Bone Health Among Aging Baby Boomers
L Curry, M Hogstel, P Frable, C Walker

Citation

Abstract
The first baby boomers will reach the age of 65 in 2011. Demographers and social policy analysts predict that they will have a major impact on the health care delivery system as they age. Boomers may not think much about osteoporosis because they regard it as a disease affecting older women. Without appropriate prevention and treatment strategies, however, osteoporosis can begin in early adulthood and progress throughout life. The most costly effect of osteoporosis is a fracture of the hip. Hip fractures can cause complications that require months of expensive rehabilitation or contribute to deteriorating health. Advanced practice nurses need to teach aging baby boomers about osteoporosis, including the common risk factors, methods of prevention, and new diagnostic and treatment options.

BONE HEALTH IN AGING BABY BOOMERS
The effects of baby boomer aging are yet to be determined. About 78 million baby boomers are between the ages of 39 and 57 in 2003. According to Dychtwald, “baby boomers radically transform every stage of life through which they travel.” (1) While arrival of the baby boom generation expanded growth of hospitals and pediatric practices in the 1950s and 1960s, demographers and social policy analysts now predict that there will be a dangerous shortage of eldercare services when baby boomers reach their 60s and 70s. Medicare, the primary source of health care payment for adults age 65 and older, is expected to be solvent only through the year 2015; however, the number needing Medicare will double from the year 2000 to 2030. (2)

Boomers influence financial, social, political, and interpersonal forces in society. As this large demographic cohort reaches middle age and anticipates older adulthood, how will society be affected? Will the boomers be healthier when they reach their 60s, 70s, and 80s than older adults today? Will they be more proactive in maintaining their health and in their contact with the health care delivery system than today’s older adults? Will their health-care problems and needs require a change in the place and way long-term care is delivered? In an AARP study of 2,127 baby boomers aged 38 through 56, 56% of respondents said their “savings aren’t on track,” 69% said that they “need to pay more attention to health,” but 63% said that they “feel good about relationships with family and friends.” (3)

OSTEOPOROSIS
Osteoporosis means porous bones, which are weak and thin and can result in fractures. During the aging process osteoclasts, which destroy bone cells, are more active than osteoblasts, which build bone cells. Osteoporosis is a major health problem, and it will continue to be a concern for Americans in the future. Healthy People 2010 addresses this health problem through Objective 2.9: “Reduce the proportion of adults, aged 50 and older, who have osteoporosis from 10% (1988-1994) to 8%.” (4) It is estimated that 55% of people currently 50 years old or older have either osteoporosis or low bone mass. Of 10 million people estimated to have osteoporosis in 2002, 80% were women. (5) Without changes in lifestyle behavior and health management, the number of people with osteoporosis will grow to 12 million in 2010 and 14 million in 2020. (6)

Osteoporosis causes 1.5 million fractures a year. (7) Many complications can occur following a fracture, particularly a hip fracture. Limited mobility can cause decreased appetite, increased malnutrition and dehydration, circulatory problems, skin problems, depression, and problems with co-morbid conditions. Without education and primary prevention strategies styled for baby boomers, the incidence of osteoporosis and subsequent complications will increase in this and future decades. Advanced practice nurses have an important role and responsibility in preventing osteoporosis among at-risk boomers, while diagnosing and treating those boomers already beset by bone loss.
Bone Health Among Aging Baby Boomers

**RISK FACTORS**

Although only 6.5% of people with low bone mass develop osteoporosis, the rates of osteoporosis are projected to rise through 2020.\(^7\), \(^8\) See Table 1. Because middle-aged baby boomers associate osteoporosis with older people, they may not give this health problem the consideration it merits.

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**Table 1: Projected Prevalence of Osteoporosis**

<table>
<thead>
<tr>
<th>Estimated prevalence of osteoporosis, United States, 2002</th>
<th>3,607.8 per 100,000</th>
</tr>
</thead>
<tbody>
<tr>
<td>Estimated prevalence of osteoporosis, United States, 2010</td>
<td>4,011.8 per 100,000</td>
</tr>
<tr>
<td>Estimated prevalence of osteoporosis, United States, 2030</td>
<td>4,328.1 per 100,000</td>
</tr>
</tbody>
</table>

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**GENDER-RELATED RISK**

Boomer women are in their perimenopausal years; therefore, hormonal effects on bone health are a major consideration. Although the average age at menopause is about 50, it ranges from 45-55. Ovaries may begin to produce reduced amounts of estrogen as early as the mid-30s. As a result, women can begin to lose bone mass long before they experience signs of menopause. During menopause, estrogen levels drastically decrease. Sixty-year-old women will have only about 12% of the estrogen their ovaries were producing at age 35;\(^9\) this dramatic decline of estrogen increases women's risk for osteoporosis.

Because risk for osteoporosis also increases among men age in their 60s,\(^9\) men should evaluate their bone health and prevention strategies. Men do not experience sudden hormonal changes that perimenopausal women do. Nonetheless, men lose bone mass in their 30s and 40s because testosterone decreases, and less new bone is formed. Men have larger bones; therefore, bone loss occurs at a slower rate in men than in women. Men experience osteoporotic fractures, but later in life than do women.\(^9\)

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**CALCIUM DEFICIENCY**

Osteoporosis can begin early for people who do not eat a balanced diet, especially if the diet is low in calcium. Calcium deficiency is a particular problem for people whose heightened body image concerns lead to drastic dieting. Although athletes and those in the performing arts have been shown to have low calcium intake, many teenaged women are also calcium deficient. An increased incidence of eating disorders during the last 25 years affected many baby boomers, particularly women. Disordered eating, amenorrhea, and low bone density are related.\(^9\) The duration and effects of eating disorders in both women and men are long term.\(^9\)

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**OTHER RISK FACTORS**

Although age, gender, and insufficient calcium intake are considered primary risk factors for osteoporosis, there are other risk factors related to lifestyle and heredity. Some of these other risk factors are a) having a small thin frame, b) being Caucasian or Asian, c) having a female family member who had a fracture as an adult, d) experiencing early menopause; e) being postmenopausal, f) taking certain medications such as thyroid and steroids, g) being physically inactive, h) smoking, i) drinking alcohol or caffeinated beverages in excess,\(^1\)\(^2\), \(^1\)\(^3\) and j) lacking sufficient vitamin D. Risk factors especially relevant to boomers are smoking and consuming caffeine and alcohol, which increase calcium excretion. For instance, one 20-ounce commuter cup of a gourmet-brand coffee sipped in morning traffic plus one can of diet cola savored during an afternoon break contain enough caffeine to deplete calcium stores.

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**PREVENTION**

Baby boomers need to understand that osteoporosis and its devastating results, such as pain, stooped posture, and fractures, are not a normal part of the aging process. The primary focus should be on prevention, starting in childhood and continuing through middle age and the later years. The key elements of prevention discussed here include good nutrition, especially foods containing calcium; daily sun exposure and/or increased vitamin D intake; decreased intake of calcium-blocking foods, and performance of an osteoporosis prevention exercise program. Although the two most important components of prevention are nutrition and exercise, estrogen's role in bone health and controversies surrounding hormone replacement therapy (HRT) are also discussed in the following paragraphs.
NUTRITION

Because the body does not make calcium, it is necessary to include this essential mineral in the daily diet. When there is inadequate calcium intake, however, calcium within the bones is used to meet body needs. This process can accentuate bone loss in adults because peak bone mass is reached in the early 30s. The average adult gets 500-800 mg of calcium per day from food sources. Healthy baby boomers (less than 60 years old), who eat a variety of nutritious foods containing sufficient calcium, usually do not need calcium supplements. Even so, baby boomers who are at high risk for developing osteoporosis may find it difficult to consume the recommended 1200-1500 mg. of daily calcium from food alone.

Calcium supplements are needed if adequate calcium cannot be obtained in a well-balanced diet. In healthy middle-aged adults, calcium citrate and calcium carbonate supplements are equally well absorbed when taken with meals. For people who take their supplements between meals or patients with reduced stomach acid, calcium citrate is better absorbed than calcium carbonate because it contains some acid that aids in absorption. Calcium supplements should not be taken with alkaline foods, such as milk or milk products; slightly acidic beverages, such as orange juice, are preferred. Calcium is better absorbed when taken in 500 mg increments (or less) and distributed throughout the day. If eaten in excess, certain foods, can adversely affect calcium absorption. These include caffeine, fiber, oxalates and oxalic acid, protein, and sodium. Calcium can adversely affect iron absorption. Instruct patients to take iron supplements or multi-vitamins containing iron at a time other than their calcium supplements. Table 2 shows benefits and concerns of consuming certain foods with calcium.


Calcium excess can cause achy joints, weakness, depression, kidney stones, ulcerative diseases, and coma. It is important to evaluate the intake of supplements to reduce the likelihood of calcium excess. Foods are the best sources of calcium because they contain other nutrients important to calcium absorption and metabolism. Although men are larger and consume more essential nutrients, the same guidelines are appropriate for men and women. Each person needs to evaluate dietary intake and the need for supplements. Dairy products provide a rich supply of calcium, but they are also high in saturated fat. Table 3 lists nondairy foods that are high in calcium, such as broccoli, collard greens, sardines, and salmon.

Figure 2

Table 2: Foods that Can Adversely Affect Calcium Absorption

<table>
<thead>
<tr>
<th>Food</th>
<th>General Benefit</th>
<th>Concern Related to Calcium Absorption</th>
</tr>
</thead>
<tbody>
<tr>
<td>Caffeine in tea, soda,</td>
<td>Acts as diuretic when over 400 mg of caffeine is</td>
<td>Excessive caffeine increases loss of calcium when intake</td>
</tr>
<tr>
<td>Medications</td>
<td>consumed per day, 400 mg of caffeine is</td>
<td>consumption exceeds 400 mg/day</td>
</tr>
<tr>
<td>Wheat fiber</td>
<td>Increase intestinal peristalsis to keep digestive</td>
<td>Can reduce the time for absorption of calcium within the</td>
</tr>
<tr>
<td></td>
<td>tract moving to prevent constipation and other</td>
<td>gastrointestinal tract</td>
</tr>
<tr>
<td></td>
<td>gastrointestinal problems</td>
<td>Fibers from rice polish calcium to prevent absorption</td>
</tr>
<tr>
<td>Protein</td>
<td>Essential to strong bones</td>
<td>Increase urinary excretion of calcium.</td>
</tr>
<tr>
<td>Sodium</td>
<td>Adequate intake needed for normal fluid/electrolyte</td>
<td>Consumption over 2400 mg/day increases urinary excretion of</td>
</tr>
<tr>
<td></td>
<td>balance</td>
<td>calcium.</td>
</tr>
<tr>
<td>Oxalates/oxalic acid</td>
<td>Compounds found in green leafy vegetables. Benefits</td>
<td>Oxalate and oxalic acid increase with calcium during</td>
</tr>
<tr>
<td></td>
<td>from total nutritional content outweigh potential</td>
<td>digestion, turning into insoluble salts</td>
</tr>
</tbody>
</table>

Adapted from “Patient Information”, Center for
Lactose intolerance can contribute to inadequate calcium intake. Because dairy products contain lactose, people who are lactose intolerant may experience mild to severe gastrointestinal symptoms, such as bloating, cramping, and diarrhea when dairy products are consumed. Several suggestions for dealing with lactose intolerance include: eating other foods along with dairy products, reducing the amount of dairy products consumed at one time, consuming foods that have lactase (a lactose-reducing enzyme) added, consuming over-the-counter lactase prior to the intake of dairy products, consuming lactose-reduced dairy products, and eating foods like yogurt and hard cheeses made with live cultures that have less lactose content. Vitamin D aids calcium absorption. Boomer women should consume 400 IU/day. Women with chronically inadequate exposure to sunlight are at increased risk for vitamin D deficiency and may need up to 800 IU/day. Vitamin D exists in the skin as a provitamin and is converted as a result of sun exposure. Safe sun exposure for 10-15 minutes a day when the sun is high can activate the production of vitamin D by the skin. Sun exposure should not be considered a major source of calcium among baby boomers, because it makes only about a third of what the body requires. After age 50, the human body has difficulty absorbing or producing vitamin D. Although sunscreens are desirable, those with a sun protection factor (SPF) of 8 or above block production of vitamin D. Because some cosmetic products contain SPF 15, deficiencies can easily occur. Women taking calcium supplements need vitamin D supplements. The most significant food sources of vitamin D are seafood (e.g., cold saltwater fish like salmon, halibut, tuna, oysters, and shrimp), and some mushrooms. Milk and some brands of juice and cereal are fortified with vitamin D.

EXERCISE
When combined with a healthy diet, exercise helps to maintain bone health. Force exerted on the bones during exercise improves bone strength and calcium absorption. The exercise program identified in Strong Women, Strong Bones combines four different types of exercise to prevent osteoporosis. These include a) weight-bearing aerobic exercises, b) high-impact activities, c) strength training, and d) exercises to improve balance and flexibility. Prior to beginning or intensifying an exercise program, boomers should collaborate with an advanced practice nurse or other health care provider to develop an individualized and appropriate exercise plan. Musculoskeletal and cardiovascular status should be established prior to initiating an exercise program. Weight-bearing aerobic activities (e.g., walking, jogging, stair climbing) create an impact on bones each time feet hit the ground, having a particular benefit on bones of the hip and spine. Attention also needs to be paid to increasing duration and intensity of exercise.

High-impact exercises include activities such as tennis, volleyball, jumping rope, and vertical jumping. Although these exercises improve bone health more quickly because of the increased force they produce on the bones, there is also a greater risk to joints. Middle-aged baby boomers, who have experienced a previous fracture should avoid high-impact exercises.

Muscle strengthening exercises increase the tension they place on the bones, which stimulates bone growth. Stronger muscles provide a stronger stimulation to the bones. Exercises that specifically improve muscle strength for the hip, spine, and arms are important because these are common fracture sites.

Balance training and flexibility exercises do not directly improve bone density. They are important, however, in maintaining balance and improving joint flexibility, both of which help to prevent falls in middle-aged and older adults.

Prevention exercise programs include activities that are enjoyable, can be performed during inclement weather, and fit people's lifestyles. Effective programs consist of a warm-up phase (e.g. stretching), site-specific strengthening exercises, a weight-bearing activity (e.g., walking), and a cool-down of slower intensity and a repeat of flexibility exercises. The prevention program for the healthy individuals should be performed 3-5 times per week. After 12 weeks, duration and frequency of exercise can be increased. No more than one day of exercise or five minutes per workout should be added at a time to avoid injury and muscle soreness.

ESTROGEN
Estrogen is important to bone formation. Bones have special receptors for estrogen, and estrogen is thought to directly affect bone mass by a) suppressing bone-dissolving activity and b) stimulating bone-building cells. Estrogen indirectly
influences bone health by stimulating the production of vitamin D, reducing the excretion of calcium by the kidneys, and increasing the absorption of calcium in the intestines. (4)

A woman's lifetime exposure to estrogen is considered to be a good predictor of bone mass. (4) Women with higher estrogen exposure are more likely to have strong bones. Because of reduced lifetime estrogen exposure, menarche after age 15, menstrual irregularities, and early onset of menopause increase women's risks for developing osteoporosis. All women are at an increased risk for bone loss following menopause, and the risk is even higher if they experience menopause before age 45. Because ovaries continue to produce a reduced amount of estrogen after menopause, the risk is higher if the ovaries have been removed. Lacking data to document decreased risk of fracture associated with estrogen use, “the Food and Drug Administration rescinded the indication of estrogen therapy as a treatment for osteoporosis” in 1999. (15)

Until recently, HRT was believed to aid in preventing osteoporosis, but safer methods, such as calcium, vitamin D, and the bisphosphonates, are now recommended. Because risks and benefits vary for each woman, the decision to commence HRT is an individual decision made by a woman and her health care provider. Advanced practice nurses, however, should operate under the guiding principle that osteoporosis prevention may be a secondary benefit of HRT, but HRT should never be given for primary prevention of osteoporosis. (15)

**DIAGNOSIS AND TREATMENT**

In 2000, life expectancy among baby boomers ranged from 79.6 to 81.4 years, so planning now for bone health with advancing age should be a priority. Although new and improved methods of diagnosis and treatment will become available for baby boomers in the future, specific diagnostic guidelines have not been developed for men. (9, 14)

Researchers recently concluded that the World Health Organization (WHO) definition of osteoporosis in women also applies to men, although the relationship between bone density and fracture rate is different. (3) When diagnosing and treating middle-aged boomers, an advanced practice nurse should assess their osteoporosis risk, screen bone density, prescribe safe medications, and educate at-risk clients.

**ASSESSING OSTEOPOROSIS RISK**

The advanced practice nurse should assess osteoporosis risk factors during the annual physical examination of all adult clients. While documenting a client's health history, the advanced practice nurse can determine osteoporosis risk (e.g. age, previous fractures, other family members who have had a fracture, past and current medications, menstrual history, diet, exercise, smoking, use of alcohol, and back pain). See Table 4 for a summary of risk factors, an explanation of the relationship of each factor to osteoporosis, and preventive strategies. A risk factor screening tool is available from the National Osteoporosis Foundation (NOF). (3) Physical examination and review of systems among aging baby boomers should include height, weight, posture, balance, gait, and evidence of musculoskeletal pain.

**Figure 4**

Table 4: Risk Factors for Osteoporosis, Rationale, and Prevention Strategies
SCREENING BONE DENSITY

The advanced practice nurse should consider ordering bone mineral density (BMD) testing for postmenopausal women less than age 65 who have one or more risk factors. Men should also be considered for BMD testing if they are high risk because of low trauma fractures or medical conditions, such as glucocorticoid excess, alcoholism, and hypogonadism. BMD scores are compared with those of young adults to make a diagnosis of osteoporosis. The most commonly used criterion for defining osteoporosis is BMD “less than 2.5 standard deviations below the young adult normal mean”. Fracture risk increases when the score is several standard deviations below the young adult mean. A BMD score between 1 and 2.5 standard deviations below the young adult normal mean is called osteopenia (decreased bone density related to insufficient bone synthesis to make up for bone decomposition). While Z-scores do not define osteoporosis, they may identify people whose bone densities are less than expected for their chronological age.

Because the predictive power of population-based bone density screening (BDS) is low, routine population-based screening inadvisable. Although a BDS program would prevent one to seven percent of fractures in elderly women, 197 women would need to be screened to prevent one fracture. Estimated annual cost of screening and follow up is $1.1 million.

There are several peripheral screening tests that are noninvasive and inexpensive. These tests usually measure bone density at the distal forearm or heel. To detect changes in the hip or vertebrae, the test most frequently used is the dual energy x-ray absorptiometry (DEXA). The DEXA is also noninvasive; it takes only a few minutes and has a high degree of sensitivity with low radiation exposure.

Paper and pencil questionnaires, such as the Simple Calculated Osteoporosis Risk Estimation (SCORE) and Osteoporosis Risk Assessment Instrument (ORAI), also have high sensitivity for detecting people with low bone mass.

PRESCRIBING SAFE MEDICATIONS

If results of BMD testing show beginning osteoporosis (osteopenia) or more extensive osteoporosis, specific medications may be prescribed. See Table 5. Commonly prescribed medications for low bone mass include the bisphosphonates, such as alendronate sodium (Fosamax) and risendronate (Actonel); calcitonin (Miacalcin); and the selective estrogen receptor modulators (SERMs) such as Evista. There are several medications being studied for the prevention and treatment of osteoporosis. A new medication, teriparatide (Forteo), has recently been approved by the Food and Drug Administration. It increases the action of the osteoblasts, the bone building cells that make bones more dense. Forteo is given daily by injection and has some side effects such as nausea, dizziness, and leg cramps. Risk for serious adverse effects have been witnessed in patients with hypercalemia due to Paget's disease, metastatic bone cancers, and parathyroidism. In laboratory tests, Forteo caused “cancerous bone tumors in rats,” but none were seen.
in the 2000 human subjects in the clinical trials.\(^{(28)}\)

**EDUCATING AT-RISK CLIENTS**

Advanced practice nurses should include educate aging baby boomers about the risk factors and prevention of osteoporosis.\(^{(29, 30)}\) It is important that men and women who possess several risk factors be informed so early diagnosis and treatment be begun. Educational literature can be obtained from the NOF\(^{(7)}\) as well as pharmaceutical distributors. Advanced practice nurses can extend their educational efforts to client family members, because prevention is important at any age. Table 6 shows a selection of internet sources that may be used when educating middle-aged clients and their families.

**Figure 7**

Table 6: Selected Internet Information Sources

<table>
<thead>
<tr>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>Bone Biology for Kids</td>
<td>Educational site for children, grades 4-8, and their parents. Produced and maintained by Susan Ott, MD</td>
</tr>
<tr>
<td>Foundation for Osteoporosis Research and Education</td>
<td>Information for public and providers. Link to electronic newsletter.</td>
</tr>
<tr>
<td>International Osteoporosis Foundation</td>
<td>International organization promoting prevention and treatment of osteoporosis.</td>
</tr>
<tr>
<td>Kidnetic.com</td>
<td>Website provides information about healthy eating and activity to children, aged 9 through 12, and their parents. It is an outreach effort of the International Food Information Council Foundation.</td>
</tr>
<tr>
<td>Milk Matters Calcium Education Campaign</td>
<td>Website for national public health education campaign to help children and adolescents increase calcium consumption. Includes information and materials for parents and professionals to use to promote milk consumption. Youth appropriate posters and coloring book available.</td>
</tr>
<tr>
<td>National Osteoporosis Foundation</td>
<td>Website for public and providers. Has easy to understand fact sheets as well as guidelines for clinicians. Link to electronic newsletter.</td>
</tr>
</tbody>
</table>

**Figure 8**

<table>
<thead>
<tr>
<th>Website</th>
<th>Description</th>
</tr>
</thead>
<tbody>
<tr>
<td>National Women’s Health Information Center</td>
<td>Phone: 800-994-9662, 1-800-994-9662 (TTY) 888-205-5496</td>
</tr>
<tr>
<td>NIH Osteoporosis and Related Bone Diseases–National Resource Center</td>
<td>Phone: (202) 223-0344 or (603) 624-DUNE (686) TTY (202) 466-4315 Fax: (202) 293-2389</td>
</tr>
<tr>
<td>North American Menopause Society</td>
<td>Phone: (440) 443-7550 TTY: (440) 443-7530 Fax: (440) 443-7590</td>
</tr>
<tr>
<td>Osteoporosis and Bone Physiology</td>
<td>Health topics page published August 2000 with general overview of osteoporosis</td>
</tr>
<tr>
<td>Osteoporosis: Progress and Promise</td>
<td>Medical site for public and providers produced and maintained by Susan Ott, MD.</td>
</tr>
<tr>
<td>Powerful Bones, Powerful Guts</td>
<td>The National Bone Health Campaign. Website for midlife national campaign to encourage men and adolescent females to adopt behaviors needed for optimal bone health. Site is suitable for youth and anyone who works with them. Has downloadable Powerful Gift Calendar.</td>
</tr>
<tr>
<td>United States Bone and Joint Decade, NFP (USBJD)</td>
<td>United States website for participation in the global campaign to improve bone and joint health information for public and providers.</td>
</tr>
</tbody>
</table>

Baby boomers with children need to understand that adequate calcium intake during youth is important to develop bone mass and reduce osteoporosis risk in later years. Boomers concerned about the possible complications of osteoporosis in their parents or grandparents need to urge their older relatives to seek appropriate medical care for early diagnosis and treatment. It is never too late to make lifestyle changes to improve bone health.

**CONCLUSION**

Bone health depends most importantly on primary
prevention. Advanced practice nurses need to assess their clients for osteoporosis. Baby boomers currently represent the largest single group needing evaluation for osteoporosis. Boomers may be more at risk for osteoporosis than they think because osteoporosis is a silent disease that may have begun in their youth. Without essential prevention and treatment, it can gradually continue to develop throughout life. Being knowledgeable about risk factors, prevention, diagnosis, and treatment of osteoporosis benefits baby boomers as well as their parents and grandparents. Advanced practice nurses should include teaching that focuses on helping people make substantive behavioral changes in their eating and exercise. Assessing middle-aged baby boomers for osteoporosis should be an integral part of each yearly exam. It is never too late for clients to take steps to improve bone health.

References

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