hormone therapy. At a minimum, the community pharmacist can make a postmenopausal woman aware of her risk for developing osteoporosis and educate her about ways to decrease this risk. Other interventions can be made in all patient populations. Encourage inactive patients to perform regular weight bearing and muscle-strengthening exercises. By performing such routine activities, the patient may notice an increase in agility, posture, balance, and strength, which would help alleviate the risk of falling. Knowing your patient population and their specific limitations and needs can allow for successful patient centered counseling. Leverage your patient relationships to tailor a plan to reduce their long-term risks for this silent disease.

Community pharmacists should talk to patients about the necessity of smoking cessation. As discussed previously, consumption of tobacco products over a long period of time can adversely affect bone status. It is estimated that on average, cigarette smokers reach menopause 1–2 years earlier compared to their counterparts. With early onset of menopause, patients may experience osteoporosis and other comorbidities earlier than expected. Non-prescription nicotine replacement options are a good place to start. Shelf cards might encourage patients to ask questions about picking a quit date, or they could compare the cost of a pack-a-day cigarette habit to the cost of patches, gum or lozenges. Pharmacists may choose to investigate options for continuing education or hosting and facilitating a support group.

There are many areas where a pharmacist can help a patient to reduce their risk of falls. Encouraging annual eye exams is an effective way to reduce the incidence of falls, along with improving home safety. Pharmacists can point out common fall risks such as loose rugs, slippery surfaces (especially icy patches outdoors, the tub and bathroom floor), inadequate lighting and stairs with no handrail. Patients who have a significant risk for falling may be advised to consider a hip protector. Some patients may also require assistance with household chores, meal planning, or other activities of daily living. Pharmacists can be a valuable source of information for patients with these special needs.

CONCLUSIONS

This activity reviewed valuable information from the NOF guidelines to enhance understanding and encourage pharmacists make recommendations to patients to prevent and treat osteoporosis. The literature has been examined to deem the value of community pharmacist based screening clinics and has shown that there is an apparent need in the community to increase the awareness of osteoporosis risk factors and complications. Studies have shown it may be easier or more convenient for the patient to have access to a pharmacist especially in rural settings. Pharmacists play a key role in not only assessing patient risk factors and giving suggestions to eliminate those risk factors, but also helping a patient best manage their osteoporosis medication regimens. Based on this information, it is evident that a pharmacist can be a key player in the prevention and detection of osteoporosis. **AP**

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Preventing Osteoporosis Within the Community Setting

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To earn continuing education credit: ACPE Program 207-000-13-009-H01-P; 207-000-13-009-H01-T

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Answer sheet for your use below

| | a | b | c | d | e | | a | b | c | d | e |
|-----|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|-----|--------------------------|--------------------------|--------------------------|--------------------------|--------------------------|
| 1. | <input type="checkbox"/> | 11. | <input type="checkbox"/> |
| 2. | <input type="checkbox"/> | 12. | <input type="checkbox"/> |
| 3. | <input type="checkbox"/> | 13. | <input type="checkbox"/> |
| 4. | <input type="checkbox"/> | 14. | <input type="checkbox"/> |
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| 7. | <input type="checkbox"/> | 17. | <input type="checkbox"/> |
| 8. | <input type="checkbox"/> | 18. | <input type="checkbox"/> |
| 9. | <input type="checkbox"/> | 19. | <input type="checkbox"/> |
| 10. | <input type="checkbox"/> | 20. | <input type="checkbox"/> |

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CONTINUING EDUCATION QUIZ

Select the correct answer.

1. A Which of the following facts is true about the prevalence of osteoporosis?

- a. An estimated 10 million Americans have osteoporosis.
- b. It is estimated that one in two women and men will experience an osteoporosis related fracture in their lifetime.
- c. An estimated 40 million Americans have osteopenia.
- d. Osteoporosis is more frequent in African Americans than Caucasians.

2. The cost to the health care system associated with osteoporosis-related fractures has been estimated at which of the following for 2005?

- a. \$25 billion
- b. \$50 million
- c. \$17 billion
- d. \$40 million

3. Which of the following is true about factors that affect bone mass?

- a. Bone growth only occurs during adolescence.
- b. Peak bone mass is achieved at the age of 35 in women and men.
- c. Bone mass is influenced by factors such as genetics, nutrition, endocrine status, and physical activity.
- d. Osteoporosis occurs when the net bone resorption occurs less frequently than bone formation.

4. Which of the following is NOT a factor that affects the risk of developing osteoporosis?

- a. Excessive Vitamin A
- b. High salt intake
- c. Athletic amenorrhea
- d. Osteoarthritis

5. Which of the following is NOT a medication associated with the risk of developing osteoporosis?

- a. Exemestane (Aromasin)
- b. Heparin
- c. Phenytoin
- d. Methylprednisolone 6-day taper (Medrol Dosepak)

- 6.** Which of the following is true about calcium intakes of greater than 1,200-1,500 mg of calcium per day?
- Increased risk for kidney stones
 - Increased risk for diarrhea
 - Increased risk for GI upset
 - Increased risk for magnesium deficiency
- 7.** A T-score of -2 in a 25-year-old female would indicate which of the following?
- Osteoporosis
 - Osteopenia
 - Normal bone
 - The results cannot be applied to a female in this age group.
- 8.** What is the recommendation for daily vitamin D intake in adults aged greater than 50 years old to support bone health and muscle formation?
- 200 IU/d
 - 400 IU/d
 - 800 IU/d
 - 1,200 IU/d
- 9.** Studies have shown that fracture occurrence decreases when vitamin D levels where are at least which of the following levels?
- 25 ng/ml
 - 30 ng/ml
 - 20 ng/ml
 - 15 ng/ml
- 10.** A patient approaches you and tells you they will be receiving zoledronic acid for the first time in her physician's office. The patient has read about possible flu-like symptoms occurring after the administration of the medication. Which of the following recommendations would be appropriate for you to tell her?
- Take an 81 mg baby aspirin one hour prior to administration to help relieve the symptoms.
 - Take 500 mg of acetaminophen one hour prior to administration to help relieve the symptoms.
 - Take 400 mg of ibuprofen one hour prior to administration to help relieve the symptoms.
 - Take 12.5 mg of diphenhydramine one hour prior to administration to help relieve the symptoms.
- 11.** Which of the following medications proven for treatment of osteoporosis can cause side effects which include local irritation, rhinitis, and nausea?
- Evista
 - Boniva
 - Calcitonin
 - Alendronate
- 12.** Which of the following medications has only been approved for women who are five years or more post-menopausal in the treatment of osteoporosis?
- Evista
 - Boniva
 - Calcitonin
 - Alendronate
- 13.** Which of the following densitometry technologies can provide confirmatory diagnosis of osteoporosis?
- DEXA
 - pDEXA
 - QCT
 - QUS
- 14.** Which of the following densitometry technologies is associated with higher amounts of radiation exposure as compared to other devices available for use in the community pharmacy setting?
- DXA
 - pDXA
 - QCT
 - QUS
- 15.** Bone mineral density testing is recommended by the NOF for which of the following?
- All women age 35 and older
 - All men age 65 and older
 - All women age 65 and older
 - All men age 35 and older

16. Which patient should be recommended for BMD testing?

- a. A patient who has been on prednisone 1 mg per day for one month
- b. A patient who is 25 years old and currently smoking
- c. A post-menopausal woman age 45 who has a family history of osteoporosis
- d. A patient who is 39 years old who does not take any calcium supplementation

17. Which of the following is NOT true about using a fracture risk calculator?

- a. This tool was established to determine the 10-year probability of a hip fracture and/or the 10-year probability of a major osteoporotic fracture.
- b. The score takes into consideration many other risk factors which include weight, height, age, sex, previous fracture, smoking status, corticosteroid use, and secondary osteoporosis that a simple bone scan is not capable of factoring into the bone mineral density measurement.
- c. Using this tool will allow the clinician to get a more complete picture of the patients' risk of developing a fracture.
- d. This assessment is valid for those who are receiving treatment for osteoporosis.

18. Which of the following activities would NOT help to decrease a patient's risk for developing osteoporosis?

- a. Tai Chi
- b. Walking
- c. Dancing
- d. Swimming

19. A pharmacist is qualified to do all of the following in order to educate a patient about osteoporosis in the community setting except which of the following?

- a. Recommend routine eye exams to improve vision to decrease falling
- b. Independently diagnose osteoporosis and initiate appropriate bisphosphonate therapy
- c. Help a smoker pick a quit date and discuss behavior modification for greater success
- d. Recommend physical activity to aid in muscle strengthening.

20. All of the following would be good suggestions to implement a community run pharmacist clinic except which of the following?

- a. Utilize technicians to design advertising materials to announce the screening event.
- b. Utilize technicians perform a heel ultrasound scan and discuss the results with the patient.
- c. Utilize pharmacy students to perform a heel ultrasound scan and discuss the results with the patient under pharmacist supervision.
- d. Physician area detailing to allow physicians to know about the services your pharmacy is offering in order to recruit patients.