



## Module 6: Osteoporosis

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### BACKGROUND

In a recent consensus statement from the National Institutes of Health, osteoporosis was defined as, "a skeletal disorder characterized by a compromised bone strength predisposing a person to an increased risk of fracture. Bone strength primarily reflects the integration of bone density and bone quality."<sup>1</sup>

The worldwide prevalence of osteoporosis makes it a serious public health concern, with approximately 200+ million people currently suffering from this disease worldwide.<sup>2</sup> Within the United States and Europe, it affects over 30% of all postmenopausal women; 40% of whom will sustain one or more fragility fractures in their lifetime.<sup>3,4</sup> In the U.S. alone, osteoporosis or osteopenia will affect over 40 million Americans and result in more than 1.5 million fragility fractures per year.

The financial burden to our healthcare system is outweighed only by the pain, suffering and disability experienced. One year after suffering a hip or spine fracture, mortality rates are reported to be as high as 30% (Rossell PA et al 2003; Kanis JA et al 2004). As life expectancy continues to increase and baby boomers age, we can expect the severity of the problem to worsen and numbers to increase around the world.

### WHAT PHYSICIANS NEED TO KNOW

#### Etiology:

Osteoporosis is considered to be a heterogeneous condition that can occur at any age. The etiology of osteoporosis is attributed to various endocrine, metabolic and mechanical factors. Genetics certainly has a strong influence on peak bone mass (which is reached by mid thirties). Following this hormonal period, physical activity level, Vitamin D levels, nutritional status and medications all influence bone integrity. Osteoporosis is a secondary condition in approximately 30% of postmenopausal women and may result from the following: impaired thyroid or adrenal function, corticosteroid use, chemotherapy, hypercalciuria, malabsorption, liver or renal disease.

Low peak bone mass, increased bone loss after menopause, and increased longevity, present a greater risk of osteoporosis among some women. By the time women reach menopause, some bone is already lost and can increase by as much as ten-fold during the first six years following menopause. Early diagnosis and intervention are important in reducing the high mortality and morbidity associated with this progressive disease. The World Health Organization has determined criteria, referred to as "T-Scores," to describe or classify individuals according to their "Bone Mineral Density." Bone Mineral Density can be measured in the clinical setting with the use of dual x-ray absorptiometry (DEXA).<sup>5</sup> Results range from Normal ( $\geq -1$ ) to Severe Osteoporosis ( $\leq -2.5$ ) with single standard deviation

reductions representing a 10% decrease in BMD from the mean value of a young, healthy, sex-matched control. For each standard deviation, decreased risk of fracture approximately doubles.<sup>6</sup>

Table 1. World Health Organization criteria for diagnosis of osteoporosis:

| T-Score   | Classification      |
|---|---------------------|
| Greater than -1   | Normal              |
| -2.5 to -1  | Osteopenia          |
| Less than -2.5  | Osteoporosis        |
| Less than -2.5 <i>and</i> fracture  | Severe Osteoporosis |
| Risk Factors for Osteoporosis that are <i>Independent</i> of bone mineral density:  |                     |
| <ul style="list-style-type: none"> <li>- Age</li> <li>- Previous fragility fracture</li> <li>- Maternal history of hip fracture</li> <li>- Oral glucocorticoid therapy</li> <li>- Current smoking</li> <li>- Alcohol intake <math>\geq 3</math> units/day</li> <li>- Rheumatoid arthritis</li> <li>- Body Mass Index <math>\leq 19</math></li> <li>- Falls</li> </ul> |                     |
| Risk Factors for Osteoporosis that are <i>Dependent</i> on bone mineral density:  |                     |
| <ul style="list-style-type: none"> <li>- Untreated hypogonadism</li> <li>- Malabsorption</li> <li>- Endocrine disease</li> <li>- Chronic renal failure</li> <li>- Chronic liver disease</li> <li>- COPD</li> <li>- Immobility</li> <li>- Drugs (aromatase inhibitors, androgen deprivation therapy)</li> </ul>  |                     |

Information based on Kenneth E S Poole and Juliet E Compston. BMJ. Osteoporosis and its management BMJ 2006;333;1251-1256

#### Fracture Risk Assessment:

Although osteoporosis predicts a strong likelihood of fracture, many fragility fractures occur in people with bone density values above the defined level.<sup>7</sup> Fracture rates can be better predicted by adding clinical risk factors that contribute to the overall fracture risk independent of BMD. The WHO in collaboration with IOF(International Osteoporosis Foundation) and the US National Osteoporosis Foundation, developed FRAX<sup>TM</sup>, a [WHO Fracture Risk Assessment Tool](#) for physicians to use with patients of both sexes, all ages, ethnic groups and in all countries. As mentioned earlier, BMD is one indicator of bone mineralization status, however, it captures only a small proportion of those individuals who will eventually suffer a fracture. This new tool considers 11 other critical factors in bone health that act independent of BMD, giving the physician a much better picture of who needs treatment and when. This becomes particularly important if the diagnosis is osteopenia and/or if there is a question of whether or not to use drug therapy or recommend more costly test.

Risk factors shown to improve the prediction of fracture risk include the following: age, previous fracture, family history of hip fracture, glucocorticoid (steroid) use, current smoking, alcohol use >2 units/day, and rheumatoid arthritis.

## Management of Osteoporosis:

### Pharmacological interventions

Current pharmacological treatments for osteoporosis include hormonal therapy, bisphosphonates (alendronate, risedronate, ibandronate, and zoledronic acid), and selective estrogen receptor modulators (SERMS, raloxifene, tibolone, and tamoxifen). Review of the risks and benefits of these medications is beyond the scope of this series, but a brief review is provided below.

There is a well-established benefit of hormone replacement therapy for treatment of osteoporosis. The optimal amount of time to initiate therapy and the optimal duration of therapy have not been determined, but the lowest effective dose is recommended. The risks of long-term hormone therapy must be considered.

Bisphosphonates interfere with osteoclast function reducing the number of osteoclasts; the net result being an increase in bone mineral density and a reduced risk of fractures. This class of drugs has been shown to reduce vertebral and non-vertebral fractures, including hip fractures. They are considered first-line options for preventing postmenopausal osteoporosis.<sup>8,9</sup> Commonly-reported side effects include GI complications (esophagitis, gastritis, and diarrhea) and rare but serious cases of muscle or joint damage, including osteonecrosis, months or years after beginning treatment.

The SERMS have mixed estrogenic and antiestrogenic properties, depending on the tissue that is being studied. These drugs were developed to benefit bone density and reduce fracture without stimulating endometrial or breast tissue.

### New Drugs to the Market

A new drug called Protelos® (strontium ranelate) is the first dual-action drug on the market and works by both increasing new bone formation and decreasing bone resorption. This medication has shown promising safety and efficacy data in the management of osteoporosis. (Ortolani S et al. 2006) Two large multinational studies conducted to explore the safety and effectiveness of Protelos®, The Spinal Osteoporosis Therapeutic Intervention Trial and The Treatment of Peripheral Osteoporosis Study, demonstrated that Protelos® caused significant reductions in risk of vertebral fractures (41% after 3 years), non-vertebral fractures (16%), and hip fractures (36%) among high-risk patients (Burlet N et al 2006).

Although not a new drug, the SERM zoledronic acid is currently being heavily marketed as an in-office intravenous treatment for osteoporosis. Once-yearly administration is clearly an advantage, however, it isn't yet clear how many ObGyn physicians are able to administer this medication within an office setting.

### Non Pharmacological Treatments

Non pharmacological interventions, a healthy diet and appropriate levels of strength training at least twice a week including, help to reduce the risk of fragility fractures from falls. For some women, as little as two minutes of certain exercise routines for six months have shown to increase hipbone density by 2-5% within a research setting women.<sup>10</sup>

### Nutrition

Given the dynamic nature of bone, it is likely that a lifelong, healthy diet will ensure that one's optimal bone health is achieved. It is also important to remember that osteoporosis is a *bone deficiency*, not simply a calcium deficiency, and requires consideration of all the components essential for bone health. In addition to calcium, other minerals and nutrients are essential for healthy bone matrix and may be obtained through a health diet. These include magnesium, potassium, Vitamin C, Vitamin K, Vitamin B12, zinc, manganese, boron, strontium and silicon.

Calcium is widely known to be important for bones, yet most women consume less than the recommended levels (1000 mg/day for women and men 30-50 years, and 1200 mg/day for women and men > 50 years).<sup>11</sup> Even with an adequate intake, absorption is impacted by intestinal absorptive capacity which averages only 10% of calcium consumed, half of which is excreted in the urine.<sup>12</sup> Vitamin D plays an essential role in the regulation of calcium absorption. Since the establishment of the DRIs for Vitamin D in 1997, new data supports higher intake of Vitamin D due to its wide-ranging benefits. These include improved lower extremity function, decrease risk of falls, decreased risk of fractures and lower risks of many cancers. Intakes of 25 µg/day are needed to reach optimal serum 25 hydroxyvitamin D levels of 90-100 nmol/L.<sup>13</sup>

Magnesium is also essential in bone formation and assists in calcium absorption. Studies reveal that magnesium deficiency is associated with osteoporosis and bone fragility. (Sasaki S 2006; Saito N et al 2005). Intakes for postmenopausal women should support a 2:1 ratio of calcium to magnesium. Low intakes are the result of inadequate consumption of dark green leafy vegetables rich in magnesium and inadequate supplementation.

Phosphorous is important in calcium metabolism, regulating bone formation and inhibiting bone resorption (Kawaura A et al 2005). Recommended intakes of phosphorous are generally about 75% of those of calcium.

Excess intakes of caffeine and sodium will negatively affect calcium status. Excess sodium increases urinary excretion and loss of calcium through the kidneys. A study of 489 elderly women (65-77 years of age) found that a daily intake of 30 mg of caffeine or more significantly increases the rate of bone loss from the spine.<sup>14</sup> The study found an even greater relationship among women with a genetic susceptibility (Vitamin D receptor polymorphism) to osteoporosis.

## WHAT PATIENTS NEED TO KNOW

Osteoporosis is a bone disease that develops slowly and is usually caused by a combination of genetic factors and lifestyle factors, including diet and exercise habits. A balanced nutrition and exercise program in combination with other lifestyle changes can positively affect bone mass maintenance and prevention of osteoporosis. Traditional diets that are high in processed foods and lacking nutrients vital to bone health can directly contribute to urinary calcium losses. Other factors known to accelerate calcium losses include smoking, alcohol, lack of exercise and various medications.

Symptoms of osteoporosis may include back pain, loss of height over time, and fracture of vertebrae, wrist, hip or other bones.

### Risk Factors for Osteoporosis:

- Race (White or Asian)
- Female
- Lack of exercise
- Diets low in calcium, fruits and vegetables
- Smoking
- Excessive alcohol intake (more than 2 servings per day)
- Family history of osteoporosis
- Use of medication such as corticosteroids

### Bone Health/Osteoporosis Nutritional Guidelines:

1. If you smoke - quit. Smoking increases the risk of fracture by approximately 40%.
2. Eat at least 4 servings of calcium-rich green, leafy vegetables per week. Consider other healthy sources of calcium including yogurt, fortified soy milk, figs, sardines, tahini and navy beans.
3. Increase fruit intake to 2-4 servings per day to provide the body with good sources of magnesium and potassium--two minerals essential for healthy bones.
4. Significantly reduce the amount of processed foods in your diet. These foods are lacking in calcium, Vitamin K, magnesium and many other nutrients that support bone health. They are also high in sodium which increases urinary calcium losses.
5. Increase intake of whole grains which provide essential nutrients that play a significant role in bone health, such as copper, potassium, zinc, manganese and B6.
6. Add nuts to your diet daily. Pumpkin seeds, pecans, Brazil nuts, almonds are important sources of copper, zinc, magnesium and selenium.
7. Drink 2-4 cups of white, green or black tea daily. Tea has been shown in some studies to prevent bone loss.
8. Moderate alcohol intake.
9. Avoid excess caffeine. Intakes of caffeine that exceeded 300 mg per day have been shown to result in greater bone loss rates in the spine area. 300 mg is equal to the amount of caffeine in 18 ounces of strong coffee or 6 glasses of soft drinks.

## SUMMARY

Osteoporosis is a worldwide health care issue that needs to be addressed. Prevention, better and timelier diagnoses, and intervention strategies that are cost effective and safe for the patient should be discussed. Better management of the disease will result in a reduced burden on health care systems and better outcomes for patients through reductions in morbidity and mortality.

To ask a question related to program module, please email our experts at [info@obgynalliance.com](mailto:info@obgynalliance.com).

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Andrea Lukes, MD, MHSc, FACOG is the Founder and Chair of the Ob/Gyn Alliance. She has partnered with Beth Reardon to help create an educational channel for both providers and patients (TV segment in 2008 on Oxygen and ABC, formation of a Healthy Lifestyle Changes program through her private practice and research center - the Carolina Women's Research and Wellness Center).