Osteoporosis: A Home Health Care Issue

M. Allison Ford[1] and Martha A. Bass[2]

[1]*The University of Mississippi*
[2]*Sam Houston State University*

Abstract

Osteoporosis is a serious health issue causing premature disability to millions of Americans. Costs associated with this disease exceed 13.8 billion dollars per year. Women have a greater risk for osteoporosis than men. However, men are also susceptible to bone loss and osteoporosis. Osteoporosis education for the health care professional is warranted. Understanding risk factors and utilizing bone measurement techniques will result in earlier detection of osteoporosis. Adequate calcium intakes and weight bearing exercise is essential in prevention and maintenance of osteoporosis. This article discusses osteoporosis as a home health care issue.

Keywords: osteoporosis, elderly, home health care, disability

Osteoporosis is a disease characterized by low bone mass and deterioration of bone tissue, leading to enhanced bone fragility and a consequent increase in fracture risk. Osteopenia occurs when bone mineral density (BMD) falls between 1 and 2.5 standard deviations (SD) below the mean value of healthy peak bone mass. Osteoporosis is defined as BMD more than 2.5 SD below the mean value of healthy peak bone mass (WHO, 1994).

This disease affects over 28 million people in the United States (NIH, 2001). Osteoporosis, along with heart disease and cancer, is one of the three most severe diseases affecting women and is, in fact, more common than heart attacks and breast cancer (National Osteoporosis Foundation, 1995).

Osteoporosis does not discriminate. It affects women and men, young and old, rich and poor. The disease is a serious bone disorder causing premature disability to millions of Americans. One in six women will have an osteoporosis-related fracture by the time she reaches 90 years of age (United States Department of Health and Human Services [USDHHS], 2000). Twenty percent of these women die within one year of the fracture. Half of the survivors never walk independently again (McBean, Forgac, & Finn, 1994). Deaths resulting from osteoporotic hip fracture are attributed to complications of immobilization and surgery, and primarily occur from pulmonary conditions such as chronic obstructive pulmonary disease and pneumonia (Riggs & Melton, 1995). Other causes of death associated with hip fracture are atherosclerosis and stroke (Lamb, Waszkiewicz, & Davis-Kipnis, 1996).

Cost to Society

The cost of osteoporosis and osteoporotic fractures in the U.S. exceeds $13.8 billion annually (Ray, Chan, Thamer, & Melton, 1997). The number of fractures due to osteoporosis occurring worldwide is expected to rise three-fold by the middle of this century. In 1990, 1.7 million fractures occurred. By the year 2050 an estimated 6.3 million fractures are expected (WHO, 1999). Hip fractures result in more functional impairment than heart attacks, cancer or stroke, the top three causes of death in the United States today (USDHHS, 2000). In 1986, the direct medical costs for osteoporosis were $3 billion for hospitalization and $2 billion for nursing home care, totaling $5 billion annually. However, only one decade later, the estimated cost of osteoporosis had grown to $10-20 billion

dollars (Smith & McGhan, 1997). Total medical costs for this disease are difficult to assess because length of and costs for hospital and nursing home stay vary tremendously.

Risk Factors for Osteoporosis

There are both modifiable and non-modifiable risk factors associated with bone mass. Non-modifiable factors include age, race, gender, and family history of osteoporosis (Kolander, Ballard, & Chandler, 1999). Females should also be aware of other non-modifiable risks such as age of menarche and prolonged years of menstruation Modifiable lifestyle factors such as inadequate calcium intake, inactivity, smoking and excessive alcohol consumption also contribute to a low BMD defined in first paragraph of paper and increased fracture risk in both men and women (Tudor-Locke & McColl, 2000).

Specific disease and the use of certain medications can also be considered a factor that may contribute to the cause or progression of osteoporosis. For example, long-term use of glucocorticoids adversely affects bone homeostasis and calcium regulation. Other medications associated with bone loss include anticonvulsants, gonadotropin hormones, aluminum-containing antacids (excessive use), and thyroid hormones (excessive use). Chronic medical problems such as chronic obstructive pulmonary disease (COPD), which require such long-term treatment, place the patient at increased risk for developing osteoporosis. Other conditions or diseases that may place a patient at risk for osteoporosis include: menopause, hypogonadism, hyperthyroidism, rheumatoid arthritis, and diabetes (Renfro & Brown, 1998).

Although there are non-modifiable risk factors associated with of bone mass, focus should be directed to the lifestyle factor or factors that can be changed. Lack of physical activity is associated with many diseases (Dubbert, Carithers, Sumner, Barbour, Clark, Hall et al., 2002), so it comes as no surprise that it is also associated with osteoporosis. People who are confined to their home are at an increased risk for osteoporosis because they commonly have sedentary lifestyles. Physical activity has been shown to protect against low BMD (Gleeson, Protas, LeBlanc, Schneider, & Evans, 1990; Kerr, Morton, Dick, & Prince, 1996; Snow, 1996). The exact site of protection of low BMD is still being investigated. One longitudinal study focusing on exercise and its effect on bone mineral density of osteopenic women defined in first paragraph of paper revealed the most significant influence of physical activity occurred in the spine (Bravo, 1996). The American College of Sports Medicine's (ACSM) position stand on osteoporosis and exercise suggest that sedentary women may increase bone mass by becoming more active, but the major benefit of increased activity would be the prevention of further bone loss (Drinkwater, Grimston, Raab-Cullen, Snow-Harter, 1995). Physical inactivity, when combined with family history of fractures and low body weight, may lead to low BMD.

Exercising at Home

Since one of the treatment and prevention measures for osteoporosis or osteopenia is weight bearing physical activity (Madsen, Adams, & Van Loan, 1999; Metz, Anderson, & Gallagher, 1993), development of a routine exercise program utilizing household items for resistance may be the solution. Examples of typical household items and exercises that may be used in resistance training to improve bone status are: 1) use soup cans to do upper body exercises such as bicep curls; 2) milk containers filled with water provide resistance for arm exercises; 3) milk containers filled with sand provide increased weight and resistance; and 4) oversized rubber bands can be used for weight bearing activities for arms, legs, chest, and abdomen. Guidelines for exercising at home include:

1. Elderly, hypertensive, homebound patients should be carefully evaluated before beginning any type of exercise.
2. Patients with a limited range of motion should train within the range of motion that is relatively pain free. Most patients will see an improvement in the pain-free range of motion as a result of resistance training.

3. Resistant training should be targeted toward major muscle groups such as hips, legs, arms, shoulders and spine.
4. Participants should maintain their normal breathing pattern.
5. Perform multi joint exercises (as apposed to single-joint exercises).

Adequate Calcium Intake and It's Role in the Prevention of Osteoporosis

Calcium intake is directly associated with osteoporosis. Adequate calcium intake has been suggested to minimize osteoporotic fracture risk. However, most American women consume less than 600 mg of calcium per day from their normal dietary intake--one half of the Recommended Daily Allowance (RDA) for calcium (Lindsay, 1996). "Evidence suggests that calcium consumption, as well as absorption, decreases with age" (Notelovitz, 1997). Physicians and other health care professionals should encourage and monitor the calcium consumption of their homebound patients.

Many individuals are unaware of the calcium content in foods. Calcium is found most abundantly in milk and milk products. Selecting low fat items from the dairy group will help the patient meet calcium needs while limiting their fat and calorie intake. For instance, one 8 oz. glass of whole milk provides 300 mg of calcium. A one 8 oz. glass of 1% or skim milk also provides 300 mg of calcium. To achieve the daily calcium requirement of 1200 mg per day, a woman would only need to include three to four servings of milk in her diet each day (Whitney & Rolfes, 1999).

For those who are lactose intolerant or do not like to drink milk or eat cheese, yogurt is an alternate choice. The active culture in Yogurt converts Lactose into lactic acid producing a product that is tolerable for those who are lactose intolerant. Also, milk and milk products can be added to foods to increase the calcium content. Powdered nonfat milk can be added to pancakes, casseroles, and other mixed dishes; five heaping tablespoons provides the equivalent of 8 oz. of milk. Not only will the patient increase their calcium intake, but that of protein, vitamins, and minerals as well. Table 1 provides a list of calcium rich foods.

Table 1
Calcium-Rich Foods (USDA, 2004)

Item	Serving Size	Calcium (mg)
Yogurt	1 cup	400
Ricotta cheese	1/2 cup	340
Milk, all types	1 cup	300
Orange juice with calcium	1 cup	300
Swiss cheese	1 oz.	260
Cheddar cheese	1 oz.	200
American cheese	1 oz.	175
Oysters	3/4 cup	170
Collard greens	1/2 cup	145
Spinach, cooked	1/2 cup	100
Ice cream	1/2 cup	100
Beans, cooked	1 cup	90
Cottage cheese	1/2 cup	80
Broccoli, cooked	1/2 cup	70

Methods Used to Measure BMD

To diagnose osteoporosis, a noninvasive measurement of the bone mineral content (BMC) at various sites may be performed. The degree of osteoporosis can be determined by the prevalence of low BMC and frequency of fractures (Melton, 1992).

There are various methods used to measure BMC. Some of these include spinal or peripheral quantitative computed tomography (QCT/ pQCT), radiographic absorptiometry (RA), single X-ray absorptiometry (SXA), Duel energy X-ray absorptiometry (DEXA), and quantitative ultrasound (Baran, Faulkner, Genant, Miller, & Pacifici, 1997). Although DEXA is considered the gold standard for bone densitometry, due to the size, cost, and availability of the instrument, it is generally not feasible to utilize this instrument on individuals who are confined to their home.

Less expensive, portable instruments are available for assessing peripheral skeletal sites. Although the heel ultrasound is not considered the gold standard, it can be used to predict fracture risk in both men and women (Adler, Funkhouser, & Holt, 2001; Mussolino, Looker, Madans, Langlois, & Orwoll, 1998). The heel ultrasound is a portable device that is less expensive, less time-consuming than the DEXA and will benefit the clinician in identifying those patients at highest risk for fracture (Adler et al., 2001). One researcher found that heel BMD measurements predicted the occurrence of non-spinal fractures as well as proximal femoral, lumbar spinal, proximal radius, and distal radius BMD (Black, Cummings, Genant, & Nevitt, 1992).

In 1995, the FDA approved a new DEXA machine that measures bone mass in the forearm called the pDEXA (peripheral DEXA). Although measuring the forearm is not as reliable as measuring femur and spine, this DEXA unit is portable and less expensive ($30,000 compared to $100,000) than the traditional DEXA machine. One other advantage of pDEXA is the forearm measurement is performed while a patient is sitting in a chair versus on a DEXA table. Some homebound individuals may not be able to get on and off a DEXA table. Also, the space needed for the pDEXA is minimized. Phalangeal measurements, using pDEXA, have also been found beneficial in identifying women with osteoporosis (Siris, Miller, Barrett-Conner, Faulkner, Wehren, Abbott, Bergern, Santora, & Sherwood, 2001).

Early detection through appropriate screening strategies, such as portable bone densitometers, will help to identify low bone mineral density. The earlier low bone mineral density is detected, the better chance of slowing the progressive bone loss.

Men and Osteoporosis

Although osteoporosis is often considered a female's disease, men certainly are at risk. Men are living longer and as they age, their risk of osteoporosis increases (Jones, Nguyen, Sambrook, Kelly, Gilbert, 1994). Men do not experience a decrease in bone mass as soon or as rapidly as women, however, osteoporosis is an increasingly prevalent problem for elderly men (Kessenich & Rosen, 1996). As with women, men who have poor nutrition and/or decreased mobility have an increased risk of developing of osteoporosis. After age 65, testosterone levels decline but may remain within the normal range. Elderly men with low levels of testosterone are more than twice as likely to experience a hip fracture than those with normal testosterone levels (Jackson, Riggs, Spiekerman, 1992). Low BMD is associated with fracture risk in men as well as in women. However, men generally do not recover from a hip fracture as well as women (Adler et al., 2001).

Conclusion

Combining assessment methods (survey of risk factors and bone densitometry) aid the clinician in identifying those homebound patients with low BMD or osteoporosis who should be treated to prevent fracture. The home health care provider must be aware of the prevalence of osteoporosis in both men and women and recognize the predisposing factors and common symptoms of the disease. Identifying and

treating high-risk patients may delay the need for institutional care and should prove cost-effective.

Health care providers and health educators are in a position to influence healthy behaviors in the prevention or treatment of osteopenia and osteoporosis. Adequate calcium intake, early detection of low BMD, starting and maintaining an exercise program, and awareness of modifiable and non-modifiable risk factors are topics health educators and health care providers should address in a home health care setting. Health educators should implement necessary interventions for preventing osteoporosis in home health care patients.

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Author Information
M. Allison Ford, Ph.D*
Assistant Professor
Department of Health, Exercise Science & Recreation Management
The University of Mississippi
232 Turner Center
P.O. Box 1848
University, MS 38677
Ph. 662-915-6770
Fax. 662-915-5525

Martha A. Bass, Ph.D.
Assistant Professor
Department of Health and Kinesiology
Sam Houston State University
Huntsville, TX 77341

* corresponding author