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Perspective

Osteoporosis and the Global Competition for Health Care Resources*

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ABSTRACT: Global aging superimposed on existing infectious diseases and trauma will aggravate competition for health care resources to diagnose and treat osteoporosis. Efforts to implement public health measures are needed, but the targeted approach to assessment and treatment of high-risk individuals must also be refined.

Increases in the elderly population worldwide will cause a dramatic rise in osteoporotic fractures, but other age-related diseases will increase as well. Changes will be superimposed on existing public health problems (e.g., malaria, alcoholism), and these acute health care needs will take priority in some areas. Societies in most parts of the world may have to limit osteoporosis control to broad public health measures, and such efforts (e.g., calcium and vitamin D supplementation) should be supported. In these regions, clinical decision-making will generally be limited to treating patients with fractures (who presumably have already failed any public health measures in place), or in a few wealthy countries, to patients with low bone density identified by case-finding. Case-finding approaches will vary with the resources available, although unselective (mass) screening by bone densitometry is largely ineffective and unaffordable anywhere. The key to clinical decision-making on behalf of individuals will be an assessment of absolute fracture risk, and the tools needed to predict the risk of an osteoporotic fracture over the next 10 years are now being developed. These include bone density measures, but also incorporate other risk factors (e.g., fracture history, corticosteroid use), which may allow extension of fracture risk prediction to nonwhite populations and to men. Even with a universal risk prediction tool, cost-effective treatment thresholds will vary by country based on the level of fracture risk in the region and on the resources available for health care. To better compete for these resources, efforts should be made to lower the cost of osteoporosis interventions. Additionally, evidence is needed that these interventions are really effective in reducing fractures in the community.
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IT'S A CHALLENGING TIME in the osteoporosis field. DXA permits recognition of osteoporosis before the onset of fractures, and recent applications of CT promise an ability to describe changes in specific bone compartments and allow bone strength to be directly assessed in vivo. Likewise, a number of effective therapies have been introduced that slow bone loss, restore structural integrity, and reduce the risk of fractures. However, it remains unclear how these tools might best be used among patients of different sexes and races residing in various parts of the world. In particular, there is concern about the best way to target drug therapy to those most in need and most likely to benefit, raising questions about the universal applicability of guidelines for bone density evaluation and thresholds for the use of pharmacologic agents. Because there will be increasing competition for the health care resources needed to diagnose and treat osteoporosis, it may be useful to take stock of some of the more important issues in the context of the larger global environment within which we must operate in the coming years.

Perhaps the most important influence will be dramatic growth in the elderly population worldwide. Because of earlier increases in life expectancy at birth and ongoing increases in life expectancy at older ages, the proportion of the population age 65 years and over is on pace to double, and in some countries triple, over the next 30 years.[1]

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Table 1. Rank Order for Top 15 Leading Causes of Disease Burden (Disability-Adjusted Life Years) in the World: 1990 vs. 2020[2]

Rank	*1990*	*2020*
1	Lower respiratory infections	Ischemic heart disease
2	Diarrheal diseases	Unipolar major depression
3	Perinatal conditions	Road traffic accidents
4	Unipolar major depression	Cerebrovascular disease
5	Ischemic heart disease	Chronic obstructive lung disease
6	Cerebrovascular disease	Lower respiratory infections
7	Tuberculosis	Tuberculosis
8	Measles	War
9	Road traffic accidents	Diarrheal diseases
10	Congenital anomalies	HIV
11	Malaria	Perinatal conditions
12	Chronic obstructive lung disease	Violence
13	Falls	Congenital anomalies
14	Iron-deficiency anemia	Self-inflicted injuries
15	Protein-energy malnutrition	Respiratory cancers

Indeed, the elderly worldwide are now increasing by about 800,000 per month, and it is anticipated that the number of those 65 years of age and over will rise from 431 million in 2000 to 696 million in the year 2020, while the population age 75 years and over will grow from 163 to 269 million over the same interval.[2] Because hip fracture incidence rates increase exponentially with aging,[3] this demographic change alone should cause the number of hip fractures worldwide to rise from about 1.3 million in 1990 to an estimated 2.3 million in 2020.[4] If, in addition, the age-specific hip fracture incidence rates themselves remain stable in Europe and North America but continue to increase by 3%/year as they have in many other parts of the world, hip fractures could total 4.7 million annually by 2020. This huge increase in hip fractures, not to mention the other fractures associated with osteoporosis, could have a devastating effect on disability and cost for the elderly population worldwide.[5]

Less often appreciated, however, is the fact that other important chronic diseases are also increasing because of this demographic shift. Indeed, the incidence of dementia increases exponentially with aging, just like hip fracture, whereas diabetes, cardiovascular disease, and cancer all show a strong relationship with age. All of these diseases will become more common as the number of elderly people rises. For instance, new cancer cases worldwide are expected to increase from 10 million in 2000 to over 15 million in 2020.[6] During this same period, deaths from coronary heart disease could rise from 18 to 27 million.[7] Because of the ongoing epidemic of obesity, there will also be a formidable rise in the prevalence of diabetes, from an estimated 135 million affected adults worldwide in 1995 to a projected 300 million by 2025.[8] Even now, some of these other conditions generate more cost and disability than does osteoporosis, which is nowhere near the top of the priority list with respect to disability-adjusted life years lost (Table 1). In fact, the category "falls" (which includes intracranial and spinal cord injuries, amputations, and dislocations, as well as fractures) ranked 13th on the list in 1990 but is projected to drop to 19th place by 2020.[2] Indeed, prevention of bone loss would seem to have less potential impact on public health than the control of hypertension, obesity, and tobacco use,[9] and the priority given by policymakers to the diagnosis and treatment of osteoporosis could become increasingly problematic.[10]

In some areas of the world, acute health care problems are so pressing that little attention can be paid to osteoporosis. For example, the 70 million people that the WHO estimates have osteoporosis[11] pales in comparison to the 2 billion infected with tuberculosis.[12] Similarly, the estimated 1.3 million hip fractures in 1990[4] can be contrasted with more than 4 billion episodes and nearly 3 million deaths from diarrheal diseases that same year,[7] with 300 million cases and 1 million deaths annually from malaria,[13] and perhaps even more disturbing, 44 million cases and over 1 million deaths from measles each year.[7] To make matters worse, the growing burden of chronic disease is being superimposed on existing communicable disease problems in many regions. Thus, it is said that adults under 70 years of age in sub-Saharan Africa have a greater risk of dying from these age-related chronic conditions than do residents of North America or Western Europe.[2]

These observations have some important implications. First, where the problem is not ignored altogether, osteoporosis control in many countries may have to rely solely on public health measures. The public health approach aims to move the whole distribution of some risk factor (e.g., bone density) in a positive direction using interventions that are safe and inexpensive enough to be used indiscriminately on the entire population. Treatment with potent pharmaceutical agents is not suitable for this purpose, and bone densitometry is not needed because there is no screening or assessment of individual risk. Unfortunately, despite the theoretical advantages of this approach,[14] its application to osteoporosis remains to be validated and few such programs have actually been implemented. Even inexpensive interventions, such as vitamin D supplementation, which significantly reduces hip fractures,[15] are not regularly used on a countrywide basis. Moreover, population behavior is difficult to change as evidenced by a recent systematic review of trials for coronary heart disease prevention, which indicated that multiple risk factor intervention accomplished only modest changes in the risk factors themselves and had an insignificant effect on mortality.[16]

As a result, attention has focused instead on the clinical approach to osteoporosis, where the highest risk subset of the population is identified and treated with more potent, more expensive, and possibly more toxic agents.[17] Although such strategies may be cost-effective,[18] many questions remain with respect to the optimal management of osteoporosis patients of different sexes or races. For example, it has been controversial whether bone density predicts fracture risk comparably in these groups. Although comparisons are confounded by discrepancies in bone size,[19] it now seems that a given absolute bone density value predicts risk equivalently in the two sexes, although relatively few men attain the low levels seen in women where fracture risk

is greatest.[20] Likewise, a recent study of >200,000 black, white, and Asian women in the United States showed that the relative risk of fracture associated with low bone density assessed at peripheral sites was comparable among women of different races.[21] More generally, many risk factors besides bone density are important in fracture etiology,[22] but there is no easy way to use this information clinically. This important problem is being addressed by a working group of the WHO through the development of an algorithm combining bone density measures with other risk factors to predict the likelihood of an osteoporotic fracture over the next 10 years.[23] The resulting risk prediction algorithm will still have to be validated in men and in women of different races because preliminary evidence suggests that the determinants of fracture may not be the same in all groups. Indeed, there may be important differences by ethnic group and locale even among members of a given race,[24] and this will need to be reflected in the ultimate practice guidelines.

Even assuming that the necessary diagnostic and therapeutic tools are available, their application will vary by region based on economic factors. In particular, costly interventions raise the potential for fracture prevention to be as expensive as fracture care, but even expensive treatments can be cost-effective if targeted to the right patients. In one analysis, a treatment costing $625 per year that lowered fracture risk by 35% did not become cost-effective in average risk Swedish women until they were 80 years old.[25] However, a 50-year-old woman whose fracture risk is four times greater than that of her peers has an absolute risk of osteoporotic fracture over the next 10 years practically identical to the average 80 year old.[26] While it should be possible to identify the high-risk 50-year-old women with increasing precision, this analysis also presupposed a cost-effectiveness threshold of $20,000-$30,000 per quality-adjusted life year saved.[25] This is far beyond the means of most countries, not to mention the 83 poorest whose annual health care expenditures average only $26 per capita; in such countries, there can be little doubt that the money would be better spent on other problems.[27]

Finally, more attention must be paid to the cultural context in which osteoporosis interventions are delivered. Although osteoporosis is as much a disease as hypertension or diabetes, some populations justifiably focus their attention on greater perceived health threats.[28] Other cultures may have entirely different concepts of health and disease. Even in affluent Western societies, not everyone has the same level of concern, and it is routinely observed that some high-risk individuals decline osteoporosis treatment. Conversely, health consciousness is high in most Asian populations, who often chose to invest in health once greater affluence is attained. The choice to accept long-term pharmacologic therapy is a complex one in any event.[29] An extensive evaluation for osteoporosis is not indicated when the patient is unwilling to accept treatment because any investment in the initial work-up will not yield a corresponding benefit in terms of ultimate fracture reduction. Empirical demonstration that high-risk patients will actually adhere to a treatment course for many years and that a program of selective screening and aggressive treatment really reduces fractures in the population would increase confidence that the clinical approach to osteoporosis management is beneficial.

A number of important problems have been raised here, but the situation is not hopeless. Although fractures and the other age-related disorders are expected to increase dramatically with continued growth of the elderly population worldwide, projections may prove to be unduly pessimistic should aging be accompanied by compression of morbidity into the end of life.[30] The struggle for resources will be greatest in developing countries where infectious diseases are still rampant. However, musculoskeletal problems in these areas relate more to arthritis and injuries than to osteoporotic fractures, which are uncommon,[31] and widespread bone density testing with long-term pharmacologic therapy for osteoporosis treatment or fracture prevention will not be cost-effective in such low risk populations. On the other hand, the key decision-maker about osteoporosis management may not be a government policymaker but rather the patient, especially the educated and wealthy ones. By virtue of "privatization of risk,"[32] these people may become candidates for bone densitometry and pharmacologic therapy regardless of the economic circumstances of their country of residence. Even where osteoporosis is more common, however, this clinical approach to the problem will only be feasible in the most wealthy societies. Consequently, professionals in the field should help to develop practical public health strategies (e.g., nutritional supplementation), the more so because adequate vitamin D and calcium intake is a prerequisite for most active treatment regimens. In summary, the resources that can rationally be devoted to osteoporosis management will vary by region, and every country will be challenged to devise a culturally appropriate and affordable approach to the control of this important condition. Now is the time to begin thinking about how these issues can best be dealt with in a global context.

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