Health and Disease among the Oldest Old: A Clinical Perspective

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IT IS EVIDENT THAT THE MEDICAL NEEDS OF THE elderly, and in particular, the very elderly, will have a major impact on the future organization and financing of the American health care system. The elderly are especially important for two reasons: (1) their health needs are quantitatively and qualitatively different from younger individuals, and (2) their numbers are increasing dramatically. Among the elderly, the oldest old, who represent the most rapidly growing segment of the population, are attracting special attention. From the clinical perspective, this is particularly fitting since it is beyond age 85 that special clinical characteristics emerge that influence the care of the elderly. The unique medical characteristics of the oldest old are the progressively increased prevalence of disability from chronic illnesses and symptoms or vulnerabilities directly attributable to the aging process. In recent years, quantification of the impact of aging has been increasingly possible up to the ninth decade, but study of the oldest age group has not been rigorously performed. Clinical observation alone, however, indicates that variability and degree of both physiologic changes and disease states is greater in the oldest old, making generalizations about their frailty more hazardous. This paper will review the special clinical characteristics of the elderly

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most accentuated in the oldest old and the resulting implications for the formulation of durable, appropriate modifications in the present health care system.

The Interaction of Aging and Disease

The major factor dominating the expression of disease in late life, which is accentuated in the oldest old, is the marked variability that accompanies advanced age (Gordon and Shurtleff 1973). Decades of study of normal and abnormal aging have shown, perhaps more clearly than anything else, that as people get older, the less like each other they become (Rowe and Besdine 1982). The marked variability in the clinical manifestations of a given illness in the elderly is due in part to: (1) variability in underlying physiological changes, (2) other diseases that the individual has accumulated over time, (3) the pattern of response to illness and interaction with health care professionals that is characteristic of the individual, and (4) the varying degrees of severity of pathophysiologic processes. The process of aging uniquely influences the oldest old and an understanding of the varying types of interaction between the normal aging processes and a variety of stresses and pathologic mechanisms is required to provide the proper framework for understanding the medical milieu of the oldest old. It is through understanding this milieu that the need for change in health policy, technology, research, and manpower can be appreciated. The spectrum of interaction between aging and disease is broad. Some physical and metabolic factors show no change, whereas others reflect exposures *over time* rather than aging per se. Some physiologic changes render specific illnesses less likely or severe, whereas other changes alter the symptoms of a disease or increase an illness's severity. Aging can create changes that imitate an illness or actually represent disease inasmuch as they have direct, predictable, and adverse clinical sequelae. Several specific clinically relevant points along the continuum can be identified. While aging processes affect all members of a population, plasticity or modification of these processes is possible. This makes it conceptually and practically possible to modify and minimize some deleterious aspects of physiologic aging. These possibilities mandate greater emphasis on health policies that support health promotion in the oldest old.

Physical and Metabolic Characteristics That Do Not Change with Age

Perhaps the most important type of change that occurs with age, from a clinical standpoint, is no change at all. Too frequently, clinicians are apt to ascribe a disability or an abnormal physical or laboratory finding to "old age," when the actual cause is a specific disease process. Several examples of this category can be identified. In the first subset, there is no effect of age on the variable under study. An example of this lack of change is the hematocrit. Elderly individuals will be found very frequently to have low blood counts (hematocrit levels), and the clinician will categorize the patient as having "anemia of old age." The physician may fail to pursue the underlying basis of the anemia in his belief that the normal aging process has induced the anemia and that no investigation or treatment is warranted. Data from several sources, including the Framingham Study, however, indicate that in community-dwelling elders, there is no change in hematocrit with age (Gordon and Shurtleff 1973). Thus, a low hematocrit in an elderly individual cannot be ascribed to "anemia of old age," but deserves a proper investigation and treatment.

A balanced physiological change results in a lack of measurable change in some parameters in elderly patients. An example of such a circumstance is the circulatory level of male sex hormone (testosterone). While the blood level of testosterone appears not to decline in healthy community-dwelling elderly men (Sparrow, Bosse, and Rowe 1980), studies indicate that this is the result of a balanced 25–30 percent decline in both testosterone production and breakdown rates. Similar changes have been identified with regard to cortisol, thyroxine, aldosterone, and probably insulin (Minaker, Meneilly, and Rowe 1985). The clinically relevant fact remains that the variable most frequently measured does not change with age, and deviation from the normal range for all adults should be viewed as clearly abnormal, independent of age.

Diseases Associated with Passage of Time

The increased *time* that elderly individuals have been alive predisposes them to certain diseases or processes apart from the biological or physiological changes of aging. Several specific examples can be cited.

Polycystic kidney disease represents an inheritable condition in which the clinical manifestations are frequently not expressed until the sixth decade of life. The aging process itself has no influence, as far as we know, on the development of cysts in kidneys. It is clear, however, that these individuals must live until at least the sixth decade of life before they show the manifestations of this inherited disease. A second type of abnormality that appears to be more related to the passage of time than to the changes associated with age are those disorders which are related to the accumulated exposure to environmental or dietary toxins. Cutaneous cancer secondary to sun exposure in individuals with fair skin is much more likely to occur in older individuals than younger individuals because older individuals have accumulated a greater exposure to the ultraviolet radiation in sunlight (Gilchrist, Blog, and Szabo 1979). Similarly, individuals who smoke cigarettes are more likely to develop pulmonary carcinoma in middle or late life than during younger adulthood because of the time required to accumulate exposure to a carcinogenic dose of cigarette tobacco (Doll and Peto 1976) and the time lag from initiation to detection of disease.

Physiologic Changes Making Specific Diseases Less Likely or Severe

While aging is characteristically considered to be associated with a greater prevalence or severity of disease, it is quite possible that the physiologic changes associated with normal aging result in many diseases being less likely or less severe in advanced age. Some disorders that appear to be based on an altered response of the immune system, such as systemic lupus erythematosis, myasthenia gravis, and multiple sclerosis are much more common in younger individuals than in older individuals. It is conceivable that the marked decrease function of T-lymphocytes and other changes in immune competence may result in a less-robust immunological response to the inciting agent or event in these disorders (Gillis et al. 1981).

Similarly, some diseases which occur in old age, as well as in younger adults, clearly have a less virulent natural history in the elderly. One example may be carcinoma of the breast. Many cancer specialists feel that carcinoma of the breast runs a more aggressive course in premenopausal than postmenopausal women. Likewise, the responsiveness of breast carcinoma to hormonal therapy increases with the number of years after menopause. Thus, elderly individuals with

this disease may be expected, on the average, to enjoy a more favorable clinical course than their younger counterparts.

Physiologic Changes That Alter the Presentation of a Disease

This poorly understood area has been recognized as one of major importance to the practice of geriatric medicine. Many diseases that occur in both young and old adults have manifestly different clinical presentations and natural histories in the two age groups. Unlike the example of breast cancer, which was discussed above, these disorders should not necessarily be looked upon as being less severe or more severe in the elderly, but just different. One such disorder is hyperthyroidism. Younger individuals with hyperthyroidism appear agitated, anxious, and hyperactive. They often have a palpable goiter (enlarged thyroid gland), elevated heart rate and blood pressure, hyperactive deep tendon reflexes, and complaints of weight loss and irritability. Many elderly individuals with elevations of circulating thyroid hormone to levels equivalent to those seen in younger individuals will have a strikingly different clinical presentation of hyperthyroidism. In these individuals, irritability and hyperactivity are infrequent and goiter is rare (Davis and Davis 1973). Deep tendon reflexes may be normal or even hypoactive, and the patient generally presents a deactivated or "apathetic," as opposed to an activated, clinical picture. The management of hyperthyroidism with the same mode of treatment used in younger individuals results in the same excellent prognosis in older individuals. Physicians must recognize hyperthyroidism in the elderly or patients will suffer from this disease which results in significant and unnecessary morbidity and mortality.

A second example of a common disorder which reacts differently in the elderly than in young adults is uncontrolled diabetes mellitus. In children and in young adults uncontrolled diabetes is generally manifested by blood sugars between 300 and 500 mg/dl, ketosis, and the presence of a severe metabolic acidosis. In contrast, elderly individuals with uncontrolled diabetes frequently react in hyperosmolar nonketotic coma, with striking elevations of blood glucose to levels over 1000 mg/dl, and a relative or absolute lack of circulating ketones and acidosis. The elderly react with obtundation and coma while younger individuals are more likely to react with manifestations of severe metabolic acidosis.

Other disorders in which the presentation is strongly influenced by

age without necessarily making the disorder more or less severe, include depression, acute glomerulonephritis, and rheumatoid arthritis.

Physiologic Changes That Increase the Likelihood or Severity of a Disease

Age-related reductions in the function of numerous organs place the elderly individual at special risk for enhanced morbidity from disease in those organs. This age-illness interaction creates most of the unique increase in frailty seen in the oldest old.

Finch has recently proposed a mechanism whereby normal age-related changes in brain neurotransmitters may influence the onset or severity of a variety of degenerative central nervous system diseases (Finch and Morgan 1985). In the case of Parkinson's disease, he points out that normal human aging has been associated with progressive reductions in levels of receptors and key enzymes required for dopamine synthesis in the brain. These decreases may interact with pathophysiologic changes to account for the increasing prevalence of Parkinson's disease in late life whether secondary to viral encephalitis or associated with a genetic or arteriosclerotic predisposition. While several models may be postulated for the interaction of aging and Parkinson's disease, Finch notes that the onset of the disease many years after acute encephalitis and the enhanced susceptibility of old individuals to the side effects of certain drugs (Ayd 1961) are consistent with the development of age-related neurotransmitter deficits which become manifest in the presence of a preexisting subclinical pathologic lesion or when the neurotransmitter tone is impaired with drugs.

Normal aging is associated with a marked reduction in pulmonary function (Weiss 1982). Healthy individuals in the ninth decade of life frequently will have lung function equal to only one-half of that of their thirty-year-old counterparts. Thus, an acute pulmonary disease, such as bacterial pneumonia, of equal initial severity, will be much more likely to induce a serious clinical manifestation in the elderly because of the markedly lessened pulmonary functional reserve. Over the past decade, very significant advances have been made in our understanding of the marked reduction in immune competence that occurs with age. Immunosenescence is likely responsible, in some ways, for the increased incidence of some infections and perhaps cancers in the elderly and for the increased severity of infections in the elderly.

Thus, an elderly individual with pneumonia may be less likely to contain and control that infection in his respiratory tract than a young individual. Failure of immune function may result in dissemination of that infection to many organs and a much more serious, if not life-threatening, clinical illness may develop.

A similar argument holds for function in many other organs, including the kidneys. Normal renal function in the elderly is approximately 40 percent less than in young healthy adults (Rowe et al. 1976). Thus, the loss of one kidney due to obstruction, vascular occlusion, or trauma in the elderly would be much more likely to result in a clinically significant reduction in overall renal function than the loss of function in one kidney in a healthy young individual.

In elderly individuals, multiple pathology or the simultaneous presence of diseases in several organs or organ systems, is often the rule rather than the exception. In many cases, physiologic changes that occur with age interact with multiple pathology to induce specifically geriatric syndromes. The high prevalence in the elderly of falls may be viewed as such a case. Several studies have demonstrated a marked increase in postural sway or decrease in the capacity to maintain upright posture with advancing age, particularly in women. Recent evidence suggests this may be related to age-associated changes in the mechano-receptors in the cervical spine (Wyke 1979). Regardless of the mechanism of this age-related effect, elderly individuals by virtue of their decreased capacity to maintain upright posture are at particular risk for falling under a variety of circumstances which would not result in falls in younger individuals. Thus, ice on the front step, a poorly lit stairway at home, or a moist bathtub without a rubber mat may all result in a near fall in a young individual and a serious fall in the elderly. The risk to the elderly of developing a serious consequence of a fall is enhanced by another age-related change which is also particularly common in elderly women, loss of bone mass or osteopenia. Thus, hip fracture is essentially a disease of elderly women, and in most instances is induced by a fall under circumstances which would not have induced a fall or fracture in younger individuals.

A final example of a mechanism whereby age-related alterations in physiologic control increases the prevalence of a disease relates to the development of accidental hypothermia in frail elderly. This disorder has a high mortality rate and can be seen not only in individuals exposed to unheated rooms in the winter, but in individuals in heated

rooms who appear to spontaneously develop marked lowering of body temperature. This disorder is essentially absent in healthy young individuals and occurs with increasing frequency with old age. While the mechanisms of accidental hypothermia are poorly understood, alterations in sympathetic nervous system responsiveness seem likely to be major contributors.

Physiologic Changes That Mimic Specific Diseases

Some changes that occur with aging may be seen to mimic specific clinical entities, thus causing confusion regarding the diagnosis of specific diseases in the elderly. Perhaps the best and most widely recognized instance of this is the decrease in carbohydrate economy that occurs with advancing age in the absence of diabetes mellitus. Normal aging is associated with a decrease in the sensitivity of peripheral tissues to the effects of insulin (Rowe et al. 1983). This change is reflected by decreased performance on oral or intravenous glucose-tolerance tests.

The oral glucose-tolerance test finds frequent clinical application as a means of diagnosing the presence of chemical diabetes mellitus. Many medical textbooks include criteria for the diagnosis of diabetes mellitus employing the oral glucose-tolerance test which are based solely on studies of healthy young control populations. The changes in glucose tolerance with age, independent of diabetes or other confounding diseases, are so dramatic that over 50 percent of individuals over 60 years of age would be diagnosed as diabetic if age-adjusted criteria were not employed. Present criteria include an attempt to age-adjust diagnostic criteria for diabetes. Unfortunately, too frequently, physicians and other health professionals are unaware of the need for age-adjustment in this as well as other types of clinical tests, thus resulting in a tendency for the over-diagnosis of diabetes in the elderly.

Physiologic Changes Having a Direct Clinical Impact

For many decades, gerontologists and geriatricians have drawn a very clear line between the changes that occur with age and those that are associated with specific disease states. We have staunchly defended the view that age is not a disease, but a normal process that must be clearly understood in order to diagnose adequately and treat the

increasing burden of illness that will befall a rapidly enlarging population. Substantial data in several different areas suggest that this approach is no longer tenable. There is no question that some physiologic changes that reflect normal aging have clearly adverse clinical sequelae. While a change may represent "normal aging" inasmuch as it is present in the entire population and cannot be avoided, one should not assume that this "normal" change is necessarily harmless.

While one can argue about the specific criteria for the definition of a "disease," one generally acceptable definition would include any process that results in clearly adverse clinical sequelae measured as either morbidity or mortality. Under this definition, there are clear changes that occur with advancing age which appear to be a consequence of the aging process and which also qualify as diseases. Of the potentially very long list of such processes, three will be briefly reviewed.

More than any other biological change, menopause seems clearly to be accepted as age-related. While menopause is thus clearly "normal," it has become abundantly clear that this normal change is associated with increased risk for certain diseases such as osteoporosis and atherosclerosis as well as symptomatic clinical manifestations such as hot flashes which are associated with sleep disturbances and are so frequent and severe as to be disabling in many individuals (McKinlay and Jefferys 1974).

A second change that occurs with normal aging which has direct adverse clinical consequences is cataract formation. Posttranslational modifications of central lens proteins with advancing age result in increasing opacity as well as decreasing flexibility of the lens, which is manifested in decreasing capacity to accommodate to near vision (Weale 1963). While the reasons for the development of cataracts in some individuals and not in others are not clearly understood, they probably lie in the marked physiological variability that was previously commented on as being characteristic of most if not all changes that occur with advancing age. Lens opacification or cataract is a common cause of blindness in older Americans. Thus, this normal, age-related change, in its most extreme form, would seem to clearly represent a disease.

A third characteristic type of change with advancing age that would appear to have direct clinical consequences is arteriosclerosis. This thickening of the walls of major arteries must be distinguished from atherosclerosis, which represents the development of plaques on the

vessel intima which encroach on the lumen. Arteriosclerosis appears to be a normal consequence of age-related changes in the extra-cellular material in arterial walls and is reflected in decreased compliance and increased stiffening of vessels with advancing age (O'Rourke 1970). This is manifested in increased systolic blood pressure. Epidemiological studies, including the Framingham study, have identified increases in systolic blood pressure as the major risk factor for several types of vascular disorders, most notably cerebrovascular disease or stroke. Thus, increases in systolic pressure, which appear to be consequences of normal age-related changes in vessel walls, carry with them an increased risk for serious morbidity or mortality.

It can thus be seen that increasing understanding of the physiologic changes with age, as well as the risk associated with the many changes that are considered "normal" leads to a consideration that aging can, in some ways, represent a disease state.

The Expression of Illness in the Oldest Old

The amount of the illness burden in any population has traditionally involved an unweighted list of diseases, each of which involves a single organ or organ system. Within each illness category or "diagnosis" a great spectrum of morbidity exists. The symptoms experienced by individuals with coronary artery disease, a very prevalent disease in late life, may vary from a mild chest discomfort during severe physical activity to severe pain occurring with minimal exertion. Additionally, each of the above may be associated with shortness of breath, fatigue, wheezing or coughing, all to differing degrees. It is common for the elderly to carry a list of diagnoses numbering five to eight in number, each with its own subset of symptoms. The result is that elderly patients often cannot localize the source of any new disability but complain of a rather narrow group of symptoms which form the final common pathways of the disease-aging interaction described above. These patterns or syndromes of geriatric medicine require new skills of diagnosis and management and have a broad range of health policy effects. Several examples, such as memory failure and urinary incontinence are highly morbid and prevalent and have created substantial shifts in allocation of research and clinical funds for health care of the elderly in recent years. In this section, several general features of illness as

expressed in the elderly will be presented, followed by discussion of common syndromes in the oldest old. Health care policy for the oldest old will center around the prevention, therapy, and rehabilitation of these syndromes.

Underreporting of Illness

A phenomenon contributing to major disability in elderly patients is the failure of the elderly themselves to report illness. Symptoms of serious and treatable disease are often concealed, or at least not reported, by elderly patients. In a study by W. F. Anderson (1956) startling numbers of problems previously unknown to the patient's physician were discovered despite the fact that these patients were all enrolled in the British National Health Service, which is designed to provide adequate service to the elderly, including doctors responsible for each patient, free care, and numerous, accessible doctor's offices. The problems were not esoteric, nor did they require sophisticated diagnostic methodology. Frequently encountered disorders included congestive heart failure, correctable hearing and vision deficits, tuberculosis, urinary incontinence and retention, anemia, chronic bronchitis, claudication, cancers, nutritional deficiencies, uncontrolled diabetes, foot disease hampering mobility, dental disease impeding nutrition, dementia, and depression.

Further questioning of subjects and review of the primary data led to some clear explanations for this apparently self-destructive illness behavior among elderly Scots. Older people perceive pain, malaise, and disability adequately but choose to conceal their distress or at least not seek treatment.

The most common explanation for symptom tolerance and nonreporting is the pervasive belief that old age is inextricably associated with illness, functional decline, and feeling sick. Old and young, lay and professional, men and women, all believe that to be old is to be ill. Obviously, this "ageist" view of health and disease guarantees that older individuals, even when afflicted with the same symptoms that impel the middle-aged sick into the mainstreams of the health care system, do not seek care, suffer in silence the progression of many diseases, and endure the functional losses engendered by untreated illness.

A second explanation for old people not reporting illness is that

the high prevalence of depression, coupled with the many losses common in late life, interfere with the desire to regain vigor.

A third block to reporting illness is intellectual loss. Though never "normal," the increasing prevalence of cognitive loss with age is doubly dangerous to the detection of disease. Cognitively impaired individuals have a diminished ability to complain and are also evaluated less enthusiastically for associated medical diseases or even reversible diseases which may produce intellectual losses themselves.

A fourth explanation for symptom concealment by elderly patients is the fear that something will be found that will generate diagnostic or therapeutic interventions that in themselves will produce functional loss and jeopardize independent living. Today's octogenarians, having grown up when health care systems produced less salubrious interventions, may be reluctant to seek care.

Geriatric Syndromes

Elderly patients may seek health care for treatment of clearly defined acute illnesses, such as nosebleeds. Much more commonly, however, the oldest old seek medical care for slowly progressive, multiple-caused, chronic medical syndromes which induce long-term disability and result in increased acute and long-term hospitalization. Memory failure, urinary incontinence, falls, systolic hypertension, and polypharmacy, are the usual reasons for referral of the oldest old for geriatric medical evaluation. A general understanding of the nature and magnitude of these syndromes is needed on which to base health care policies capable of addressing the multidisciplinary challenges they present.

Memory Failure

Progressive cognitive dysfunction has recently been recognized as a major handicap of many older individuals. While prevalence figures remain inexact, it has been estimated that memory failure of significance affects nearly half of all the oldest old individuals in institutions and perhaps one-third of those living in the community. There are many causes of memory failure and an exact diagnosis should be attempted in all identified cases. A significant subset of individuals has a reversible

component to their cognitive impairment and are able to function at a higher level following specific therapy.

Dementia of the Alzheimer's type is responsible for approximately two-thirds of the progressive memory failure that afflicts 10 percent of all Americans over age 65 and a larger percentage of the population of the oldest old (Kurtzke and Kurland 1981). Alzheimer's disease may be the fourth leading cause of death in the United States (Wisniewski and Terry 1976). It is a progressive, global impairment of intellectual functions, usually initially affecting memory, in a normally conscious and responsive patient. Pathologic examination of the brain reveals increased numbers of senile plaques and neurofibrillary tangles. Present standards for the diagnosis of this condition in life depend on the judgment of skilled physicians, neurologists, psychiatrists, and neuropsychologists and are, in general, determined by exclusion of other clinically diagnosable illnesses. In several studies, 10 to 20 percent of elderly individuals with dementia have reversible conditions, and failure to recognize these cases is unfortunate. This illness may run a course over a decade and health care policy must support interventions at a variety of levels to maintain optimal functioning of the individual.

The etiology of Alzheimer's disease is unknown, but it is now clear that the underlying pathologic process is a primary, neuronal degeneration and the reduced regional blood flow is secondary to brain atrophy rather than "hardening of the arteries." Metallic "poisoning" as a cause has been suggested, but the present consensus is that although aluminum and perhaps lead accumulate in the affected neurons, this phenomenon is secondary to the degeneration itself. Aluminum toxicity has been shown to be a cause of "dialysis dementia," but experimental animal models of this disorder have a separate pathologic picture from Alzheimer's disease.

A viral cause has been suspected since slow viruses have been found to be etiologic for two rare degenerative diseases associated with dementia, kuru and Creutzfeldt-Jacob disease. Recent, albeit contested, reports of "subviral particles" in dementia-diseased brains and the ability of Alzheimer tissue to create paired helical filaments in fetal cortical neurons sustain research along this track.

A genetic etiology for at least a proportion of victims seems likely. The risk of Alzheimer's disease is increased five-fold among first degree relatives of victims in one Swedish study. Certain immune-system profiles are more prevalent in Alzheimer patients, and all long-surviving

Down syndrome patients develop Alzheimer's. Chromosomal defects appear more commonly in females with Alzheimer's disease.

It has been an old saw that patients who complain of memory difficulty are not likely to be suffering from Alzheimer's. It has been recently recognized, however, that nearly two-thirds of individuals developing Alzheimer's disease show behavioral and mood disturbances which strongly suggest recognition and frustration with the new onset of cognitive disability. A great spectrum of affective reactions to self-recognized memory failure have been documented. They include confabulation, depression, anger, aggressiveness, denial, and anxiety. In many cases it will be recognized that these behavioral alterations are exaggerations of coping mechanisms characteristic of that individual's prior responses to stress. More rarely, mood changes never previously observed will appear.

Where lack of insight and judgment accompany mild changes in memory function, other responsible family members will recognize memory failure which will increase the general assistance they normally provide. Another common pattern of the onset of Alzheimer's disease is the appearance of recurrent acute confusional states associated with therapeutic drug administration, during periods of sensory deprivation or overload, and consequent to metabolic or psychological stress. Hospitalization often provides a combination of these stimuli. Although far from certain, it appears that perhaps one-third of patients with acute confusional states will eventually develop Alzheimer's.

The disease is slowly progressive, and regardless of the mode of presentation even in professionally sensitive households, the onset often can be dated back six months to one year. In clinical practice, mismanaging the checkbook, forgetting names, slow apathetic withdrawal from established social activities, and loss of memory skill in well-established games, such as bridge, are sensitive, but nonspecific indicators of early disability. Behavioral abnormalities often appear at this point.

Subsequently, possessions are misplaced, appointments are forgotten, and phone calls to family increase with perseveration of details of arrangements for appointments. Judgment and insight are variably impaired early on; some individuals become sexually aggressive and unkempt in appearance, while others maintain social and physical graces as well as personal safety skills until late in the illness. Disturbing to us all, because of the customary preservation of visual-spatial capacity early in the disease, most individuals with mild and even moderate

dementia are driving their cars. Speech, motor, self-care, incontinence, and nutritional deficiencies are usually later manifestations of this disorder and are major determinants of institutionalization.

Urinary Incontinence

Urinary incontinence is unexpected, uncontrolled urination and is a malodorous social stigma, which 5 to 15 percent of community-dwelling elderly experience. In acute-care hospitals, nearly 50 percent of the elderly experience incontinence and in long-term care settings, the rate is probably higher. Several risk factors are associated with a high risk for this disorder, including immobility, being female, and having central nervous system disease. The oldest old appear at increased risk for this disorder on the basis of being more likely to have impaired mobility and neurologic disease. The cost of urinary incontinence has been measured in a number of ways. Up to 20 percent of nursing home costs are devoted to care of the incontinent patient. The loss of self-esteem and social withdrawal that incontinent patients experience is great, and it is as yet poorly quantified.

Urinary incontinence is a prevalent and particularly distressing symptom in the elderly that frequently leads to their placement in long-term care facilities and causes considerable morbidity. If it is approached optimistically, evaluated carefully, and treated rationally, it can often be reversed (Resnick and Rowe 1982).

Falls

Physicians dealing with the oldest old frequently encounter individuals whose chief complaint is falling. Increasing age and debility are associated with a marked increase in the risk of and damage from falls. Not only do falls result in injury, but they create a lack of confidence that further impairs mobility in elderly individuals.

Surveys of community-dwelling elderly individuals in Great Britain and the United States have repeatedly shown that 35 to 40 percent of individuals over 65 will suffer at least one fall per year and that the risk of falling increases dramatically with advancing age. An important study in a long-term care facility by Gryfe, Amies, and Ashley (1977) chronicled the experience of over 400 individuals for a period of five years. The overall incidence of falls in this study

population was 45 percent. While this is somewhat higher than the incidence found in community-based studies, it is more likely to be accurate since individuals were in a supervised environment in which the staff was particularly interested in documenting episodes of falling. Elderly women seem to be especially vulnerable to falls, and particularly prone to falling down stairs. Falls are likely to be recurrent. (In Gryfe's study, over the course of five years, the average man who had fallen had 2.7 episodes of falling and the average woman, 3.5.)

Most falls are of no clinical consequence. Gryfe and colleagues have shown that 54 percent result in no injury whatsoever, and an additional 28 percent were considered to be trivial; 18 percent were noted to be severe, with 6 percent resulting in fracture. In view of the high prevalence of falls in the elderly, this rather small percentage of severe injuries accounts for the major portion of traumatic illness in the elderly. The likelihood of significant fracture from a fall corresponds with the degree of structural strength of bones which is less in whites than in nonwhites, less in women than men, and decreases progressively after age 65. The annual incidence of femur fracture increases from less than 100 per 100,000 population at age 40 to greater than 500 episodes per 100,000 population at age 60. With regard to mortality, death rates from falls are less than 50 per 100,000 at age 65 and increase progressively to 525 per 100,000 over age 85.

Systolic Hypertension

Isolated systolic hypertension (systolic blood pressures greater than 160 mmHg accompanied by diastolic pressure less than 90 mmHg) is found in approximately 25 to 30 percent of men and women over age 75 (Kannel, Dawber, and McGee 1980). While convincing evidence indicates that elderly individuals with systolic and diastolic hypertension have lessened risk of death from cardiovascular events after treatment, it is not currently known whether treatment of isolated systolic hypertension is associated with reduction in risk.

In most developed countries, advancing age is associated with progressive increases in systolic blood pressure to levels of 150 mmHg by age 70, while diastolic pressure does not rise beyond middle years and falls slightly after age 60. Follow-up studies of the oldest old are presently being supported, and changes in this age group will soon be defined. The major factor responsible for age-related increases in

systolic pressure is decreased distensibility of the aorta and major vessels secondary to arteriosclerosis.

Above the age of 70, isolated systolic hypertension is more prevalent than diastolic hypertension. Several studies indicate that elevation of systolic pressure has been seriously underrated as a risk factor for adverse cardiovascular events. The 1959 Build and Blood Pressure Study reported a 19-year follow-up of men and women aged 40 to 69 years on entry and clearly indicated that for any given level of diastolic blood pressure, mortality rate increases in proportion to systolic pressure. In men with diastolic pressures of 83 to 87 mmHg, systolic pressures of 158 to 167 mmMg were associated with a 34 percent increase in mortality compared to systolic pressures of 138 to 147 mmHg. In women with diastolic blood pressure of 83 to 87 mmHg, similar increases in systolic blood pressure were associated with a doubling of the mortality rate.

Our understanding of the importance of isolated systolic hypertension in the elderly has increased substantially and it is now recognized to be associated with a two- to three-fold increase in mortality, especially related to cardiovascular disease and stroke. In addition, several studies have shown, contrary to prior opinion, that systolic blood pressure can be safely lowered in the elderly. What remains uncertain, however, is the value of therapy. Evidence that the risk is attributable to systolic pressure itself, rather than the underlying vascular changes, is indirect, and there are currently no data on the value of treatment in reducing risk. Since the benefits of the therapy are uncertain, any but the most minor side effects should be considered unacceptable and therapy modified or discontinued (Amery et al. 1978; Gray, Weber, and Drayer 1983). Encouraged by a pilot study in elderly patients with isolated systolic hypertension, which demonstrated the ease and safety of treatment, the National Institutes of Health is launching a large multi-center, randomized, double-blind, placebo-controlled trial to determine the value of treatment (Rowe 1982).

Polypharmacy

As people age, they accumulate disease, doctor visits, and disability. These events, coupled with appropriate anxiety about their health, make the aged use an excess proportion of the prescription and over-the-counter drugs consumed in the United States. Although our 25

million citizens over 65 years of age represent less than 12 percent of our population, they purchase 25 percent of the drugs sold in America, spending nearly 20 percent of their personal funds. In Great Britain, outpatients over 75 years old take three times as many medicines as the national average, with women consuming twice as many drugs as men. This excess consumption of medicines is accompanied, not surprisingly, by higher rates of side effects. Of equal importance is that when older people consume the same drugs with the same frequency as the young, toxicity is more frequent and severe in the elderly. Standards for the use of most current therapeutic agents were obtained in young adults, and applying these guidelines to the elderly is often hazardous.

Because the prevalence of disease rises sharply with age, an old sick person is likely to have several associated disorders, and multiple organ-system dysfunction also increases the risk of adverse drug reaction. When the high prevalence of cognitive and visual impairment in the elderly is juxtaposed to the similar size, shape, texture, and color of many medicines, errors involving drugs are especially likely. A better understanding of the special features of drug use in the elderly is necessary to reduce excess toxicity.

Numerous studies have documented that old people have more trouble with drugs than do their descendants. As many as one-seventh of all hospitalizations result from adverse drug reactions, and elderly people comprise nearly one-half the hospital admissions caused by drug intoxication. Rates of adverse drug reaction rise steadily after age 50, and patients over 60 years old are twice as likely to suffer an adverse drug reaction as younger patients. Those over 80 years have a one-in-four risk of drug intoxication, twice the rate seen in patients under 50 years. Hospital stay is prolonged for all patients with adverse reactions, but older patients remain hospitalized longest. Two age-related phenomena, impaired kidney function and multiple drug use, are major risk factors in adverse reactions.

When a patient fails to improve with a prescribed therapeutic regimen, suspicion of medication failure or worsening disease, or both, often impel the physician to change drugs. The possibility of noncompliance with the prescribed medication regimen may be overlooked unless the patient manifests obvious psychopathology.

In most studies, noncompliance was highest among elderly patients and was related to the following age-related characteristics: (1) poor

vision, (2) poor hearing, (3) unusable childproof containers, (4) dementia, (5) difficulty swallowing large pills, and (6) consuming more than three medications (Rowe 1983).

Improved compliance, especially for the elderly, can only be expected if the special problems of the oldest old related to drug treatment, packaging, education, and testing are recognized.

Implications for Health Care Policy

The preceding discussion of the interaction of aging and disease, the altered expression of illness in the oldest old, and the common clinical syndromes of geriatric medicine provide the clinical perspective crucial to the formulation of health care policy for the oldest old.

Need for Individualized Care

From the discussion of the variability of the aging process and its spectrum of effects, it is apparent that the oldest old represent an extremely heterogeneous population and demonstrate the broadest range of capacities and disabilities heretofore expressed by any population group. This mandates the need for *individualized* care of this group. Not only will health policy be challenged to cope with the needs of a progressively diverse group of individuals, but policies must adapt to the rapid shifts in needs that characterize the oldest old's response to illness. For example, it will become more common for a healthy oldest old individual to fall very ill, very suddenly, and then over a period of months require acute hospital care, rehabilitation, convalescent home care, a return to the acute hospital, and then, finally, long-term care. Networks of health care facilitating smooth transitions and appropriate levels of care will become a high priority for the oldest old.

Rationing of Care and Ethical Issues

Substantial variability in the oldest old of both the biologic effects of aging and each medical diagnosis make age and diagnosis poor criteria for health care policies attempting to "ration" care. Eligibility for access to high-cost technologies (e.g., coronary artery bypass surgery,

chronic renal dialysis, organ transplantation, etc.) must be based increasingly on the functional capacity demonstrated by the potential recipient (Katz et al. 1983). Reliable and valid measures of function in physical, mental, and social domains must be developed that predict a favorable response to high-cost medical care and that can be adapted to measure quality of the care being delivered. After all, successful function, rather than elimination of aging or disease, is the goal and measure of modern medical care.

Health policy in clinical care of the oldest old must actively engage in robust discussions of the criteria determining the initiation and ongoing application of life-sustaining technologies such as renal dialysis, resuscitation, supplementary feedings, and antimicrobial therapy in the oldest old whose quality of life appears to be poor. Input from all interested, responsible groups that are affected by these ethical and moral decisions must be sought. Presently, there is no organized forum for discussion of these major issues, which deserve attention independent of their impact on health care costs. Only by the establishment of networks of experts in health care provision, ethicists, policy makers, and religious and legal groups, can we begin to create comfortable policy guidelines in this most unclear area.

Importance of Acute Care

From the discussion of expression-of-illness and geriatric syndromes, it is clear that care of the oldest old, i.e., geriatric medicine, should not be equated with long-term care. High-quality acute care is necessary for the successful health of elderly patients. Indeed, 44 percent of all present health care expenditures for the elderly arise from acute-care settings. The oldest old have the highest acute hospitalization rates, and for most elderly, incomplete recovery from acute hospitalization is the pathway into the long-term care system. Health care policy must creatively foster improved acute hospital care for the oldest old, in order to save long-term care expenditures. The geriatric syndromes presented in this chapter must be recognized skillfully and accurately diagnosed and treated if the clear long-term morbidity and mortality from them is to be lessened. Current acute hospital care is organized for sick young individuals and the elderly are expected to adapt into this setting. Health care policy must stimulate the development of a system capable of responding to the needs of the acutely ill oldest

old (who are usually also chronically ill or acutely decompensated chronically ill).

Need for Case-finding Strategies

Nonreporting of symptoms of underlying disease in elderly persons is an especially dangerous phenomenon when coupled with the American organizational structure of health care delivery. Our health care system is passive, especially for elderly people, and lacks prevention-oriented or early detection efforts. American medical care of the critically ill, elderly hospitalized patient is the best in the world. Science and technology are expertly blended to help the sick. But American hospital beds, health maintenance organizations, physicians' offices, emergency rooms, and neighborhood health centers all wait passively for the symptomatic patient to activate the system. For the most part, this passive system of health care provision is adequate for children, who have parental advocates, and for young and middle-aged adults who have the need to work and earn which impel them to seek medical relief for function-impairing symptoms. Aged persons often lack advocates, jobs, and finances, and are burdened by society's and their own ageist views of functional loss with aging. They cannot, therefore, be relied upon to initiate appropriate health care for themselves, especially early in the course of an illness. Periodic health checks and active care-finding methods must be designed to compensate for these realities. This would also foster the institution of ongoing, long-term community care, which may lessen the burden on institutional long-term care. The health care system relies on the patient to enter the system and initiate care; and that is precisely the one illness behavior most often missing in aged individuals. Health care policy has initiated the development of geriatric assessment units as a new technology for surveillance, preventive, and restorative care. These units require funding and careful evaluation in order to permit the growth of units demonstrating reductions in morbidity and mortality in the oldest old.

Need for Research and Training

While substantial progress has been made in characterizing the biomedical aspects of aging in recent years, this growing area of medical research remains a challenging frontier. We are "skating on thin ice" when

we attempt to be specific or predictive of the impact of aging on an individual's clinical performance. However, because our data base is so small, small insights may yield great gains in therapeutic benefit. Policies must continue to support basic research and stimulate technologies designed to specifically assist in the care of the elderly, not only to promote better diagnosis, but to improve therapy. A major area requiring research support is the area of drug testing and drug taking. Earlier sections have documented the changes that occur in drug metabolism and excretion and the prevalence of adverse drug reactions in the elderly population. Drugs likely to be extensively used in older-aged individuals should be specifically tested in healthy older subjects for tolerance and given to sick older patients for evidence of efficacy prior to general release. This should be mandated particularly for agents designed to treat illnesses of high prevalence in late life, such as dementia, incontinence, and hypertension.

Manpower issues in geriatric care have been neglected by health policy experts, medical schools, and local health authorities. Staffing problems in long-term care settings abound and only recently have medical schools incorporated the teaching of the principles of geriatric care into undergraduate curricula. Quality clinical rotations in geriatric medicine remain scarce. The need for professional expertise in care of the oldest old is stimulating the development of a cadre of individuals who will populate medical schools, teach students, and serve as a resource for practitioners. Continued and increased support for post-graduate fellowship programs is an appropriate tack for health policy, as these programs are most likely to develop committed, academically viable leaders in geriatric care.

Health Promotion

The oldest old will suffer less disability but ultimately live no longer, according to one hypothesis relating to the consequences of improving health and illness prevention (Fries and Crapo 1981). This has been challenged, however, suggesting that preventive and therapeutic advances in medicine and health care policy may result in a survivorship of more disabled oldest old, with the longest survivors perhaps living to new extremes of age (Manton 1982). Health policy, regardless of the outcome, will increasingly stress preventive care, which for the oldest old will reduce the impact of illness as well as that of the aging process (U.S. Department of Health, Education, and Welfare

1979). A broad range of educational, recreational, nutritional, life style, exercise, and pharmacologic possibilities exist.

Improvements in the quality of old age require understanding of risk factors for common diseases in the elderly and the efficacy of strategies to decrease risk. Simplistic applications of studies of young and middle-aged adults to the old are fraught with difficulty. The elderly clearly represent a select group of survivors with an altered physiology that may influence pathophysiology. Similarly, one should not assume that risk factors are purely cumulative in their impact and that little is to be gained by altering long-term habits or treating long-standing disorders, such as hypertension, in eighty year olds.

The widely cited Alameda County Study identified reduced mortality in young and middle-aged adults who never smoked, drank little alcohol, were physically active, and slept seven or eight hours nightly (Wingard, Berkman, and Brand 1982). Recently, a similar analysis in elderly Massachusetts residents found that five-year mortality rates were *not* influenced by alcohol intake, physical activity, or sleeping habits. While women who never smoked were a lower risk, this effect was not significant for men (Branch and Jette 1984). In another recent report regarding old-age smoking (Jajich, Ostfeld, and Freeman 1984), elderly current smokers had a 52 percent higher risk of coronary mortality than nonsmokers, while quitting smoking late in life was associated with a rapid and sustained reduction in coronary mortality. This provides support for efforts to reduce smoking in those elderly with long-term smoking histories.

In the same study (Jajich, Ostfeld, and Freeman 1984), overweight elderly were found to have a lower, rather than higher, risk of coronary death, a finding which is consistent with prior reports that optimal weight (that associated with lowest mortality) may increase with age (Andres 1980, 1981). These very controversial findings are difficult to explain in view of the known adverse effects of obesity on diabetes, hypertension, and hyperlipidemia, and indicate the need for detailed evaluation of the potential protective effect of moderate overweight in old age.

Summary

The oldest old present special challenges to the American health care system based largely on their dual afflictions of progressively increased

chronic disease and the varying impacts of the aging process. The projections of increased numbers of this population group add to the broad implications for health policy changes.

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