Chapter 11: Key Messages

- Individual organizations—even very small ones—can apply a "systems-based" approach to clinical care and other services by putting into place any of a variety of formal policies and processes.
- There are four distinct systems-based activities that collectively encompass the overall goal of improving the bone health status of Americans:
  - ~ Identifying and developing intervention strategies for various risk levels of the population.
  - ~ Educating and raising awareness among clinicians and the public about bone disease.
  - ~ Ensuring that individuals receive appropriate preventive, diagnostic, and treatment services based upon their level of risk.
  - ~ Monitoring and evaluating bone health outcomes within populations and the community.
- The most important role for individual clinicians in promoting a systems-based approach to bone health is to educate themselves and their patients about prevention, assessment, diagnosis, and treatment.
- Medical groups have the opportunity to implement a systems-based approach as well. For example, they can dedicate staff to certain important tasks; use bench-marking data or academic detailing to promote quality improvement; or implement evidence-based care paths and computerized reminder systems that promote the provision of timely and appropriate care. Some groups may be able to develop specialized osteoporosis clinics or disease management programs.
- Hospitals and rehabilitation facilities can go beyond their traditional role of simply treating bone-related problems or symptoms by developing strategies for improving overall bone health and preventing future falls.
- Skilled nursing homes can institute measures to prevent falls and fractures; to assure that residents receive appropriate amounts of calcium and vitamin D; and to include activities that strengthen bones in their daily regimens.
- Health plans and insurers can get involved in managing bone health by assessing and monitoring provider performance; engaging in quality improvement programs; and/or implementing pay-for-performance initiatives.
- The public health system and other government agencies can play a vitally important role in promoting a systems-based approach to bone health, including:
  - ~ Promote awareness among consumers and clinicians of bone health and disease.
  - ~ Improve linkages between health care organizations, community-based organizations, and the public health system.
  - ~ Train health professionals to promote bone health and recognize and treat bone disease.
  - ~ Develop strategies to promote bone health and appropriate treatment.
  - ~ Monitor and evaluate activities within a community and the Nation as a whole.
- Other institutions, organizations, and agencies can facilitate a systems-based approach to bone health through research, education, and purchasing policies.

Chapter 11

SYSTEMS-BASED APPROACHES TO BONE HEALTH

Overview

The health care system in the United States is not a system *per se*. Rather, it is a collection of independent enterprises, some small and some large, that provide or pay for various aspects of health care. Despite the fragmented nature of this system, individual organizations—even very small ones—can apply a "systems-based" or "systematic" approach to providing clinical care and other services in order to function most effectively. Under this approach, health care organizations and other facilitators (such as employers and other purchasers) put into place any of a variety of formal policies and processes that are designed to ensure that individual consumers receive timely and appropriate preventive, diagnostic, and treatment measures to promote bone health. The nature of these measures is tailored to the underlying risk of bone disease.

For example, an individual clinician's office can create a simple protocol or flow sheet to ensure that a consistent approach is taken to a specific health issue, such as administering preventive care. Larger organizations can make use of more complicated systems such as computerized reminders and triggers based on clinical indicators and/or prescribing patterns.

Systems-based approaches to the prevention and treatment of osteoporosis can be exceptionally valuable both in improving the management of osteoporosis care and in reducing adverse outcomes from poor bone health. This type of approach can help to overcome the problems created by poor communication and a lack of collaboration among the various components of the health care system (e.g., government, communities, provider organizations, health plans, employers, the media, academics). Fragmentation makes the system ill equipped to serve the chronically ill and to provide population-based care (IOM 2002). It also means that those who finance care may not receive the benefits of such care. With increasing job turnover, employees commonly change insurers, even while remaining with the same health care provider. As a result, employers and insurers may have little incentive to cover expensive preventive services (e.g., drug therapy to prevent future osteoporotic fractures) that may not pay dividends until the patient is covered by a different plan or by Medicare.

This chapter lays out four distinct systems-based activities that collectively encompass the overall goals of the larger health system within the United States for improving the bone health status of Americans. The four activities are as follows:

1. Identifying the various risk levels of the population being served and developing an intervention strategy for individuals

Population-Based Risk Stratification: A Prerequisite to a Systems-Based Approach

There is one overriding principle that governs systems-based approaches to osteoporosis and bone health—that is, to focus on populations. A population-based approach considers the health of a group of persons (as defined by factors such as age, gender, geography, or risk factors) who may have diverse needs rather than the patient who has individual needs. Good population-based interventions also accommodate individual needs. The overall goal is to ensure that all persons receive the care they need, especially those at high risk of debilitating and costly fractures. To that end, two tasks must be accomplished. The first is to categorize the population being served into subgroups defined by their underlying risk of bone disease, falls, and fractures. The second is to define appropriate preventive, assessment, and therapeutic strategies for each subgroup based on the best available evidence. These steps should be taken by each of the various components of the health system, be it an individual provider assessing risks among his or her patients, a medical group assessing risks among its patient population, a health plan evaluating the risks of its enrollees, an academic health center educating providers, or a public health department surveying risks in the community at large. When implemented well, risk-stratification and population-based approaches provide ample opportunity for decision-making by providers. For more information on risk stratification, please see Chapter 8.

in each category of risk, with a particular focus on high-risk individuals.

2. Educating and raising awareness among clinicians and the public at large about the risks of bone disease, as well as the best ways to prevent, diagnose, and treat it in the various risk categories identified above.
3. Ensuring that individuals receive appropriate prevention, diagnostic, and treatment services based upon their level of risk.
4. Monitoring and evaluating bone health outcomes within specific populations and the community to identify problem areas and assess the impact of strategies and interventions for improving bone health.

The chapter is organized around each of the individual entities that make up the overall system—individual clinicians, medical groups, health plans/insurers, public health, and other facilitators of bone health, such as public (e.g., Medicare and Medicaid) and private purchasers (e.g., employers) and academic medical centers. Separate sections describe each of their respective roles and responsibilities within each of the activities listed previously. The individual organizations within the overall system need to collaborate and coordinate their activities. To facilitate this type of collaboration, Table 11-1 summarizes the potential participants in a broad set of major interventions and activities designed to promote bone health. It is important to remember, however, that the distinctions between the various levels are somewhat arbitrary. For example, a staff-model health maintenance organization (HMO) includes both a medical group and health plan. Thus, while the strategies discussed within the chapter will appear where they are most commonly employed, it is perfectly conceivable that other stakeholders can and should consider their use as well.

Table 11–1. Health Systems Interventions for Osteoporosis and Bone Health That Can Be Provided at Different Organizational Levels

Intervention/Activity	Individual Clinician	Medical Group	Hospital or Post-Acute Facility	Health Plan or Insurer	Government and Public Health Department	Voluntary Health Organizations and Professional Associations	Academic Institution	Health Care Purchaser	Industry
Promoting bone healthy lifestyles (nutrition, physical activity, no smoking)	■	■	■	■	■	■	■	■	■
Awareness campaigns	■	■	■	■	■	■	■	■	■
Guidelines/evidence-based reports	■	■	■	■	■	■			
Continuing education	■	■	■	■	■	■	■		
Sponsored programs (e.g., education, exercise, fall prevention)		■	■	■	■	■	■	■	■
Behavioral approaches (e.g., computerized reminders, chart flags, structured notes)	■	■	■	■					
Specialization of staff		■	■						
Benchmarking		■	■	■					
Academic detailing		■	■	■	■				
Quality improvement projects		■	■	■	■		■	■	
Patient registries		■	■	■		■			
Specialized clinics		■		■					
Disease management programs		■		■				■	■
Community-based targeted screening programs		■		■	■	■		■	■
Pre-discharge assessment/ protocols			■						
Standing orders			■						
Testing (e.g., BMD) requirements prior to prescription authorization				■					
Performance reporting				■				■	■
Training of health care professionals					■	■	■		
Developing research agenda, conducting research					■	■	■		
Monitoring and surveillance					■	■			
Insurance coverage for desired management				■	■			■	■
Policy interventions (e.g. regulations, tax credits, urban planning, standards for densitometry)					■	■	■		

Finally, examples of systems-based approaches to osteoporosis and bone health are provided whenever possible. Since such approaches are still rare in bone health, examples of successful systems approaches to other lifelong or chronic health issues are also included. They contain valuable lessons that may potentially be relevant to bone health.

Systems-Based Approaches for Various Stakeholders

While all components of the health system should engage in risk stratification, the roles and responsibilities for different types of organizations will vary when it comes to implementing systems-based approaches. This section discusses each of the key stakeholders, including individual clinicians, medical groups, insurers, public health departments, and other facilitators.

Systems-Based Approaches for Individual Clinicians

Perhaps the most important roles for the individual clinician in promoting a systems-based approach to bone health relate to 1) educating themselves and their patients about bone health prevention, treatment, and assessment, and 2) putting into place systems to ensure that patients receive appropriate services based on their risks and needs.

Unfortunately, however, clinicians may not always fulfill these roles. Evidence-based interventions (i.e., those whose effectiveness has been demonstrated) are often not used on those who need them. For example, a recent large-scale study of older patients who had suffered hip or forearm fractures found that roughly four out of five did not fill a prescription for an osteoporosis medication in the 6 months after the fracture (Solomon et al. 2003). Moreover, most individuals who did fill a prescription were already on a medication before the fracture, meaning that the net number of individuals initiating drug therapy was quite small. The same study also found that certain groups, including men, non-Whites, and those with other medical conditions, are less likely than White women to receive treatment for osteoporosis. There are also certain characteristics of health care providers that can predict their rates of diagnosis and treatment of osteoporosis (Morris 2004), such as gender, specialty, and years since medical school. However, there are no studies on the effectiveness of programs to increase awareness in improving diagnosis and therapy. Two recent large studies conducted in managed care settings generated similar findings, with only a minority of post-menopausal women who had sustained a fracture receiving pharmacologic treatment following the fracture (Feldstein et al. 2003b, Andrade et al. 2003). These studies highlight the important role for physicians in both prescribing the appropriate therapy and in encouraging patients to comply.

Evidence alone, even when compelling, is frequently insufficient to change provider practice patterns. To overcome the barriers to change, it might make sense to consider adoption of a comprehensive model for accelerating the diffusion of innovations. One such approach, known as the Rodgers Diffusion model, provides insight into both the limitations of current behavioral change techniques and potential strategies for accelerating diffusion of evidence-based innovations (Rodgers 1995). This model lays out five stages to the process of deciding when and how to use a new innovation: 1) knowledge; 2) persuasion; 3) decision; 4) implementation; and 5) confirmation.

Knowledge

There are two aspects to the knowledge stage. The first is the need for consumers to be aware of the importance of the health issue. While

individual clinicians can help in educating their patients, this public awareness role is best played by medical groups, health plans/insurers, public health departments and other government agencies, and potentially other facilitators, such as medical societies. It is important to remember, however, that these awareness campaigns are not the only sources of information for individual consumers. They also receive information from the media (e.g., newspapers, magazines, television program-ming) and pharmaceutical companies (e.g., via direct-to-consumer advertising). For more information on public awareness campaigns, see the section on the role of public health.

The second aspect of the knowledge stage relates to making sure that clinicians are aware of the evidence related to best practices for bone health. Individual clinicians can employ a variety of systems-based approaches to ensure their own awareness of up-to-date information on best practices. Among these systems are practice guidelines and evidence-based medicine reports that synthesize findings from multiple studies and sources. These reports and guidelines have been issued by government agencies (e.g., the U.S. Preventive Services Task Force [USPSTF], a panel of experts with representation from the non-Federal sector that is housed at the Agency for Health Care Research and Quality [AHRQ]) and by professional and public societies (e.g., American Association of Clinical Endocrinology, the National Osteoporosis Foundation). The National Guideline Clearinghouse (NGC) serves as a comprehensive source for credible guidelines related to bone disease and other diseases. Sponsored by AHRQ in partnership with the American Medical Association and America's Health Insurance Plans, NGC includes 71 general and specific guidelines related to osteoporosis and bone health.

Since the evidence base is often not sufficiently developed to allow the crafting of comprehensive guidelines, supplemental information based on expert opinion is often added, thus leading to variations across guidelines. This lack of complete evidence also means that guidelines often do not answer all clinical questions of interest, including the applicability of the guideline to important subpopulations (e.g., minorities, older persons) or the role of comorbidities. In addition, guidelines and evidence-based reports often fail to incorporate patient preferences, although this is changing. In spite of their limitations, guidelines and evidence-based reports should be seriously considered by individual clinicians, since they attempt to provide the best recommendations for what clinicians should do. See Chapter 8 for more on risk assessment guidelines and Chapter 9 for more on treatment guidelines.

In addition, as discussed in Chapters 8 and 10, individual clinicians should also consider the use of risk assessment tools such as the Osteoporosis Risk Assessment Instrument (ORAI) and the Osteoporosis Self-Assessment Tool (OST). These tools, which are based on risk factors that have been demonstrated to be associated with osteoporosis, are helpful in identifying individuals who are at risk of bone disease and/or fracture and who therefore might benefit from further assessment and/or treatment.

Persuasion

Just because guidelines and evidence-based reports exist, there is no guarantee that clinicians will read and absorb them. Even if they do, the evidence suggests that they may not change their behavior by implementing the recommended practices. In fact, the gap between evidence-based care and the actual care provided in the community (the "knowledge-practice gap") is well recognized as a barrier to quality care (Reuben 2002).

Several steps are needed, therefore, to ensure that individual clinicians become aware of and act on the evidence. One common strategy is the use of professional education to disseminate guidelines and evolving research, including presentations at meetings and other common continuing medical education (CME) activities.

However, these techniques have generally been ineffective in changing provider behavior on their own (Grimshaw et al. 2001, Grol and Grimshaw 2003). In fact, it has proven remarkably difficult to convince clinicians to implement evidence-based changes for improving care within clinical settings. Many factors related to knowledge, attitudes, and behaviors contribute to this inertia. These barriers have been well described (Cabana et al. 1999) and are listed below:

- Lack of awareness or familiarity with the guidelines
- Disagreement with specific guidelines or guidelines in general
- Doubt that following the guideline will lead to desired outcomes
- An inability to overcome existing practice habits
- Patient factors, such as preferences
- Environmental factors, such as lack of time or resources

The disappointing results from CME and guidelines has led to the use of other approaches for persuading providers, including academic detailing (described in the next section) and opinion leaders. These techniques have long been used by the pharmaceutical industry in marketing new products to prescribers. They also fit within the model described earlier, which relies on respected peers to assist with persuasion.

Decision and Implementation

Even after clinicians become convinced of the merits of adopting an evidence-based practice, they still may need help in deciding when and how to implement it on a daily basis. For that reason, a variety of systems-based approaches have been developed to assist individual physicians in practicing evidence-based medicine. One common approach is computerized reminder systems, which have been used in a variety of settings, including hospitals (Dexter et al. 2001). These systems are commonly employed to promote use of preventive services such as influenza immunizations (Gaglani et al. 2001) and to support adherence to clinical protocols (Demakis et al. 2000). The same kind of approach can be taken in bone health. For example, a recent study demonstrated the usefulness of sending e-mail messages to primary care providers of patients who had recently suffered an osteoporotic fracture but had not yet received a bone mineral density (BMD) test; 51 percent of the patients of doctors who received the e-mail message were given a BMD test or a medication for osteoporosis, compared to just 6 percent in a usual care group (Feldstein et al. 2003a). A less technologically sophisticated but similar approach involves the use of chart flags (Melville et al. 1993), which alert physicians on the paper chart when they should consider a particular evidence-based course of action for a patient. Flow diagrams or algorithms represent similar approaches that have been used to determine who needs testing (e.g., mammography) and how often they need it (Melville et al. 1993).

Confirmation

All of these steps outlined above are not enough to result in lasting behavior change (Rodgers 1995),

unless the clinicians who change behavior receive confirmation after the fact that they made a wise decision in doing so. For example, clinicians who agree to try using a pre-visit questionnaire will need to see that it has achieved its intended results (and not caused any unanticipated problems, such as negatively affecting office work flow) before the change will be permanent. Without this confirmation step, innovations tend to be dropped after a period of time.

Summary

The best approach for individual clinicians is to adopt a comprehensive behavior-change plan that targets the different barriers to change with distinct strategies aimed at each (Grol and Grimshaw 2003). One example of a multi-component strategy aimed at individual physicians was developed during the intervention phase of the Assessing Care of Vulnerable Elders (ACOVE) project ([a]Reuben et al. 2003). This intervention is aimed at changing practice behaviors related to the care of three geriatric conditions (falls, cognitive impairment, and urinary incontinence) through the following:

- Use of medical record prompts via structured visit notes
- Delegation of some tasks to office staff to encourage performance of essential care processes by clinicians
- Patient education, including encouraging the patient to play an active role in follow-up, which may also be quite influential in changing physician behavior (Maly et al. 1996)

Finally, it is important to remember that individual clinicians not only need to change their own behavior, but they also need to encourage their patients to do the same. To that end, clinicians should constantly be advising their patients about appropriate lifestyle changes related to bone health, as discussed in Chapter 10. In addition, clinicians should provide their patients with information on resources that can assist them in changing behavior. For example, ACOVE provides information to patients about community-based resources, such as exercise programs that reduce the risk of falls. (See Chapter 6 for more information.) These programs are particularly valuable for high-risk individuals. Unfortunately, the quality and availability of community-based programs and resources varies considerably within and across geographic areas. Most clinicians do not currently have readily available information for their patients about community-based programs and resources, including where they are located and how to access them. This represents an area where public health departments and clinicians could collaborate.

An Example of a Systems-Based Approach

An action plan for the prevention of osteoporotic fractures in the European Community provides an interesting example of a systems-based approach (Compston 2004). In 2002, the European Union Osteoporosis Consultation Panel was formed to develop an action plan to implement recommendations for the prevention of osteoporotic fractures. Six action steps were developed to achieve the stated goal of reducing the social and economic burden of osteoporotic fractures by 2005: 1) awareness campaigns targeted at potentially high-risk individuals, e.g. postmenopausal women; 2) preventive lifestyle strategies, including the development of government-backed health education programs and policies and the harmonization of public health policies; 3) evidence-based guidelines, including developing guidelines in member States, making existing guidelines more accessible, and providing

government endorsement and financial support to these efforts; 4) evidence-based fracture care and fall prevention programs, along with multidisciplinary approaches to rehabilitation; 5) economic data and analysis, including the identification of resource needs (particularly bone densitometry systems) and the analysis of the cost-effectiveness of interventions; and 6) the European fracture database, including a survey of existing data, development of data collection methods, and economic modeling and planning of health care resources.

Systems-Based Approaches for Medical Groups

Medical groups should be able to employ all of the approaches available to individual clinicians. In addition, because of their larger size, medical groups have the opportunity to implement a greater degree of systematization. For example, office staff can be assigned to perform a small number of targeted functions (e.g., checking visual acuity as a component of an evaluation of the risk of falls), thereby reducing the burden on clinicians and allowing staff to develop expertise in specific tasks. Group practices also have an additional tool available to them to promote behavior change—benchmarking, a process that allows physicians to compare their performance with that of others or with a "gold standard." Benchmarking can also allow an individual clinician to track his or her performance over time. When complemented with other quality improvement techniques, benchmarking has been shown to improve performance in managing conditions such as diabetes (Kiefe et al. 2001). It is important to note that individual clinicians who are members of independent practice associations (IPAs) may also have access to benchmarking data through the IPA's central office.

Larger group practices can also employ other formal quality improvement techniques based on measurement of processes (Nelson et al. 1998) and outcomes, with the goal of reducing variations in care delivery and improving overall outcomes. For example, medical groups can employ rapid-cycle improvement techniques such as the "Plan, Do, Study, Act" (PDSA) cycle. The PDSA cycle begins with clinicians planning and conducting small-scale, local tests of change in their own offices and in the health care organizations in which they work. After studying the results, clinicians and health care organizations can then apply relevant systems-based improvements to everyday practice. In many cases, PDSA cycles are often more appropriate and informative in facilitating systems-based improvement than are formal studies with experimental designs (such as randomized trials) or the implementation of changes without evaluative measurement (Berwick 1998). The Institute for Health Care Improvement has been successful using the PDSA approach in the areas of diabetes and depression.

Medical groups also have the ability to create registries of patients with specific disorders so that evidence-based interventions can be delivered systematically to the population in need. These registries also allow the monitoring of patients' responses to these interventions. For example, medical groups have used registries to ensure that patients with diabetes receive glycosylated hemoglobin testing and eye care referrals. Within bone health, a registry of patients with higher-than-average risk for osteoporotic fractures could help to identify those who are not taking medications to improve bone health. Similarly, a registry of those who have fallen or are at high risk of falling could facilitate preventive measures such as environmental modifications (e.g., installation of grab bars, hand rails, raised toilet seats) and/or referrals to a fall prevention program. The

registry could also be used to monitor those who have fallen and/or those who have a fear of falling to determine whether progress in addressing these problems has been made.

Medical groups can also implement systematic education efforts aimed at physicians and other health professionals, such as academic detailing (Siegel et al. 2003, Solomon et al. 2001). Academic detailing involves having trained professionals advise individual providers in one-on-one sessions about how to follow evidence-based practice guidelines in a specific area, such as appropriate use of a diagnostic test (e.g., dual x-ray absorptiometry [DXA]) or of pharmacologic therapies. Some groups may even serve enough patients to sponsor education classes, Internet resources, and exercise programs.

Very large groups may be able to develop specialized clinics for caring for specific disorders, such as osteoporosis. These clinics can be a practical approach to ensuring that the quality of care for the disorder is uniform throughout the group. They can also allow for the concentration of expensive resources such as bone densitometers in a few locations. These clinics may also allow personnel to develop in-depth expertise in caring for patients with conditions such as osteoporosis. For example, nurse practitioners have gained such expertise in treating patients with heart failure (Crowther 2003) and diabetes (Litaker et al. 2003). Although experience with osteoporosis clinics has been limited, a nurse practitioner-led Fracture Liaison Clinic in Glasgow was successful in increasing the frequency of BMD testing and treatment in fracture patients as compared to historical controls. The clinic identifies patients who have suffered one or more fractures in emergency departments and then follows up with their health care providers to encourage BMD testing and treatment (McLellan and Fraser 2002). Specialized clinics can also refer patients with osteoporosis and those at risk of falling to therapists and community-based exercise programs with expertise in addressing their specific needs (as discussed earlier, individual clinicians can do this as well). The optimal staffing, referral criteria, and volume of patients needed to justify an osteoporosis clinic are unknown. In particular, innovative, effective strategies for using nurses, nurse practitioners, physician assistants, physical therapists, and other health professionals to promote bone health need to be identified.

Large medical groups may have enough patients with bone disease to justify the development of their own disease management programs. (Smaller groups and individual clinicians may be able to refer patients to programs run by health plans, if they exist.) In disease management programs, persons identified as having specific medical conditions are followed more intensely. The goals are to improve health outcomes and reduce costs by preventing declines in health status that lead to the need for costly medical care, including hospitalizations and emergency department visits. Disease management programs tend to be utilized primarily for conditions associated with frequent hospitalizations and high expenditures, such as heart failure (Rich et al. 1995), diabetes, and asthma (Legoretta et al. 2000). These programs also tend to be relevant for conditions that require intensive monitoring and frequent changes in regimens (e.g., diuretics for congestive heart failure, insulin doses for patients with diabetes). As they require considerable human resources (e.g., frequent telephone calls and visits), the typical disease management programs are likely to be too expensive for a disease like osteoporosis, which does not demand frequent adjustment of medication schedules. A possible

exception, however, is disease management for those who have had prior falls or are at high risk for falling. In fact, some fall prevention programs look very similar to disease management programs (Tinetti 1986), and it can be argued that the high risk of fracture among persons who have already fallen or who have multiple risk factors for falls merits the intensive monitoring and resources associated with disease management programs.

As an example, Kaiser Permanente Northwest (with 450,000 members in Oregon and Washington) is instituting a comprehensive program to manage osteoporosis after fractures and to prevent falls. The program is based on a pilot study, described earlier in this chapter, which demonstrated the effectiveness of sending e-mail reminder notices to the physicians of patients suffering recent fractures (Feldstein et al. 2003a). The e-mail reminders include recommendations on BMD testing and osteoporosis treatment. If a patient is identified as being at risk of falling, clinicians can enter an order for a low- or high-risk referral into Kaiser's electronic medical record. For those patients identified as being at low risk for a fall, Kaiser's health education department sends educational information about osteoporosis and fall prevention along with a referral to a community-based exercise program. Those at high risk for a fall also receive educational materials and a referral to an exercise program, and they are also referred to an outpatient falls prevention program run by the physical therapy department. This 8-week program provides a complete assessment of the risk of falling along with muscle strengthening, balance, and gait-training programs. This regional, population-based program is provided through a physician assistant in Kaiser's Department of Endocrinology with oversight by an endocrinologist.

Finally, large group practices and vertically integrated health systems can consider taking a more population-based approach. For example, large group practices may implement community-based screening for osteoporosis. Such approaches have been employed successfully in increasing mammography screening for breast cancer (Reuben et al. 2002).

Systems-Based Approaches for Hospitals and Post-Acute Rehabilitation Facilities

The consequences of poor bone health and osteoporosis frequently lead to admission to hospitals and post-acute rehabilitation facilities. Osteoporotic fractures of the hip, pelvis, and spine (if symptoms are severe) frequently require hospitalization for surgery or symptom control. A systems-based approach to osteoporosis requires more than just treating the immediate problems or symptoms; rather, it should include efforts to both improve bone health and prevent future falls. Similar approaches have been employed in managing coronary artery disease (Fonarow et al. 2001) to ensure that patients in the hospital after a heart attack are discharged on appropriate medications that reduce the risk of future heart attacks. For osteoporosis, this type of approach would entail patient education about nutrition, orders for pharmacologic therapy, referrals for physical therapy or exercise programs, and social services (if needed).

A large group of hospitalized patients may not yet have been diagnosed with osteoporosis, but their admitting diagnosis (e.g., falls, syncope, gait instability, failure to thrive) may nonetheless serve as a "red flag" about a high future risk of fracture. A systems-based approach to caring for these patients could involve putting into place a process for identifying these individuals at admission and then conducting BMD tests prior to discharge to determine if they are osteoporotic or osteopenic. However, the current diagnosis-

related group (DRG) reimbursement system for fee-for-service Medicare discourages the performance of screening tests during the hospital stay, since reimbursement is the same whether or not these tests are performed. Furthermore, scheduling additional tests such as BMD during the hospitalization may delay discharge. At a minimum, however, clinical risk factors for osteoporotic fractures should be assessed using standardized protocols during the hospital stay or at discharge, unless such action is precluded by the patient's acute illness.

Many patients who suffer fractures or falls, as well as those with gait and balance disorders, are discharged to skilled nursing facilities to receive additional rehabilitation. These patients typically do not qualify for Medicare reimbursement in an acute inpatient rehabilitation facility. (Under current Medicare guidelines, patients must need at least 3 hours per day of a combination of different types of rehabilitation, such as physical therapy, occupational therapy, and speech therapy, to qualify for reimbursement.) Similar to hospitalized patients, a systems-based approach to skilled nursing facility residents who suffer fractures would consider them as candidates for specific bone and fall prevention interventions. Those who are at high risk of falling but who have not fractured should be considered candidates for rehabilitation to reduce this risk. However, the assessment and treatment of frail patients can be challenging. Although BMD testing may not be available in many nursing homes, many of the patients have already suffered fractures and testing is therefore unlikely to provide additional, useful information. The goal for these individuals should be the prevention of new fractures. Since the frail elderly are especially prone to falling, residential settings such as nursing homes should take advantage of the opportunity for social group exercise activities that reduce the risk of falling by building muscle strength and improving balance. In addition, medication administration can be challenging in the frail elderly who live in nursing homes and in the community, since many of these individuals are cognitively impaired and therefore may have trouble with compliance. In these situations, long-acting medications, including those that could be administered once a year intravenously (e.g., intravenous bisphosphonates are currently under development) or by injection (e.g., vitamin D) hold great promise, as do drinks fortified with calcium and the use of hip protectors in those most prone to falling.

In addition, other systems-based approaches to improving bone health in the nursing home are possible. For example, a nursing home could implement a policy of "standing" orders for vitamin D and calcium supplementation (in those who can tolerate it) that are followed unless the clinical provider specifically rejects the order. Similar "standing" orders are common for laxatives and for mild pain medications (e.g., acetaminophen). Another possibility would be "standing" orders for hip protectors for all residents at risk of falling (Lauritzen et al.1993). (See Chapter 9 for more details on hip protectors.)

Systems-Based Approaches for Health Plans and Insurers

The role of health plans and insurers in systems-based approaches to medical conditions varies considerably from plan to plan and insurer to insurer. It depends in large part on the degree to which health plans and insurers hold their contracted medical groups accountable for management of specific diseases, including the processes of care. To date, most health plans and

insurers have played a limited role in promoting optimal care for patients with bone disease. Some of these organizations might have limited incentives to invest today in preventive services and programs that likely will not yield financial and/or clinical benefits for many years (perhaps when those who receive the services have changed health plans or are covered by Medicare). Nonetheless, there are ways in which all health plans and insurers affect bone health—that is, coverage policies that directly affect the provision of services, procedures, and medications used to promote bone health and to prevent, diagnose, and treat bone disease. In addition, at least some plans and insurers are getting more intimately involved in a systems-based approach to bone health and disease. These plans are assessing and monitoring performance, engaging in quality improvement programs, and/or implementing pay-for-performance initiatives that reward high-quality, evidence-based care. The rest of this section covers these various leverage points for plans and insurers—that is, coverage, performance measurement, quality improvement, and pay-for-performance.

Medicare and Private Sector Coverage

The Medicare program tends to set the standard with respect to coverage policies for testing and treatment within the area of bone health. In other words, most private insurers tend to follow Medicare's lead.

Coverage of Tests for Screening and Monitoring. Under a provision of the Balanced Budget Act of 1997 (P.L. 105-33), Medicare is required to cover BMD testing every 2 years for people at risk of developing osteoporosis or under treatment for osteoporosis (USDHHS 1998). This law is applicable to individuals enrolled in Medicare fee-for-service and Medicare + Choice plans. Under this law, BMD testing is defined as radiologic, radioisotopic, or other procedures approved by the FDA for the purpose of identifying bone mass, detecting bone loss, and interpreting bone quality. Although many different testing modes and devices have been approved by the FDA and are covered by Medicare and some private payers, it is important to remember that not all of these tests have been shown to have a strong predictive relationship with fracture risk (see Chapter 8 for a more detailed discussion). The most thoroughly investigated tool is DXA, which measures bone density at the most likely sites of fracture, the hip and spine. Since DXA is expensive and not available everywhere, ultrasound of the heel can be used as an initial screening tool, to be followed by a DXA test in those identified as having low bone density. Individuals with the following characteristics are considered at risk and eligible for Medicare coverage of BMD testing:

- Women who are estrogen deficient as defined by their physicians and who are at risk for osteoporosis
- Individuals with vertebral abnormalities, osteoporosis, or spine fracture determined by x-ray
- Individuals with primary hyperparathyroidism
- Individuals being monitored to assess the response to or efficacy of an FDA-approved osteoporosis drug therapy
- Individuals receiving or expecting to receive glucocorticoid therapy, equivalent to $\geq$7.5 mg of prednisone per day, for more than 3 months

Men and minority (especially Black) women who present with these risk factors are often not recognized as being in need of BMD testing. White women are known to have a higher risk of fracture, but it is important to remember that individuals in other racial and ethnic groups need to be tested and, if appropriate, treated if they exhibit the risk factors cited above or have suffered a fragility fracture at any site.

Policies for coverage of BMD testing by private health plans generally follow the eligibility criteria for Medicare, though individual plans vary in their coverage. For example, BlueCross of California considers all women age 65 and older as eligible regardless of additional risk factors (BlueCross of California 2002). Likewise the specific tests to assess BMD that are covered may vary from plan to plan.

Coverage of Pharmacologic Treatment. The Medicare Modernization Act (MMA) was signed into law in 2003 and provides beneficiaries with access to some level of coverage for drugs that treat bone disorders. In addition, Medicare beneficiaries enrolled in Medicare Advantage (formerly Medicare + Choice) plans with pharmacy benefits typically have some level of coverage for medications related to bone health. Neither traditional Medicare or Medicare Advantage beneficiaries have coverage for nutritional supplements, such as calcium and vitamin D. Most private health plans do cover estrogen and at least one of the bisphosphonates. Coverage for selective estrogen receptor modulators (raloxifene), calcitonin, and parathyroid hormone varies among different plans.

Coverage of Non-Pharmacologic Treatment. Physical therapy is covered under Medicare Part B for certain diagnoses related to falls. Medicare does not cover physical therapy for individuals solely on the basis of being at high risk of falling. Effective September 1, 2003, there is a combined $1,590 annual limit on Medicare coverage of outpatient physical therapy and therapy for speech-language pathology. Private health plans have variable coverage for physical therapy.

Coverage for vertebroplasty and kyphoplasty under Medicare Part B varies from state to state. These procedures are generally covered for painful spine fractures that have not responded to conventional therapy. The coverage policies of private health plans for these procedures is limited, due largely to the lack of solid evidence on their effectiveness. For example, BlueCross and BlueShield of Montana will consider coverage of vertebroplasty and kyphoplasty on an individual basis for patients who have failed to respond to standard non-surgical treatment (BlueCross BlueShield of Montana 2003). Aetna considers kyphoplasty to restore bone height lost due to painful osteoporotic fractures to be an experimental/investigational intervention and consequently does not cover this procedure (Aetna 2003).

Performance Assessment

In addition to coverage policies, health plans and insurers are uniquely positioned to employ a systems-based approach to improving bone health through the use of performance assessment. Health plans can use their data about diagnoses and utilization of services to assess whether indicated preventive measures and treatment are provided to their members, whether such measures and treatments work, and whether members are satisfied with the care that they receive. To date, plan-driven programs to improve quality have largely focused on the assessment and reporting of performance for preventive services and selected chronic diseases. Osteoporosis has not been a target of performance assessment, although it may become a target condition in 2004 with the introduction of a performance measure for osteoporosis by the National Committee for Quality Assurance (NCQA).

NCQA is a nonprofit health care oversight organization that accredits managed care plans and has produced a widely used quality reporting system called the Health Plan Employer Data and Information Set (HEDIS). HEDIS measures were initially designed to provide information to large purchasers about the quality

New HEDIS Performance Measure for Osteoporosis

A new HEDIS performance measure related to osteoporosis goes into effect in 2004. The measure will evaluate how well a health plan does in diagnosing and treating osteoporosis in elderly women who suffer a fracture. The measure is defined as: "The percentage of women age 67 or older who suffer a fracture who receive either a BMD test or prescription treatment for osteoporosis with 6 months of the date of the fracture." The new HEDIS measure will evaluate the care of women age 67 or older on Medicare who are enrolled in a managed care plan.

of care delivered to their employees. More recently, the audience for HEDIS results has broadened, and they are often reported in consumer-oriented report cards. Since HEDIS has standard measures and uniform data reporting requirements, comparisons can be made between various health plans.

With the planned implementation of a performance measure for osteoporosis in 2004, health plans and insurers will have an opportunity to assess performance and promote quality care for osteoporosis. The measure reports the percentage of women age 67 or older who suffer a fracture who receive either a BMD test or prescription treatment for osteoporosis within 6 months of the date of the fracture.

A complementary approach to the HEDIS measures has been the development of quality indicators (e.g., those developed in the Assessing Care of the Vulnerable Elderly [ACOVE] project) that can be used to identify deficiencies in care provided (Wenger and Shekelle 2001, Shekelle et al. 2001). While guidelines exist that can assist in determining appropriate services for other populations, ACOVE spells out seven evidence-based quality indicators that specifically apply to elderly individuals (i.e., those over age 75) at high risk of functional decline due to osteoporosis (Table 11-2). Some are based on chart review of documented care and others on data obtained in interviews with elderly individuals (Grossman and MacLean 2001, RAND 2004).

Quality Improvement Initiatives

Health plans and insurers that sponsor performance measurement can and often do supplement these activities with other programs designed promote use of evidence-based medicine. While osteoporosis has generally not been a major focus of such activities, existing quality improvement programs could be adapted to osteoporosis. For example, like some medical groups, health plans have implemented disease management programs targeting high-cost, common diseases such as diabetes, heart failure, and asthma. Given the high cost of osteoporotic fractures both in terms of health (Tosteson et al. 2001, OTA 1994) and dollars (Max et al.2002), disease management programs for osteoporosis might be beneficial for both plans and patients, especially if individuals who have already sustained (or are at high risk for) osteoporotic fractures are targeted. In fact, some osteoporosis disease management programs have been implemented (although the details of most of these are considered proprietary). For example, one osteoporosis disease management program implemented by the BlueShield of Northeastern New York contains components aimed at both members and providers. Among the member-centered interventions were mailings, education days at local pharmacies, and newsletter articles

Table 11–2. ACOVE-2 Quality Indicators for the Management of Osteoporosis in Vulnerable Elders

Indicator Purpose	Process Measure
Quality Indicator 1 Prevention	ALL female persons age 75 or older should be counseled at least once regarding intake of dietary calcium and vitamin D and weight-bearing exercise.
Quality Indicator 2 Smoking Cessation	ALL female persons age 75 or older who smoke should be counseled annually about smoking cessation.
Quality Indicator 3 Pharmacologic Preventive Therapy	EVERY female person age 75 or older should be counseled about risk for osteoporosis and the potential need for pharmacologic prevention of osteoporosis at least once.
Quality Indicator 4 Identifying Secondary Osteoporosis	IF a person age 75 or older has a new diagnosis of osteoporosis, THEN during the initial evaluation period an underlying cause of osteoporosis should be sought by checking medication use and current alcohol use.
Quality Indicator 5 Calcium and Vitamin D for Osteoporosis	IF a person age 75 or older has osteoporosis, THEN calcium and vitamin D supplements should be recommended at least once.
Quality Indicator 6 Calcium and Vitamin D With Corticosteroid Use	IF a person age 75 or older is taking corticosteroids for more than 1 month, THEN the patient should be offered calcium and vitamin D.
Quality Indicator 7 Treatment of Osteoporosis	IF a person age 75 or older is newly diagnosed with osteoporosis, THEN the patient should be offered treatment with hormone replacement therapy, SERMs, bisphosphonates, or calcitonin within 3 months of diagnosis.*

* ***Note:*** Estrogen is listed as an option, with the Women's Health Initiative finding that it is effective for the prevention of hip fractures. Potential increases in risk of cardiovascular disease may make it a less favorable choice.

Source: RAND 2004.

that were all focused on osteoporosis. These were supplemented with infomercials on a local cable channel and posters developed for placement in local clinicians' offices. To support providers in providing evidence-based osteoporosis care, the plan developed guidelines and encouraged adherence to them by sending notices and placing stickers on the patient's chart alerting providers when patients had been contacted about osteoporosis. In addition, providers were given information about compliance issues related to specific patients. For example, providers were notified if a patient did not fill his or her prescription for osteoporosis drugs at least 80 percent of the time. Finally, the plan initiated a requirement that BMD be measured

before the approval of new prescriptions for osteoporosis drugs. The program appears to be working; during its first year BMD usage doubled and medication compliance rates increased by almost 60 percent (Paccione 2003).

Despite this anecdotal evidence of success, disease management for osteoporosis has not yet been adequately evaluated to determine its cost-effectiveness. It may be possible for osteoporosis disease management programs to be integrated into similar types of programs for other chronic diseases, such as heart disease or diabetes.

Pay-for-Performance Initiatives

Reimbursement policies represent one of the most innovative ways that health plans and insurers can promote quality and quality improvement. In fact, the National Health Care Purchasing Institute, through an initiative of the Robert Wood Johnson Foundation, identified 11 potential provider incentive models for improving quality of care (Bailit 2002). Several plans have recently started to tie reimbursement to performance within specific conditions. However, it is important to recognize that clinical performance is typically not the only parameter assessed when determining the level of the incentive payment. Other factors that may be considered include patient satisfaction, availability of providers (e.g., office hours that are favorable to the patient), and use of educational services.

One example of such an approach comes from California, where a coalition of health plans and physician groups has initiated, "Pay for Performance". This statewide program will pay physician groups extra if they can document strong performance in caring for patients with certain diseases (Integrated Health Care Association 2003). Participants include Aetna, BlueCross of California, BlueShield of California, CIGNA Health Care of California, Health Net, and PacifiCare, each of which has agreed to use common performance measures for asthma, coronary artery disease, and diabetes. These plans have also agreed to implement "significant" financial incentives based on performance, although the size of the incentive and the distribution methodology for the payments will be determined independently by each plan. The first payments to medical groups under this plan will be in 2004 based on 2003 performance data.

Systems-Based Approaches for Government and Public Health Agencies

Federal, State, and local governments, including the public health system, can play vitally important roles within many of the four core activities described earlier. In fact, a recent Institute of Medicine (IOM) report made a number of general recommendations on the appropriate role of governments and public health agencies that are applicable to bone health and osteoporosis (IOM 2002). Among these were urging local health departments to support community-led, joint efforts between the corporate community and public health agencies to strengthen health promotion and disease and injury prevention programs for employees and their communities, along with a call for increased collaboration between public health officials and local and national entertainment media to facilitate the communication of accurate information about diseases and medical and health issues.

As the IOM report suggests, perhaps the most important role for public health agencies is to promote awareness among consumers and clinicians of the importance of bone health, and of the best methods for preventing, assessing, and treating bone disease. While the lack of a cohesive health care system creates challenges for the prevention and treatment of bone disease, the public health system can help overcome these problems by mobilizing to increase awareness.

A better informed and more concerned public can facilitate adherence to recommended care management practices by influencing provider behavior (Maly et al. 1996) and policy changes.

To that end, public health agencies may sponsor broad-based and targeted public awareness campaigns, with messages tailored to different population subgroups. For example, for younger persons, the emphasis may be on nutrition (e.g., calcium intake), lifestyle choices (e.g., smoking avoidance and cessation), and physical activity to build peak bone-mass. In contrast, for older persons who have already suffered an osteoporotic fracture, the message may focus on whether they are receiving appropriate medications and fall prevention measures. The choice of venues should vary based upon the message. Younger persons might best be reached through the Internet, advertising on evening television and billboards, and/or in magazines oriented at youth. In contrast, the elderly might best be reached through daytime television programs, magazines, and senior centers. Of course, other stakeholders within the overall health system, including health plans/insurers, large medical groups, and professional associations can assist with these awareness campaigns, while individual clinicians can reinforce the campaign's messages during their interactions with consumers.

Public health agencies may also want to consider supplementing their awareness activities with broad-based and/or targeted screening programs, provided either independently or in collaboration with health care delivery systems. Similar types of programs have been conducted in other areas, including nationwide programs promoting vaccinations for influenza and polio and local screening programs for disorders like hypertension and hypercholesterolemia.

Another potential role for public health and government is to improve the linkages between health care organizations, community-based organizations, and the public health system. At present the lack of such linkages makes it difficult to provide consumers—especially those with multiple, chronic health conditions—with a full range of beneficial services. While public health agencies do not typically provide the continuity of care that is required for management of chronic conditions like osteoporosis, they may be able to play a vital role in bridging the gap between health care organizations, community-based and educational resources, and other complementary services in various aspects of bone health, including fall prevention and BMD screening. For example, public health agencies could partner with community-based organizations to provide consumers with an assessment of their risk of bone disease (possibly including BMD screening). Consumers could take this information to their health care provider (a referral could be provided, if necessary), who could then work with the individual to determine the appropriate course of action. Some individuals may need a referral to a specialist or an osteoporosis clinic, while others can continue to have their bone health managed by their primary care provider. By educating consumers and engaging the health system in this manner, public health can play a critical role in helping to ensure that consumers receive appropriate, evidence-based care.

Yet another area for public health is in helping to train health care professionals to be more skilled at promoting bone health and in recognizing and treating bone disease. Public health agencies can work with health professional associations to co-sponsor conferences and seminars and can work with academic institutions in the development and promotion of curricula.

Policy-making represents another strategy that governmental agencies at the local, State, and Federal level can use to promote bone health and appropriate treatment of bone disease. They can use policies to promote bone health and to encourage the prevention, timely diagnosis, and early, appropriate treatment of bone disease and fractures. For example, regulations could require the installation of grab bars in the showers of all retirement communities. Financial incentives such as tax credits could promote the widespread availability of fitness centers that provide exercise classes to seniors at risk for falling. Local urban planning policies can also promote bone health by developing public spaces that minimize the risk of falling and that offer opportunities for outdoor exercise. Finally, governmental agencies can also set quality control standards for assessing BMD tests and certification standards for densitometer operators.

A final, vitally important role for public health is in monitoring and surveillance activities. These activities relate not only to monitoring compliance with regulations, but also to implementing ongoing surveillance methods to monitor and assess trends in the following:

- The prevalence of bone disease and fractures in the community
- The degree to which individuals engage in bone-healthy behaviors
- The degree to which community-wide and institution-specific interventions are influencing consumer and clinician behavior and having an impact on bone health outcomes

Other Facilitators

Individual clinicians, medical groups, health care delivery systems, insurers, and public health departments are the primary drivers of systems-based approaches to improving bone health and reducing the consequences of osteoporosis. Other institutions, organizations, and agencies can facilitate these efforts through research, education, and purchasing policies and power. Diverse entities such as voluntary health organizations and professional associations, academic institutions, health care purchasers, and industry (including pharmaceutical and technology companies) are all stakeholders in the system. While they have rarely collaborated in developing approaches to health care problems such as osteoporosis, a cohesive approach could provide substantial momentum towards optimization of bone health on a large scale.

The Role of Voluntary Health Organizations and Professional Associations

Voluntary health organizations (or advocacy groups) and professional associations play important roles in any systems-based approach to bone health. They are able to reach the public and providers with critical information quickly and often with fewer constraints than can government organizations.

One of the most important roles for voluntary organizations is to raise public awareness about specific health problems such as bone disease. By including individuals who have personally been touched by bone disease, these organizations are uniquely positioned to provide important guidance to other sectors of the health system regarding the real-life impact of bone disease on individuals, families, and communities.

Lacking the label of government and being composed of persons from the community, voluntary health organizations also can be quite effective in persuading local residents—their peers—to adopt the lifestyle changes necessary to prevent the onset or progression of bone and other diseases. For some diseases, the absence of the government label has also made it possible

for voluntary health organizations to develop registries of affected individuals, thereby improving access to information and other resources related to the treatment of the disease.

Professional associations also play a critical role in promoting a systems-based approach to bone health. They are key facilitators in the training of professionals needed to address public health problems such as bone health. They also promote changes in the curricula of professional schools and provide continuing education to practicing bone health professionals. These associations can also be instrumental in the development of evidence-based prevention and treatment guidelines and standards of care for bone health. These guidelines help to ensure that individuals who have or are at risk of getting bone disease can benefit from the best practices related to prevention, assessment, diagnosis, and treatment.

The Role of Academic Institutions

Academic institutions can be critical facilitators through their two core missions of education and research. Typically, health professions education has focused more on teaching the clinical aspects of care than on the delivery or systems aspects. With respect to osteoporosis and bone health, various professionals are essential for promoting bone health, including physicians, nurses, physician assistants, dietitians, physical and occupational therapists, social workers, dentists, ophthal-mologists, optometrists, and pharmacists. While the amount of training each professional student receives in bone health and osteoporosis has not been quantified systematically, discipline-specific curricula could be created. For example, some schools have created "bone curricula" that teach basic science and clinical aspects related to bone health and bone diseases such as osteoporosis, osteomalacia, and bone tumors. Teaching tools such as CD-ROMs, standardized patient case studies, and videotapes have been created to help teach this material. Equally important is the development of professional skills to become effective members of a health care team that focuses on improving bone health and preventing adverse outcomes. For example, trainees from different disciplines (e.g., medical students and residents, nurse practitioners, physician assistants) could be given the opportunity to rotate through osteoporosis clinics. Although a variety of models for interdisciplinary team training have been implemented, organizational challenges ([b]Reuben et al. 2003) and discipline-specific barriers to such cross-discipline training (Reuben et al. 2004) may impede these efforts. Finally, academic institutions may also serve an important educational role for the general public by teaching lifestyles that promote bone health in primary and secondary schools and colleges. Schools must begin to play a role in promoting and supporting good dietary habits and regular physical activity, beginning in childhood.

The second role of academia is to advance research on bone health. To date, such research has focused primarily on clinical issues, but some academic institutions have active research programs on health care delivery. While many of these have focused on preventive measures (e.g., cancer screening, smoking cessation), a few have attempted to improve bone health.

The Role of Health Care Purchasers

Health care purchasers have begun to use their power both individually and collectively to influence health care delivery. For example, the Leapfrog Group, a coalition of major employers around the country, has attempted to change

health care delivery by encouraging adoption of computerized physician order entry (CPOE) systems, referral of patients to specialized, high-volume centers for some surgical procedures, and minimum requirements for physician staffing in intensive care units (Leapfrog Group 2003). If successful, these types of efforts by purchasers may be very influential in promoting evidence-based care, and thus may represent a potential top-down approach to ensuring that good bone health care is provided. As mentioned previously, the Federal and State governments in their roles as purchasers can also influence bone health and osteoporosis care by coverage and other purchasing-related decisions. It is important to remember that the role of purchasers in promoting better bone health will likely continue to be limited in a financing environment where those that pay for prevention, assessment, and treatment today frequently do not realize the benefits of such investments, which tend to materialize over the long term.

The Role of Industry

The pharmaceutical and medical device industries have been important facilitators in reducing the consequences of poor bone health through the development and promotion of drugs, devices, and other technologies. In fact, these companies are critical sources of information for providers and the public on the use of pharmaceutical agents to prevent and treat bone disease. This information needs to be combined with a more comprehensive approach to promoting bone health, including appropriate diet and physical activity.

In addition, there are other, independent companies that focus on disease management that can promote bone health by contracting with health plans, insurers, and other organizations to provide evidence-based care, just as they are doing now for conditions such as heart failure and diabetes. As mentioned previously, however, it is not clear to what extent these companies focus on osteoporosis today or what type of services they provide.

Special Populations

Several populations deserve special attention by all components of the health care system because they face barriers in accessing care and/or limitations in medical knowledge that may prevent them from receiving good care. These populations include the uninsured and underinsured, the poor, minority populations, men, nursing home residents, frail elderly persons, and rural or other remote populations.

The Uninsured

Thanks largely to government programs such as Medicare and to commercial insurance, the vast majority of persons who are at risk of poor bone health and osteoporosis have or are eligible for health care coverage. In fact, most persons lacking insurance in the United States are working age-adults and children who, in the absence of medical conditions and medications that interfere with good bone health, are at low risk of short-term adverse bone health outcomes. Nevertheless, children and adults without access to health care may not receive important information about behaviors that promote peak bone mass (e.g., appropriate diet and levels of physical activity, avoidance of smoking). Those uninsured individuals who are at high risk of bone disease represent a particularly vulnerable population, since all of their costs for medical care and pharmacotherapy must be borne out of their own pockets or through uncompensated care mechanisms. In many cases these individuals fail to access preventive care services and to obtain early diagnosis and treatments, waiting instead until their health deteriorates to the point that they face an urgent or emergent situation.

The Underinsured

A potentially bigger problem than the uninsured is the far larger number of Americans with health insurance coverage who are "underinsured." These individuals often face problems in getting access to appropriate services to promote bone health and to treat osteoporosis. Medications designed to treat or prevent bone loss can be expensive and the costs can be highly variable. For example, in June 2004, costs ranged from $25 per month for persons who only receive conjugated equine estrogens, to $64 per month for bisphosphonates, to $502 per month for those receiving teriparatide (Drugstore.com 2004). Of course, the new Medicare drug benefit will provide some level of coverage to beneficiaries. However, hip protectors, which cost only $50–$100 and may prevent fractures in frail elderly persons (Kannus et al. 2000, Parker et al. 2001), are not covered by Medicare, while coverage for important environmental modifications such as grab bars, railings, and raised toilet seats is inconsistent. Items considered to be durable medical equipment (e.g., raised toilet seats) are covered under Part B Medicare, but home modifications (e.g., installation of grab bars) are not. Some of these modifications may be provided, typically on a sliding scale basis, by programs sponsored by the Administration on Aging.

Minority Groups

Along with the uninsured and underinsured, people of color also need special consideration with respect to bone health and osteoporosis. As noted in earlier chapters, the definition of osteoporosis and assessments of fracture risk from BMD test results are based upon standards developed for Whites. Minority groups that have different average body and bone size, such as Asians and Blacks, present some challenges for the assessment of bone health by standard bone density tests. Blacks have higher bone density and a lower risk of fracture than do Whites of the same age. Nevertheless, the presence of strong risk factors such as a previous fracture or the use of glucocorticoid drugs, especially when combined with low body weight and/or older age, should be a signal for immediate attention to the potential need for intervention. In other words, while a person's race may suggest a lower average risk of fracture, it by no means indicates that there is no risk.

The bone density of Asians is similar to that of Whites after accounting for a smaller average body and bone size (Finkelstein et al. 2002). Nevertheless, standard bone density assessment does not compensate for these differences, and thus it is important to evaluate family and personal history of fracture and other risk factors in Asians (and small Whites) before determining if they are at high enough risk to warrant the initiation of treatment.

With respect to prevention and treatment of bone disease in minorities, there is no indication that pharmacologic interventions act differently or less effectively in minority populations. Blacks and Asians are more prone to lactose intolerance than are other groups, and thus they may be at greater risk of consuming inadequate levels of calcium and vitamin D. Thus, it is important to promote alternative sources of calcium and vitamin D in those who are lactose intolerant. (See Chapter 7 for more details.)

Another issue facing people of color is timely access to all health care services. The goal of better bone health for all Americans cannot be reached without significant improvements in preventive services, screening, diagnosis, and treatment, as well as significant changes in individual behaviors. This goal will not become

a reality for people of color unless there are major improvements in their ability to access care on a timely basis. These minority populations are at the highest risk for poor health, yet they rely on an unorganized patchwork of providers for services that are necessary to prevent illness and maintain health. Emergency facilities are a major source of care for people of color, and their dependence on these often overcrowded facilities continues to grow (IOM 2002). These facilities are ill equipped to provide or even facilitate the coordinated, ongoing preventive and treatment services that people of color need to maintain bone health and overall health and well-being.

People of color not only have difficulty in accessing care, but there are also concerns about the quality of those services that they do receive. A recent study by the Institute of Medicine concluded that people of color tend to receive lower quality health care than does the majority population, even after accounting for access-related factors (Smedley et al. 2003). These disparities are consistent across a wide range of services, including those critical to bone health. A recent study found that few Black women (11.5 percent) had been screened for osteoporosis despite the presence of important risk factors for low bone density; the study also found that the prevalence of low bone density among these Black women was substantial (Wilkins and Goldfeder 2004). Overcoming these disparities will require specific strategies and programs geared towards bringing improvements in bone health to minority populations.

Men

Men represent another population of concern, since far less is known about the epidemiology, risk factors, and treatment of osteoporosis in males. As noted in Chapter 4, men account for roughly 20 percent of all hip fractures. It is unclear whether the diagnostic criteria for osteoporosis in women should be applied to men. While aging is associated with bone loss in men, the pattern of loss does not appear to be the same as that experienced by women for several years after menopause. (See Chapter 3 for more details.) The National Osteoporosis Foundation recommends BMD testing for men who present with fractures or are receiving treatment with a GNRH agonist for prostate cancer, as well as for all individuals who have primary hyperparathyroidism or are on long-term glucocorticoid treatment (NOF 2003). For more details on the evidence related to BMD in men, see Chapter 8. With respect to therapy, bisphosphonate and PTH treatments are effective in men (Finkelstein et al. 2003, Orwoll et al. 2000). The use of testosterone for bone and muscle loss in elderly men has been debated due to the possible increased risk of prostate cancer (Liverman and Blazer 2004). At this time, testosterone would not be considered a first-line treatment to prevent fractures.

The Frail Elderly

As with men, the knowledge base for how best to manage frail elderly persons with osteoporosis is not fully developed. As discussed earlier, the frail elderly living in nursing homes and retirement communities can benefit greatly from group-based exercise programs that reduce the risk of falling by improving muscle strength and balance. These supervised programs help to reduce some of the barriers to getting frail individuals to become more physically active, including lack of knowledge about what types of activities are safe and effective and the fear of falling or becoming injured while exercising. As noted earlier, the frail elderly also stand to benefit from the development of long-acting medications that make compliance problems less of an issue.

Populations in Underserved Rural and Inner City Areas

Individuals living in areas that lack health care resources, including rural areas and inner cities, represent another special population to be considered. Although many of the therapeutic options for promoting bone health are accessible nationwide, some communities may lack bone densitometry services and/or specialists with expertise in osteoporosis. Furthermore, newly developed procedures are not available in every community.

Conclusions

Major advances in bone health have been made over the past decade. The knowledge base needed for clinical decision-making has grown substantially, resulting in a much better understanding of the risk factors for poor bone health outcomes and strategies and interventions for reducing that risk. Measurement of bone density has become more widely available as the hardware for BMD testing has become less expensive. New, well-tolerated drugs have been introduced that are effective in increasing BMD and preventing fractures. Fall prevention programs have been developed and demonstrated to be effective, as described in Chapters 6 and 7. For those individuals who are at extremely high risk of fracture, rigorously tested hip protectors can significantly reduce the risk of fracture from a fall. Some payment decisions (e.g., Medicare's decision to cover BMD testing) have facilitated identification of those who need specific treatment to help prevent fracture. Finally, there has been increased public awareness of the importance of bone health and the potential consequences of osteoporosis.

In the context of these advances, systems-based approaches offer the potential to make substantial improvements in bone health and to reduce the adverse outcomes of bone disease. Historically, a number of barriers have prevented the widespread application of such approaches. These barriers include the lack of a comprehensive evidence base to guide decision making on osteoporosis and bone health, the fragmented nature of the delivery system, a financing and payment system that does not always create the proper incentives for the promotion of bone health, a workforce that has not historically been trained to engage in a cross-disciplinary, systems-based approach to care, and the lack of a strong push for improvement from outside facilitators, such as purchasers.

Fortunately, some of these barriers are being broken down. Further progress is possible through changes in policy, financing, organizational management, and education. Such changes are critically important to improving the bone health of Americans. As the evidence base continues to grow, a piecemeal approach to translating research findings into practice will no longer suffice. On the contrary, to benefit the largest numbers of individuals, it will be essential to utilize systems-based approaches that promote use of evidence-base bone health care for a broad spectrum of Americans, including the special populations discussed earlier in this chapter.

Key Questions for Future Research

Many systems-based approaches have been found to be effective in promoting certain aspects of health, but few have been specifically tested in bone health. Key research questions in this area are listed below:

- What are the most effective methods for increasing consumer and health care pro-

vider awareness of the need for improving bone health? Do these methods need to vary depending upon the racial and ethnic make-up of the target population? If so, how? How do these differ by age group and treatment goals (e.g., preventive versus therapeutic)?

- What are the most cost-effective methods for stratifying the population according to risk of bone disease? What role can measures of bone density and of fall risk play in the risk-stratification process?
- What are the optimal diagnostic and therapeutic approaches for special populations (e.g., men, racial and ethnic minorities, nursing home residents) for whom the evidence base is lacking?
- What are the optimal clinical, educational, and social rehabilitation programs for persons who have sustained hip or painful vertebral fractures?
- Which provider incentives and quality improvement techniques are most effective in changing current patterns of care for osteoporosis and bone health to be consistent with commonly accepted guidelines?
- What systems changes (e.g., computerized reminders, registries, standing orders) can be broadly implemented in various settings to guide osteoporosis and bone health care in a manner that is consistent with commonly accepted guidelines?
- What are the best measures for assessing the quality of comprehensive osteoporosis care?
- Is the use of specialized osteoporosis clinics a more cost effective way to improve bone health than attempting to improve practice patterns among primary care physicians?
- How can health care providers and systems effectively link with community-based organizations to reduce the risk of falling?
- How can the public health system be most effectively engaged as a partner in improving bone health?
- How effective are fall prevention clinics in reducing the risk of future falls?
- What screening tools are most appropriate for provider organizations to use in primary care settings?
- How is screening and treatment for osteoporosis best integrated into management of other chronic diseases?

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