SUPPLEMENT TO
MANAGED Care

Mobilizing Efforts In Osteoporosis Management

Based on the proceedings of an Academy of Managed Care Pharmacy Satellite Symposium, on April 21, 2005, in Denver

HIGHLIGHTS

- Current and Emerging Treatment Options
- Identification of Patients at High Risk for Fracture
- Implications of the Medicare Modernization Act For Care of Osteoporosis Patients
- Managed Care and Best Practices

QUESTION-AND-ANSWER SESSION:

- Optimizing Treatment of Patients With Osteoporosis

Continuing education credit for physicians and pharmacists sponsored by The Chatham Institute

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INTRODUCTORY MESSAGE

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Evaluating Trends in Osteoporosis

The phrase *if current trends continue* commonly appears in discussions of disease states that threaten to impose heavy burdens on society. Osteoporosis is one such disease. Worldwide, in 1990, there were 1.7 million hip fractures — the most dreaded complication of osteoporosis, owing to the high morbidity and mortality rates associated with it. *If current trends continue*, 6.3 million hip fractures are predicted worldwide by 2050. *If current trends continue,* 40 percent of U.S. white women now ages 50 and above will suffer a fracture of the hip, spine, or wrist. *If current trends continue*, by 2020 nearly 50 percent of Americans ages 50 and above will be at increased risk for osteoporosis of the hip (or will already have it).

In health care, one trend often affects another. Osteoporosis trend lines follow paths that are determined, in part, by population trends because the risk of osteoporosis increases with age. *If current trends continue,* the number of Americans ages 65 and above will more than double by 2050 to 86 million. Included in this cohort will be 20 million of the "oldest old" — people ages 85 and above. Today, these potential osteoporosis patients range in age from 25 to 45. Although past their prime bone-building years, they are not yet candidates for bone density tests or drug therapy. Many should never need these interventions — provided that low-cost preventive strategies are implemented, starting now.

Sound health care policy is directed toward ensuring that negative trends are not allowed to continue unchecked. This supplement is intended to help achieve that end.

The first article is my overview of osteoporosis and the available pharmaceutical agents that improve bone quality. Next, Bruce Ettinger, MD, discusses strategies for identifying the high-risk patients who would most benefit from intervention, and he then presents case studies. Richard G. Stefanacci, DO, MBA, draws on his yearlong experience as a health policy scholar at the Centers for Medicare and Medicaid Services to explain the implications of the new Medicare pharmacy benefit program (Part D) for osteoporosis. In the last article, Terry Maves, RPh, offers suggestions for health plans that seek to craft programs to improve management of challenging conditions such as osteoporosis.

Heading off an epidemic of osteoporotic fractures is but one of many challenges facing MCOs, so techniques to allocate scarce health care resources in a wise manner are sorely needed. We hope this material enhances your understanding of osteoporosis so that unfavorable current trends cease. Please take advantage of the continuing education opportunity that is being offered through this publication, which is sponsored by The Chatham Institute.

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Mobilizing Efforts in Osteoporosis Management

A CONTINUING EDUCATION ACTIVITY

Based on the proceedings of an Academy of Managed Care Pharmacy Satellite Symposium, on April 21, 2005, in Denver

This supplement is supported by an educational grant from GlaxoSmithKline and Roche Pharmaceuticals. The material in this supplement has been independently peer reviewed. The grantor played no role in reviewer selection.

SELF-STUDY CONTINUING EDUCATION ACTIVITY

MOBILIZING EFFORTS IN OSTEOPOROSIS MANAGEMENT

Continuing education credit is offered to physicians and pharmacists who read pages 3 through 23 of this publication, complete the post-test on page 25, and submit the evaluation form on page 24. Estimated time to complete this activity is 2 hours.

Target audiences

Medical directors, pharmacy directors, clinical pharmacists, and other targeted personnel in the managed care and pharmacy benefit management sectors.

PURPOSE AND OVERVIEW

In the past 15 years, great scientific strides have been made in the area of bone health and osteoporosis. Yet, due to a lack of awareness and failure to use evidence-based recommendations, bone health remains a growing public health concern. Estimates hold that in 2020, 1 in 2 Americans over age 50 will have osteoporosis or will be at high risk of developing the disease. The potential impact on health care led to the first Surgeon General's Report on bone health and osteoporosis in late 2004.

This publication seeks to educate managed care professionals on osteoporosis and its implications for health care professionals, patients, their caregivers, and managed care providers. Expert authors provide a comprehensive overview of current and emerging disease management tools and techniques, and offer a look at the implications of the Medicare Modernization Act and the new HEDIS measurement for management of osteoporosis. Recent information from the Surgeon General's Report also is highlighted.

Educational objectives

After reading this publication, participants should be able to:

- Describe the burden of the disease, risk factors for fracture, and strategies that reduce that risk
- Discuss expected effects of the Medicare Modernization Act and HEDIS on access to osteoporosis care
- Calculate fracture risk using simple models and risk data for management decisions
- Explain the value of enhanced adherence to osteoporosis therapies

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Current Trends in Osteoporosis

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The definition of osteoporosis is malleable, reflecting frequent changes in our understanding of its complexities. A National Institutes of Health consensus development panel recently described osteoporosis as "a skeletal disorder characterized by compromised bone strength predisposing a person to an increased risk of fracture." Bone strength primarily reflects the integration of bone quality and bone density (NIH 2001).

This definition underscores the notion that resistance to fracture depends on more than bone mineral density (BMD). The added factor is embraced by the concept of bone quality. Aside from overall loss of mass, degraded bone quality may be characterized, for example, by loss of trabecular connectivity or by a change from platelike structures in normal trabecular bone to more rodlike structures in osteoporotic bone. The goal of therapy for patients at risk of a fragility fracture is to prevent the occurrence of the initial fracture — which, far too often, is the first sign of osteoporosis — or subsequent fractures in patients with a history of fragility fracture. This article briefly reviews the disease burden presented by osteoporosis and highlights the leading pharmaceutical agents available to improve bone quality.

Epidemiology of osteoporosis

About 1.5 million osteoporotic fractures occur in the United States each year (Riggs 1995). According to the U.S. Surgeon General's 2004 report on bone health and osteoporosis, these fractures are associated with direct medical costs estimated to be as high as $18 billion (HHS 2004). A recent analysis of medical and disability claims data compiled by seven large employers shows that female employees, age 50 to 64, who were treated for osteoporosis incurred annual direct medical costs averaging $6,259 per covered employee — more than twice that of the average direct medical costs for randomly selected age-matched employees (Table 1).

If current trends continue, half of Americans ages 50 and above are predicted to experience an osteoporosis-related fracture during the remainder of their lifetime. Among these, hip fractures are the most serious, being associated with a 24 percent mortality rate in the year following fracture and a 25 percent need for long-term care. Hip fractures account for about 63 percent of direct health care expenditures for osteoporotic fractures. About 50 percent of patients with hip fracture cannot walk without assistance, and 50 percent never regain their prefracture status for activities of daily living (Ray 1997).

Osteoporosis also can lead to height loss and sometimes disfigurement, which is unacceptable at any time in life. Patients with spinal osteoporosis may develop kyphosis (curvature of the spine, sometimes called dowager's hump) owing to compression fractures. As the spine collapses and the upper part of the trunk settles, the abdominal contents are forced outward, resulting in a protuberant lower abdomen not due to obesity. Loss in height is a very sensitive measure of spine collapse (Figure 1, page 4).

Underdiagnosis and undertreatment

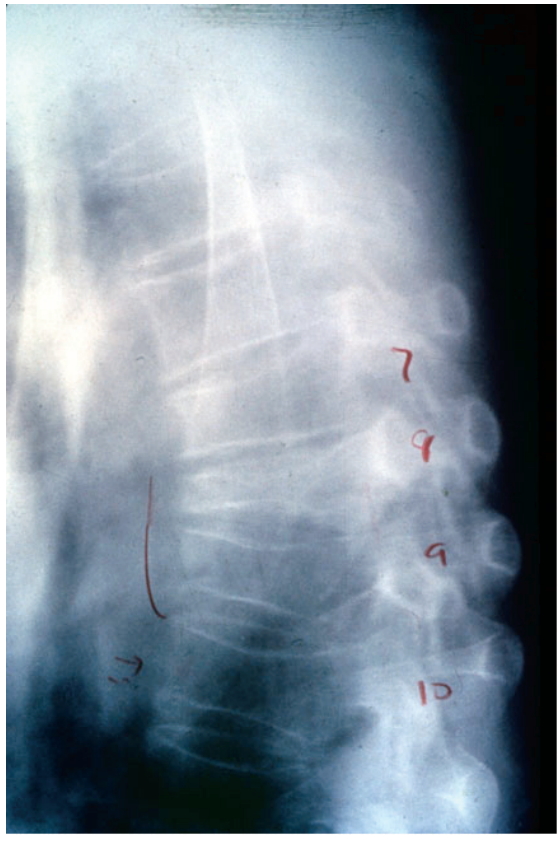
A prevalent fracture is a strong indicator of the risk of future fractures (Melton 1999). Despite this, women with osteoporotic fractures often go undiagnosed and untreated. In a study of Canadian patients treated at community-based fracture clinics for fragility-type fractures, 15 percent of the women (n=96, 83 percent postmenopausal) had undergone bone densitometry prior to their fracture, and only 24 percent had BMD testing performed within 1 year after their fracture (Hajcsar 2000). Within that year, a diagnosis of osteoporosis was made in only 21 percent of these women. Calcium supplements had been prescribed for 35 percent of these patients, and vitamin D supplements for 15 percent. Only 8 percent of these high-risk patients were

TABLE 1 Annual economic burden of chronic illnesses among employed postmenopausal women (per person covered)

	Direct costs ($)	Indirect costs ($)
Osteoporosis (n=2,314)	6,259	4,039
Breast cancer (n=555)	13,925	8,236
Cardiovascular disease (n=1,710)	12,055	4,990
Aged-matched random sample (n=7,575)	2,951	2,292

SOURCE: SASSER 2005

FIGURE 1 Depiction of spine collapse



This X-ray depicts four abnormal vertebrae. The seventh thoracic vertebra (T-7) is wedged slightly; T-8 is severely wedged; and T-9 and T-10 are both compressed. These four abnormal vertebrae may have caused the patient to lose 2.5 inches in height.

SOURCE: RECKER, UNPUBLISHED, USED WITH PERMISSION

taking a bisphosphonate. In this population, the low rate of BMD testing prior to fracture is acceptable, but the low rate of BMD testing postfracture is not, and neither are the low rates of treatment.

Likewise, in a U.S. database of 17,325 elderly patients with hip fracture, rates of osteoporosis treatment were low prior to the fracture, and they remained low afterwards (Figure 2).

Diagnosis of osteoporosis

Too often, fractures are the first sign of osteoporosis. According to the National Osteoporosis Foundation, "The only way to detect osteoporosis before a fracture occurs is through BMD testing." This statement is tautological, however, because osteoporosis is commonly defined in terms of BMD measurements. Results of BMD tests are expressed as T scores or Z scores, which reflect the number of standard deviations (SD) by which the patient's score deviates from the mean BMD recorded in healthy young adults (T score) or the mean BMD in age-matched persons (Z score). Thus, it is possible for a person to have a negative T score (BMD below the mean in healthy young adults) and a positive Z score (BMD above the mean in age-matched peers) (Figure 3). The World Health Organization (WHO) defines osteoporosis as a T score below –2.5. A T score between –1.0 and –2.5 is designated as osteopenia (low bone mass).

A BMD measurement, preferably made by dual-energy X-ray absorptiometry (DXA), is the linchpin for evaluating risk and evaluating treatment. A decrease of 1 SD in BMD, as measured by DXA at the hip or spine, represents a 2.5-fold increase in relative risk of fracture. Few tests in medicine are as predictive of an event as decreased BMD is of osteoporotic fracture.

BMD testing is recommended for postmenopausal women who have had a fracture to determine whether osteoporosis is the underlying cause. In postmenopausal women without a prior fracture, BMD testing is recommended if additional risk factors are present. Among these factors: slight stature, as determined by low weight and body mass index; family history of osteoporosis; smoking; low levels of physical activity; propensity for falling; and corticosteroid use. BMD testing also is recommended if it will facilitate the decision-making process for a woman contemplating drug treatment for osteoporosis.

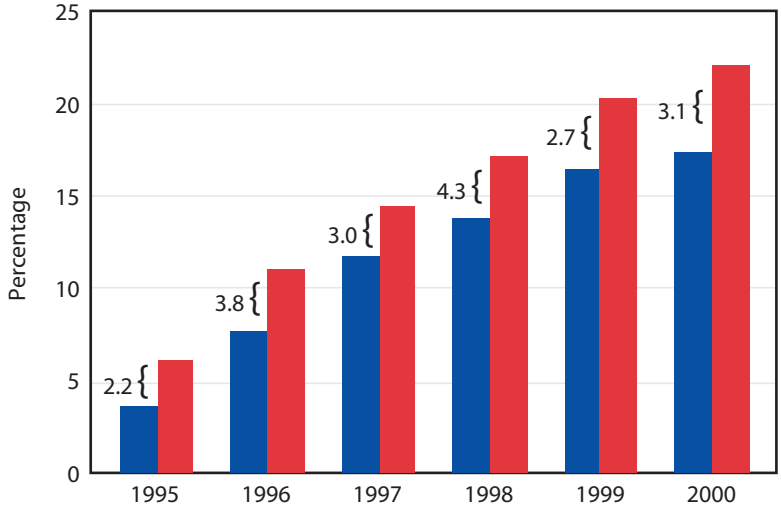
Medicare will cover BMD testing for women identified by their health care provider as estrogen-deficient and at clinical risk for osteoporosis; individuals with vertebral abnormalities; individuals receiving long-term glucocorticoid therapy; individuals with excess parathyroid hormone; and individuals being monitored to assess their response to U.S. Food and Drug Administration-approved osteoporosis pharmacotherapy.

BMD testing usually is not indicated for perimenopausal women unless they have at least one additional risk factor, but for all women ages 65 and above, BMD testing is recommended regardless of the presence of additional risk factors.

This recommendation follows from changes in whole-body bone mineral content observed during the 6-year period surrounding the last menstrual period. Bone loss owing to estrogen deprivation begins about 2 years prior to the last menses and is completed 4 years later (Figure 4, page 6). After 6 years, bone loss ranges from about 6 percent of the hip to about 12 percent of the total body. During this time, the loss of bone equals about one T score at each site measured. Thus, if a woman's T score is –1.5 at

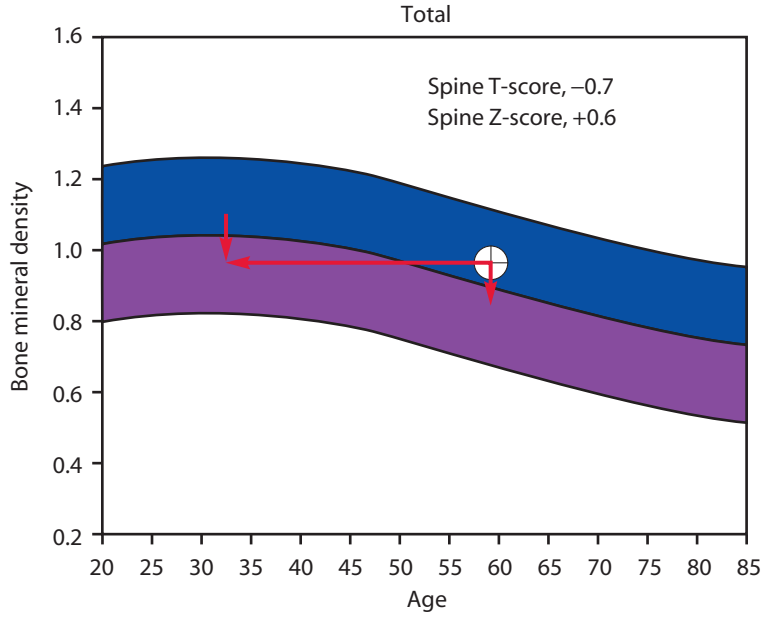
FIGURE 2 Osteoporosis treatment before and after hip fracture

17,325 hip fracture patients in the PennPharmaceutical Assistance Contract for the elderly



SOURCE: SOLOMON 2003, USED WITH PERMISSION

FIGURE 3 Bone mass measurement: 60-year-old patient



Because of the different reference groups used to compute T and Z scores, it is possible for a patient to have a negative T score (reference group is healthy young adults) but a positive Z score (reference group is age-matched peers), as with this 60-year-old patient.

SOURCE: RECKER, UNPUBLISHED, USED WITH PERMISSION

baseline, by the time she finishes menopause (without intervention) her T score will be –2.5 — which is the WHO definition for osteoporosis.

Therapy for osteoporosis

If naturally occurring estrogen deprivation is a leading cause of osteoporosis, hormone replacement therapy (HRT) is a rational therapy to prevent and treat osteoporosis. Yet, because the results of the estrogen plus progestin component of the Women's Health Initiative (WHI) were released, HRT has been viewed with suspicion. This is unfortunate, because the WHI yielded important data about estrogen replacement therapy and fracture risk.

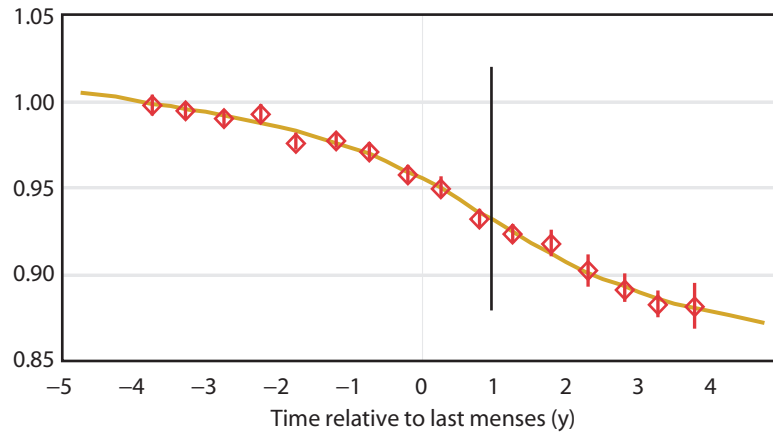
The WHI was conducted primarily to investigate the value of HRT for prevention of coronary heart disease (CHD). It comprised two parallel, randomized double-blind, placebo-controlled trials. One trial randomized women to placebo (n=8,102) or estrogen 0.625 mg/d plus progestin 2.5 mg/d (n=8,506) (Rossouw 2002). The other trial randomized women to placebo (n=5,429) or conjugated equine estrogen (CEE) 0.625 mg/d only (n=5,310) (Anderson 2004).

In 2002, after a mean of 5.2 years of follow-up, the Data and Safety Monitoring Board recommended stopping the estrogen plus progestin trial, because the number of CHD events indicated that continuation would be highly unlikely to show that HRT prevents CHD. In addition, the between-group difference in cases of invasive breast cancer exceeded the predetermined limits, resulting in an unfavorable risk to benefit ratio. In the meantime, the estrogen-only trial continued until it too was prematurely stopped, in 2004. The reason for termination was that, after nearly 7 years of observation, estrogen treatment seemed very unlikely to reduce the risk of CHD while exposing women to the same risk of stroke that was

seen in the estrogen plus progestin trial. Importantly, the event rates per 10,000 person-years of treatment were different among women receiving estrogen plus progestin compared with those receiving estrogen only (Table 2).

In the aggregate, these results suggest that progestin is the agent responsible for many of the adverse events associated with HRT. Notably, in the estrogen-only study, the risks of hip fracture and total osteoporotic fracture were reduced by 39 and 30 percent, respectively, relative to patients receiving placebo. With respect to reduced fracture risk, it is noteworthy (and somewhat ironic) that the reduction in total fracture risk was achieved in a population that was not selected because of its high risk of fracture.

FIGURE 4 Change in bone mineral density during menopause



*The vertical line indicates the point at which 50 percent of the menopause-related bone loss has occurred.
SOURCE: RECKER 2000, USED WITH PERMISSION

In a placebo-controlled trial, my colleagues and I demonstrated the bone-sparing effects of low-dose HRT (CEE 0.3 mg/d and medroxyprogesterone 2.5 mg/d) used in conjunction with calcium and vitamin D supplements in a population of white women ages 65 and above with low BMD (Recker 1999). In the intent-to-treat group, spinal BMD increased by 3.2 percent after 3.5 years of observation; in patients who were at least 90 percent adherent to therapy, spinal BMD increased by 5.2 percent. These results are comparable to those reported in women receiving CEE greater than or equal to 0.625 mg. Low-dose estrogen is as effective as CEE 0.625 mg in controlling hot flashes (Utian 2001). These results also suggest that, whether being treated for osteoporosis or the control of menopausal symptoms, women receiving HRT have been overdosed for years. Yet it is unlikely that HRT ever will regain the prominent role it once enjoyed as a treatment for osteoporosis, owing to not only doubts about its safety among patients and clinicians, but also to the emergence of new treatments. The most recent statement from the U.S. Preventive Services Task Force, which incorporates the results of both WHI trials, concludes that whether combined estrogen-progestin therapy or unopposed estrogen therapy is employed, the risks are likely to exceed the benefits of chronic disease prevention (USPSTF 2005).

TABLE 2 Excess risk per 10,000 person-years of treatment in WHI

	Estrogen + progestin[1] (vs. placebo)	Estrogen only[2] (vs. placebo)
Total CVD events	25 more	24 more (*P*=.02)
CHD events	7 more (*P*=.05)	0 more
Strokes	8 more	12 more (*P*=.007)
Venous thromboembolism	18 more	7 more
Deep vein thrombosis	13 more	6 more (*P*=.03)
Pulmonary embolism	8 more	3 more
Total cancer	3 more	7 fewer
Invasive breast cancers	8 more	7 fewer (*P*=.06)
Colorectal cancers	6 fewer	0 more
Total osteoporotic fractures	44 fewer	56 fewer (*P*<.001)
Hip fractures	5 fewer	6 fewer (*P*=.01)
Clinical vertebral fractures	6 fewer	6 fewer (*P*=0.2)

CVD=cardiovascular disease, CHD=coronary heart disease, WHI=Women's Health Initiative.
SOURCES: [1]ROSSOUW 2002, [2]ANDERSON 2004

The relatively new selective estrogen receptor modifiers (SERMs), such as raloxifene (Evista), have gained a role in osteoporosis treatment because they reduce the risk of fracture while greatly minimizing the risk of estrogen-positive breast cancers (Cummings 1999). Compared with placebo, raloxifene 120 mg/d reduced the risk of new fractures by 50 percent in postmenopausal women with preexisting fractures (Ettinger 1999).

The first anti-osteoporosis product to be marketed in the United States was Calcitonin, but few clinicians would use it as first-line therapy today, due to concerns

about its efficacy. It is favored, however, for use in nursing homes because of the ease of nasal administration.

The drug class that has become the mainstay of therapy for the prevention and treatment of osteoporosis is the bisphosphonates, of which alendronate (Fosamax) and risedronate (Actonel) were the first and second members, respectively. With alendronate treatment, although the majority of the increase in BMD occurs within the first 24 months, BMD continues to increase out to 84 months. Both alendronate and risedronate have been shown to be efficacious in the treatment of women at high risk for osteoporotic fracture. For example, 3 years of alendronate therapy reduced the risk of hip fracture by 51 percent (P=.047), relative to placebo, in postmenopausal women with low BMD and prior vertebral fractures (Black 1996). Likewise, 1 year of treatment with risedronate 5 mg/d reduced the risk of new vertebral fractures by 68 percent among patients with 2 or more prior vertebral fractures at baseline (Watts 2003). A review of clinical trials of risedronate shows relative risk of vertebral and nonvertebral fractures in postmenopausal women was reduced by about 40 percent, as was risk of hip fracture in older women (Recker 2005).

On the basis of bridging studies, all the bisphosphonates have moved from once daily to longer dosing intervals. Alendronate was introduced as a once-daily product, but a once-weekly formulation now accounts for most of its usage. In postmenopausal women with osteoporosis, it has been shown that alendronate 70 mg once weekly is the therapeutic equivalent of alendronate 10 mg once daily (Schnitzer 2000). Risedronate also is available in a once-weekly formulation, 35 mg, which has been shown to be the therapeutic equivalent in postmenopausal women of once-daily risedronate 5 mg (Actonel 2004).

The reason for the trend away from once-daily bisphosphonates is that the administration requirements for any bisphosphonate are somewhat taxing: the patient must take the drug on an empty stomach, first thing in the morning, with plain water only, and must remain in an upright position for at least 30 minutes (60 minutes for ibandronate [Boniva]). Any food or beverage other than water greatly reduces the drug's bioavailability, and a reclining posture increases the risk of gastroesophageal irritation. For these reasons, the newest bisphosphonate to be marketed, ibandronate 150 mg, may gain adherents because it needs to be taken just once a month. (Once-daily ibandronate was approved by the FDA in 2003 but was not marketed until 2005.) Ibandronate 2.5 mg was approved for daily treatment and prevention of osteoporosis on the basis of studies showing that, over the course of 3 years, it reduced the risk of new vertebral fractures in postmenopausal women with osteoporosis and increased BMD in postmenopausal women who did not have osteoporosis. The approval of ibandronate 150 mg for once-monthly use was based on results from a non-inferiority trial enrolling 1,602 women with postmenopausal osteoporosis, which showed that after 1 year the monthly dose was at least equivalent to the daily dose in increasing BMD at the lumbar spine and other skeletal sites (Miller 2004).

Another new treatment is teriparatide (Forteo), which is indicated for treatment of postmenopausal women at high risk of fracture or men with primary or hypogonadal osteoporosis, also at high risk of fracture. Compared with placebo, teriparatide reduces the risk of new vertebral fractures by 65 percent in postmenopausal women at high risk of fracture (Neer 2001).

Whereas the bisphosphonates act primarily by inhibiting bone resorption through suppression of osteoclast activity, teriparatide promotes formation of new bone through preferential stimulation of osteoblasts. Manufactured by means of recombinant DNA technology, teriparatide consists of the first 34 amino acids in human parathyroid hormone. It is administered once daily, in a dose of 20 mcg, via subcutaneous injection. In my clinical experience, the injections (into the thigh or abdominal wall) are well tolerated.

Whether a drug regimen for the prevention and treatment of osteoporotic fracture involves a bisphosphonate, SERM, HRT, or parathyroid hormone, its foundation is supplementary calcium and vitamin D. A small study suggests that these supplements alone may reduce the risk of a first nonvertebral fracture by 60 percent among essentially healthy older (ages ≥65 years) community-dwelling men and women (Dawson-Hughes 1997). Not surprisingly, in populations at higher risk for osteoporotic fracture (i.e., elderly patients with a history of fracture or other risk factors besides age) these supplements by themselves appear to be insufficient for reducing fracture risk (Grant 2005, Porthouse 2005). Supplements should be used in conjunction with increased physical activity — the chief benefits of which are improved neuromuscular function, which reduces the risk of falling, and greater muscle tone, which provides greater skeletal protection in the event of a fall.

Conclusion

Osteoporosis has important physical, emotional, and financial consequences. Too often, the first sign of osteoporosis is a fragility fracture. By identifying patients at high fracture risk, it is possible to diagnosis osteoporosis and provide intervention before a fracture occurs. Calcium and vitamin D supplements, complemented by increased physical activity, are the foundation of therapy, but many patients may require the addition of a drug to reduce their risk of fracture. The availability of once-weekly and once-monthly bisphosphonates offers the likelihood of increased compliance with bisphosphonate therapy, and raloxifene and teriparatide expand the options available to both patients and physicians.

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Appropriate Intervention Through Fracture Risk Assessment

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When deciding whether a patient should receive drug therapy to reduce the risk of osteoporotic fracture, the decision-making process should embrace more than bone mineral density (BMD) measurements alone. This article discusses the value of a comprehensive approach to fracture risk assessment to identify patients for whom drug therapy is warranted because their risk of fracture is high, as well as patients for whom drug therapy would be inappropriate because their risk of fracture is low. In this manner, scarce health care resources can be directed toward patients whose absolute risk of fracture is highest, regardless of their BMD measurements.

Various models of the risk of osteoporotic fracture that have been developed by the National Osteoporosis Foundation and other organizations contain four independent risk factors: thinness, smoking, personal history of fracture, and family history of fracture (mother or sister for a woman, father or brother for a man). Use of high-dose corticosteroids or excessive alcohol consumption also are recognized risk factors for osteoporotic fracture, but in the generally healthy population they do not play a contributing role.

The clinical risk factors complement BMD measurement. BMD is reported in two ways: as a T score or Z score, in terms of standard deviations (SD) away from the mean. For women, the T score compares a woman's BMD to the mean BMD for healthy young women, while a Z score compares a woman's BMD to the mean for age-matched women. Each decrease of 1 SD in BMD approximates a loss of about 10 percent of total BMD and an increase in fracture risk of 50 to 100 percent (Kulak 1999). According to the World Health Organization, a woman whose T score is –2.5 or less is defined as osteoporotic, and a woman whose T score is between –2.5 and –1.0 is defined as osteopenic.

The current gold standard for BMD measurement is dual-energy X-ray absorptiometry (DXA) of the lumbar spine or total hip. The American Association of Clinical Endocrinologists recommends using the lower measurement from either of the two sites (Hodgson 2001), because women in their 50s, or women using corticosteroids, tend to lose BMD to a greater extent at the spine than the hip, whereas in older patients, spinal calcification due to osteoarthritis confounds BMD measurement.

One recent model of fracture risk, which was validated in women above age 70, is based on a large epidemiologic study that followed women who were 65 years old and above for about 20 years (Black 2001). In addition to the four risk factors mentioned, this model incorporated the total hip BMD T score, age, and propensity for falling. (For women in their 50s and 60s, falling tendency rarely plays a role in fracture risk, but for women in their 70s and 80s, it is a critical risk factor. The propensity to fall can be assessed by asking a woman to sit in a chair and fold her arms across her chest, and then to try to arise from the chair without using her hands.)

In this particular model, a patient's risk is scored based on the following: 1 point each for smoking, weight under 125 lb., fracture since age 50, mother with a hip fracture, or every 5 years of age beyond age 65 (to a maximum of 5 points); 2 points for needing hands to arise from chair, or T score below –1.0; 3 points for T score below –2.0; and 4 points for T score below –2.5. A total score of 8 or more predicts a 20 percent or greater risk of any nonvertebral fracture over the course of 5 years.

More recently, another model was based on a cohort of postmenopausal women (age range, 50–99 years; mean, 67) in the National Osteoporosis Risk Assessment (NORA) (Miller 2004). This model incorporated data for 57,421 white women whose baseline T scores (for heel, hand, or forearm) were between –2.5 and –1.0 and who were followed for 1 year for osteoporotic fractures of the hip, spine, ribs, and wrist, or forearm. In this cohort, the overall fracture rate was 2.0 percent, and in each 10-year age group elevated risk of fracture was predicted by any 1 of 4 risk factors: prior fracture, poor health, poor mobility, or a T score below –1.83.

In the Kaiser Permanente Medical Care Program, Northern California Region, we recently used fracture incidence from the inpatient and outpatient databases to develop a simple computer model (Excel 97 spreadsheet) to calculate a woman's age-based, 5-year risk of osteoporotic fracture (Ettinger 2005). The databases included 14,528 fracture events (including 3,412 hip fractures) among 400,000 women health plan members, age 45 to

75, who were followed between 1996 and 2000. This population was 70 percent white, 13.5 percent Asian, 8 percent Latino or Hispanic, and 7.5 percent black. Relying on the medical literature, our model assigned a relative risk to the following risk factors: thinness (body mass index [BMI] <21), smoking, family history of hip fracture (mother or sister), prior nonspinal fracture after age 50, number of prior spinal fractures, and the lower of the spinal and hip BMD Z scores.

The usefulness of a comprehensive approach to risk assessment can be illustrated by considering three case studies (Ettinger 2005). The risk factors for each patient are provided in Table 1.

TABLE 1 Candidates for osteoporosis drug therapy?

	Case 1	Case 2	Case 3
Age (y)	53	67	75
Height (in.)	62	62	62
Weight (lb.)	116	127	135
Body mass index	21	23	25
Smoker?	No	No	No
Nonspinal fractures?	No	Yes	Yes
Spinal fractures (number)	0	1	3
Sister hip fracture?	No	No	No
Mother hip fracture?	Yes	No	No
Hip — bone mineral density			
T score	–1.0	–2.5	–3.3
Z score	–0.5	–0.7	–1.5
Spine — bone mineral density			
T score	–1.6	–2.0	–3.4
Z score	–0.8	–0.9	–0.8

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Case 1 is a 53-year-old woman who stopped hormone replacement therapy 2 years ago. Her BMI shows that she is a thin person, and she has a family history of fracture, as her mother fractured her hip. Her BMD is at about the 16th percentile for a normal young population, just slightly below average for her age.

Case 2 is a 67-year-old woman who has lost 2 inches in height and fractured her wrist 4 years ago. She also has early wedging of the twelfth thoracic vertebra (T-12). Along with the adjacent first lumbar vertebra (L-1), T-12 often is the site where osteoporotic changes to the spine first become evident. That occurs because the thoracic spine can move considerably, whereas the lumbar spine is stationary, creating an opportunity for deforming forces to be greatest on vertebrae at the junction of the thoracic and lumbar spine. Although this woman's BMD T score at the hip is at the threshold for osteoporosis, she is not too different from her peers, as her BMD is slightly below average for women of her age.

Case 3 is a 75-year-old woman who is frail and frequently falls and has a history of multiple fractures, including a humeral fracture. Like a hip fracture, a fracture of the humerus is a very significant indicator of frailty and osteoporosis. At this age, hip and humeral fractures are more common than wrist fractures, owing to different kinds of falls and different kinds of trauma. Her BMD is in the fairly severe low range, and it is about 15 percent below the average for women of her age. This woman obviously has severe osteoporosis.

Because of their varying risk factors, these women vary markedly in their estimated risk for sustaining an osteoporotic fracture during the next 5 years (Table 2). The 53-year-old woman has a 1 in 1000 chance of having a hip fracture, reflecting the rarity of hip fracture in women of this age, and a 1 in 250 chance of a clinical spinal fracture. At her age, a wrist fracture is most common, but her risk for even that fracture still is fairly low, 1 in 50.

Compared with the 53-year-old woman, the 67-year-old woman is at a substantially higher risk of fracture, in part because she is older: every 7 to 8 years of added age represents a doubling of fracture risk. But other risk factors come into play, namely her history of spinal and nonspinal fractures. Her 5-year risk of hip fracture is about 1 in 30, and her risk of a clinically troubling spinal fracture is about 1 in 8.

For the 75-year-old woman, the risks of sustaining additional fractures during the next 5 years are extremely high: a 1 in 11 chance of a hip fracture and a 1 in 4 chance of either a spinal or peripheral fracture.

Application to therapeutic decision making

Knowing the 5-year fracture risk faced by a patient allows us to apply findings from clinical trials to estimate the risk reduction that might be achieved with drug therapy, and then to calculate the number needed to treat (NNT) as well as the cost per fracture avoided. The NNT is the number of patients who need to be treated to prevent one clinical event during a given period of time. For example, if the 5-year risk of hip fracture in a certain population is 10 percent, then 10 women out of 100 in this population can be expected to have a hip fracture over the course of 5 years. If drug therapy were known to reduce the risk of hip fracture by 50 percent in this population, 20 women would need to be treated for 5 years to prevent one hip fracture. (The NNT is simply the reciprocal of the difference between the absolute risk without treatment and the absolute risk with treatment. In this example, $1/(0.10 - 0.05)=20$.)

In general, antiresorptive therapies reduce the risk of fracture to about the same degree, although they have dif-

TABLE 2 Risk for sustaining osteoporotic fracture: 5-year expectations

	Case 1	Case 2	Case 3
Spinal fracture, absolute risk	0.4%	11.7%	29.7%
Relative risk reduction expected from treatment	45%	45%	45%
Absolute risk after treatment	0.2%	6.4%	0.1%
NNT	602	19	7
Nonspinal fracture (hip, wrist, or humerus)	2.0%	13.5%	27.0%
Relative risk reduction expected from treatment	15%	30%	45%
Absolute risk after treatment	1.7%	9.4%	14.9%
NNT	361	25	7
Hip fracture, absolute risk	0.1%	2.8%	9.3%
Relative risk reduction expected from treatment	15%	30%	45%
Absolute risk after treatment	0.1%	2.0%	5.1%
NNT	6,332	118	20

NNT=Number needed to treat.
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ferent effects on vertebral fractures than on nonvertebral fractures. This occurs because the spine is more metabolically active and has more surface area than long bones, and thus responds better to antiresorptive drugs. With agents like alendronate, risedronate, and raloxifene, the relative risk of vertebral fracture is reduced by about 40 to 45 percent over 3 years, regardless of whether a woman has a history of spinal fracture.

With nonvertebral fractures, relative risk reduction from drug therapy tends to be less than that seen with vertebral fractures. The more serious the osteoporosis, however, the greater the relative risk reduction that is achieved with drug treatment. This accounts for the differences seen among clinical trials: if the osteoporosis in the study population is not severe, effects on the spine will be similar, but effects in peripheral bone may be quite different. Likewise, the lower the BMD, the greater the risk reduction is with treatment (Cummings 1998). In some instances, bisphosphonates have shown no statistically significant effect on clinical fractures, but subgroup analysis has shown good effects among subjects with very low BMD.

For our risk-assessment model, we assumed that treatment reduces the relative risk of spinal fracture by 45 percent at any T score, and that treatment reduces the relative risk of nonspinal fracture by 45 percent if the T score is below –2.5, by 30 percent if it is between –2.0 and –2.5, and by 15 percent if it is greater than –2.0.

When these percentages are applied to the case studies (Table 2), it becomes apparent that for patients resembling the 53-year-old woman with osteopenia, the NNTs are extremely high. In contrast, because the second patient has a higher baseline risk, the NNTs are much more reasonable. For the third patient, who has severe osteoporosis, the NNTs are quite low.

In populations resembling the osteopenic woman (Case 1), the cost per fracture avoided is about $800,000. This calculation assumes that treating 602 women for 5 years incurs drug costs of $800 per patient per year and avoids one spine and two nonspinal fractures in the group. In populations resembling the 67-year-old woman (Case 2), treating 19 women for 5 years averts one spine and one nonspinal fracture, reducing the cost per fracture avoided to $38,000. In populations resembling the 75-year-old woman (Case 3), treating seven patients for 5 years averts one spine and one nonspinal fracture, reducing the cost per fracture averted still further, to an extremely reasonable $14,000.

Cost per quality-adjusted life-year (QALY) is another measure of the cost-effectiveness of therapy. A recent study has shown that in osteopenic postmenopausal white women with no additional risk factors, alendronate is not cost-effective (Schousboe 2005). In this population, the cost per QALY gained (based on years spent in the no-fracture state) via 5 years of alendronate therapy (compared with no drug therapy) ranged from $70,000 to $332,000.

Effect on prescribing

In the Kaiser Permanente Medical Care Program, we have found that the presentation of information about NNTs has the potential to alter physicians' prescribing habits. We conducted a survey among physicians who had prescribed alendronate (the formulary's first-line osteoporosis drug) 5 or more times, and ordered 10 or more BMD tests during a 2-year period (Ettinger 2005). We first presented them with three case studies that were similar to those just described, omitting information about absolute risk and NNT, and we asked them to indicate the likelihood of prescribing alendronate for each

patient, using a Likert scale of 0 to 100. A few weeks later, we provided them with essentially the same clinical profiles — this time adding information about absolute risk and NNT, and again we asked them to indicate their likelihood of prescribing alendronate in each case.

When the information about 5-year absolute risk and NNT was not provided, 26 percent of the respondents indicated a high likelihood (70 percent or more) of prescribing alendronate for the young woman with osteopenia. When the physicians were given the information about 5-year absolute risk and NNT, however, the percentage of those highly likely to prescribe alendronate for such a patient fell to 13 percent. Providing the additional information did not alter the percentage of physicians who said that they were highly likely to prescribe alendronate for the 67-year-old woman (91 percent with the additional information, 92 percent without) or the 75-year-old woman (99 percent with, 100 percent without).

Conclusion

A BMD report indicating that a patient has osteopenia sounds alarming to many patients and clinicians. On the basis of such a report, the clinician may recommend that a patient start drug treatment to reduce the risk of osteoporotic fracture. Nevertheless, if an assessment of multiple risk factors shows that the patient's 5-year risk of osteoporotic fracture actually is low (despite the finding of osteopenia), then pharmacotherapy would be inappropriate and would represent a squandering of scarce health care resources. By reducing the inappropriate prescribing of osteoporosis drugs for young, low-risk patients, more money can be allocated for their utilization in the older population where the risk of fracture is much higher and where drugs have been shown to be extremely effective in reducing risk.

Risk-assessment tools for osteoporosis would enhance discussions between physicians and patients. If a woman has an ominous-sounding diagnosis of osteopenia but only a 1 in 500 chance of fracture during the next 5 years, her fears can be allayed. She can live comfortably with that level of risk and then have her risk reassessed in 3 to 5 years. Hence, a simple-to-use tool for calculating fracture risk has the potential to be useful in any clinical situation where a discussion of the desirability of drug therapy to reduce fracture risk arises.

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Implications of the Medicare Modernization Act for the Treatment of Osteoporosis

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The Medicare Prescription Drug, Improvement, and Modernization Act of 2003, more commonly known as the Medicare Modernization Act (MMA), provides a prescription drug benefit program (Part D) starting Jan. 1, 2006. Through Medicare Part D, seniors will have greater access to medications such as those used to treat osteoporosis. This article will describe the MMA pharmacy benefit and discuss its implications for prescription drug plans serving enrollees, for whom drug therapy for prevention or treatment of osteoporosis is a concern.

Some 41 million people will be eligible to enroll in the new Part D pharmacy benefit — anyone entitled to Medicare Part A (hospital insurance) or enrolled in Part B (medical insurance). The Part D benefit will be administered through a private prescription drug plan (PDP), of which, currently, there are three types: a fee-for-service prescription drug plan (FFS-PDP) for patients who opt to stay in fee-for-service Medicare; a Medicare Advantage plan (formerly known as a Medicare Plus Choice or Medicare Managed Care Plan); and a fallback plan supported by the Centers for Medicare and Medicaid Services (CMS).

Every Medicare beneficiary will have access to at least two plans, one of which must be an FFS-PDP. If a region lacks at least two plans, CMS is prepared to underwrite the establishment of a fallback plan. Nonetheless, given that CMS is evaluating applications from about 150 FFS-PDPs and 350 managed care plans — including six that have stated their intention to participate in Part D on a nationwide basis — there will be no need, apparently, to create any fallback plans. CMS has divided the country into 26 regions, and a $10 billion stabilization fund has been established to make sure that every senior has access to one managed care plan.

Title II of the MMA addresses Medicare Advantage plans. Under Section 231, specialized managed care plans also may be offered. Previously, a Medicare managed care plan had to include everyone in a geographic region. Now it can focus on one of three groups: the institutionalized elderly, the dually eligible, or patients with chronic illness. Because of this emphasis, it can be expected that a large percentage of enrollees in the special needs plans will have osteoporosis.

Changes in coverage patterns

The beneficiaries who will enroll in Part D likely obtain their prescription coverage from various sources, but by next January, there will be numerous changes in their coverage patterns (Table 1). For example, dually-eligible patients — those having Medicare and the Medicaid pharmacy benefit — will lose their Medicaid pharmacy benefit on Jan. 1, 2006, and will be enrolled automatically in the new Part D plan. These people still will have the opportunity to voluntarily choose a plan. If they fail to do so, however, the Part D plan will be the one provid-

TABLE 1 Current and future prescription coverage in Medicare population

Type of current coverage	Percent covered	Anticipated changes in 2006
None	38	Level of participation of the currently uninsured is still unknown. CMS will be evaluated based on the reduction of this percentage. Success will be a figure less than 10 percent.
Employer-sponsored	28	Shift to FFS-PDP or managed care plans.
HMO	15	Expected to double to 30 percent.
Medicaid	10	Automatically enrolled in Medicare Part D.
Medigap	7	Shift to FFS-PDP or managed care plans.
State pharmacy-assistance plans	2	Shift to FFS-PDP or managed care plans.

CMS=Centers for Medicare and Medicaid Services, FFS-PDP=fee-for-service prescription drug plan.
SOURCE: LASCHOBER 2002

ing their coverage when their Medicaid pharmacy benefit ends on Dec. 31.

It is likely that about a third of those who currently have an employer-sponsored prescription benefit will lose that benefit. Although employers receive a 28 percent tax subsidy for maintaining the benefit, which amounts to about $700 per retiree, a company enjoys greater financial gain by eliminating the benefit entirely. For example, a company such as General Electric could realize a gain of several billion dollars, along with the shedding of significant administrative burdens. The only retirees likely to continue receiving a pharmacy benefit are those with support from state and federal employee unions or some of the larger labor unions in the private sector.

CMS believes that the percentage of patients covered by HMO plans will double, to 30 percent, in 2006. As for the 38 percent who currently lack coverage, CMS estimates that 94 percent would benefit from enrolling in Medicare Part D. The Kaiser Family Foundation sees a benefit for only 40 percent (KFF 2005). In other words, the number of people currently lacking a pharmacy benefit who will decide to participate in Part D is not known.

As patients move into Part D from other plans of pharmacy coverage, CMS is concerned about ensuring that they make the transition smoothly, such as when the dually eligible lose their Medicaid pharmacy benefit and move into private PDPs. The problem is not new, as it is now encountered whenever a patient moves, for example, from a hospital covered by Part A to a skilled nursing facility, where the pharmacy benefit typically is provided through Medicaid — but the scale is daunting.

CMS has issued a guidance regarding the transitioning process. It asks pharmacy and therapeutics (P&T) committees to develop the transitioning needs of a plan, and it recommends that freestanding plans provide participants with a temporary 1-time fill or a 30-day supply of noncovered medications. For patients in long-term care facilities, the transitioning time frame would be longer, 90 to 180 days, because these residents have been identified as high-risk individuals.

Formulary review

Every Part D formulary must be overseen by a P&T committee. Most of its members must be practicing physicians or pharmacists. At least one physician and one pharmacist must be independent practitioners with expertise in the care of geriatric patients or the disabled. The P&T committee determines the composition of the formulary, but it is left to the discretion of the plan to determine the placement of drugs on tiers and any requirements for prior authorization.

Prescription drug plans that seek to provide pharmacy services through Part D will be subjected to a detailed review of their formularies. The process of evaluating more than 500 formularies in a short period presents a considerable challenge to CMS, considering that it has only 10 pharmacists at its central office and another 10 dispersed regionally. Hence, CMS has contracted with a consulting group that will provide 125 consultant pharmacists to assist with this massive review of formularies.

The CMS formulary review will be guided by six principles:

1. *Key drug types.* Within the United States Pharmacopeia (USP) Model Guidelines, many pharmacological classes are further subdivided into what CMS refers to as "Key Drug Types." CMS believes that commercial best practice includes at least one drug in each of these types, so they will expect to see them in Part D formularies, unless plans present a "reasonable clinical justification." There are about 120 of these key drug types listed. Some of the more prominent are selective serotonin reuptake inhibitors, angiotensin receptor blockers, statins, and estrogen replacement therapy.

2. *Tier placement.* CMS will look at tiers to make sure that certain patient types are not discriminated against in Part D formularies. For example, if a formulary included *all* drugs to treat high-cost illnesses, like those for HIV or cancer, in the highest tier, CMS would view that as discriminatory toward patients who take those drugs, as they are obviously among the higher-cost patients that plans will have.

3. *National treatment guidelines.* CMS holds that drugs that are recognized by widely accepted clinical treatment guidelines generally are covered in best-practice formularies. Therefore, CMS will look at formularies to ensure that adequate access is provided to these drugs.

4. *Coverage of drugs commonly used by Medicare patients.* CMS will use risk-adjustment data to ensure that Part D formularies include drugs that are commonly used by the Medicare population.

5. *A majority of drugs in certain classes.* CMS singled out six classes: antidepressants, antipsychotics, anticonvulsants, antiretrovirals, immunosuppressants, and antineoplastics. They will review formularies to ensure that a majority of drugs in those classes are covered.

6. *Most commonly used drug classes:* CMS released a list of the 40 most commonly used drug classes from Medicare Current Beneficiary Survey data. Many classes did not receive a distinct listing by USP, but are widely used by Medicare patients, such as bisphosphonates, the group of medications used most commonly for the treatment of osteoporosis.

CMS hopes that through enforcement of these six principles, they can assure access to all medically necessary medications for beneficiaries.

Model guidelines

The USP has issued model guidelines that identify146 unique therapeutic categories and pharmacologic classes

TABLE 2 Drugs for parathyroid/metabolic bone disease

Key drug types	Drugs
Bisphosphonates	Alendronate Etidronate Ibandronate Pamidronate Risedronate Tiludronate Zoledronic acid
Calcium-regulating hormones	Calcitonin, salmon Teriparatide
Vitamin D-related agents / metabolic bone disease agents	Doxercalciferol Paricalcitol

SOURCES: CMS 2004, FDA 2005

to help P&T committees construct Part D formularies. The MMA states: a formulary "must include drugs within each therapeutic category and class of covered part D drugs, although not necessarily all drugs within such categories and classes." In guidance for the MMA, CMS "encourage[s] plans to submit formularies similar to those in widespread use today," and it states that "a formulary must include at least two drugs in each approved category and class (unless only one drug is available for a particular category or class)." The guidance notes that this requirement is considered a floor, not an absolute standard. The guidance also states that CMS will check whether a formulary provides appropriate access to drugs addressed in widely accepted national treatment guidelines for osteoporosis. Where a *key drug type* is listed in the model guidelines, as the bisphosphonates are designated, it is CMS's expectation that a formulary will include at least one drug of the type.

Formularies may be tiered, even to the extent of requiring a 100 percent copayment for fourth-tier drugs. Such a designation would not be meaningless, because it would allow expenditures for fourth-tier drugs to qualify as TrOOP (true out-of-pocket expenses). TrOOP refers to the funds counted to move toward the catastrophic benefit. Note that calcium supplements and nonprenatal vitamins are excluded from coverage under Part D. Some plans, however, have stated their intention to use administrative dollars to provide coverage for these medications because their use makes clinical sense.

Injectable and intravenous medications can be covered by either Part B or Part D. Agents provided in a physician's office and administered by the physician or a nurse practitioner can be covered as a Part B benefit. Self-administered injectables that a patient acquires via a prescription filled at a pharmacy would be covered under Part D. Plans will develop strategies to determine whether it makes financial sense to encourage Part B or Part D utilization of agents that can be administered in either setting.

Coverage determination and appeals process

A coverage determination and appeals process (modeled after the Medicare Advantage appeals process) has been established in the event that a physician or patient desires access to a drug that is not on a formulary. When a request for coverage is submitted, a plan has 72 hours to consider a standard request but only 24 hours to make a decision on an expedited request, which would be sought because of medical urgency.

If the plan's initial coverage determination is not favorable, the first level of appeals lets an enrollee request a redetermination, in which case the plan has up to 72 hours to make a decision on an expedited appeal and up to 7 days on a standard appeal. In the event of a second unfavorable determination, the enrollee then may take the appeal to the second level, a request for reconsideration by an Independent Review Entity (IRE). An unfavorable decision by the IRE on a standard appeal may be taken to an administrative law judge, and an unfavorable decision by the judge may be taken to the Medicare Appeals Council (MAC), an entity within the Department of Health and Human Services (HHS). An unfavorable decision by the MAC may be appealed to a federal district court. CMS and Part D plans will provide more information about the coverage determination and appeals processes.

Because of the financial and administrative burdens on plans that support an infrastructure capable of handling expedited requests in 24 hours, some plans probably will find it financially advantageous to provide access to at least 3 days of medication.

The coverage gap

The Part D prescription drug benefits vary according to a beneficiary's annual income (Table 3, page 16). Every enrollee is protected against catastrophic drug expenses, defined as out-of-pocket expenses exceeding $3,600 per year, but the extent of the protection is adjusted by relating the beneficiary's income to the federal poverty level (FPL) established by HHS. The poverty guidelines also are used to determine the monthly premium, yearly deductible, and percentage of co-insurance required before the out-of-pocket limit is reached.

If the patient's annual income is less than 100 percent of the FPL, the copayments are $1 for generic or preferred multiple-source drugs and $3 for all other drugs; if the patient's annual income is less than 135 percent of the FPL, the copayments are $2 and $5, respectively. About

TABLE 3 Summary of Medicare prescription drug benefits

	Monthly premium	Annual deductible	Cost-sharing	Copayments
Standard benefit	About $35	$250	25% up to out-of-pocket limit of $3,600	Once out-of-pocket spending is ≥$3,600, the greater of 5% of the price or $2 for generic/preferred multiple-source drugs, $5 for other drugs
Low-income benefits				
Income 135–150% of HHS poverty guidelines*	Sliding scale from 0% to 100% of standard premium	$50	15% up to out-of-pocket limit	$2 or $5 once the out-of-pocket limit is reached
Income 100–135% of HHS poverty guidelines	None	None	None	$2 or $5 up to the out-of-pocket limit; $0 once out-of-pocket limit is reached
Income <100% of HHS poverty guidelines	None	None	None	$1 or $3 up to the out-of-pocket limit; $0 once out-of-pocket limit is reached; $0 for dual-eligible nursing home residents

*The Department of Health and Human Services (HHS) updates its poverty guidelines annually, publishing them in the *Federal Register* (usually in February), to reflect changes in the Consumer Price Index for the previous calendar year. The 2005 poverty guidelines were published on Feb. 18 and are $9,570 for a one-person family unit and $12,830 for a two-person family unit. (These guidelines apply to the 48 contiguous states and the District of Columbia; amounts are higher in Alaska and Hawaii.) Using the 2005 guidelines, the 150 percent thresholds for one- and two-person family units would be $14,355 and $19,245, respectively; the 135 percent thresholds, $12,920 and $17,320.

SOURCE: CMS 2005

6.3 million people would be eligible for the $1/$3 copayments, 5.8 million for the $2/$5 copayments.

For beneficiaries whose income is between 135 and 150 percent of the poverty guidelines, the benefit design includes a sliding-scale premium, an annual deductible of $50, and 15 percent co-insurance up to the out-of-pocket limit of $3,600. About 1.9 million people fall into this benefit category.

For all others who receive the standard benefit, a monthly premium of about $35 will be charged regardless of whether a person uses the drug benefit. In addition, an annual deductible of $250 will be in effect for 2006. The initial coverage applies to the next $2,000 beyond the deductible. The beneficiary is responsible for 25 percent of that amount, the plan for 75 percent. Because of the monthly premium, the annual deductible, and the patient's responsibility for 25 percent of the first $2,000 beyond the deductible, the point at which it makes financial sense to participate in Medicare Part D is when total annual drug expenditures are expected to exceed around $810, depending on the exact premium.

Under the standard benefit package, if once-yearly drug expenditures exceed $2,250, there is no coverage at all until they reach $5,100; the beneficiary is responsible for 100 percent of the $2,850 in this coverage gap. Once drug expenditures for the calendar year exceed $5,100 (at which point the patient's out-of-pocket expenses would have reached $3,600), the beneficiary is responsible, at most, for just 5 percent of the drug price and the plan for 15 percent, while CMS covers the remaining 80 percent through reinsurance.

In addition to providing reinsurance to cover high-cost patients, CMS also has established "risk corridors" that protect plans. Plans bear 100 percent financial responsibility only for the first 2.5 percent of their estimated expenses. Between 2.5 and 5 percent, plans are responsible for 25 percent,and CMS covers 75 percent; over 5 percent, plans are responsible for 20 percent, and CMS covers 80 percent (hence, the submission of more than 500 applications to CMS to establish Part D formularies).

Because of the $5,100 threshold, if a patient is over or very close to this amount as the end of the calendar year approaches, it would make financial sense for the patient to pay for as many prescriptions as possible during December to take advantage of the 5 percent co-insurance.

The existence of the coverage gap presents an interesting question regarding the behavior of patients being treated for osteoporosis: once patients have reached the point where their out-of-pocket expenses are 100 percent, will they continue to adhere to a therapy that is relatively

expensive on a monthly basis? This may present an opportunity for managed care plans to develop a benefit structure that minimizes the potential for nonadherence when patients fall into the coverage gap.

Another opportunity for plans to optimize medication use is through medication therapy management services (MTMS). The design of MTMS is at the discretion of the plan. Providers of such services may be registered nurses, physicians, nurse practitioners, or consultant pharmacists. Unfortunately, such programs can be officered only to targeted beneficiaries. These are patients meeting three conditions: (1) taking multiple medications, (2) suffering from multiple chronic illnesses, and (3) likely to incur expenditures more than $4,000 per year. A large percentage of patients currently being treated for osteoporosis probably will not satisfy these criteria.

Medicare managed care plans have an incentive to prevent the adverse consequences of untreated or undertreated osteoporosis, because they are financially liable for these expenditures. As a result, managed care plans will provide coverage for disease state management or adherence programs. This is in contrast to PDPs, which are at risk only for medication costs; therefore, they have an incentive toward underutilization of medications such as those used to treat osteoporosis. To counter any temptation by freestanding PDPs to underutilize medications, CMS is developing scoring mechanisms to quantify and monitor appropriate utilization. In the end, it will be all those stakeholders in the health care system that will be responsible for assuring appropriate use of medications.

Conclusion

With the MMA, major changes are looming in the way a large percentage of the elderly U.S. population receives its prescription drugs. Mindful of the gap in coverage that many Part D enrollees will encounter, FFS-PDPs and Medicare Advantage plans will be challenged to structure their benefits in such a way as to meet the medical needs of chronic diseases like osteoporosis.

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The Role of Managed Care In the Management of Osteoporosis

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Many health plans have designed multifaceted programs that improve outcomes and conserve health care resources for high-cost diseases like diabetes, asthma, and heart disease. This article suggests that the same techniques can be applied to osteoporosis management, and concludes with a summary of a program in Pennsylvania that reduced the rate of hip fracture, as well as health care costs, over the course of 5 years.

Touchpoint Healthplan serves 150,000 members in a 16-county area in the northeast corner of Wisconsin. In the mid 1990s, our president gave Touchpoint the ambitious goal of becoming the best health plan in the United States as measured by Health Plan Employer Data and Information Set (HEDIS) standards. Until then, we were an illness-oriented organization that had been paying scant attention to preventive medicine, particularly with regard to chronic disease, and we failed to involve patients in their care. These circumstances led to overutilization of health care resources, increased complications, increased cost, and poor quality of life.

The chief components of our basic strategy for rectifying this situation were to improve patient compliance, improve physicians' performance, and rigorously monitor patients to allow early-stage intervention. As a result, in 2002 and 2003 we were rated the top health plan in the nation on the basis of overall HEDIS performance; in 2004, we ranked second. Specific HEDIS measures in which we ranked first in the nation (among 260 health plans) were nephropathy and HbA_{1c} testing and eye examinations for patients with diabetes, and treatment with beta blockers following a heart attack. We ranked second in pediatric immunization, LDL testing for patients with diabetes, and cholesterol control in patients with diabetes.

The importance of achievements like these is not to enhance our status among our members and peers, but to improve patients' outcomes and reduce costs. In the management of diabetes, it has been shown that every 1 percentage point decrease in HbA_{1c} results in a 35 percent reduction in complications, an 18 percent reduction in heart attack and sudden death, and a 7 percent reduction in all-cause mortality (ADA 2002). Likewise, in patients with coronary artery disease (CAD), a 16 percent reduction in mean LDL-cholesterol translates to a 32 to 48 percent reduction in the risk of major events. Furthermore, patients with documented CAD and elevated LDL levels are 12 times more likely to die of CAD than patients with desirable LDL levels (Gonzalez 1998).

As a result of our effort to make wholesale improvements, the percentage of members with diabetes whose LDL-cholesterol was less than 100 mg/dL increased from 47 percent to 65 percent in a period of 4 years, the percentage with HbA_{1c} levels below 8 percent increased over the course of 5 years from 43 percent to 76 percent, and the percentage receiving eye exams increased over a period of 6 years from 69 percent to 85 percent (falling back from 2 years at 95 percent due to a methodology change). For the entire health plan membership, between 1998 and 2004, the mean HbA_{1c} level decreased by about 1.4 percentage points, from 8.6 to 7.2 percent, and the mean LDL level dropped by 23 percent, from 114 mg/dL to 88 mg/dL.

These improvements were reflected financially. Between 2000 and 2003, inpatient per member per month costs for diabetes declined by 45 percent, from $102 to $56. For CAD during the same period, average PMPM inpatient costs fell by 20 percent, from $92 to $74; total medical costs declined by 22 percent, from $346 to $271.

Improving physician performance

Changes in physician performance were a key factor underlying these results. When we initiated these programs, we found that most of our clinicians were unaware of the level of their own performance, tending to overestimate it. The organization's president, who was regarded as an expert in cholesterol reduction, exemplified this tendency. He was certain that the vast majority of his 48 patients whose LDL goal was less than 100 mg/dL had attained that level, but when he examined his data, he found that only a third of these patients were at goal. He resolved to get more patients to goal, as did other physicians in our health plan.

The way to foster improvement in physician performance is to establish clear expectations, develop clinical programs that incorporate effective interventions, provide clinicians with feedback in the form of comparative data, and reward performance improvement. Components of a performance-improvement program for osteoporosis might address clinical guidelines, provider education, an electronic registry, risk stratification, case management and outreach, clinic support, and performance feedback.

Teaching compliance

The Everybody Teaching Compliance (ETC) Program at Thedacare encompasses 16 disease states. Each disease state is summarized in a handout that can be given to the patient at the point of care by a physician, nurse, or pharmacist and read by the patient in about 1 minute. The handout describes the disease in simple terms, identifies populations at high risk for the disease, and lists specific actions that the patient can take to reduce his or her risk. In the case of osteoporosis, the action items include engaging in regular weight-bearing exercise, walking, or jogging; smoking cessation; moderating alcohol consumption; taking cortisones only if prescribed; maintaining a balanced diet; and ensuring that intake of calcium and vitamin D is adequate. The handout contains a list of calcium-rich foods and delineates the amount of calcium that each provides; it also shows how a person's daily calcium requirements vary with age.

Thus, when patients come to a pharmacy to fill a prescription for a bisphosphonate, the pharmacist can give them the handout and ask whether they are taking calcium with their medication. We have found that as many as a third of patients do not. In that case, the handout serves as a point-of-care teaching tool. If the patient already is taking calcium, the handout acts as reinforcement for that positive behavior. In some pharmacies, after 3 or 4 months of use of these handouts, women began to tell pharmacists that they now knew what their calcium requirements were and no longer needed to be told.

Postmenopausal women constitute the primary audience for the osteoporosis handout, but we also give it to teenagers, the age group that needs that highest amount of calcium on a daily basis to build up bone mass. We specifically target young women filling prescriptions for birth-control pills, asking them whether they know what their daily calcium intake should be. Most do not. Hence, our point-of-service educational activity brought a simple message about osteoporosis prevention to an age group that very much needs to hear this message (especially as the younger generations tend to favor carbonated beverages over milk).

New HEDIS measure

A new HEDIS measure, "Osteoporosis Management in Women Who Had a Fracture," has demonstrated that health plans have considerable room for improving the care provided for members at risk for osteoporosis. The measure, which applies only to Medicare plans, was reported for the first time in 2004 on a voluntary basis by 113 plans, but now is required of all Medicare plans. It considers women who are age 67 or above who suffered a fracture (i.e., high-risk patients) and who then, within the next 6 months, either had a bone mineral density (BMD) test or received a prescription for a drug to prevent or treat osteoporosis.

The mean plan rate for meeting either of these criteria in 2003 was 18 percent, and the 90th percentile score was 26 percent — low, but still more than twice the national average (Andrade 2003). Whether or not they will be submitting data to the National Committee for Quality Assurance, health plans seeking to improve their performance in osteoporosis management are advised to look at the results achieved by the Geisinger Health System.

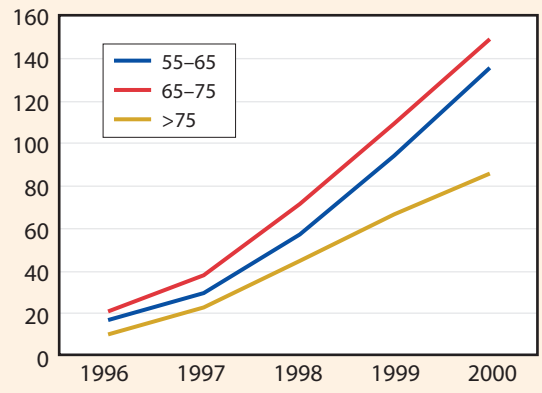
The Geisinger example

The experience of the Geisinger Health System may be illustrative of what can be achieved with a multipronged osteoporosis program. One of the largest rural HMOs in the nation, the system consists of two hospitals, 50 primary care sites, and a health plan serving 300,000 members in 40 counties in central and northeastern Pennsylvania. In 1996, Geisinger developed an osteoporosis program incorporating clinical guidelines; education for physicians, allied health professionals, and patients; and increased access to technology. The guidelines addressed treatment algorithms, diet, secondary causes of osteoporosis, BMD measurement, and medications to prevent or treat osteoporosis (Newman 2000). Geisinger also prepared a continuing medical education activity based on a slide show that was presented during 30 sessions attended by 500 providers over the course of 2 years. The community-education component reached out to community pharmacists and women 50 years of age and above, who were invited to 2-hour sessions. Depending on the severity of their disease, participants received follow-up postcards or phone calls, and in some cases faxes were sent to their physicians.

When the program began in 1996, BMD testing (dual-energy X-ray absorptiometry [DXA] or heel ultrasound) was performed at a rate of 17 per 1,000 person-years, and osteoporosis was diagnosed at an overall rate of 43 per 1,000 person-years among female Geisinger patients whose age exceeded 55 years (ages 55–65, 0.8; ages 65–75, 5.2; ages>75, 24.2) (Newman 2003). In these age groups, alendronate was used by 0.7, 1.6, and 2.1 percent of patients, respectively. The rates of hip fractures per 1,000 person-years were 0.8, 5.2, and 24.2 in the groups ages 55 to 65, 65 to 75, and 75 years and above, respectively.

By 2000, the situation was quite different. First, the rate of BMD testing had increased from 17 to 174 per 1,000 years. Figure 1, on page 20, shows the increase in DXA scans among three age groups. Second, the rate of osteoporosis diagnosis increased dramatically (Figure 2). Third, alendronate utilization increased substantially, especially among women ages 65 and above (Figure 3). Most importantly, statistically significant reductions in the rate of hip fracture were observed in three age groups. Rates fell by 44 percent among 65- to 74-year olds, from 5.0 to 2.8 (P=.011), and by 38 percent among 75- to 84-

FIGURE 1 DXA scans per 1,000 person-years



DXA=dual-energy X-ray absorptiometry.

FIGURE 2 Osteoporosis diagnoses per 1,000 person-years

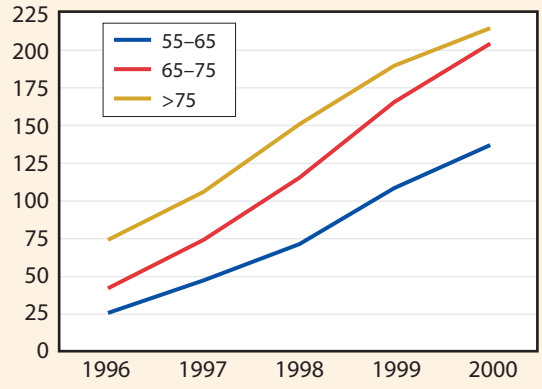
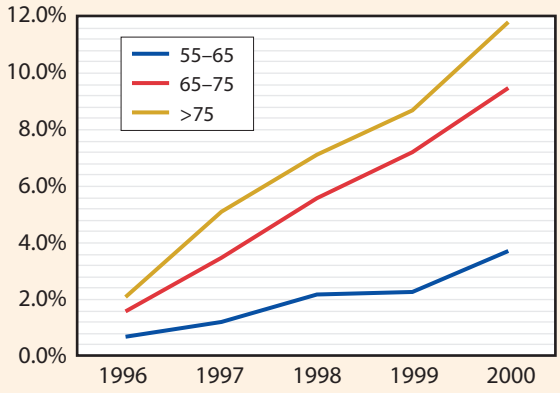


FIGURE 3 Alendronate utilization



SOURCE FOR FIGURES 1–3: NEWMAN 2003

year-olds, from 20.1 to 12.5 (P=.005), and by 38 percent among women ages 85 and above, from 53.5 to 33.4 (P=.005).

Compared with no intervention, it was estimated that the health plan saved about $7.8 million in health care costs over the course of 5 years, mostly owing to decreased incidence of hip fracture. Financial results differed markedly by age group, however. The greatest net savings, $7.2 million, were achieved among patients ages 75 and above. Among patients ages 65 to 75, the net savings amounted to $3.1 million. These results were partially offset by a net loss of $2.4 million in the 55-to-65 age group, due to the low rate of hip fracture in this group (and suggesting that routine BMD testing may not be warranted in this low-risk population). *[Editor's note: See "Appropriate Intervention Through Fracture Risk Assessment," page 9, for a discussion of strategies for identifying patients at high risk of osteoporotic fracture.]*

Conclusion

A new HEDIS measure that addresses prudent management of patients at high risk for osteoporotic fracture gives health plans added incentive to introduce multidisciplinary programs in osteoporosis. These programs may be modeled after existing programs aimed at other disease states or programs with demonstrated achievements in osteoporosis, such as one developed by the Geisinger Health System.

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QUESTION-AND-ANSWER SESSION

Optimizing Treatment Of Osteoporosis Patients

PANELISTS

Robert R. Recker, MD

Bruce Ettinger, MD

Richard Stefanacci, DO, MBA

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HRT AND COMBINATION THERAPY

QUESTION: After the results of the Women's Health Initiative were released, women became fearful and were taken off hormone replacement therapy (HRT). I have seen them lose inches in height. How do you feel about this study and its effects on osteoporosis?

ROBERT R. RECKER, MD: I've also seen this. I'm not sure the population has benefited from the estrogen scare. I offer estrogen therapy to women, carefully reviewing its side effects. If they retain their uterus, they must take progesterone to reduce risk for endometrial cancer. I neither promote estrogen replacement therapy (ERT) nor HRT, nor do I aggressively take people off HRT or ERT. My patients tend to intelligently select the risks they want to take. I help them to understand the risks. A woman who has had a hysterectomy can take estrogen without progesterone; then, her major risk is an increased risk of venous thromboembolic disease.

QUESTION: What about women at high risk of osteoporosis taking osteoporotic drugs along with HRT?

RECKER: It's not unprecedented to use combination therapy, but we don't have much data to support it. Data from Greenspan[1] show similar results to what I showed with raloxifene. I'm now writing up the results of a project showing an added benefit to bone mass when low-dose estrogen is added to a bisphosphonate.

QUESTION: When will MCOs start advocating self-care and physical fitness to prevent osteoporosis?

BRUCE ETTINGER, MD: Patient education is essential as far as what patients can do, short of taking a drug. Good data show that calcium and vitamin D reduce fracture risk in the elderly. Men and women over age 65 have deficient vitamin D activity and calcium absorption, making them prone to bone loss and more fractures. You can reverse that with a modest amount of calcium and vitamin D. Initiating other kinds of programs is more difficult. Of all the muscle-building physical activities, Tai Chi seems most promising for reducing risk of fracture and of falls. It can be relatively easily taught and maintained. Most other programs that build muscle will help with bone building, but those usually require a lot of effort and maintenance.

RISK REDUCTION

QUESTION: Dr. Ettinger, the 35 percent risk reduction figure you used seems low. Most studies of bisphosphonates indicate risk reduction in the neighborhood of 50 percent, which you yourself mentioned earlier.

ETTINGER: The answer to this question, for those who are skeptical, could be called subgroup subterfuge. In every clinical trial I have seen, there has been a major group outcome and then subgroups are looked at, particularly if the overall result is not quite as good as you'd like. Typically, the subgroup analyses show a better response in the patients most severely affected, which seems counterintuitive. In fact, though, the lower the T score, the more vertebral fractures, the better the risk reduction. For vertebral fractures, you get similar results, around a 40 percent reduction; you can select subgroups in all the trials that have done remarkably well, however, with risk reductions of 50 or 60 percent in nonvertebral fractures. On the other hand, the entire study may have shown a nonsignificant effect. You need to be a bit skeptical about subgroup analyses.

QUESTION: If you wait until risk gets high enough to intervene, won't patients experience quite a few fractures that otherwise would have been preventable? For example, in the case of a premenopausal woman with a T score of –1.5, when she goes through meno-

[1] Greenspan SL, Resnick NM, Parker RA. Early changes in biochemical markers of bone turnover are associated with long-term changes in bone mineral density in elderly women on alendronate, hormone replacement therapy, or combination therapy: a three-year, double-blind, placebo-controlled, randomized clinical trial. *J Clin Endocrinol Metab.* 2005;90:2762–2767. Epub 2005 Feb 15.

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pause she will have a T score of the hip or spine of about –2.5. How do you deal with such a person who thinks you won't help her until it's too late?

ETTINGER: Do we want to give statins to everyone at age 40? We know it would reduce their risk of heart disease. It would please the pharmaceutical industry. Yet we know that at age 40, the general population will not be at risk of heart attack for many years. It's only people with dyslipidemia, family history of heart disease, who have a high risk at that age. Osteoporosis treatment is comparable. It's a matter of the limits to MCOs' and patients' bank accounts. To use drugs that cost $800 a year for early prevention when you will not see much effect doesn't make sense. Now, with strategies other than drugs, there is a middle ground. The U.S. Preventive Task Force and National Osteoporosis Foundation and others have said we should start thinking about osteoporosis at age 60 for generally healthy women. At age 65, everyone should be assessed and have a bone density measurement. Those recommendations are appropriate given the yield — finding vertebral deformity. At age 50 hardly anyone has it, and most would be from falling out of a tree as a teenager. At age 65, about 15 percent of women have an asymptomatic vertebral deformity on X-ray. About that same percentage have T scores below –2.5. That's a good yield. It's a matter of seeing what resources you have and using medicine to allow reasonable return on your investment in the next 10 years.

RECKER: What would you say about using lifetime risk rather than 1-, 5-, or 10-year risk?

ETTINGER: I think it's inappropriate and scary. I don't like to say that 1 of 2 women will get osteoporotic fractures, because that hides age-related incidence. Most fractures occur after age 75. The average age for the first vertebral fracture is around 73; hip fracture, 82. So the 50-year-old woman who is told that she has a 50/50 chance in her lifetime of having an osteoporotic fracture is not getting useful information because "in her lifetime" means until she is 85. She needs something more proximate, and the next 10 years provides a reasonable window to think about risk.

ADHERENCE TO THERAPY

QUESTION: I understand that some entitlement programs permit reimbursement of only daily bisphosphonates. Would this also be the case with Medicare Part D?

RICHARD STEFANACCI, DO, MBA: It's more likely that Medicare Advantage Prescription Plans will provide access to a broad range of medications that can reduce Part A and B expenses, because it's in the plans' best interest to do so. Within the bisphosphonate class, many medications are thought to be interchangeable chemically, but as a practicing geriatrician, one big difference I see is in adherence differences based on formulations. If you have a once-monthly medication compared to a once-weekly medication, patients are more likely to be adherent — and, as a result, reduce their fracture risk. Because of this, you will see greater access to a broad range of medications, especially bisphosphonates, among those plans that understand the pharmacoeconomic data.

RECKER: How does frequency of administration of chronic oral drugs affect adherence to therapy? How big an issue is this in osteoporosis, especially for older patients? How will less-frequent dosing of bisphosphonates effect adherence?

TERRY MAVES, RPH: A weekly dose is a step forward in adherence, and a monthly dose certainly sounds like it would be easier. It's a great step forward, provided people remember to do it.

RECKER: I was involved in publishing data on adherence to daily versus to weekly medications, and I found that adherence is better with weekly. One problem is that the once-monthly pill likely will cost about the same as the four once-weekly pills, or 30 once-daily pills. If you lose one, you lose the whole month. I understand that suppliers will have a lost-pill program, so if you drop your pill down the sink, they'll have a way to replace it. Also, they will offer an optional program of telephone, e-mail, or postcard reminders.

STEFANACCI: It will be interesting to see what patients' reactions will be to a $70 pill. We need to think about how we are going to get a positive message out.

ETTINGER: I would like to make a few points about how far we have come and how far we need to go. I'm aware of five persistence studies that have compared oral weekly and daily bisphosphonates. Typically, persistence at the end of 1 year is around 35 percent with daily bisphosphonates and around 50 percent with weekly. At best, half the people are discontinuing. The improvement of weekly over daily is statistically significant, but it's in the order of about 15 percent better. Probably the simplest way to improve adherence is a phone call at the end of the month. Those kinds of simple interventions increase persistence around 70 or 75 percent at the end of the year.

BISPHOSPHONATE FAILURES AND BONE MARKERS

QUESTION: How often do you see patients who are bisphosphonate failures?

RECKER: Well, how do you determine failure? I ask because the best bisphosphonate results provide about a 50 percent reduction in fracture risk. You can't expect a 50 percent reduction in the first 6 weeks of therapy, but if patients have a fracture after 3 years, are they actually in the 50 percent expected to fracture? Or would they have had *two* hip fractures had they not

been on treatment? With an individual patient, I know of no way, including bone density and bone marker measurements, to know what you are dealing with. On the other hand, somebody suffering a fracture that treatment was supposed to prevent isn't usually very happy.

ETTINGER: I like bone markers for assessing response. Bone turnover is the best immediate measure of the drug's effect. I don't use the markers initially, but rather if I have a patient whose BMD measurements have not changed or whom I suspect isn't taking the drug. All of the antiresorptive drugs reduce bone turnover, which should be in the lower half of the premenopausal range. There are many problems with taking bisphosphonates. If a woman is taking orange juice or coffee with a bisphosphonate, it won't get absorbed. Drinking well water that contains calcium will reduce absorption of the bisphosphonate, as will taking a multivitamin. You need to consider reasons other than pure noncompliance if you are not seeing a result. I also use bone markers if I am worried about too much medicine. After a patient has been on a bisphosphonate for a couple of years, if the bone turnover is extremely low, then I worry about frozen bone syndrome. There is some support for that in animal studies and clinical studies, suggesting that too much suppression of bone turnover may be bad.

RECKER: Have you ever stopped a bisphosphonate based on a marker value?

ETTINGER: Absolutely. I see many patients who have been on alendronate 70 mg weekly for 3 or 4 years who have virtually no bone turnover marker; their values are below the premenopausal range. Sometimes they are leery about stopping treatment when I advise them that they are getting excessive treatment. I tell them that most studies have shown it takes about 1 year to get halfway back to your initial bone turnover rate. I tell them the bisphosphonate has been building up for a long time in their bones, so they can safely stop and we'll check a turnover marker in 6 months if they'd like. Often these patients can resume therapy at a much lower dose.

RECKER: You hear us talk about bone turnover markers and not very much about bone mineral density in patients on bisphosphonates. It's worth pointing out that at least half the benefit in preventing fractures with bisphosphonates comes from suppression of remodeling. For quite a while, people thought this might be bad for your skeleton — because remodeling repairs microdamage that accumulates as you load your skeleton during life. So, why is suppressing remodeling good for your skeleton? When we first saw suppression of remodeling we lacked a context in which to place it, and so we interpreted a 70 percent reduction in remodeling markers as pointing to elimination of microdamage repair to the extent that fractures might recur. But the context turns out to be that women with postmenopausal osteoporosis have remodeling rates that are 3-fold and above beyond those in healthy premenopausal women. Thus, a 70 percent reduction in remodeling brings you into the healthy premenopausal range where fractures are not occurring. And we have seen publications on this problem, the so-called "frozen bone." I have looked at many transiliac biopsies in patients on bisphosphonate, and I almost never see "frozen bone." It doesn't seem to happen on bisphosphonates any more than it does in patients who present on no treatment at all, which is pretty rare.

ETTINGER: Osteoporosis drugs have a wide spectrum of antiresorptive effects. Some reduce bone turnover by as little as 20 or 25 percent, yet seem to be effective for reducing fracture risk. Some reduce it by 70 percent and also seem to be effective.

ROLE OF TERIPARATIDE

RECKER: In my practice area, many physicians want to use teriparatide as first-line therapy in patients who have severe osteoporosis, based on the rationale that teriparatide "works better" in bisphosphonate-naïve patients. Has this practice been validated? Do any treatment algorithms state teriparatide's place in therapy?

ETTINGER: Our guidelines stipulate a vertebral fracture and T score below –3, but I'm not sure how well that guideline has been followed. For the patient who needs a T-score-and-a-half improvement and who is already at extremely high risk because of prior fractures, teriparatide is a very reasonable first step. Within 18 to 24 months you can move the patient from a very low BMD score to a more normalized one, but you need to follow with antiresorptive drugs to maintain the gain. Teriparatide is the first of the anabolic agents that truly differs from these other drugs. None of the antiresorptive drugs build bone. The increase in BMD seen with antiresorptive drugs is not more bone — it's not more connective bone, more trabecular bone, or thicker bone. It's just that the remaining bone is more highly mineralized because it's not turning over. To some degree that enhances bone strength, but it's not the same as making bone bigger or thicker or more connective, and that's what teriparatide does.

RECKER: Unfortunately, we don't have the data that you might require to support, for example, the –3 cutoff. It's probably reasonable. Teriparatide probably would be used more except for two impediments. First, it has to be given by daily injection, though in my practice that's not a big impediment. The second is that it is expensive — costing about $600 a month in our area — so you have to believe it really is that much better before you use it. Actually, we use it fairly liberally, even at that.

CONTINUING EDUCATION ANSWER SHEET/EVALUATION/CERTIFICATE REQUEST
MOBILIZING EFFORTS IN OSTEOPOROSIS MANAGEMENT

CE Credit for Physicians/Pharmacists

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I certify that I have completed this educational activity and post-test and claim (please check one):
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Physician — This activity is designated for a maximum of 2.0 category 1 credits toward AMA Physician's Recognition Award.

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ACPE Universal Program Number (UPN): 812-000-05-010-H01
Release date: Aug. 15, 2005
Expiration date: Aug. 15, 2006

To receive credit, complete the answer sheet/evaluation form and mail or fax the completed form to:

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EXAMINATION: Place an X through the box of the letter that represents the best answer to each question on page 25. There is only ONE correct answer per question. Place all answers on this form:

	A.	B.	C.	D.	E.
1.	☐	☐	☐	☐	☐
2.	☐	☐	☐	☐	
3.	☐	☐	☐	☐	☐
4.	☐	☐			
5.	☐	☐	☐	☐	
6.	☐	☐	☐	☐	
7.	☐	☐	☐	☐	
8.	☐	☐	☐	☐	
9.	☐	☐	☐	☐	☐
10.	☐	☐	☐	☐	☐
11.	☐	☐			
12.	☐	☐	☐	☐	
13.	☐	☐	☐	☐	
14.	☐	☐	☐	☐	
15.	☐	☐	☐	☐	☐
16.	☐	☐	☐	☐	
17.	☐	☐	☐	☐	
18.	☐	☐	☐	☐	
19.	☐	☐	☐	☐	
20.	☐	☐	☐	☐	

PROGRAM EVALUATION

So that we may assess the value of this self-study program, we ask that you please fill out this evaluation form.

Have the activity's objectives been met?

1. Describe the burden of the disease, risk factors for fracture, and strategies that reduce that risk. ☐ Yes ☐ No

2. Discuss expected effects of the Medicare Modernization Act and HEDIS on access to osteoporosis care. ☐ Yes ☐ No

3. Calculate fracture risk using simple models and risk data for management decisions. ☐ Yes ☐ No

4. Explain the value of enhanced adherence to osteoporosis therapies. ☐ Yes ☐ No

Was this publication fair, balanced, and free of commercial bias? ☐ Yes ☐ No

If no, please explain: _____

Did this educational activity meet my needs, contribute to my personal effectiveness, and improve my ability to:

Strongly Agree 5
Agree 4
Neutral 3
Disagree 2
Strongly Disagree.....1

Treat/manage patients?
5 4 3 2 1 N/A

Communicate with patients?
5 4 3 2 1 N/A

Manage my medical practice?
5 4 3 2 1 N/A

Other _____
5 4 3 2 1 N/A

Effectiveness of this method of presentation:

Excellent	*Very good*	*Good*	*Fair*	*Poor*
5	4	3	2	1

What other topics would you like to see addressed? _____

Comments: _____

CONTINUING EDUCATION POST-TEST
MOBILIZING EFFORTS IN OSTEOPOROSIS MANAGEMENT

Please tear out the combined answer sheet/evaluation form on page 24. On the answer sheet, place an X through the box of the letter corresponding with the correct response for each question. There is only one correct answer to each question.

1. If a patient's T score is –2.1 but her 5-year-risk of osteoporotic fracture is low, the most appropriate drug therapy would be:
a. Alendronate.
b. Ibandronate.
c. Low-dose estrogen.
d. Raloxifene.
e. No drug therapy.

2. Which of the following is *not* a dosing requirement for a bisphosphonate?
a. The drug must be taken at least 30 minutes before eating (ibandronate, 60 minutes).
b. The patient must remain upright for at least 30 minutes after taking the drug.
c. The drug must be taken with plain water only.
d. The drug must be taken immediately before retiring.

3. A Z score expresses the number of SDs by which a person's BMD differs from the mean BMD in:
a. People of the same age as the patient.
b. Age-matched people with documented osteoporosis.
c. Age-matched people with documented osteopenia.
d. Young adults with documented osteopenia.
e. Healthy young adults.

4. The new HEDIS osteoporosis measure assesses the rate at which osteoporosis drugs are prescribed to postmenopausal women whose T score is less than –2.5.
a. True.
b. False.

5. In a 5-year study, the rate of osteoporotic fracture in the placebo group was 8 percent, while the fracture rate in the group receiving the study drug was 4 percent. In this population, how many patients need to be treated for 5 years to prevent one fracture?
a. 20.
b. 25.
c. 30.
d. 32.

6. Under the standard benefit in Medicare Part D, a person whose annual income is >150 percent FPL and whose year-to-date drug expenditures have exceeded $2,250 will not receive coverage until expenditures for the year reach _____.
a. $3,100.
b. $4,100.
c. $5,100.
d. $6,100.

7. Antiresorptive drugs generally produce a greater effect in the spine than in long bones because:
a. Antiresorptive drugs have greater selectivity for spinal osteoclasts than for osteoclasts in other types of bone.
b. The spine retains antiresorptive drugs 40 percent longer than other osteocytes.
c. The spine has greater vascularization than do long bones.
d. The spine has more surface area than long bones and is more metabolically active.

8. If a woman who is seated with her arms folded across her chest can arise from her chair without using her arms:
a. The T score of her lumbar spine probably is greater than –1.5.
b. Her propensity for falling is less than that of someone who cannot do so.
c. She is not a candidate for osteoporosis drug therapy.
d. The T score of her thoracic spine probably is greater than –1.5.

9. The setting in which calcitonin is most likely to be used is:
a. An academic health center.
b. A community health center.
c. A nursing home.
d. A primary care practice.
e. A rheumatology practice.

10. Which osteoporosis drug may be taken just once per month?
a. Alendronate.
b. Ibandronate.
c. Raloxifene.
d. Risedronate.
e. Teriparatide.

11. Everyone enrolled in the new Medicare drug plan will be responsible for an annual deductible of $250.
a. True.
b. False.

12. With respect to reducing the risk of osteoporotic fracture, the chief benefit of increased physical activity is improved _____.
a. Bone quality.
b. Cardiovascular function.
c. Cognition.
d. Neuromuscular function and muscle tone.

13. If DXA has been used to measure a patient's BMD at two sites, lumbar spine and total hip, which measurement should be used?
a. Average of both.
b. Lower of the two.
c. Lumbar spine.
d. Total hip.

14. An osteoporosis program helped a Pennsylvania health system achieve savings of $7.8 million over 5 years. In which age group was a net *loss* experienced?
a. 55 to 65.
b. 65 to 75.
c. 75 and above.
d. None of the above — net savings were achieved in every age group.

15. Which osteoporosis drug is administered once daily via subcutaneous injection?
a. Alendronate.
b. Ibandronate.
c. Raloxifene.
d. Risedronate.
e. Teriparatide.

16. If a formulary is constructed for a Part D plan, it should contain at least how many drug(s) in each of the 146 therapeutic categories and pharmacologic classes identified by the United States Pharmacopeia?
a. One.
b. Two (provided that the category/class contains at least two agents).
c. Three (provided that the category/class contains at least three agents).
d. As many as have FDA approval within the category/class.

17. The goal of osteoporosis therapy is to:
a. Improve a patient's BMD T score.
b. Improve a patient's BMD Z score.
c. Prevent fragility fractures.
d. Prevent osteopenia (T score of –1.5 to –2.5) from developing into osteoporosis (T score less than –2.5).

18. If the annual income of a Part D enrollee is 99 percent of the poverty guidelines, what is the patient's copayment for a generic drug once the out-of-pocket limit has been reached?
a. $0.
b. $1.
c. $3.
d. $5.

19. Decisions about initiating osteoporosis drug treatment should be guided by:
a. DXA measurement of BMD at lumbar spine.
b. DXA measurement of BMD at hip.
c. DXA measurement of BMD at lumbar spine *or* hip.
d. Comprehensive assessment of fracture risk.

20. Teriparatide consists of the first 34 amino acids of human _____.
a. Adrenocorticotropic hormone.
b. Growth hormone.
c. Parathyroid hormone.
d. Thyroid-stimulating hormone.