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Introduction

This sixth volume of the *Annual Review* addresses key areas in the provision of geriatric health care. These range from an understanding of issues basic to helping patients with respiratory difficulty to the very important concerns for care of the acutely confused patient in the general hospital setting. Geriatric nursing issues and inpatient management are discussed in chapter 2. Two other areas of importance to many of the readers of the *Annual Review* have recently emerged as significant public concerns, particularly the problems attendant to long-term care. These are home health care and the neglect and abuse of the elderly. This latter is of special saliency as there is growing emphasis on long-term caring at home, and reflects a dilemma of increasing magnitude in the community.

"The Epidemiology of Aging" is so basic to a range of biomedical and health policy issues, as well as broader social issues, that it merits substantially longer treatment than has been the tradition for chapters of the *Annual Review*. Chapter 6 includes an orientation to the scope and importance of epidemiology, a description of several of the more significant epidemiologic studies now taking place in the United States, and a concluding report and analysis of the current epidemiologic literature. The implications of the data presented for future health care delivery to the aged cannot be overstated. The chapter will be of major importance in the field of gerontology and to those involved in discussions of health policy over the next several years.

In developing this volume, which focuses heavily on medical care and its substrate, we have chosen subjects in which the social and health policy concerns interface with medical and health management concerns. It is our hope that this book will be of value to the broadest spectrum of readership in these fields.

Our pattern of alternating between biomedically oriented and psychosocially oriented volumes of the *Annual Review of Gerontology and Geriatrics* will continue. The editor for Volume 7, Dr. K. Warner Schaie, has assembled review chapters on psychological and social issues. Volume 8 will emphasize biological and biomedical issues.

CARL EISDORFER

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FORTHCOMING

THE ANNUAL REVIEW OF GERONTOLOGY AND GERIATRICS, Volume 7 (1987)

K. Warner Schaie, Guest Editor

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JOHN F. CORSO (SUNY at Cortland)

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CHAPTER 1

Acute Confusional States (Delirium) in the Hospitalized Elderly

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The acute confusional state (delirium, DSM-III) has been identified as one of the most important cognitive disorders among the aged. The syndrome, which is of acute onset, is characterized by concurrent disorders of attention, perception, thinking, memory, psychomotor behavior, and the sleep–wake cycle (DSM-III, 1980). The frequent occurrence of transient confusion in physically ill old persons hospitalized for acute care makes delirium one of the most formidable challenges in geriatric medicine.

Acute confusional states are widely neglected and cause substantial morbidity and mortality in geriatric patients. Often the first sign that

brain function is compromised, delirium occurs as either a prominent presenting feature of life-threatening physical illness or as a serious complication of disease. Other factors that contribute to the clinical importance of delirium are the failure to recognize the clinical picture itself and the misdiagnosis of causation. Acute confusion, muted in the elderly, is frequently misdiagnosed as dementia, leading to inadequate work-up and lack of treatment for the potentially remediable condition. Determining the cause of acute confusion is complicated by the tendency for affective disorders, especially depression, to present with cognitive impairment. Worse yet, cognitive deficits may be overlooked completely, and the acutely confused patient is identified as unintelligent or uncooperative. Misdiagnosis of causation can also result in mismanagement, especially in the older patient, because of the frequent coexistence of multiple diseases and the slow response even to the best treatment. Common errors in practice include failure to recognize treatable causes, particularly iatrogenic ones related to medications, and the tendency to attribute a confusional state to a preexisting illness. Failure to diagnose and treat the underlying causative illness can result in permanent brain damage or death. However, accurate diagnosis and early treatment of both the primary disease and the confusion will likely restore the patient to premorbid function (Wetle, 1982).

In some cases, the clinical consequences of the disorder can still be severe, even with accurate diagnosis and prompt treatment. Individuals who develop acute confusion are usually so seriously ill that they require emergency medical treatment. Even in mild cases of confusion, patients are at increased risk of injury during the episode. Moreover, measures taken to ensure the safety of the delirious patient, such as restraints and medications, can themselves be harmful or lethal.

Acute confusion has important policy implications because of its high prevalence among hospitalized elderly. While in the hospital, the acutely confused patient requires more nursing surveillance than other patients and thus generates greater hospital costs. Patients with acute confusional states are likely to remain hospitalized longer than those without the disorder (Lamont, Sampson, Matthias, & Kane, 1983). Moreover, they may also incur large expenses after hospitalization if their cognitive status is compromised to the extent that they require expensive custodial or institutional care.

Despite their clinical importance, acute confusional states have been a seriously neglected focus of inquiry. We present an overview of the clinical features, epidemiology, course and consequences of the disorder, etiology, pathophysiology, and management strategies. Finally, we provide an analysis of the health policy implications of the syndrome in the current health care environment.

CLINICAL FEATURES

The core features of the acute confusional state include disorders of attention, cognition, sleep–wake cycle, and psychomotor behavior. DSM-III (1980) diagnostic criteria for the acute confusional state are presented in Table 1-1.

Several different clinical subtypes of delirium may exist (Lipowski, 1980, 1983). The hyperactive variant is characterized by psychomotor overactivity, hyperresponsiveness to stimuli, increased cortical excitation, and sympathetic nervous system arousal. The hypoactive variant exhibits reduced levels of psychomotor activity, alertness, and vigilance. The mixed variant shows features of both hyper- and hypoactivity (Lipowski, 1980, 1983). The recognition of these various subtypes is critical, because the patient who develops the florid subtype, with its accompanying visual hallucinations, fear, and irritability, may more often be diagnosed and subsequently treated, compared with the apparently calm, quiet, and hypoactive subtype.

Studies of the phenomenology of the acute confusional state in the aged are nonexistent, but it is usually assumed that the core features of the syndrome are consistent across all age groups (Lipowski, 1983). Although features such as the occurrence of dreamlike phenomena, hallucinations, and visual illusions seem to be less common among the aged (Lipowski, 1983; Robinson, 1956), associated features of the syndrome, including dysphasia, tremor, impairment of coordination, urinary incontinence, and focal neurological signs, tend to be more common among the aged (Lipowski, 1980; Robinson, 1956). Because the biologi-

Table 1-1
DSM-III Diagnostic Criteria for Acute Confusional States

Clouding of consciousness (reduced clarity of awareness of environment) with reduced capacity to shift, focus, and sustain attention to environmental stimuli
At least two of the following:
Perceptual disturbance (misinterpretations, illusions, or hallucinations)
Speech that is sometimes incoherent
Disturbances of sleep–wakefulness cycle, with insomnia or daytime drowsiness
Increased or decreased psychomotor activity
Disorientation and memory impairment
Clinical features that develop over a short period of time (usually hours to days) and tend to fluctuate over the course of a day
Evidence from history, physical examination, or laboratory tests of a specific organic factor judged to be etiologically related to the disturbance

From DSM-III (1980). Reprinted by permission.

cal changes of aging in the CNS reduce reserve capacity and the ability to compensate for insults to homeostasis, the elderly brain is likely to show impaired function in response to stress. According to Blass and Plum (1983), the signs and symptoms of acute confusion in the elderly differ in three principal ways from those in younger individuals: they can develop more insidiously because the added impairment blends into preexisting limitations; they often exceed in degree and in form those observed in younger individuals with comparable illness; and following treatment they typically subside much more slowly.

Detection

Acute confusion is frequently misdiagnosed; one common error is that the clinical picture is often mistaken for chronic dementia. Dementia is the long-term loss of intellectual abilities, especially those higher order functions measured by memory, judgment, abstract thinking, reasoning, and visual-spatial relations, in the context of preserved alertness (Wetle, 1982). This chronic disorder must be differentiated from delirium, which is a clouding of consciousness with decreased awareness of both internal and external environment and a decrease in the ability to sustain attention or to maintain a coherent stream of thought, speech, or action. Although both dementia and delirium are global disturbances of cognition, the two conditions reveal different patterns in their onset and natural history, as shown in Table 1-2 (Wetle, 1982).

It is clear from Table 1-2 that it is difficult to distinguish delirium from dementia without extensive knowledge of a patient's prior cognitive status. The history should include information about the onset of the disorder (abrupt or slow), as well as the duration and nature of symptoms. The detection of delirium, even with adequate history, can be complicated by the frequent concurrence of dementia and delirium (Wolfson & Katzman, 1983). Estimates indicate that approximately one-third

Table 1-2
Delirium Versus Dementia

Delirium	*Dementia*
Develops abruptly	Develops slowly
Nonprogressive	Progressive
Short duration	Present for many months or years
Fluctuating consciousness	Rarely altered consciousness
Precise time of onset	Uncertain date of onset

of demented hospitalized geriatric patients are likely to have an acute confusional episode superimposed on their dementia (Report of the Royal College of Physicians, 1981). Lipowski (1983) suggests that symptoms of confusion may be modified in the demented patient, because the concurrent dementia limits the patient's ability to elaborate symptoms such as complex hallucinations, dreamlike mentation, and confabulations. The demented patient may simply sink quietly and apathetically into an unresponsive state. Generally speaking, one can assume that a patient suffers from an acute confusional state if he or she has functioned well intellectually and then develops an attentional disorder that fluctuates in severity during the day and worsens at night (Lipowski, 1983).

Determining the cause of confusion may also be difficult in patients suffering from functional psychoses, because these disorders often present as cognitive impairment in older patients (Libow, 1973). However, careful consideration of the onset, symptoms, and course of the behavior can usually differentiate psychiatric from organic etiology (Devaul & Jervey, 1981). In contrast to acute confusion, functional psychoses are marked by a history of psychotic symptoms and increasingly bizarre behavior. Because the onset is usually at an early age, elderly patients are likely to have had a previous psychiatric history. The symptoms of functional psychoses occur with a clear sensorium and intact memory, and there is accurate perception of reality simultaneous with the psychotic symptoms. The content of psychiatric symptoms differs from symptoms of acute confusion, in that the delirious patient has hallucinations that are familiar and understandable, whereas the psychotic patient has bizarre hallucinations and illusions. Although the patient with a functional psychosis may exhibit sleep disturbance and agitation, symptoms do not follow the fluctuating course that characterizes acute confusion (Devaul & Jervey, 1981).

EPIDEMIOLOGY

Although the importance of acute confusional states among the aged is increasingly acknowledged, consistent epidemiological data are not available. Incidence estimates vary widely because of the lack of precise diagnostic criteria, the inconsistent use of terms, the varying methods of case finding, and the different settings in which patients are studied (Lipowski, 1984). Moreover, during the 25 years that acute confusion has been studied, the terminology used by the American Psychiatric Association to define the syndrome has changed. Despite these methodological problems, it appears that the disorder is highly prevalent among the

hospitalized elderly. Studies have examined the prevalence of the disorder at hospital admission and during hospital stay and the incidence among hospitalized patients after a surgical procedure.

Prevalence on Hospital Admission

Studies of acute confusion among hospital admissions find between 10 and 40% of elderly patients acutely confused on admission. These estimates come from different types of clinical facilities, including psychiatric hospitals, psychiatric wards in general hospitals, neurological hospitals, general medical wards, and geriatric units (Lipowski, 1984). Kral (1975) suggests that the estimates of acute confusion from the geropsychiatric literature, which range from 7 to 10% in mental hospitals or psychogeriatric wards, are low because they represent only the most severe cases, who either require hospitalization or psychiatric consultation or those whose condition develops during another psychiatric illness. In a study of geriatric admissions to a general hospital's psychiatric wards in 1959, 13% of admissions had an acute brain syndrome, 28% had chronic brain syndrome, and 33% had acute brain syndrome superimposed on chronic brain syndrome (Simon & Cahan, 1963). Robinson (1956) mentions an incidence of between 20 and 42%, based on several different reports from staff at a neurological hospital. Bedford (1959) found an incidence of 80% among 5,000 patients admitted over an 8-year period to a geriatric unit of a general hospital.

Estimates of acute confusion from general medical wards have generally been found to be much lower. Hodkinson (1973) reported that about 25% of geriatric patients in a British multicenter study (across 21 geriatric departments) were acutely confused on admission (defined as mentally normal 3 months before admission with less than 2 weeks' history of confusion). Comparable estimates were found by Bergmann and Eastham (1974) and Seymour, Henschke, Cape, and Campbell (1980). The former reported an incidence of 15% among geriatric patients admitted to a general medical ward, and the latter found that 16% of patients over age 70 admitted as emergencies to a general medical unit were acutely confused.

Incidence of Confusion in the Hospital

Several studies report that approximately 25 to 35% of hospitalized geriatric patients who are cognitively intact on admission develop an acute confusional state during the first month of their hospital stay

(Hodkinson, 1973; Report of the Royal College of Physicians, 1981). A higher incidence was found in a survey of patients aged 70 or more years in a 400-bed community hospital. Of the 50% of patients diagnosed as confused, 19% demonstrated mild confusion and 31% showed moderate or severe confusion (Warshaw et al., 1982). Confusion and advanced age were significantly correlated, with 61% of female patients aged 85 years or older either moderately or severely disoriented. In a prospective study of the adverse consequences of hospitalization, 30% of those over age 70, compared to 3.6% of those under age 70, exhibited confusion within 6 weeks of their admission to general medical wards (Gillick, Serrell, & Gillick, 1982). Chisholm, Deniston, Igrisan, and Barbers (1982) found that 55.5% of patients over age 60 on general medical and surgical units in a general hospital experienced acute confusion. They found a daily prevalence rate ranging from 0 to 13% (averaging 5.5%) and a shift prevalence (the proportion of 8-hour periods when confusion was noted, among those who were confused at some time during the observation period) of 27% upon analysis of 2,371 shifts "at risk."

Postoperative Incidence

Still other studies have examined the incidence of postoperative confusion. As with older medical patients, symptoms of confusion are important in elderly surgical patients, because such symptoms often represent the only manifestation of serious physical complications that can both interfere with management and delay recovery (Millar, 1981). Postoperative incidence was 9.7% among 258 elderly patients admitted to a general surgical teaching hospital unit, with no differences attributable to type of surgery [hernia and nonabdominal surgery, biliary and upper gastrointestinal (GI) surgery, and lower GI surgery], urgency of procedure, or preoperative activity level but with a significantly increased incidence among males and those over 75 years old (Seymour & Pringle, 1983). In a consecutive series of elderly patients undergoing elective surgery from a 48-bed general surgical unit, 14% developed confusional states that were associated with physical complications but not with environmental or preoperative psychiatric variables (Millar, 1981). In a controlled study matched by type of surgery, age, and gender, significantly more postoperative confusion was found among those who were identified as having impaired ego capacity due to a number of causes, including psychological, social-environmental, and constitutional as well as organic influences (Morse & Litin, 1969). Williams et al. (1985) found that 51.5% of elderly patients developed confusion after hip fracture repair. Admission variables, such as advanced age, errors on mental status exam, and diminished

preinjury activity, were significant predictors of postoperative confusion. In a separate model predicting daily confusion, age and presurgery test errors remained significant, and urination problems were added, but the previous day's confusion score was the strongest predictor.

Postoperative confusion may result in part from the anticholinergic effects of drugs that are given to surgical patients. In a study of 27 patients undergoing cataract extraction in which 7.4% ($N = 2$) developed postoperative confusion, the confusion cleared rapidly in one patient after the administration of physostigmine (Summers & Reich, 1979). In another prospective study of patients undergoing cataract extraction, older patients (mean age, 74) showed important deficits on the first postoperative day in all but two items of cognitive testing; memory consolidation showed the greatest decline and lasted 3 days. In contrast, the younger members of the sample (mean age, 50) showed impairment on only one test (memory consolidation), which lasted only 1 day (Burrows, Briggs, & Elkington, 1985). These authors also suggest that the higher incidence of postoperative confusion in the elderly represents enhanced susceptibility to anticholinergic intoxication resulting from anticholinergic drugs given either as premedication agents, during anesthesia (atropine), or as mydriatic eye drops.

Several other studies support the theory that postoperative mental dysfunction can be an acute anticholinergic syndrome. In one such study, 34% of patients became delirious during the first week after cardiac surgery, and those patients who developed confusion had significantly higher serum levels of anticholinergic drugs than those who remained cognitively intact (Tune et al., 1981). Greene (1971) reported a significantly greater incidence of delirium in patients who had received scopalamine as part of their preoperative medication than in those who had not received the drug.

COURSE AND CONSEQUENCES

The natural history of acute confusion is not well documented. By definition, the onset of the disorder is rapid, over a few days or even hours. Kral (1975) has suggested that the onset varies depending both on the severity of the stress and on the stress resistance of the patient. For example, when the stress is not too severe and the stress resistence is relatively high, it may take days before the full clinical picture develops. During these prodromal days, the patient may appear anxious, depressed, and perplexed. If, on the other hand, the stress is severe or the stress resistance is low, or both, it might only take a few hours before

acute confusion appears. During the day, the mildly confused patient may conceal deficits. A patient often first experiences the full-blown disorder during the night, typically being frightened after waking from a dream. The patient may become confused about place and often will attempt to get out of bed. As the patient becomes more confused, symptoms are experienced more consistently, and hyperactive or hypoactive inattention and disorientation are the rule. During the period of full disorientation, the patient's attention, contact with surroundings, and ability to communicate are severely impaired. Some patients develop hallucinations of smell and taste along with paranoid delusional ideas. Many patients show a reversal of sleep pattern, being drowsy and difficult to arouse during the day but confused, agitated, and vigilant during the night.

Whereas the majority of cases of acute confusion clear within 1 to 2 weeks after the underlying problem is detected and treated, episodes can last as long as a month. Prognosis is good for survivors, as transition from an acute syndrome to dementia appears uncommon (Lipowski, 1983). However, since the delirium may signal the onset or exacerbation of life-threatening physical illness, failure to diagnose and adequately treat the underlying disease can result in death.

In Bedford's study (1959), 33% of patients who were acutely confused on admission to the hospital died within a month of admission. Of those who recovered, 82% did so within a month, and less than 6% remained confused at the end of 6 months. In Roth's study (1955) on the natural history of mental disorders in old age, 39.5% of acutely confused patients admitted to a mental hospital were dead 6 months after admission, 50% had been discharged, and 10.5% remained as inpatients. Kral (1975) reported earlier studies done in the 1960s indicating that approximately 25% of cases had died within a year of admission, another 25% had developed a clinical picture that was indistinguishable from senile dementia, and a full 50% had cleared up within a few months. These early studies are particularly difficult to interpret because of the lack of consistency in the definition of acute confusion and in the case finding techniques. It is probable that those patients considered confused for several months would be called "demented" by DSM-III (1980) criteria.

More recent studies have also attempted to delineate the natural history of the condition. In the British multicenter study, within 1 month of admission, 25% of individuals with an acute confusional state had died, 35% had been discharged, and 40% remained in the hospital, compared to 12%, 47%, and 41%, respectively, for those mentally normal (Hodkinson, 1973). Simon and Cahan (1963) found that 17% of acutely confused patients admitted to a psychiatric ward of a general hospital died within a

month after admission, but no deaths occurred during the second or third month after admission. Patients with a mixed diagnosis of acute confusion and chronic dementia had a similar mortality in the first month after admission (16%), and more than 5% died during the next 5 months. In a general hospital study of emergency admissions to the medical service, 18% of patients with an acute confusional state died, and another 10% needed to enter an institution for the first time after hospitalization (Seymour et al., 1980). Those most at risk for either death or institutionalization were those with an abnormal mental test score on admission.

Differences in discharge disposition have also been noted, comparing acutely confused patients who were normal prior to the confusion with those whose confusion was superimposed on dementia. In a retrospective review of adult admissions to a general hospital, the majority (68%) of patients with acute decompensation of a chronic brain syndrome required institutional or custodial care, and only a third resumed independent living; the majority of patients with an acute episode alone resumed independent living (Purdie, Honigman, & Roseen, 1981).

ETIOLOGY

In his book on acute geriatric medicine, Jolley (1981) summarizes the basic mechanism that produces the acute confusional state as one in which "many factors contribute a little, rather than one factor contributing the whole." The multifactorial etiology of the syndrome is widely acknowledged. In fact, the potential causes of confusion include most clinical disorders as well as some not within the traditional confines of medicine (Arie, 1978). By definition, the disorder requires cerebral dysfunction due to systemic or central nervous system (CNS) disease, to exogenous physical or chemical agents, or to withdrawal from certain substances of abuse (Lipowski, 1983). However, little is known about the precise mechanisms that precipitate the acute confusional episode. According to Kral (1975), brain damage and lowered resistance to stress predispose the older person to cognitive disorganization in response to a range of psychological and physical stresses. Similarly, Kennedy (1959) suggested that impaired brain function due to physical disease renders the older person particularly vulnerable to psychosocial stresses, such as excessive or deficient sensory inputs, sleep loss, fatigue, bereavement, or transfer to an unfamiliar environment, which may precipitate the acute syndrome.

It is generally agreed that age itself is a predisposing factor for acute confusion, but there are no data available for rates of acute confusion according to age. Whatever the specific mechanisms, there is certainty

that aging of the brain, brain damage or disease, and impairment of vision and hearing facilitate cognitive disorganization in response to both physical and psychological stresses (Lipowski, 1983). CNS compromise by aging or cerebral disease, or both, can be exacerbated by acute and chronic disease and by polypharmacy among the aged.

Several studies have examined the physical illnesses that are most often associated with acute confusion in the aged. In some of the earliest studies on the physical accompaniments of acute confusion in old age, Kay and Roth (1955) found a high incidence of metabolic, cardiac, respiratory, and genitourinary disorders among older patients who presented with acute confusion. In another early study, Flint and Richards (1956) found that 30% of cases of confusion were attributable to cerebral disease, 50% to systemic disease, and, in another 20%, no specific organic factor could be identified. Of the systemic diseases, heart failure, pulmonary disease, and uremia were found to be more frequently associated.

More recent studies support these early attempts to find the etiological factors related to acute confusion in the aged. Hodkinson (1973) differentiated between those factors that predisposed to delirium and those that precipitated it. Predisposing factors included preexisting dementia, impaired hearing and vision, Parkinson's disease, and advanced age. Precipitating factors included pneumonia, cardiac failure, urinary infection, carcinomatosis, hypokalemia, and any severe illness.

The range of phenomena associated with acute confusion is wide, and perhaps the most characteristic features are its variation and variability (Jolley, 1981). Underlying diseases associated with acute confusion are systemic far more often than neurologic. The numerous, potentially treatable diseases that produce delirium impair cerebral function via anoxia, ischemia, electrolyte disturbance, infectious processes, drugs, or failure of metabolism in kidney or liver (Wolfson & Katzman, 1983). Table 1-3 lists causes of acute confusion in the elderly.

Intoxication with drugs, particularly those with anticholinergic properties, is perhaps the single most frequent cause of acute confusion. Age-related changes in the metabolism, distribution, and excretion of drugs, coupled with high drug consumption and polypharmacy, are clearly related to the high incidence of drug-related acute confusion. Some of the drugs most often implicated in producing acute confusional states among the aged are included in Table 1-4.

PATHOPHYSIOLOGY

Although the literature suggests clinical precipitants of acute confusion, little is known about the precise mechanisms by which these disorders

Table 1-3
Causes of Delirium in the Elderly (Decreasing Order of Frequency)

- Therapeutic drug intoxication
- Metabolic disorders
  - Azotemia/renal failure
    (dehydration, diuretics, obstruction, hypokalemia)
  - Hyponatremia
    (diuretics, excess ADH, salt wasting, i.v. fluids)
  - Volume depletion
    (diuretics, bleeding, inadequate fluids)
  - Hypoglycemia
    (insulin, oral hypoglycemics, starvation)
  - Hepatic failure
  - Hyperthyroidism
  - Hypercalcemia
  - Cushing's syndrome
- Any infection and/or fever
- Cardiovascular
  - Congestive heart failure
  - Arrhythmia
  - Acute myocardial infarction
- Brain disorders
  - Stroke
  - Trauma
    - Subdural hematoma
    - Postconcussion syndrome
  - Infection
    - Meningitis
    - Subdural empyema
    - Brain abscess
  - Tumors
    - Metastatic to brain
    - Primary in brain
- Pain, especially fecal impaction or urinary retention
- Sensory deprivation states, such as blindness or deafness
- Hospitalization
  - Anesthesia or surgery
  - Environmental change and isolation
- Alcohol toxicity
- Anemia
- Tumor—systemic effects of nonmetastatic malignancy
- Chronic lung disease with hypoxia or hypercapnia
- Chemical intoxications
  - Heavy metals such as arsenic, lead, or mercury
  - Consciousness-altering agents
  - Carbon monoxide
- Accidental hypothermia

Table 1-4
Drugs Associated with Delirium in the Elderly

Psychoactive
Sedatives/hypnotics
Long-acting benzodiazepines [Dalmane® (flurazepam), Valium® (diazepam), Librium® (chlordiazepoxide)]
Short-acting benzodiazepines (less often a problem)
Barbiturates
Antidepressants
Heterocyclics, especially sedating [amitriptyline (Elavil®), doxepin (Sinequan®), trazadone (Desyrel®)]
Lithium
Neuroleptics (less common)
Medical agents
Cardiac
Digitalis glycosides
Diuretics
Antiarrhythmics (most)
Calcium channel blockers
Antihypertensives
Beta-blockers
Alpha methyldopa
Gastrointestinal
H_2 antagonists (cimetidine, ranitidine)
Metaclopramide (Reglan®)
Analgesics, especially narcotics and derivatives
Antiinflammatory
Corticosteroids
Nonsteroidal antiinflammatory agents
Over-the-counter drugs
Cold remedies (antihistamines, pseudoephedrine)
Sedatives (antihistamines)
Stay-awake (caffeine)
Antinauseants
Alcohol

cause acute confusion in the older patient. A wide range of factors, including intracranial and systemic diseases, exogenous poisons, and withdrawal from alcohol and sedative-hypnotic drugs, may give rise to acute confusion, but these are unlikely to produce delirium through a common pathway (Lipowski, 1984). Engel and Romano (1959) proposed that derangement of cerebral metabolism is a factor in all cases of

delirium, and that this is reflected at the clinical level by disturbances in cognitive functions and at the physiologic level by a slowing of the EEG.

The acute onset of agitated delirium may be caused by cerebral infarctions in the most ventral and medial aspects of the occipital and temporal lobes, whereas acute onset of delirium without agitation may result from infarctions in either the posterior parietal or prefrontal regions of the right hemisphere (Mesulam, 1979). However, the pathogenetic importance of these anatomical lesions is not clear (Lipowski, 1984). Numerous pathophysiological mechanisms have been suggested, including inadequate substrates for oxidative metabolism; interference with synaptic transmission; impairment of synthesis of neurotransmitters, especially acetylcholine; abnormalities in excitable membranes; and chemical changes in the internal milieu (Lipowski, 1980).

A number of age-related changes in psychologic, physiologic, anatomic, and biochemical factors in the brain as well as a number of nonneural factors may predispose the elderly to acute confusion (Blass & Plum, 1983). Age-related psychologic changes, such as the reduced ability to process new information presented rapidly, increase the older patient's susceptibility to acute confusion. Structural changes of the aging brain, in which populations of nerve cells have fallen to a level critical for maintaining function, may allow a mild disorder to reduce function below the threshold at which clinical signs and symptoms of confusion develop (Blass & Plum, 1983).

Age-related decreases in the endosynthesis of neurotransmitters have also been suggested to explain the older person's extreme vulnerability to acute confusion (Blass & Plum, 1983). Blass and Plum (1983) have proposed that impairment of cerebral oxidative metabolism may further decrease synthesis of acetylcholine. The elderly patient may be more susceptible to confusion than the young because the cholinergic pathways in the cortex are already impaired by normal aging (Blass & Plum, 1983).

Another interesting recent hypothesis (Krueger, Walter, Dinarello, Wolff, & Chedid, 1984) suggests a possible role for interleukin-1 (endogenous pyrogen) in the delirium of febrile and possibly other acute illnesses. Interleukin-1 (Il-1) is produced by numerous cells in response to varied toxic, infectious, and inflammatory stimuli. Among the many actions of Il-1, beyond producing hypothalamically mediated fever, is increasing significantly slow-wave sleep in experimental animals. The EEG pattern in slow-wave sleep is similar to that in delirium, and, thus, Il-1 may be one mediator of delirium.

In addition to CNS changes, other nonneural factors increase the older person's susceptibility to delirium. Important decremental changes have been documented in a variety of biological functions during normal

human aging (Finch, 1985), and these reductions in organ function, along with important changes in body composition, diminish homeostatic capacity sharply and increase vulnerability to delirium provoked by biochemical alterations and drug accumulation. Thus, most organs and tissues of the body are at least indirectly involved in cerebral metabolism, and a disturbance of function of any may lead to adverse mental consequences.

The accumulated evidence suggests that acute confusion is probably the outcome of several pathogenic mechanisms that involve both the cerebral cortex and the subcortical structures, and in which integrated function is required for the normal sleep–wake cycle, directed attention, and information reception, processing, and retrieval (Lipowski, 1984). Blass and Plum (1983) offer the following explanations for the enhanced susceptibility of the older patient to acute confusion:

1. Lowered reserves in the brain and other organs of older patients predispose them to developing cerebral complications of systemic diseases.
2. Abnormalities in neurotransmitters, particularly in cholinergic function, may be important pathophysiologic mechanisms in producing the symptoms of acute confusion in older adults.

MANAGEMENT

Successful management of the acutely confused patient depends first on the correct identification of the clinical picture and second on the correct diagnosis of its specific etiology. Once a delirium is detected, it is imperative to look for all possible causes, as more than one etiological factor is likely to be implicated. A mnemonic, SUNDOWNERS, is offered by the authors to identify factors that put patients at high risk for delirium (Table 1-5).

The value of the "SUNDOWNERS" mnemonic is severalfold. First, it reminds us that acute confusion, sometimes referred to as "sundowning," often begins at night, when reduced lighting and activity, combined with nadirs of several circadian hormones, conspire to make the aged brain even more vulnerable to misinterpretation of reality. Second, the mnemonic is a useful reminder that there may be remediable risk factors, which, if addressed early in the course of hospitalization, may prevent or ameliorate an impending delirium. Thus, the mnemonic becomes a checklist, suggesting that to prevent delirium, begin by (1) treating *S*ickness; (2) ruling out or relieving *U*rinary retention or fecal impaction; (3) being sensitive to the psychic needs of the newly admitted elder in a *N*ew

Table 1-5
Mnemonic: SUNDOWNERS

*S*ick
*U*rinary retention/fecal impaction
*N*ew environment
*D*emented
*O*ld
*W*rithing in pain
*N*ot adequately evaluated
*E*yes and ears
*R*x—therapeutic drug intoxication
*S*leep deprived

environment; (4) promptly identifying the patient with preexisting *De*mentia and reducing confusing stimulation; (5) realizing that the very *O*ld patient is at high risk; (6) being particularly attentive to analgesics for the patient *W*rithing in pain; (7) recognizing that patients *N*ot adequately worked up can have discoverable conditions whose treatment may prevent delirium; (8) supplying adequate sensory inputs to those with impairments in *E*ye or ear function; (9) being aware of the great potential of many therapeutic drugs (*R*x) for producing or contributing to delirium; and (10) preventing *S*leep deprivation. A third value of the mnemonic is to alert the clinical team to those patients who have risk factors for delirium that, although identified, are not remediable and therefore mark those individuals as especially likely to become acutely confused. Whether delirium can be prevented is uncertain and merits further investigation.

Treatment of the underlying pathology is first and foremost in management of delirium. A principle of geriatric medicine is that the classic presentation of disease is commonly replaced by nonspecific symptoms, and this is especially true in the case of acute confusion. Whenever an older person presents with confusion, the search for physical illness, either acute or chronic with acute exacerbation, should begin immediately. Many acutely confused patients with reversible disorders go untreated because they are not properly worked up. The misidentification of the clinical picture of delirium as chronic dementia aborts the search for and treatment of an underlying reversible physical illness. Misdiagnosis of causation, such as the attribution of confusion to a psychosis brought on by a recent change in life events or psychosocial stress, can be disastrous by provoking the wrong treatment.

Drug toxicity is one of the most common preventable causes of acute

confusion. Careful examination of all drugs taken by the patient is critical, and those drugs that can produce delirium should be eliminated to the extent possible. When the drug is considered essential, a reduction in the dosage may be sufficient to eliminate adverse effects. A useful strategy in the delirious old patient is to stop all drugs and resume only those for which a clinical indication emerges, and then only at lower doses. It must always be kept in mind that the underlying cause for the acute confusional episode is likely to be multifactorial; for example, drug toxicity could be implicated along with concomitant urinary infection that results from urinary retention and incontinence from fecal impaction. Maintenance of fluid and electrolyte balance and sound nutrition are important to prevent dehydration, hypo- or hypernatremia, malnutrition, and vitamin deficiencies, all of which can potentially give rise to acute confusion.

While identifying and treating the underlying cause or causes of delirium, symptomatic and supportive measures must be given equal attention, because it often requires hours to days for treatment of the underlying cause to relieve delirium. Measures should be instituted to avoid extremes of sensory input, including deficient or excessive stimulation, since either is likely to exacerbate delirium and both are potentially preventable (Trockman, 1978). Eyeglasses and hearing aids, often left at home or in the nursing home during the hectic transfer to the acute hospital, should be retrieved and provided to the patient as quickly as possible. Loud, disruptive noise should be eliminated when possible, but manageable sensory stimulation can help. Hospital staff should assume a calm and consistent approach toward confused patients, providing frequent reorientation and reassurance. Family members and friends should be encouraged to visit.

The physical environment of the patient also merits special attention. Abrupt relocation, especially at night, to a new and unfamiliar environment should be avoided. The patient should be placed in a safe and ordered environment with familiar personal objects, such as toiletries, bedclothes, photographs, and family mementos. The patient should rest in a quiet, well-lighted private room during the day and a dimly-lighted room at night. Minimizing demands on impaired function can be achieved through the use of orienting devices such as written signs that give the place, date, time, and other necessary information. Staff should attempt to make the immediate environment as constant as possible, avoiding room changes and providing labels for the bathroom, the patient's closet, and even the bed or other pertinent objects. Nursing routines and personnel should be adjusted to make them as consistent as possible. Safety precautions such as siderails and close observation are

imperative during periods of confusion. In some cases, restraints may be unavoidable to protect the patient; when considered necessary, they should be accompanied by frequent explanations as to their purpose and by close monitoring (Boss, 1982).

The acutely confused patient often suffers from disruptions in the sleep–wake cycle, exhibiting sleeplessness at night and drowsiness during the day. It is likely that such disruptions of normal sleep, particularly in the presence of cerebral disease, play an important role in the development of acute confusion, and, thus, efforts, like careful use of sedation, should be made to ensure sleep.

Drug therapy is an important aspect of the management of the acutely confused agitated patient, and several different classes of drugs are commonly employed. Benzodiazepines should only be used for minor degrees of agitation or anxiety, because they themselves may cause excessive drowsiness or paradoxical agitation. Shorter acting agents, including lorazepam and oxazepam, are preferred when a benzodiazepine is indicated.

The neuroleptics are usually preferred in delirious patients because they help organize thinking and diminish hallucinations and delusions. Individual agents can be selected for varying degrees of sedation as required by the patient's condition. These drugs have a prolonged clearance time in the aged, and elderly individuals show earlier and greater sensitivity to adverse effects, necessitating lower doses than used in younger individuals. The aged are more susceptible to side effects of neuroleptics, perhaps, in part, because of reduced CNS levels of acetylcholine and dopamine. The choice of drug depends on the side effects that are most important to minimize and the degree to which certain side effects are desirable. Some agents have higher anticholinergic potential and sedation and may cause orthostatic hypotension. Other drugs, with low anticholinergic potential, have serious extrapyramidal side effects, including akathisia, parkinsonism, and tardive dyskinesia.

For the elderly hospitalized patient with underlying dementia who becomes acutely confused, a sedating neuroleptic is generally desirable because of the high degree of agitation usually accompanying delirium; and thioridazine (Mellaril®) is a reasonable choice. Concern over anticholinergic effect should not be excessive when using thioridazine. Although thioridazine is the most anticholinergic of the currently used neuroleptics, its atropine equivalence is only 0.003 mg/mg, and, thus, each 10 mg dose of thioridazine yields 0.03 mg atropine effect. For comparison, the least anticholinergic agent among the tricyclic antidepressant drugs, desipramine, is used with enthusiasm in elderly patients, in part because of its minimal anticholinergic side effects, and yet its atropine equivalence is identical with thioridazine, 0.003 mg/mg. Ac-

cordingly, it seems reasonable to use thioridazine if its sedating side effects are indicated, especially in the agitated, delirious, previously demented elderly patient. Initial dose should be 5 mg, with careful observation of behavioral and physiologic effect. If the liquid concentrate is used, the dose may be doubled as early as 30 to 60 minutes after the first administration in urgent clinical situations. If the patient weighs more than 100 lb, 10 mg may be given safely as the first dose. Most patients will respond to a dose of 10 to 30 mg during the delirious episode, but 50 mg or more may be required in some instances. These dose ranges are much lower than those commonly used in younger adult psychotic patients, but they are usually quite sufficient in frail and previously demented elderly who most often exhibit "sundowning" in the acute hospital. Patients will frequently require administration of the neuroleptic drug for several days following the first episode, and common sense titration is the rule. In the high risk patient, it may be a useful strategy to give a small dose (5 to 10 mg) of thioridazine in the afternoon or early evening if mild agitation or confusion begins to appear, to try and prevent the development of a more florid syndrome.

For the patient with no previous cognitive impairment or in whose delirium agitation is not prominent an agent without sedating effect may be preferred. Haloperidol (Haldol®) is the least anticholinergic, least sedating of the neuroleptics, but it is the agent with most intense and frequent extrapyramidal side effects. If thioridazine is too sedating and haloperidol not sufficiently sedating, acetophenazine (Tindal®), an agent midway between the poles of the first two, may provide the desired effect.

Several general principles are useful in administering neuroleptic drugs to elderly delirious patients:

1. The initial dose should be half of the smallest one supplied by the manufacturer, followed by careful continuing assessment of the effect.
2. Expect that the effective dose, if administered for more than a few days consecutively, will likely lead to side effects, especially excess sedation, and will need to be reduced.
3. The beneficial effect on behavior is limited to the period during which delirium is present, and thus the neuroleptic should usually be stopped during hospitalization as delirium abates.

The beta-blockers may be valuable in treating chronic confusional states. They are particularly useful in patients with outbursts of rage. The therapeutic range for propranalol may be as high as 80 to 200 mg per day, but the starting dose should be 10 mg t.i.d.

Thus, a variety of management strategies are useful for the acutely

confused patient, both during evaluation and after treatment of the underlying cause is begun. Supportive and symptomatic measures should be given as much attention as drug therapy. Only when all measures are employed in a coordinated and sensible way can success be anticipated in managing these most challenging and vulnerable hospital patients.

CLINICAL AND POLICY IMPLICATIONS

Although regarded by many as the most important cognitive disorder of the aged, acute confusion has been neglected as a focus of serious clinical and epidemiological inquiry. Yet, it may be the most underdiagnosed and mismanaged of the mental disorders among the elderly. One factor responsible for the mismanagement of confusion in the aged is that few physicians recognize the acute confusional state as, in the words of Arie (1978), the "great non-specific reaction of old people." Most physicians detect only the most flagrant cases, such as the hyperactive patient, whose behavioral manifestations of confusion become a management problem for staff, and physicians cannot always differentiate confusion from other types of mental disturbance commonly encountered in seriously ill medical patients. The quietly confused patient is even more likely to be overlooked and misdiagnosed.

Another factor that contributes to the mismanagement of confusion is physicians' reluctance to systematically measure and document cognitive function. Several studies indicate that cognitive deficits, including severe memory loss and inability to concentrate, are frequently not identified or documented by medical staff (Gehi, Strain, Weltz, & Jacobs, 1980). In a study of physician behavior related specifically to geriatric patients, chart reviews showed no mention of cognitive deficits or symptoms of confusion by physicians in 79% of patients identified as suffering such deficits in systematic cognitive testing (McCartney & Palmateer, 1985). As part of nearly 400 medical examinations in 165 elderly patients, including admission histories and physical examinations, only four mental status exams were recorded. This is particularly disturbing, given that any level of cognitive impairment (mild, medium, or severe) detected on admission has been associated with the subsequent development of an acute confusional episode (McCartney & Palmateer, 1985). These studies underscore the importance of a systematic approach to the assessment of cognitive function in all hospitalized older patients. Routine assessment of the patient's mental status is particularly important for chronically ill patients, who are at high risk for confusion because of the nature of their illness and the medications they receive (Gehi et al., 1980). A routine

mental status examination establishes a baseline against which future changes can be measured, as well as allowing identification of current cognitive impairment.

Diagnosis and treatment of the acute confusional state require coordination among the various caregivers. The identification of symptoms and ongoing management falls as much to the nurse and other members of the caregiving team as it does to the physician. It is important that those who spend the most time with the patient identify symptoms, document these symptoms in the medical record, and call them to the attention of other care providers. The physician, upon whom primary responsibility for diagnosis and treatment falls, should pay attention to these observations of caregivers who are more likely to have monitored the patient over longer periods of time and under varying circumstances. Studies indicating that physicians frequently overlook behavioral disturbances (Brody, 1980) place even greater importance on attention to the observations of others.

In addition to the diagnosis and treatment of the underlying cause(s), the symptoms of the confusional state require careful, coordinated management efforts on the part of the entire health care team. Similar to the identification of signs of confusion, the burden of managing the symptoms of the acute confusional state rests on the nurse and other nonphysician members of the caretaking team. The goals of symptom management should be to maintain and maximize existing function, to minimize the demands on impaired function, to ensure patient safety and comfort, and to minimize disruption of hospital routine and disturbance of other patients. A consistent, team-oriented approach is most effective in accomplishing these objectives.

Treatment of acute confusion is complicated by the increasing financial pressures confronting hospitals, particularly with the recent implementation of prospective payment by the Medicare program. The federal payment system, based on diagnosis-related groups (DRGs), does not fully reimburse hospitals for more complex cases, including those that include a co-morbid diagnosis of acute confusion as a complication of other underlying physical disease. Because the DRG assignment is based primarily on the specific primary diagnosis responsible for the patient's admission, acute confusion is likely to be considered as a treatment modifier. The occurrence of acute confusion increases the costs of treating a hospitalized patient, yet the hospital may not be fully paid for these additional expenses. For patients over the age of 70, no additional increase in DRG payment is provided for the complication of acute confusion. For example, in one hospital the 1984 DRG payment for a Medicare patient over the age of 70, admitted for a hip fracture repair,

was $8,247. Examining the records of two acutely confused elderly hip fracture patients indicates how dramatically length of stay may vary, from 6 days to 104 days, with costs ranging from $7,390 to $56,963 (data abstracted from patients' medical records). Administrative pressures to decrease length of stay may undermine enthusiasm for careful evaluation of confused patients. Unfortunately, this is a short-sighted and potentially costly approach to the problem. Careful evaluation of acutely confused patients could lead to system-wide cost savings for those patients in whom appropriate treatment leads to early resolution of the confusional state.

Although it is difficult to estimate precisely the aggregate health care expenditures that result from acute confusional states, and even more difficult to determine how much could be saved by early identification and treatment, it is clear that both are quite large. Assuming that proper management of acute confusional states would shorten hospital stays, it would follow that savings would result. It should be noted that in the short run, under the DRG reimbursement system, Medicare would pay no less for a shorter hospital stay. The hospital, on the other hand, would benefit from decreased costs, while payments remain the same. If early detection and proper management of the acute confusional state decreased the average length of stay for each hospitalized elderly confused patient by just one day, it can roughly be estimated that the savings based on 1983 data would be between $1 and $2 billion!* If early detection and intervention prevent a nursing home admission or rehospitalization, the savings could be even larger.

Care for the acutely confused patient often does not terminate with hospital discharge; posthospitalization placement is a crucial issue. In a study of 116 elderly patients admitted to an acute hospital from the community, Lamont and colleagues (1983) noted that 31.4% of those with "abnormal" mental status (as indicated by chart review) were discharged to nursing homes, compared to only 8.6% of those with "normal" mental status. Moreover, this relationship became stronger with increasing age. For patients over the age of 85, 71% of those with "abnormal" mental status were discharged to nursing homes. Discharge of confused elderly patients to home may also cause problems. Confused patients are more likely to require home services such as meals, nursing

*These estimates are based on data from the Medicare Statistical System, Bureau of Data Management and Strategy, as reported in Gornick, Greenberg, Eggers, and Dobson (1985).

Average hospital cost/day × Hospital discharges × Incidence of ACS
$519 × 10.38 million × 15% to 40%
= $808 million to $2.2 billion.

care, and supervision. Even with these supports, the confused patient is less likely than others to comply with a treatment regimen and may prove to be a safety risk to self and others. As a result, the persistent confusion makes rehospitalization and other negative health outcomes more likely.

Finally, quality of life issues must be considered. The acute confusional state may be terrifying for the patient and disturbing to the family. When the acute confusional state is not resolved, the patient is at risk for long-term cognitive impairment that jeopardizes the ability to live independently in the community. Rarely are community services adequate to maintain a severely cognitively impaired individual at home, so that the burden of care falls on family members who may be unprepared for the additional stresses. Family caretakers may well be the "hidden victims" of this syndrome. Studies of the chronically impaired and their families indicate that informal caretakers are likely to suffer from a variety of stress-related problems including alcohol and drug abuse, depression, divorce, and physical diseases thought to have strong psychosomatic components (Fengler & Goodrich, 1981; Gurland, Dean, Gurland, & Cook, 1978). For those patients without family to provide care, institutional placement is an unavoidable consequence.

The arguments for careful attention and response to symptoms of acute confusion are compelling. Successful treatment and effective management of acute confusional states will lead to shorter hospital stays, cost savings, improved health outcomes for patients, and a better quality of life for patients and their families.

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CHAPTER 2

Geriatric Nursing in Acute Settings

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TRENDS IN GERIATRIC NURSING

Nursepower

The specialty area of geriatric/gerontological nursing has made notable progress in the past 10 years in terms of developing units within professional organizations, reviewing curricular issues, and developing position papers that discuss the role of the gerontological nurse. However, the number of nurses who choose this area of concentration continues to be small. While there are 2.3 million elders in nursing homes (Butler, 1979a) only about 8% (79,647) of the 1.6 million registered nurses in the United States work in nursing homes (Moses & Roth, 1979). Similarly, while fully 60% of all hospital beds nationally are occupied by the elderly, few nurses would identify themselves as gerontological nurses. Only 14% of a sample of 1,374 basic nursing education programs indicated that they offer specialized courses in gerontological nursing (Wells, 1979). Furthermore, only 0.2% of nurses functioning in the expanded role as defined by the American Nurses' Association (ANA) are in gerontological nursing

practice (ANA, 1983). Historically, care of the elderly has carried with it little prestige. The lack of high technology associated with modern care coupled with the goal of maintenance and restoration instead of "cure" have been perceived by some as less important. Also, there is an unspoken bias that nurses who choose geriatric care are less intelligent, less motivated, and have fewer credentials. Clearly, "image" in geriatric nursing has been a problem.

One process that has enabled nurses to become credentialed in the field of gerontological nursing is the ANA certification process. Between 1975 and 1983, 785 nurses were certified as gerontological nurses, and 342 nurses were certified as gerontological nurse practitioners (ANA, 1983). Certification is a positive trend in improving the image and status of gerontological nursing because it legitimizes this field as a specialty area and awards a title to those who demonstrate expertise.

The modern history of gerontological nursing, albeit brief, is important to review. The ANA founded its first Division of Geriatric Nursing in 1966. The first standards for geriatric care were developed in 1973 and subsequently revised in 1976 as Standards of Gerontological Nursing Practice. Through its Council of Gerontological Nursing, the ANA has since published documents that provide professional direction for nurses in gerontological care. Important among these are *A Statement on the Scope of Gerontological Nursing Practice* (ANA, 1981), which explores societal changes that have affected the health care of older adults and the practice of nursing, and *A Challenge for Change: The Role of Gerontological Nursing* (ANA, 1982), which reviews the development of gerontological nursing and discusses essential components of a health care system for older adults. *A Challenge for Change* also presents a nursing model for long-term care and explores timely issues in gerontological nursing.

Such leadership at the national level is critical to the future development of the specialty. In order to develop as a cohesive body, it is important that gerontological nurses have a process for debating standards, policy issues, and practice concepts. The increased number of gerontological nursing journals and federal programs that focus on the elderly provide such channels for communication and collaboration among gerontological nurses.

Educational Trends

The national accrediting body for schools of nursing, the National League for Nursing (NLN), requires that "the curriculum provides learn-

ing experiences in health promotion and maintenance, illness care, and rehabilitation for clients from diverse and multicultural populations throughout the life cycle" (NLN, 1983). This criterion encompasses the requirement that gerontological nursing content be addressed in the curriculum. A common approach to meeting this requirement is to integrate the gerontological content in appropriate courses throughout the curriculum. But despite this trend, the *Report on Education and Training in Geriatrics and Gerontology* stated that "The largest single problem in strengthening the gerontological content in basic schools of nursing is the inadequate preparation of faculty in gerontology" (NIA, 1984). A 1978 survey of gerontological nursing educators cited in this report indicated that most of their knowledge came from self-study or continuing education. A more recent survey in 1980 estimated that about 420 nurses hold masters or doctoral degrees with a primary focus in geriatrics or gerontology (HRSA, 1985). Special efforts to address the problem of inadequately prepared faculty and faculty shortages have been the Geriatric Education Center (GEC) initiatives sponsored by the Bureau of Health Professions of the Health Resources and Services Administration (HRSA) of the U. S. Department of Health and Human Services. To date, 20 GECs have been developed for the purpose of providing intensive training for faculty in schools of health professions in order to increase the number of trained faculty and the level of teaching proficiency in geriatric/gerontology education (HRSA, 1985) (Table 2-1).

Utilization of Nursing Services

There are currently 1,662,382 registered nurses in this country, 1,272,900 of whom are employed (77%). Hospitals are the major employers of registered nurses. Fully 65.7% of nurses who work do so in hospitals. The second largest group of employers are nursing homes, where 8% of nurses are working (ANA, 1983). Given that the majority of patients in hospitals are elderly (60%), it seems that there is a logical deduction to be made from these numbers. If the majority of nurses are employed in hospitals where the patient population is mostly elderly, most nurses need a substantial background in gerontological nursing.

In the following sections of this chapter, the primary nursing model will be discussed as the model of choice for acute care nursing and the elderly. The "functional health patterns" as outlined by Gordon (1982) will be used as a framework for discussing the special needs of elderly patients in the acute care setting.

Table 2-1
New Geriatric Education Centers Funded

Grantees	*Geriatric Education Center (GEC)*	*Program Director*
Public Health Services (PHS), Region I		
Harvard Medical School* Boston, MA	Harvard GEC	Benjamin Liptzin, M.D. Division on Aging 643 Huntington Avenue Boston, MA 02115 (617) 732–1463
PHS Region II		
University of Puerto Rico San Juan, PR	GEC of University of Puerto Rico	Elizabeth Sanchez, Ph.D. University of Puerto Rico Sciences and Graduate School of Public Health G.P.O. Box 5067 San Juan, PR 00936 (809) 753–4700
State University of New York at Buffalo* Buffalo, NY	Western New York GEC	Evan Calkins, M.D. Division of Geriatrics/Gerontology Veterans Administration Medical Center 3495 Bailey Avenue Buffalo, NY 14215 (716) 831–3097

Hunter College jointly with Research Foundation of CUNY New York, NY	Mount Sinai–Hunter College GEC	Rose Dobrof, D.S.W. Brookdale Center on Aging of Hunter College, CUNY 425 East 25th Street New York, NY 10010 (212) 481–4350
PHS Region III		
Temple University Institute on Aging Philadelphia, PA	GEC of Pennsylvania	Bernice A. Parlak, M.S.W. Temple University Institute on Aging University Services Bldg.—Rm. 206 1601 North Broad Street Philadelphia, PA 19122 (215) 787–6837
University of Pennsylvania Philadelphia, PA	Delaware Valley GEC	Laurence H. Beck, M.D. University of Pennsylvania Center for the Study on Aging 3906 Spruce Street/H1 Philadelphia, PA 19104 (215) 898–3163
Virginia Commonwealth University Richmond, VA	T.B.A.	Iris A. Parham, Ph.D. Virginia Commonwealth Univ. Medical College of Virginia Gerontology Department P.O. Box 568—MCV Station Richmond, VA 23298-0001 (804) 786–1565

Table 2-1 (continued)

Grantees	*Geriatric Education Center (GEC)*	*Program Director*
PHS Region IV		
University of Alabama at Birmingham Birmingham, AL	T.B.A.	Glenn H. Hughes, Ph.D. University of Alabama at Birmingham Center for Aging Medical Towers Bldg., 731 1717 11th Avenue, S. Birmingham, AL 35205 (205) 934–5619
University of North Carolina Chapel Hill, NC	University of North Carolina GEC	William G. Weissert, Ph.D. School of Public Health 263-Rosenau University of North Carolina at Chapel Hill Chapel Hill, NC 27514 (919) 966–3141
University of Mississippi Medical Center Jackson, MS	Mississippi GEC	Norman C. Nelson, M.D. Vice Chancellor for Health Affairs and Dean of School of Medicine 2500 North State Street Jackson, MS 39216 (601) 987–4572
University of Kentucky Research Foundation Lexington, KY	Ohio Valley/Appalachia Regional GEC	James K. Cooper, M.D. Department of Medicine E108 Wright University Medical Plaza University of Kentucky Lexington, KY 40536 (606) 233–6268

PHS Region V		
University of Michigan* Ann Arbor, MI	Michigan GEC	Richard Adelman, Ph.D. Institute on Gerontology The University of Michigan 300 North Ingalls Ann Arbor, MI 48109 (313) 764–3493
Case Western Reserve University Cleveland, OH	Western Reserve GEC	Jerome Kowal, M.D. Department of Medicine Cleveland, OH 44106 (216) 844–7246
PHS Region VI		
Baylor College of Medicine Houston, TX	Texas Consortium of GECs	Robert E. Roush, Ed.D., M.P.H. Baylor College of Medicine One Baylor Plaza Houston, TX 77030 (713) 788–4611
University of Texas Health Science Center San Antonio, TX	South Texas GEC	Robert T. Jensen, M.D. Division of Geriatrics Department of Family Practice Health Science Center 7703 Floyd Curl Drive San Antonio, TX 78284 (512) 691–7241

Table 2-1 (continued)

Grantees	*Geriatric Education Center (GEC)*	*Program Director*
PHS Region VII		
Curators of the University of Missouri Columbia, MO	T.B.A.	Richardson K. Nobak, M.D. University of Missouri at Kansas City School of Medicine 2411 Holmes, Rm. M5-303 Kansas City, MO 64108 (816) 474-4100
PHS Region VIII		
University of Utah Salt Lake City, UT	University of Utah GEC	Margaret F. Dimond, R.N., Ph.D. University of Utah College of Nursing 25 South Medical Drive Salt Lake City, UT 84122 (801) 581-8198
University of North Dakota Grand Forks, ND	Dakota Plains GEC	Robin J. Staebler, M.D. Department of Family Medicine University of North Dakota School of Medicine 221 South Fourth Street Grand Forks, ND 58201 (701) 780-3200

PHS Region IX		
University of Southern California*	University of Southern California GEC	R. Bruce Sloane, M.D. Los Angeles Campus/University of Southern California Medical Center 1934 Hospital Place Los Angeles, CA 90033 (213) 226-5575
PHS Region X		
University of Washington Seattle, WA	Northwest GEC	Itamar B. Abrass, M.D. Institute on Aging University of Washington Seattle, WA 98195 (206) 233-3089; (206) 543-8727
PHS Region I		
University of Connecticut Farmington, CN†	University of Connecticut GEC	Richard Besdine, M.D. Travelers Center on Aging University of Connecticut School of Medicine Farmington, CN 06032 (203) 674-3958

*Four original centers funded in 1983.
†Funded in October 1986.
T.B.A., to be announced.

PRIMARY NURSING: A MODEL FOR GERIATRIC CARE

History and Evolution

During the late 1960s and early 1970s, primary nursing was instituted in some hospitals by professional nurses who were unhappy with fragmented care and lack of direct patient contact. Since the early 1950s, the delivery of nursing care had been organized under a philosophy called "team nursing," which supported achieving goals through group action. First described by Lambertsen (1964), the team method utilizes all nursing personnel at various levels of skill. The professional nurse knew how to give skilled care but was often in the role of directing and supervising the work of other team members (Arndt & Huckabay, 1980). After World War II, there was a shortage of registered nurses, and the number of auxiliary personnel had increased (Marriner, 1980). Each patient was cared for by many different members of the team, and the team leader (the registered nurse) was mainly responsible for administering medications and treatments other team members were not qualified to give. This traditional delivery system had pitfalls in terms of both patient outcomes and nurse satisfaction. Responsibility for care planning was widely distributed and lacked any identifiable nurse professional as being accountable for that care (Clifford, 1982). Both patients and nurses expressed dissatisfaction with a system that depersonalized, fragmented care, and shared responsibility. Out of this dissatisfaction was born the concept of primary nursing. It was first described by Manthey and was based on the philosophy that patients, instead of tasks, should be the focus of professional nurses. Primary nursing features a registered nurse who gives total patient care to a small number of patients while on duty. The nurse remains responsible for the care of those patients 24 hours a day throughout the patient's hospitalization (Marriner, 1980). An associate nurse cares for the patient by using the care plan developed by the primary nurse while the primary nurse is off duty. The primary nurse has authority over changes in the nursing care plan. Clifford (1982) describes primary nursing in this way:

> The role of the primary nurse, which is analogous to that of the primary physician, requires the ability to form therapeutic relationships with individual persons, to make decisions, and to assume accountability for these decisions. Professional nursing allows for comprehensive, coordinated patient-centered care. It encourages the nurse to use all intellectual and creative resources and skill to formulate and implement the most appropriate and personalized nursing care plan for a particular patient.

Current Trends

The system of primary nursing fosters the professional development of nurses. This should be highly inspiring, creating hope for new graduates who leave their educational programs with an idealistic and professional attitude toward nursing but find that, because of the beliefs and standards of their employing institutions, they are unable to practice in the way they feel that they should. Manthey (1980) describes it this way: "With the current move toward baccalaureate education with professionally oriented education programs, it is necessary to create a delivery system that lives up to the expectations created by contemporary education and facilitates professional practice. That system is primary nursing."

What about costs? With the current financial crisis faced by hospitals, concerns about the use of professional staff are often voiced. Marram, Schlegel, and Bevis (1974) in a comparison of team and primary nursing units showed that primary nursing was no more costly. The primary nursing units also reported greater productivity, higher morale, less overtime reimbursement, and less sick time and absences than nurses on other units. Other studies (Burt, Forster, Brown, Christman), as described by Clifford (1982), have shown a similar trend of cost effectiveness.

With the recent implementation of diagnosis-related groups (DRGs) as a system of reimbursement and a move towards early hospital discharge, the age group most likely to be adversely affected will be the elderly. Those without family or community supports will be particularly vulnerable. The role of the primary nurse in the care of elders is an important one, and this system of nursing lends itself to their care.

Benefits for Elderly Patients

Primary nursing consists of four design elements: (1) allocation and acceptance of individual responsibility for decision-making to one individual, (2) assignments of daily care by case method, (3) direct person-to-person communication, and (4) one person operationally responsible for the quality of care administered to patients on a unit 24 hours a day, 7 days a week (Manthey, 1980). Having continuity of care with one responsible individual promotes the primary nurse as advocate for the elderly patient who often cannot speak for her- or himself. The primary nurse also acts as a support for the elder faced with difficult decisions regarding treatment or discharge planning. With all of the daily care given by one

person, the nurse is able to assess individual skills and strengths of each patient. There is more time to talk to patients, find out their needs, and to learn things about them that may affect care plans (Manthey, 1980). For the elderly, who may have lifelong habits and routines, altering these may affect their overall health, cognitive performance, and sense of well-being. Direct person-to-person communication can only serve to benefit this age group, many of whom in times of illness are socially isolated, lonely, and depressed. The continuity that primary nursing provides will limit the number of unfamiliar people that the elderly will come in contact with and thereby hopefully reduce the chances of a hospital-induced delirium. Lastly, having one person responsible for care 24 hours a day promotes a genuine concern for each individual patient, making care more tailored, with higher likelihood of following through on physicians' prescribed treatment regimens (Marran et al., 1974). Since noncompliance often contributes to illness, this will have far-reaching implications in terms of health of the elderly population.

Projected increases in demographics predict that 20% of the U.S. population will be over 65 by the year 2000. This projection will mandate that professional nurses be educated in the care of acute and chronic illnesses, assessment of the elderly, nursing diagnosis, interventions, and management. With the majority of acute care beds being occupied with members of this age group, primary nursing as a philosophy of care is needed now more than ever. Manthey (1980) quotes Mauksch, who aptly said, "Professional services are meaningful only if they meet societal needs. Patient care in hospitals has not done this for a long time, if ever. Primary nursing offers the vehicle to accomplish this service to society. Let us hope its promise will be realized."

FUNCTIONAL HEALTH PATTERNS AS A TYPOLOGY FOR ORGANIZING GERIATRIC NURSING CARE

Introduction

The functional patterns that are addressed in the following section of this chapter are common health-related areas that can be reviewed by patient reports and nurses' observations. These pattern areas were first identified by Gordon in 1974 for the purpose of teaching assessment and diagnosis to nursing students (Gordon, 1982). The information gathered is basic and is organized in a succinct manner. Most importantly, the information gathered leads nurses to a nursing diagnosis, not a medical diagnosis.

For elders in the acute care setting, such patterns enable the nurse to focus on the individualized nursing care needs of the patient as distinct from the medical interventions that will be taking place concurrently. The combination of the nursing and medical diagnoses and the success with which they are addressed determines the patient's ultimate health outcome. Change in one pattern area is usually reflected in other areas due to the interdependent nature of these patterns.

Health Perception–Health Management Pattern

This diagnostic category clusters data that reflect the individual's perception of health, current health status, and ability to manage health (Gordon, 1985). Diagnoses subsumed under this category identify patient problems in maintaining health and adhering to health promotion activities. Included in this category are the following nursing diagnoses: health management deficit, potential for infection, potential for physical injury, noncompliance, potential for poisoning, and potential for suffocation.

Age-Specific Considerations. There are a number of variables that place the elderly at risk for problems within this diagnostic category. Nurses in the acute care setting need to be especially aware of these issues.

Aging results in the decline of many protective mechanisms. Cilia, which normally protect the trachea and bronchi, decrease in number and flexibility. The skin decreases in thickness, becomes dry, and capillaries become more fragile, all of which lessen its effect as a protective barrier. Additionally, the immune system becomes less competent in its response to physiological insult. These age-related changes in combination with other pathological problems increase the risk of the elderly to a number of infectious processes. Nursing assessment of these problems can be complicated in the acute care setting, since the elderly may not develop classic signs and symptoms such as an increased temperature (Gleckman & Hilbert, 1982; Hammer & Lalor, 1983).

The diagnosis of potential for suffocation can be initiated for the elderly individual at risk for aspiration. Aspiration is a common problem among the aged (Wynne, 1979). Aspiration is highest in those elderly individuals with altered levels of consciousness, swallowing difficulties, and deficits that impair the ability to self-feed (Ebersole & Hess, 1985; Wynne, 1979). Wynne (1979) indicated that most aspiration is the result of passive regurgitation in individuals with depressed mental functioning.

Of special interest in the acute care setting are the problems of injury and noncompliance among the elderly. Injury is a serious problem in the

elderly because it can result in acute hospitalization or prolonged hospitalization, loss of mobility, initiation of a progressive decline in health, and loss of confidence (Lund & Sheafor, 1985). Falls represent the most common injury in the elderly. Most studies indicate that falls correlate positively with age and occur more frequently in institutional settings than in community settings (Lund & Sheafor, 1985; Venglarik & Adams, 1985). Researchers have not reached a consensus on predicting the environmental factors surrounding falls such as the time of day, location, or type of activity prior to a fall. There are multiple factors that contribute to the risk of falling in the elderly. Decreased peripheral vision and alterations in depth perception can impair the ability to see objects and judge distances. With aging, the vestibular apparatus in the inner ear becomes less effective in orienting the elderly to position and balance (Hayter, 1983). Physiological changes in bone and muscle can alter posture and gait and impair mobility.

Impaired cognitive functioning has also been cited in studies as a significant risk factor for falls (Lund & Sheafor, 1985; Lynn, 1980). This is of special interest for the acute care setting. Several studies document the incidence of hospital-induced confusion among previously mentally intact and independent elders (Chisholm, Denniston, Igrisan, & Barbus, 1982; Liston, 1982; Roslaniec & Fitzpatrick, 1979; Williams et al., 1985). This should heighten awareness for the need to routinely reassess cognitive functioning and injury potential in the elderly. Other factors that have been associated with falling include debilitation, sensory deficits, and use of assistive ambulatory devices and drugs (Lund & Sheafor, 1985; Lynn, 1980). The drugs most commonly implicated in falling include sedatives, tranquilizers, diuretics, and hypotensive agents. This is particularly important because a 1977 Services Research Report indicated that these drugs were among the most commonly prescribed drugs for the elderly (Gioiella & Bevil, 1985).

Noncompliance, especially in the self-administration of medications, is another important aspect to consider in geriatric care. Noncompliance, in its generic sense, refers to a failure to adhere to therapeutic recommendations. Noncompliance with medications can take the form of omitting medications, taking inaccurate dosages, and improper timing in drug administration. Self-medication with over-the-counter drugs and adverse drug reactions are also important to include in discussion of drug use in the elderly, although they do not necessarily represent noncompliance.

Studies indicate that the elderly have special problems with drug compliance (Kim & Grier, 1981; Lilja, 1984; Sands & Holman, 1985). Schwartz, Wang, Zeitz, and Goss (1962) reported that medication errors increased with age and with the number of medications prescribed (Kim

& Grier, 1981). This is of special interest because the 1977 Services Research Report documented that individuals over the age of 60 are taking between two and nine prescription drugs (Gioiella & Bevil, 1985). Kofoed (1985) reports that, in addition to prescription medications, at least 40% of the elderly population take over-the-counter medications on a daily basis. These reports have relevance to the acute care setting. Failure to appropriately take prescribed medication can result in acute hospital admission with exacerbation of symptomatology. Other causes of drug-related hospital admissions include drug toxicity, adverse reactions, and problems with drug interactions. Clark and Vestal (1984) reported on one study that estimated that 41% of hospital admissions in the elderly were drug related.

The effect of aging on pharmacokinetics is a significant factor in the elderly. The elderly generally require decreased dosages of medication. This is related to several factors. Decrease in body size, increase in body fat, and decrease in body water may alter drug distribution. A decline in hepatic function may slow drug metabolism. Similarly, impaired renal function prolongs drug excretion. In many instances the therapeutic drug level and the toxic drug level are narrowly separated (Simonson, 1984).

There are disparate findings on the cause of noncompliance in the elderly with regard to medications. Research is conflicting as to the role knowledge has in effecting compliance (Sands & Holms, 1985). Simonson (1984) suggests that compliance is related to a variety of factors including failure to understand the importance of medications or instructions, concurrent use of over-the-counter drugs, physical disabilities, increased number of medications, experience of side effects or adverse reactions, financial constraints, and failure of health providers to establish a therapeutic relationship. Lilja (1984) documents research that has shown the importance of social support and network in compliance.

Nursing Management. Nursing management for the prevention of injuries in acute settings is predicated on knowledge of aging process, recognition of high risk individuals and situations, and initiation of safety measures. Individuals with cognitive impairment, sensory limitations, gait impairment, and debilitation should be considered high risk for falls. Additionally, it is widely documented that there is a tendency for individuals who have fallen to fall a second time (Lynn, 1980; Venglarik & Adams, 1985). The percentage of second time fallers varies widely but is estimated up to 40% (Venglarik & Adams, 1985). These elderly should also be considered high risk. Some indication that the older individual is at risk for falls should be noted at the bedside in order to alert all hospital personnel to the need for special safety precautions. This can be done in an unobtrusive way through the use of symbols or

color coding. Close supervision of high-risk patients is essential. Restraints should be used cautiously with the elderly. Some suggest that high-risk patients should be assigned to semiprivate rooms rather than private rooms. This selection provides some peripheral supervision by increasing the number of people in contact with the high-risk person.

It should be noted that not all elderly who fall are cognitively impaired or debilitated. Diuretic and hypotensive drugs are thought to contribute to falls by causing some degree of orthostatic hypotension. Patients should be educated to this side effect and instructed to sit upright for 5 minutes before rising. Baseline postural vital signs may be helpful in these individuals. While studies have documented falls at both active and inactive times, it has been speculated that some falls are related to fatigue (Venglarik & Adams, 1985). This should suggest the need to increase supervision at times when patient fatigue is greatest, such as following diagnostic tests, following high energy expenditure activities, and in patients requesting to go back to bed. Environmental considerations are also appropriate for the acute care setting and include keeping the bed in a low position, side rails raised, call light and personal belongings within patient reach, and hallways cleared so handrails can be used.

Falls are not the only injury that the elderly may sustain in the acute setting. Nurses must be acutely aware of the need to monitor hot packs more frequently in the elderly, since sensory perception of heat and pain declines with aging. Special note should be made that heating hot packs in a microwave oven is a dangerous practice. Microwaves cause retained heat sufficient to cause severe burns. Burns are also a possibility during mealtime. Impaired vision as well as other sensory impairments can result in accidents.

Nurses in the acute care setting play an important role in helping to establish an appropriate medication regimen and in assisting the geriatric patient in maintaining adherence to a regime upon discharge.

Nursing assessment is essential in determining patient tolerance to medications. It is especially important since very few drugs come with dosage recommendations for the geriatric patient (Simonson, 1984). Since therapeutic levels and toxic levels are so close in measurement, nurses should follow serum drug levels. Drug-induced problems are very common in the elderly. Sudden onset of change in behavior or other symptomatology such as skin rash, nausea, headache, and dizziness should be reported and followed (Gioiella & Bevil, 1985). Close patient observation is required when a new drug is instituted. Clark and Vestal (1984) report that the elderly have the highest rate of adverse drug reactions, estimated at 25%. Awareness that certain drugs have a propensity for toxicity or adverse reactions in the elderly is important. The half-

life of digoxin may be up to 72 hours in a frail elderly person with decreased kidney function (Simonson, 1984). This author also reports that toxicity in the elderly may present in subtle forms including anorexia instead of nausea, vomiting, and diarrhea, vision disturbances, and fatigue. Coumadin® has a high degree of toxicity and can result in severe bleeding problems in the elderly. Other drugs that account for a large percentage of drug reactions in the elderly include Inderal®, diuretics, antihypertensives, Aldomet®, Reserpine, Cimitidine, codeine, and Valium® (Simonson, 1984).

It is important for nursing to establish a strong primary relationship with the geriatric patient. Medication planning for the elderly patient should be an interdisciplinary endeavor. The physician, primary nurse, and pharmacist need to collaborate on simplifying the patient's medication schedule. Medication education should be clear, straightforward, and slow-paced. Kim and Grier (1981) demonstrated that geriatric patients had significant gains in medication learning when the pace of information delivery was slowed by 50%. Written instructions in large print should always accompany verbal instructions. Some have suggested that medication administration is facilitated when it is associated with daily events. Medication schedules can be complex. Patients might benefit from having the opportunity to demonstrate medication management while still in the acute setting. Medication education should also include information on over-the-counter drugs. Aspirin and laxatives are two drugs that have been implicated in overuse in elderly populations (Kofoed, 1985). The nurse can also be instrumental in establishing support networks for geriatric patients. Some problems in drug prescription and usage could probably be avoided if the patient establishes a single pharmacy relationship where patient profiles are used.

Nutritional–Metabolic Pattern

The nutritional–metabolic pattern describes patterns of food and fluid consumption as they relate to the individual's need and the nutrient supply (Gordon, 1985). Meal preparation, type and quantity of food and fluids consumed, references, and availability are considered.

Age-Specific Consideration. The nutritional–metabolic pattern describes the pattern of food and fluid consumption relative to metabolic need (Gordon, 1985). With normal aging, the total energy production per square meter of body surface falls progressively (Roe, 1983). The reduction in energy metabolism is related to both a decrease in physical activity, especially after age 75, and to tissue loss (Exton-Smith, 1972).

According to Young (1982), "many organs and organ systems show alterations in function with advancing age that may have a direct influence on the utilization of nutrients." Changes in the aging intestinal tract play a significant role in the nutritional–metabolic pattern of the elderly. While little research has been conducted on intestinal enzyme activity, digestion, and absorption, there is some data to suggest there is a reduction in fat absorption in the elderly (Young, 1982). Disease states such as poor dental health, xerostomia, and constipation, as well as economic concerns regarding the high price of foods, all effect the elder's nutritional–metabolic pattern. Exton-Smith (1978) elaborates on this and adds that the factors of depression, loneliness, poor vision, arthritis, alcoholism, medications, and inadequate knowledge of dietetic principles may lead to inadequate nutrition in the elderly.

Wolanin (1986) has provided an excellent prototype care plan that addresses the age-specific considerations that are extremely important for nurses to be aware of in caring for elderly patients (Table 2-2).

Nursing Management. This prototype care plan has clear applications to the acute care setting. Mechanical problems such as dysphagia and paralysis coupled with arthritic joints and an unfamiliar environment can severely limit an elderly patient's ability to maintain adequate nutrition.

In the acute care setting, the schedule of meals may also pose problems. Perhaps the elder has regular eating times at home that do not coincide with the times used in the hospital. If assistance is necessary, perhaps the elder may be asked to wait until a nurse is free to assist him/her and by that time the elder may no longer be hungry or the food may be cold. Packaging of institutional foods is also a problem for elders. Silverware, milk cartons, condiments, juices, and the like are frequently prepackaged in a way that makes them extremely difficult to open. Such a seemingly minor problem may be just the thing that defeats elders and leaves them feeling helpless, vulnerable, and disinterested in eating. If elders feel rushed or sense that the person helping them does not wish to do so, a negative outcome may also result. Trays can come and go untouched.

Therapeutic diets that are new and strange to elderly patients may also prevent the goal of adequate dietary intake from being met. A new order for a sodium-restricted diet may cause an immediate cessation of eating. Likewise, a liquid diet may do the same. The importance of assessing the meaning of food and the food preferences of elderly hospitalized patients cannot be overstated.

The specific disease state that has warranted a hospital admission will be an important consideration in successful intervention strategies for elderly patients. The individual who has recently had a cerebrovascular

accident will need specific guidance in overcoming mechanical problems associated with this disease as it affects eating. The person with a new diagnosis of metastatic lung cancer will obviously need an entirely different set of nursing interventions based on his/her individual emotional response to the diagnosis and the degree of pathological impairment as well as resulting symptoms.

Drugs may be a cause of altered food intake in the hospitalized patient. Some drugs, such as antihistamines, psychotropic agents, and tricyclic antidepressants, are known to produce a hyperphagic response. Hypophagic drugs include cancer chemotherapeutic agents, chelating agents, alcohol, and cardiac glycosides (Roe, 1983). Successful outcomes for the patient will depend on effective assessment of the drug regimen being used and the patient's response.

Elimination Pattern

Elimination is a diagnostic category that reflects a person's ability to adequately regulate and control excretory functions. Perhaps culturally based toilet training and media commercials about body odor and waste disposal emphasize this functional health pattern (Gordon, 1982). For purposes of this discussion, the focus will be ordinary incontinence and constipation, two common afflictions in the geriatric population. It is particularly important to examine what the patient feels to be a normal elimination pattern, as many lay people, specifically the elderly, have misconceptions.

Age-Specific Considerations. Urinary incontinence, or the uncontrollable, unexpected wetting of oneself with urine, is a malodorous social stigma (Resnick & Rowe, 1982). The prevalence has been estimated to be as high as 50% in elderly in acute care hospitals (Milne, 1976). Age alone does not cause urinary incontinence. There are, however, several age-related changes that may play a factor in its development. Resnick and Yalla (1985) describe changes with aging in this way: "Bladder capacity, the ability to postpone voiding, urethral and bladder compliance, maximal urethral closure pressure, and urinary flow rate are all probably reduced. Post-voiding residual volume and the prevalence of uninhibited detnisor contractions are probably increased."

After menopause and its resultant loss of estrogen, the tissues of the vagina and urethra are at high risk for developing atrophy. Atrophy of the mucosal barrier permits acid urine to inflame the urethra. This inflammation may extend to the bladder neck and may overwhelm the ability of the CNS to inhibit a detnisor contraction (Resnick, 1984).

Table 2-2
Nutritional Problems of the Elderly

Alteration in Nutrition: Less than body requirements related to increased need or decreased intake.* On the basis of structural and functional problems:

- Mechanical problems
  - Chewing
  - Swallowing
  - Feeding self (hand, arm, shoulder)
  - Position
  - Visual impairment
- Socioeconomic problems
- Cultural/religious beliefs
- Iatrogenic problems that interfere with nutrition
- Physiological states that interfere with nutrition
- Unable to give self-care for pathological problem that interferes with nutrition
- Psychological factors that interfere with nutrition

Goals of Nursing Care

- To restore and/or maintain optimum body weight
- To achieve energy level adequate to meet activity needs
- To restore independence in self-care (feeding) where feasible
- Maintain highest level of health compatible with pathology

Altered Nutrition in the Elderly: Malnutrition Etiologies	*Nursing Interventions*
Mechanical problems that prevent adequate nutrition	
Inability to chew	
Edentulous	Referral to dental care
No dentures	Food prepared for swallowing without chewing
Dentures not serviceable	
Dentures loose: slip when eating	
Decubitus ulcer under dentures	
Dentures cannot be cleaned by patient	Mouth care/teaching for self-care
No opposing molars	
Loss of opposing molars	Referral to dental care
Insecure teeth (periodontal disease)	Mouth care/teaching for self-care
Painful molars (abscesses)	Food prepared for swallowing without chewing
Periodontal disease	
Gum tenderness prevents chewing	Mouth care/teaching for self-care Avoidance of spicy, acid foods; food prepared for swallowing without chewing; dental referral
Mouth infection	
Postantibiotic infection	As above for periodontal disease, plus specific treatment for infection
Canker sores (Aphthous stomatitis)	Note history for possible stresses that lead to occurence (food allergies, etc.) Treatment as for periodontal disease
Neurological deficits	
Masseter weakness	Food prepared for swallowing without chewing
Tongue weakness	Small quantities often; mouth care
Cannot clean mouth with tongue	May require enteral feeding

Table 2-2 (continued)

Altered Nutrition in the Elderly: Malnutrition Etiologies	*Nursing Interventions*
Unable to swallow	
Neurological deficits	May require enteral feeding
Pain on swallowing (throat infection)	Smooth textured foods, cold temperatures
Obstruction (cancer, etc.)	Enteral feeding
Tongue weakness	
Dehydration	Adequate hydration, mouth care; teach to recognize own hydration and prevent
Comatose	Comatose patient requires enteral or parenteral feeding
Cannot feed self (unable to give self-care feeding)	
Hand-arm deficit, dominant hand	Assist with mouth care and feeding; teach patient to use nondominant hand; use assistive devices
Elbow/shoulder joint stiffness or pain	
Hand joint stiffness or pain	
Hand, elbow joint stiffness or pain	
Muscle weakness	Prepare food for singlehanded self-feeding by opening containers, cutting, etc.
Casting or splinting	
Amputation	Refer to occupational therapist
Temporary (restraints) (dressing)	
Hand-arm deficit nondominant hand	
No hand use	Assist with feeding until assistive devices and self-feeding strategies can be worked out through patient education, rehabilitation, and referral to occupational therapist
Hand intact but cast, dressing, restraints	
Hand intact, painful	
Amputation	

Position	
Horizontal position	Assist patient with feeding if position cannot be changed
Prone position	Mouth care
Unable to see or reach food (no visual problem)	
Visual problem that prevents feeding self	
Hemianopsia	Teach patient to scan from left to right
Partial blindness (can see sharp contrasts)	Use linen and china that contrasts with food and always use same placement of equipment and food on plate
Functional blindness	Assist until self-feeding skills are learned
New disability	
Old and compensated disability	
Socioeconomic problems that interfere with nutrition	
Poverty	Work with social agencies for income maintenance that ensures adequate food budget or assistance with shopping and preparation; congregate meals or meals on wheels
Unable to transport food from market	
Unable to cook and prepare food	
Peer group pressures (food fads)	Education regarding nutritional needs
Fast food outlets	Prepared foods for the time-pressed and counseling regarding priorities for time
Time pressures	
Cultural-religious problems that interfere with nutrition	
Learned food dislikes	Analysis of nutritional deficits and substitution of accepted foods; education regarding adequate nutrition
Food customs or religious beliefs that interfere with nutrition	
Ignorance of nutritional needs	
Fad diets	
Iatrogenic problems that interfere with nutrition	
Treatment regime	
N.P.O., for diagnostic tests or surgery, etc.†	Enteral or parenteral feeding
	Mouth care

Table 2-2 (continued)

Altered Nutrition in the Elderly: Malnutrition Etiologies	*Nursing Interventions*
Drug therapy	
Nauseating drugs (chemotherapy, iron)	Assessment of drug regimen as balanced against nutritional status
Dry mouth (atropine-like drugs)	Ice chips or hard candies to hold in mouth before eating
Sedating or tranquilizer drugs	Limit sedation and drug dosage times to nonmeal time reaction times
Drug taste in mouth	
Mouth infection/drug-related	
Special diets, restricted diets	Restriction diets should be evaluated for nutritional deficits; refer to nutritionist
Mouth surgery	
Intubation	
Avoidance of allergens	
Physiological states interfering with nutrition	
Nausea	Parenteral feeding; mouth care
Pain due to ingestion	
Dehydration	Restore hydration by oral or parenteral means
Pain	Offer pain relief before meals
Unable to give self-care needed for pathological problem that interferes with nutrition (diabetes)	
Requires teaching regarding self-care	Teaching for self-care or teach significant others who will be giving care; plan for regimen that includes food likes and dislikes and customs
Unable to prepare therapeutic diet	Refer to nutritionist where possible
Psychological factors that interfere with nutrition	
Depression	Assessment to determine if situational or endogenous; assessment of support system and development of social supports to encourage coping skills and eating

Fear–anxiety	Support through recognition and acceptance of state, but helping to develop inner strengths
Grief	Support through the grief process and use of human interaction to restore normal eating patterns.
Disgust (odor, sight)	Discussion with patient to determine cause and alteration of environment to eliminate obnoxious stimuli
Substance abuse	Assess support system, and refer to social services as appropriate for help
Loneliness	Social support while discovering assistance that will restore normal pattern of living and meaning; refer to community agencies and/or church and seek significant others who can assist

Outcomes

Restoration or maintenance of normal body weight
Energy adequate to meet activity level
Independence in self-care (eating) where feasible
Learns to use assistive devices in eating
When possible, patient uses own coping skills to bring about solution
Referral has been made to appropriate members of health care team or to community agency, and assistance is requested and used
Educational efforts result in patient or caregiver being able to give appropriate and adequate nutritional self-care.

*Swaeringen, P. L. (1986) *Manual of nursing therapeutics.* Menlo Park, CA: Addison Wesley.
†N.P.O.: nothing by mouth

Local discomfort, secondary cystitis, and stress incontinence may occur. In men, prostatic enlargement can lead to urge and overflow incontinence.

Age and chronic bacteriuria are not risk factors for developing incontinence. Those who are at higher risk are females, those with a neurologic disease, and the immobile (Brocklehurst, Dillane, Griffiths, & Fry, 1968; Willington, 1969). Not surprisingly, many of those hospitalized in an acute care setting fit into these categories. Factors that contribute to the onset of incontinence include an acute confusional state from illness, medications such as diuretics which increase urine output, a strange environment where the location of bathroom facilities is not known, and immobility, very often from restraints. These insults, superimposed on what may be an already decompensated bladder function, make the development of urinary incontinence a likely event.

There are also age-related changes in the bowel that need to be considered. The large bowel has active resorptive (water, chlorine, sodium) and secretory (mucous, potassium, bicarbonate) functions (Minaker & Rowe, 1982). Transit-time analysis of radiopaque markers in healthy elderly subjects reveals that the first marker is always excreted in 3 days, and 80% have passed by 5 days (Eastwood, 1972). This is no different from healthy, young, normal individuals. Normal stool frequency is between 3 and 20 stools per week (Minaker & Rowe, 1982). These same authors state that elderly individuals have normal sensibility to distention of the rectum. Despite this, it is estimated that 40 to 60% of elders use laxatives regularly. These are self-administered in many individuals who do not consider themselves constipated but wish to maintain a preconceived idea of regularity. Of those who claim to be constipated, 25% have normal bowel transit times (Eastwood, 1972). The cost of this health practice is enormous, with estmates as high as $130 million per year in the United States (Minaker & Rowe, 1982).

Why, then, do elderly people become constipated? Changes with aging include a loss of tone of the bowel wall, diminished peristalsis, and a loss of strength of the abdominal musculature (Reichel, 1978). As is often the case with this population, multiple factors contribute to the dysfunctional pattern. Frequently mentioned among these are insufficient fiber in the diet, inactivity, depression, drugs, inadequate fluid intake, laxative abuse, neurologic disease, and dementia. Constipation may also lead to fecal incontinence in the form of diarrhea. In any elderly person, fecal impaction should be a foremost consideration in the differential diagnosis of diarrhea.

Nursing Management. Assessment of urinary incontinence in the hospitalized elderly includes obtaining a history from the patient, family, or

previous caregiver. The history should focus on the duration of incontinence in relation to the current acute illness. The presence of urgency, frequency, hesitancy, and burning may indicate the development of a symptomatic urinary tract infection that may respond to antibiotic therapy. The leakage of urine with an increase in abdominal pressure, such as during a cough or sneeze, may point to a history of stress incontinence. The nurse may be responsible for teaching the patient how to do Kegel exercises to increase the muscle tone of the pelvic floor. Documentation of a carefully taken history is important as it contributes to selection of a treatment plan.

The incontinence chart very often determines the nursing intervention and subsequent management of urinary incontinence. It is the responsibility of the primary nurse to ensure that the associate nurses understand the importance of documenting the voiding pattern. The patient is checked by the nurse every 2 hours to document whether or not she or he is wet or dry. The patient is then asked to void during the waking hours, and the amount voided is recorded. The chart is kept for 24 hours a day for 2 to 3 days. After collection of this information the charts are compared to look for an observable pattern of times when incontinent episodes occur. If a pattern is obvious, the primary nurse plans his or her intervention accordingly. If a patient is checked and is dry every 2 hours consistently but is wet after 4 hours, the nursing management would include toileting every 3 hours. Special focus also needs to be given to times when medications that increase urine output are given. More frequent toileting may be required after diuretics or an increase in intravenous fluids.

Physical assessment, which can be done by a nurse in the acute care setting, includes a mental status exam. Frequent reorientation to new surroundings, including instructions on how to call the nurse for assistance, the location of the bathroom or a urinal, and careful, appropriate use of restraints are all part of the nursing care plan. Since sensory deprivation can contribute to an increase in confusion in the elderly, the primary nurse should obtain the patient's glasses and hearing aid if appropriate and include the use of these on the nursing care plan.

A rectal exam, checking for fecal impaction, may be the most valuable part of the assessment done by the primary nurse. A fecal impaction acts as an obstruction, can cause urinary retention, and results in overflow incontinence. Acute illness, change in routine and diet, use of narcotics, and dehydration predispose an elderly person to constipation and fecal impaction. A bowel regimen after clearing the impaction may be all that is needed to restore continence.

The nurse can act as an advocate for the elderly woman patient by

encouraging her through teaching and support to continue the health practice of routine pelvic examinations. Atrophic vaginitis is a treatable condition and may be contributing to urinary incontinence. Glowacki (1977) states that "in up to 70% of patients in several series, topical estrogen applied to vaginal mucosa achieved considerable, if not complete, restoration of urinary incontinence."

The nursing evaluation of incontinence should include a measuring of a postvoid residual volume. Ideally, this would consist of having the patient void, measuring the amount, and then immediately catheterizing to determine the amount left in the bladder after voiding. Finding the patient wet and then catheterizing (a common practice) is not accurate. With this information the nurse is able to determine whether or not urinary retention is contributing to the incontinence. Once again, nursing management will vary and may include intermittent straight catheterization or a foley catheter after an acute episode of retention to deflate the bladder and restore function. A foley that is placed for accurate urine output measurement during an acute illness should be removed as soon as the patient's condition allows. Opinion varies on whether the practice of clamping a foley before removal is useful. It may be harmful if inadvertently forgotten.

If the problem of urinary incontinence in the hospitalized elderly is viewed as hopeless and evaluation and treatment is not sought, very often this has a direct effect on discharge planning. It is the role of the nurse to be the link between the elderly patient and the health care system. Incontinence is socially isolating, embarrassing, and often causes health care providers to infantalize care. By creating an atmosphere of acceptance, openness, and a positive attitude toward the problem, nurses may facilitate patients being helped or even cured of this affliction.

The nurse can play a vital role in educating patients about health practices that will promote bowel regularity without the use of medications. Adding fiber to the diet by eating raw fruits and vegetables, leafy green salads, and whole grain cereals (which are easily prepared) will accomplish this. Bran added to the diet is an inexpensive and easily adhered to ritual that has been shown to be effective. Whole prunes as a dessert or prune juice as a snack will also help promote regularity. Increasing a patient's activity level during the day by encouraging walking will increase conditioning and the overall sense of well-being. Limiting the use of narcotics and anticholinergic medications, which have other side effects besides constipation in the elderly, should be done whenever possible. The nurse needs to monitor the patient's fluid intake and encourage him/her to take up to 2 liters per day unless contraindicated. Stool softeners should be used with caution only in those who have

a need for them because of a problem with hard stools. Stool that is too soft in a patient with a weakened musculature is more difficult to evacuate and may contribute to repeated impactions.

Educating the patient on the importance of establishing a daily routine is an important nursing intervention. The patient should be instructed to toilet him- or herself every day at the same time when he or she will not be interrupted. The preferable time for this is after breakfast. Coffee or warm prune juice at this meal may act as a cathartic. Laxatives should be used only when all other measures have failed. Glycerine suppositories may aid lubrication and evacuation.

In summary, regularity is a problem that is a concern of the elderly. The nurse can play a vital role in educating and supporting the patient with a dysfunction in the area of elimination.

Activity–Exercise Pattern

The activity–exercise pattern is a diagnostic category that clusters those nursing diagnoses that reflect, in some manner, a patient's inability to participate fully in either activities of daily living and/or exercise. This category incorporates a broad range of physiological conditions including diminished cardiac output, insufficient energy, impaired respiratory function, and joint pathology, all of which may impinge on the individual's performance of activity and exercise (Gordon, 1985). The beneficial effects of exercise and activity are well known. Among these effects are improved cardiac output, enhanced efficiency in oxygen utilization, improved endurance, increased joint mobility, and increased muscle strength. There is also evidence that indicates that exercise in the geriatric population can improve orientation and cognition as well as increase motivation and self-care (Clark, Wade, Massey, & Van Dyke, 1975). Additionally, continuance of activities, despite the presence of limitations, is considered to be important in the developmental process of the elderly (Kehrli & Spencer, 1984).

Age-Specific Considerations. The extent to which the elderly individual is able to participate in activity and exercise is dependent on a multiplicity of factors. The aging process creates special concerns. Predominant among these are the changes in the skeletal-muscular system. Aging results in loss of muscle mass as well as muscular atrophy. These changes are accompanied by some decline in motor function, and as a result, the older individual may experience a decline in strength, endurance, and timing of movements. Some loss of neuromuscular control with resulting postural changes affects the ability to balance properly

(Gioiella & Bevil, 1985). While these changes may require adaptations in activity, physiological aging does not result in disability. Elderly disability is related to muscular deconditioning rather than the aging process (Kehrli & Spencer, 1984; Kraus, 1978).

Osteoarthritic changes—loss of articular cartilage with formation of thick, irregular bone at joint surfaces—represent the most common form of joint disease in the elderly. It is estimated that osteoarthritis is present in all elderly individuals by the age of 70 (Gioiella & Bevil, 1985; Rossman, 1979). Joint stiffness, pain, and potential atrophy from disuse of the muscles surrounding the affected joints represent a significant threat to the mobility of the elderly.

Other normal processes of aging influence the mobility of the geriatric patient. Presbyopia, resulting from decreased elasticity of the lens of the eye, impairs the vision of close objects. Loss of peripheral vision, decreased ability to accommodate to the dark, and slowed response to external stimuli also accompany aging (Bowles, Portnoi, & Kenney, 1981). These changes make activity more hazardous for the elderly, and some of the changes may impose limitations on activity out of the elder's fear of falling.

Another consideration in the activity patterns of the elderly is the presence of chronic illness. Chronic illness is generally present by age 60, and it is estimated that at least 85% of those over age 65 have at least one chronic condition (Bowles et al., 1981; Ebersole & Hess, 1985). Dyspnea, for example, is frequently cited as a cause of lowered exercise capacity in the elderly (Lillington, 1984). While normal, age-related changes in the respiratory system such as decreased forced expiratory volumes, loss of alveolar surface area, increased residual volume, and lowered Po_2 levels do occur, they produce only a mild dyspneic response and should not cause dyspnea at rest or with standard exercise (Lillington, 1984). Dyspnea in the elderly is likely to be a result of pathological conditions such as obstructive airway disease or cardiac failure. Many other chronic conditions that are prevalent in the elderly have the potential to compromise activity levels. Rheumatoid arthritis can cause severe limitation in joint mobility. In the elderly population, rheumatoid arthritis is also frequently associated with anemia (Gioiella & Bevil, 1985). This can impair exercise tolerance by requiring the heart to increase its workload in order to meet increased oxygen demands. Cerebral vascular accidents can cause not only impaired physical mobility but increased energy expenditures in order to overcome the limitations of the physical impairment. Cardiovascular disease may affect activity exercise patterns by compromising the ability of the heart to respond to increased demands.

In the acute care setting, the geriatric patient has a greatly increased

risk for an alteration of activity–exercise patterns. Illness has been correlated to inactivity (Ebersole & Hess, 1985). It is well documented that the elderly have limited physiological reserves. While elderly individuals may be able to make normative adaptions to both the aging process and the presence of chronic illness, the stress associated with hospitalization and acute exacerbation of a medical problem can severely compromise their physiological status. Activity–exercise requires an increase in metabolic energy, in cardiac output, and in vasodilation as well as in respiratory rate. These represent overwhelming demands to a system already being taxed by the stress response. Other factors that also have a critical bearing on activity–exercise patterns in the acute setting include presence of pain, fluid and electrolyte balance, nutritional status, mental status, medical and nursing therapies, and the admitting diagnoses (Gordon, 1976).

Nursing Management. In the acute care setting, goals for the management of activity–exercise patterns include decreasing functional limitations, returning the patient to preillness activity level, and preventing the complications associated with inactivity (Tobis, 1979). It is important to establish specific objectives that reflect the unique circumstances of the patient in order for activity to achieve therapeutic outcomes. In the geriatric population, it is appropriate to consider as patient goals the need to improve range of motion, muscle strength, motor skill, and endurance.

In caring for the geriatric patient, there are some general guidelines for activity management. The elderly individual needs some form of daily exercise even during acute exacerbation of illness where activity may be limited as a result of medical therapy or patient condition. Complete bedrest and inactivity can be devastating to the elderly because of rapid muscle wasting, joint stiffness, orthostatic intolerance, and the threat of complications such as thrombus formation and decubitus ulcers (Gioiella & Bevil, 1985; Wenger, 1984). Active exercise during these periods is usually contraindicated because of the increased physiological demands, but passive range of motion exercises and a 1- to 2-hour turning schedule are recommended to maintain joint mobility, muscle tone, and skin integrity. The need for immobilization should be routinely assessed and activity reinstated as soon as medically indicated (Tobis, 1979).

Activity and exercise schedules should be started slowly, with paced activities, provide for rest periods, and be performed on a regular basis. The elderly individual must devote more time to exercise than other age groups in order to achieve therapeutic benefits (Kraus, 1978).

Activities should be selected that will achieve specific patient outcomes. In order to increase muscle strength, active exercises that stimu-

late muscle hypertrophy must be used (Tobis, 1979). While either isometric or isotonic exercises will increase muscle tone and strength, isotonic exercises are recommended in geriatric patients, because they place less demands on the heart, and they have the additional benefit of improving joint mobility (Tobis, 1979). Isotonic, aerobic exercises are selected for increasing endurance because they stimulate intracellular muscle enzymes, which improve the efficiency of oxygen utilization. In the acute care setting, this can best be accomplished through ambulation and chair calisthenics. Some have questioned whether the elderly are able to achieve cardiovascular training effects from these exercises. It is estimated that a cardiovascular training effect is only achieved when the individual can sustain a pulse increase of 60% to 80%, an increase that few elderly can tolerate (Tobis, 1979; Wenger, 1984).

A critical aspect of patient management is assessing the patient for indications of activity intolerance. Clearly, the most striking and easily observed indications that activity has exceeded physiological capability are the presence of chest pain or tightness, dyspnea, dizziness, or calf pain. Gordon (1976) identifies seven parameters for determining activity tolerance including heart rate, heart rhythm, pulse strength, blood pressure, skin temperature, equilibrium, and activity performance. Change in heart rate from baseline measurements is generally considered to provide the best indication of activity tolerance, because it reflects left ventricular function (Gordon, 1976). While Gordon does not identify specific parameters for the elderly, she does suggest that a heart rate increase greater than 20 beats/minute, in individuals with physiological limitations, be considered intolerance unless a higher limit has been medically determined. Tobis (1979) recommends caution in exercising elderly patients whose resting pulse is greater than 100 beats/minute or whose immediate postactivity heart rate is greater than 120 beats/minute. Another clinical indication of exercise intolerance in the elderly is exercise-induced systolic hypertension or hypotension (Wenger, 1984). Other measures that indicate activity intolerance include irregular cardiac rhythms, a weakening of the pulse strength, extreme flushing, diaphoresis, pallor or cyanosis, complaints of fatigue, and signs of slowing and loss of dexterity (Gordon, 1976).

In working with the elderly, special consideration should be given to encouraging functional activities and conserving energy. Energy expenditure charts are available that estimate the number of calories per minute expended in performing specific activities of daily living. These can be helpful in determining high energy expenditure activities, predicting those activities of self-care that the patient will need assistance with, and anticipating discharge needs. These charts are based on average adult energy expenditure, so discretion and judgment must be used in apply-

ing the information to the elderly. Other aspects of energy expenditures should also be evaluated. Ambulatory assistive devices require varying degrees of energy expenditure. Canes and walkers require the lowest expenditure, whereas all models of crutches require relatively high levels of energy to operate (Habermann, 1979). The hospital environment should be arranged so that personal possessions and other self-care articles are easily accessible. This acts to conserve patient energy for participation in goal-directed activity.

The geriatric patient in the acute care setting presents with pathological processes. In the nursing management of activity-exercise patterns in these patients, interventions clearly must be related to medical diagnosis.

Arthritis is cited as a major problem among the elderly (Gioiella & Bevil, 1985; Habermann, 1979). Because arthritis is predominantly an inflammatory disease, any nursing plan to increase activity must include patient education regarding medication. Aspirin is the most frequently prescribed drug for arthritis. In order for aspirin to exert maximal antiinflammatory effect, a salicylate blood level of 15 to 30 mg/dl is needed (Gioiella & Bevil, 1985). This will not be achieved unless approximately 1,600 mg to 4,800 mg are taken on a regular, daily schedule. Unless patients are educated, the tendency may be to take lesser doses more sporadically, since aspirin exerts an analgesic effect at a much lower dose than is needed for an antiinflammatory response (Gioiella & Bevil, 1985). Other nursing interventions specific to arthritis include the application of heat for muscular relaxation and the provision of rest periods (10 to 15 minutes) between exercises. Exacerbations of arthritis have been correlated with overfatigue and stress (Gioiella & Bevil, 1985). A significant observation of activity intolerance in arthritic patients is the presence of pain lasting more than 1 hour after exercise or an increase in joint stiffness on the day following exercise (Gioiella & Bevil, 1985; Shanck, 1979).

When an alteration in activity–exercise pattern is related to respiratory function, which can occur with chronic obstructive pulmonary disease, nursing management reflects this. Exercise programs for patients with obstructive pulmonary disease are cautiously managed with emphasis on progressive ambulation and performance of activities of daily living (Wynne, 1979). A major focus of nursing intervention is on teaching correct methods of deep breathing and effective coughing (Acee, 1984).

The geriatric population is clearly at risk for disturbance in activity–exercise patterns. Risk does not translate into disability. Appropriate nursing management based on an understanding of the interrelatedness of the aging process, pathological conditions, and the individual can facilitate the elder's ability to participate fully in activities of daily living.

Sleep-Rest Pattern

The sleep–rest pattern assesses the effectiveness of the pattern from the patient's perspective (Gordon, 1982). The effectiveness of sleep and rest are subjective. Some patients feel rested after napping, while others complain of fatigue after a full night's sleep.

Admission to an acute care facility virtually guarantees that a person's usual sleep–rest cycle will be disturbed. Hospital routines such as taking vital signs every 4 hours around the clock, medications given during the night, noise created by staff and other patients, an unfamiliar environment, and fear over one's condition all make "having a good night's rest" impossible. This loss of sleep has its greatest impact on the elderly population. Confusion, restlessness, agitation, and noncompliance with treatment modalities may all be a direct result of sleep deprivation.

Age-Related Considerations. Mild difficulties in falling asleep and early morning awakening are common in the elderly (Salzman, 1982). For patients in their sixties and seventies, the average time taken to fall asleep normally increases by 10 minutes as compared to patients in their thirties. Objectively, the duration of stage 4 (deep sleep) declines in the elderly as does the total number of hours of nightly sleep. The basic 90-minute REM cycle remains in old age, although dream recall associated with REM sleep declines (Kramer, 1979). Of the hypnotics prescribed in 1977, 39% were for persons over the age of 60 years (Soloman, White, Perron, & Mendelson, 1979). In a survey of 2,542 patients in a variety of hospitals, 42.7% of the flurazepam recipients were 60 years of age or older (Salzman, 1982).

Nursing Management. As with any assessment, taking a history is of utmost importance. How much sleep does the elderly patient usually require? What is the usual pattern and duration of sleep? Is medication regularly taken to induce sleep? Has the person's sleep pattern changed over the years? Does she or he take a nap on a regular basis? All of this information will be important when planning nursing interventions to ensure adequate sleep.

When an elderly person is admitted to an acute care hospital it may be necessary for him or her to be placed on bedrest. It is wise for this period of time to be kept to a minimum. When bed becomes a focus of other activities of daily living such as eating, bathing, grooming, and toileting, it is not associated with sleep. People on bedrest are also more likely to take short naps during the day, which may cause them to be awake at night. Whenever possible, the elderly patient should be allowed and encouraged to spend as much time as possible out of bed to avoid deconditioning, and to increase waking time during the day. A reversal of

the sleep–wake cycle often occurs with hospitalization, and being up during the day may help to combat this problem. Establishment of a nightly routine before retiring may also help a person settle down before sleep. Very often, the usual practices of brushing teeth, washing face and hands, changing into nightclothes, and toileting are forgone because of busy hospital schedules. Allowing time for these rituals may help even a confused patient understand that it is time for sleep. It is common practice to leave lights on at night in the acute care setting, but an effort should be made to leave only a night light on while dimming or eliminating bright lights. A small amount of light will help/persons reorient themselves to a new environment upon waking and may help avoid a stumble or fall on the way to the bathroom, which could have serious consequences.

Any patient with a sleep disorder must also be evaluated for depression. Sleep disorders are often a sign of a more serious underlying psychiatric illness that needs to be addressed. The nurse should be alert to the possibility of a depressive illness and, by creating a therapeutic, supportive environment, can allow a patient to verbalize his or her concerns or fears.

Medications to induce sleep should be used cautiously in the elderly population. If a medication is absolutely necessary, one with a short half-life and quick onset of action should be chosen to avoid grogginess the next day. Many medications are addictive and have side effects, and the potential for these consequences should be included in teaching the patient.

The nurse can play an important part in creating an environment that is conducive to sleep. Selecting an appropriate roommate, keeping the room as quiet as possible, and soothing measures such as back rubs and a warm drink before bed may help to decrease anxiety and induce sleep. Being alert to signs of sleep deprivation is also part of the nursing assessment. There is much that nurses can do in the way of preventing a dysfunction in the health pattern of sleep and rest.

Cognitive–Perceptual Pattern

Nursing diagnoses in this category are derived from data indicating impairments in the patient's cognitive abilities, such as memory, language, and problem solving and/or sensory functioning including vision, hearing, and touch (Gordon, 1985). Cognitive–perceptual patterns have broad implications since the integrity of these patterns will influence the extent to which the aged patient is able to perform self-care activities,

adhere to therapeutic regimens, maintain a healthy self-concept, and participate in relationships and activities that bring joy to life.

Age-Specific Considerations. As with other organs, the brain undergoes some changes as a result of the aging process. The most notable of these is a steady loss of neurons (Gioiella & Bevil, 1985). Arenberg and Robertson-Tchabo (1980), in a summary of cognitive research, report that there is a statistically significant decline in memory, learning ability, and problem solving associated with aging. It should be clearly noted that these findings represent normal age-related changes from previous levels of functioning and do not imply cognitive deficits or impaired competence.

There are, however, a number of factors associated with advanced age that can impair cognitive functioning, sensory perception, or both. Aging is accompanied by a decrease in sensory functioning, but losses in hearing and vision carry the most significant impact on the functioning of the elderly. Uncompensated, these losses can create behavioral changes, such as inappropriate questions and responses or repetitious statements, which can be mistaken for cognitive deficits. Moreover, sensory loss, deprivation, and overload have been commonly implicated as causes of temporary, reversible mental impairment in the elderly (LaPorte, 1982; Shelby, 1978). Two situations, which have been frequently cited for their deleterious effects on mental functioning in the elderly, are environmental change and immobility (LaPorte, 1982; Roslaniec & Fitzpatrick, 1979; Williams et al., 1985). The aging neurological system is also sensitive to physiological changes. Infections, metabolic disturbances, fluid imbalances, and drug toxicities can all cause reversible dementia in geriatric patients (Goldenberg & Chiverton, 1984; LaPorte, 1982; Palmateer & McCartney, 1985). Pathological conditions, such as cerebrovascular accidents, multiinfarct dementia, and Alzheimer's disease, are more prevalent in the elderly and result in impaired cognition.

Nursing Management. Early identification of geriatric patients with cognitive and sensory impairments is essential in order to minimize or reverse the deficits and prevent deleterious effects. The initial nursing assessment should include key questions and observations that provide information on the elder's level of consciousness, appearance, ability to speak and comprehend, orientation, and memory. Use of a formal tool for assessment is recommended. Palmateer and McCartney (1985) reported in their study that nurses did not assess cognition in a consistent fashion and failed to identify a significant number of elderly with measurable cognitive deficits. These researchers speculated that without a formal assessment tool, some deficits were too subtle to be identified, and nursing observations for cognition relied primarily on the patient's ability

to engage in appropriate social interaction. A number of tools that are simple, valid, and reliable can be used for assessment. The Mental Status Questionnaire developed by Kahn et al. and the Set Test developed by Issacs and Kennie are two examples of simple examinations that have proved helpful in providing baseline data on cognitive functioning (Gioiella & Bevil, 1985; Goldenberg & Chiverton, 1984). Both of these tests were designed as screening measures and should be used in conjunction with other observations to determine whether a more comprehensive examination is indicated.

A cognitive baseline is necessary in order to establish achievable goals for self-care and education. It is also necessary in order to initiate prompt investigation when behavior deviates from baseline. Elderly patients who demonstrate a sudden decline in cognitive function during hospitalization need a comprehensive review. LaPorte (1982) suggests that nurses can have a significant role in this process by complete documentation of the onset and pattern of behavior, assessing the elder for signs of depression, evaluation of possible environmental factors, careful review and monitoring of the medications being given, and monitoring for the presence of hypotension at regular intervals throughout the day.

Nurses need to take an active role in preventing hospital-induced cognitive dysfunction. Sensory deficits should be documented, and assistive devices located near the patient for easy use. Emphasis is placed on reducing monotonous sensory input such as the noise from cardiac monitors and other equipment and increasing meaningful sensory input. Frequent personal contact through backrubs, conversation, and explanations of what is happening in the environment can help to provide stimulation and decrease isolation. This is especially important for those patients who are immobile. While private rooms increase a sense of privacy, they also tend to isolate the patient. Patients who are able to sit in a chair should be placed where they are in contact with other people and the environment. Because aging results in a decrease in peripheral vision, the elder should be placed directly facing the activity to be viewed. Gioiella and Bevil (1985) suggest that orientation can be facilitated in the hospitalized elderly by incorporating familiar cues. The elder who uses a newspaper at home to orient him- or herself to the date should be encouraged to receive the paper in the hospital. Many routines established at home by the elder can be accommodated in the acute setting including wearing one's own clothes, setting up personal belongings, and patterns of family contact. A concerted effort to maintain orientation in the elderly is part of daily nursing care. This includes the use of clocks and calendars, as well as encouraging all hospital personnel in contact with the patient to introduce themselves and explain their roles.

Several strategies can be included in a plan of care to improve performance of those with cognitive impairments. Instructions should be simple, and tasks that are to be performed by the patient should be analyzed and presented in the most basic form. This is thought to decrease the amount and complexity of data to be processed by the patient (Arenberg & Robertson-Tchabo, 1980; Tariot et al., 1985). Repetition in skills is thought to increase performance by incorporating the skill into an automatic behavior (Arenberg & Robertson-Tchabo, 1985). Since most elderly demonstrate significantly better recognition memory than recall memory, using written instructions for those who can read and substituting pictures for words are appropriate interventions (Tariot et al., 1985).

Self-Perception-Self-Concept Pattern

This diagnostic category is a grouping of those factors that influence individuals' perceptions of themselves. The concept of self-perception is multidimensional. Nursing diagnoses that are related to self-concept include anxiety, depression, fear, and disturbances in body image and self-esteem.

Age-Specific Considerations. Self-concept can be simplistically defined as the unique view one holds of oneself. Developmental theorists agree that the process of self-concept and identity begins at an early age and is continuously refined as one progresses through the life cycle (Erikson, 1968). It is beyond the scope of this chapter to discuss all of the complexities involved in the evolution of self-perception, but there are, clearly, some major features associated with aging that can influence the elder's perception of his or her identity, abilities, and sense of self-esteem. Gioiella and Bevil (1985) list eight conditions that commonly influence self-esteem in the aged. These include retirement, activity level, mobility, body image, losses, social interactions, living conditions, and powerlessness. Aging is accompanied by the need for constant adjustment and adaptations. Retirement, for example, represents not only loss of an important role in society, but may result in the loss of a valuable social network. Masini (1980) believes that the elderly have similar needs to other age groups but that they have diminished resources for satisfying those needs (Boettcher, 1985). Decreased mobility through physical impairment, limited access to transportation, or safety concerns may preclude the elderly from participating in activities that, formerly, had heightened personal satisfaction and self-esteem. Age-related changes in physical appearance, sensory losses, and therapeutically induced alterations such as stomas, mastectomies, and amputation can significantly

affect body image in the elderly. Burnside (1972) indicates that prosthetic devices used to correct physical deficits can, in themselves, be sources of humiliation, self-consciousness, and depression in the elderly. Poorly fitting dentures, a common problem in the elderly, change physical appearance and may create problems in enunciation. Losses in social interactions may also negatively impact on self-esteem. Additionally, loss of control over the decisions in one's life impairs a positive view of self-worth.

Acute hospitalization is a major threat to the self-concept of the elderly. Physical deterioration, loss of independence and control over decision making, and hospital-imposed limitations in providing self-care may all contribute to this (Gioiella & Bevil, 1985). It is not surprising that anxiety and depression frequently accompany hospitalization in the elderly.

Nursing Management. There are some nursing strategies that can be used in the acute care setting to help the geriatric patient to adapt to hospitalization in a positive manner. The older person needs to be actively involved in the formulation and execution of treatment plans. Too often the elderly are expected to comply to a standard of behavior at a speed set by the health care team. Nurses can foster self-determination in geriatric patients by providing educational information and encouraging the elder to provide input on the scheduling of activities such as bathing, walking, eating, resting, and treatments. In situations where a rigid compliance to a set schedule is necessary in order to achieve therapeutic results, the elder needs to be provided with complete information. The geriatric patient should also be encouraged to participate in self-care. A disservice is done to the elderly when, for reasons of time or efficiency, self-care activities are performed by the nursing staff. In working with the frail elderly, clinical judgment must determine whether the benefit to self-esteem of performing self-care activities outweighs the energy expenditures required of such activities.

Hearing and vision are essential to autonomy and independence in the elderly (Matteson, 1979). Sensory losses can contribute to a loss of self-esteem, making it important for the elder to have adequate assistive devices. These devices should be readily available for use as part of early morning care. Many physicians make early morning visits. Without these devices, the patients may be severely disadvantaged in communicating with their physicians. Loss of assistive devices in the hospital is a problem. Glasses and dentures should be placed in a clearly labeled container when not in use. Patients and their families should be encouraged to have both dentures and glasses initialed. Burnside (1972) indicates that evaluation of the effectiveness of assistive devices can fall within the purview of

nursing. Dentures that fit poorly may need to be relined. Patients who demonstrate difficulty with vision despite the use of glasses may need to be referred for refraction. Nurses need to be familiar with inserting hearing aids and replacing batteries, since this requires fine motor skills and may be difficult for some elderly to perform.

It is also important to assess the hospitalized elderly for depression. Depression is cited as the most common psychiatric disorder in the elderly, and it is estimated to be present in hospitalized elderly at greater than 20% (Gioiella & Bevil, 1985). Depression in the elderly can be difficult to determine, because the symptomatology mimics other conditions commonly seen in this age group (Burnside, 1976). In assessing the geriatric patient for depression, somatic complaints such as insomnia, headache, or loss of appetite and changes in cognition such as decreased memory and attention span are prominent signs (Gioiella & Bevil, 1984; LaPorte, 1982). There are a number of scales that can be used in assessing the elderly for depression. These include the Zung Self-Rating Depression Scale and the Hamilton Depression Inventory Scale. Both of these scales are fairly easy to administer and can be useful in documenting depression. A number of interventions can be used in assisting the depressed elderly patient, including allowing expression of feelings, encouraging the patient to participate in activities that were previously enjoyed, encouraging physical exercise, and the use of touch (Gioiella & Bevil, 1985). When the services of other health professionals (physical therapy, occupational/recreational therapy) are indicated, nursing assumes the role of facilitating communication and coordinating efforts.

Role–Relationship Pattern

The role–relationship pattern according to Gordon (1985) describes "the patterns of role engagements and relationships." Both satisfactory and disturbing aspects of roles and relationships are explored as the individual relates to other individuals, groups, and systems.

Age-Specific Considerations. Roles and functions in society generally mirror the trends of the times. Mezey, Rauckhorst, and Stokes (1980) state that "social age reflects performance of age-specific roles" and that social age can be thought of as "a state of development or a status confirmed by a social group." To many, aging connotates loneliness. The loss of loved ones, forced retirement, and constrictions brought about by illnesses all impact the elder's ability and motivation to carry out role behaviors that may have previously been very pleasurable. A previously active individual may be forced into a dependent role that is most

unsatisfactory to that person. For example, an older woman who has served in a matriarchal position in a large family may find it devastating to be on the recipient end of caring and nurturing behavior. Reverence for the aged is not a universal custom, and it may be that an elderly person is now in a position to be ridiculed or scorned.

Ebersole and Hess (1985) state that there are three role categories that confine, restrain, or enhance individuality: social roles, work roles, and intrinsic roles. It is felt by these authors that there is less personal devastation when one loses an ascribed role than when one loses an achieved role, because the latter role is one that the individual aspired to and worked to achieve. The role changes that occur with aging are usually the result of significant losses for the elderly individual and can produce a crisis state in that person. Several factors influence the effect role changes have on individuals (Ebersole & Hess, 1985):

- relevance of models
- supportive milieu
- presence of sustained roles not affected by a particular role transition
- age appropriateness of change
- geographic and cultural milieu
- personality and motivation in regard to constancy or change

In the absence of a supportive milieu and loved ones who are truly concerned about the elder, role changes can have a devastating and demoralizing effect on aging individuals. With aging, there is less opportunity for paid employment, less social acceptance of the continuing work role, and subtle social pressure to have elders leave the work force in order to "free up" positions for younger individuals. There are volumes of excellent research describing the effect of retirement and its impact on the family and individual relationships, which will not be addressed in this chapter but which provide excellent insight into this enormous life transition.

Widowhood presents another major role transition for aging individuals. The loss of a spouse may mean an entirely new lifestyle for an older person who may have been married for 40 to 50 years. It is important to consider variations in adaptation to the widowhood role when assessing an elderly person, however, because for one person, it may mean great sorrow and loss, whereas another person may view the new role with interest and relief. Here again is a topic that has been researched by many and is described in much greater detail elsewhere.

Not all role changes in old age are losses. New roles such as that of the

grandparent, the volunteer, the late marriage partner, or guidance counselor may add dimensions to life that had heretofore been absent. An important nursing function is to identify with the patient what role transitions are the result of an acute hospitalization (if any) and prepare to address any needs that may result from this transition.

Nursing Management. Role transition and the manner in which it is achieved cannot be dictated by any health care professional. The method and outcome will depend on the previously stated factors and the individual response of the elder. Suggested nursing interventions (Kuypers & Bengston, 1973) for facilitating the transition into new roles include the following:

- improving life supports such as housing, health, economics, nutrition, and services
- encouraging internal evaluation and control
- building adaptive problem-solving abilities
- maintaining coping skills and the level of independence
- reducing susceptibility to external opinions by increasing self-confidence

In the acute care setting, many of these interventions can be initiated in order to facilitate role transitions that may result as an outcome of that hospitalization. One example might be an elderly woman who has had a myocardial infarction and has been told she can no longer pick up and carry her grandchildren. The nurse who is aware of the impact of this new behavior on the woman's role as a grandmother will be able to provide support as well as constructive alternatives that can ease the stress induced by such a change. In the acute care setting, it is often possible to provide important linkages to community services that can aid in the transition to new roles. New choices in housing for people with altered mobility or new dependency needs can be explored while the person is still an inpatient. Although the current trend toward early discharge has dramatically decreased the average length of stay in hospitals, it is still possible to make progress in discharge and rehabilitation planning before the person goes home. Nursing management of such plans may include teaching the elder how to obtain access to required resources once she or he goes home. Role transition can also be facilitated by the nurse who clearly communicates to the elderly person that he or she is available as a resource after discharge. Many elderly patients feel that once they are discharged their ties with the hospital are severed. This is obviously not the case, and this message needs to be reinforced.

Sexuality-Reproductive Pattern

The sexuality–reproductive pattern addresses the level of satisfaction or dissatisfaction an individual has with her or his sexuality. "Sexuality" is meant to encompass a broad range of behaviors and emotions that make up the person's sexual identity.

Age-Specific Considerations. Butler and Lewis (1976) state that "a mythology fed by misinformation surrounds late-life sexuality. The presumption is that sexual desire automatically ebbs with age—that it begins to decline when one is in one's forties, proceeds relentlessly downward and eventually hits bottom at some time between sixty and sixty-five." In our society, older individuals who express an interest and desire to remain sexually active are viewed as perverted. Butler and Lewis summarize this sentiment well when they say "lustiness in young men is called lechery in old men." One national survey (*Aging International* Staff, 1980), based on a survey of individuals ranging in age from 60 to 91 years (with 45% over age 70), documented that sex is an important aspect of life in aging individuals. Also, there is little anxiety about a decline in sexuality with aging. While it is known that the frequency of sexual activity does decline with age, it is also clear that an individual's previous sexual behavior is the best indicator for sexual behavior in later life.

Physiologically, in the absence of disease, the ability for elderly individuals to have sexual intercourse remains constant throughout life. However, physiological responses do change. In males, erections occur more slowly, ejaculation may be less intense, and the amount of seminal fluid may be decreased. In females, vaginal lubrication is diminished, and orgasm may be lessened in duration and intensity; dyspareunia may occur after menopause. Steffl (1984) provides an excellent summary of chronic physical conditions and their impact on sexuality in late life. Examples of conditions such as arthritis, uterine prolapse, cardiovascular conditions, and Parkinson's disease are discussed in relation to their impact on sexuality and sexual performance, which provide insight into some of the problems faced by the elderly who are affected by these disorders. Concomitant with chronic disorders are the prescriptions and utilization of medications that may affect sexual performance. These need to be evaluated when sexual dysfunction occurs.

Nursing Management. Nursing management of sexual dysfunctions or sexual concerns can begin when the elderly person is a patient in the acute care setting. The nurse who is informed can initiate discussion regarding the impact of acute illness on sexual function and provide specific teaching as it relates to the disorder of the patient. For example,

the elderly patient with a recent myocardial infarction will need information to the same extent as his or her younger counterparts regarding what postcoronary measures are important to prevent episodes of angina or a reoccurrence of a myocardial infarction. Adaptions in positions for intercourse should be discussed; it is less stressful for coronary patients to be in the bottom position. Avoidance of isometric activities as well as nonweight-bearing positions are important. The nurse should not assume that because the patient is old the information is not necessary.

Another important example where sexual counseling should be initiated relates to individuals who have impaired cognitive function. The newly diagnosed Alzheimer's disease patient may have enormous fears about how this disease will affect future sexual function. Partners will need direction and counseling as well, and the nurse can provide such individuals with contact telephone numbers for an Alzheimer Support Group, special counselors, or professionals with special skills in this area. In the acute care setting, nurses may encounter aging patients who make sexual advances that are inappropriate and extremely disturbing. In such situations, it is important to address the behavior and clearly communicate that it is not acceptable. The nurse should be cautious not to avoid the patient (which is likely to be the natural response) but to ask him or her to refrain from the behavior. If the patient is confused, it may be appropriate to adapt the environment to provide decreased exposure of the behavior to other patients and families who may be upset by such actions. A primary nurse should be assigned as soon as possible to provide consistency and continuity of care.

Drug regimens should be reviewed with aging patients in order to discuss potential side effects that may affect libido and performance. If the elderly person knows in advance that this might be a problem, he or she can seek help if symptoms occur, instead of attributing the change to aging.

In summary, there are valuable adaptational strategies to enhance the sexuality of older patients. The nurse can provide specific information that allays fears and apprehensions in their older patients. If the nurse doubts his or her ability to provide adequate information, he or she can explore the possibility of involving other counselors at the institution or in the community.

Coping-Stress Tolerance Pattern

The coping–stress tolerance pattern describes the effectiveness with which the individual is able to withstand and respond to the various

stressors of life. The changes that accompany aging or are associated with aging make this category a particularly important area for nursing assessment and interventions in the acute care setting.

Age-Specific Considerations. The elderly are faced with "more stresses and more serious stresses" than any other age group (Butler, 1979b). Ebersole and Hess (1985) outlined some of the common stressors in elderly populations. These include the following:

- illness and changes in the body
- significant losses of spouses, friends, and family
- loss of mobility
- disruption of daily living patterns
- relocation

Additionally, Ebersole (1976) identified two maturational events that the elderly must confront: retirement and anticipation of one's own death. Even when the elderly person is not actively confronted with a stressful situation or crisis, the threat of such a situation may be present and induce some degree of concern, fear, or anxiety. Elders may fear that sudden illness, worsening of chronic illness, or falls and accidents will result in loss of mobility and independence. In modern society, it is not unrealistic to be concerned over the prospect of financial crises or geographical distancing of families. Burnside (1970) indicates that learning to live with losses is a continuous process for the aged (Ebersole, 1976). It is not as surprising that the elderly may need some assistance with coping as that they are able to cope so well and retain resiliency despite the enormity of stressors present in their lives. Butler (1967) identified four factors that significantly affect the perception of stress in the elderly. These include the magnitude of the stressor, the personal resources of the elder, the amount of energy that can be directed toward resolving the stress, and the individual's past history in coping with stress (Ebersole & Hess, 1985).

Acute hospitalization can initiate the stress response. This precipitates a number of physiological reactions. Since the elderly have limited physiologic reserves, prolonged stress can result in fatigue and a heightened vulnerability to illness (Ebersole & Hess, 1985). Hospitalization may also increase stress in the older patient because it is a relocation. For some patients, this will only be a temporary situation, but for others, acute hospitalization is followed by a more permanent move to a relative's home, a rehabilitation facility, or a nursing home. The stress of relocation to the geriatric patient cannot be minimized. Amenta, Weiner, and Amenta (1984) report that mortality rates increase with forced reloca-

tion. In their own study, relocation resulted in significant deterioration in mental status, mobility, and sensory perception.

Nursing Management. Primary nursing plays a critical role in assisting the geriatric patient to cope with stressful situations. The primary relationship fosters the development of trust and facilitates an understanding of the elder perspective. It is important to maintain a heightened awareness of the many factors that can contribute to stress in the hospitalized elderly. Holmes and Rahe (1967) developed a Life Change Scale that attempts to quantify some of the stressors confronted in life. This scale can be helpful in providing an index on the magnitude of stressors and the cumulative nature of stress, but it should be used only as a guide. The scale does not account for losses that are important to the elderly, such as sensory functioning and ability to drive, and the scale, of course, cannot predict the individual's unique response to stressors. Nursing assessment of the elder's response to stress includes evaluating both physical and psychological parameters. Ebersole (1976) suggests that physical symptoms are the most common indicators of stress. These include anorexia, restlessness, fatigue, and sleep disturbances. Change in level of consciousness has also been cited as an important indication that stress has exceeded adaptive abilities (Ebersole, 1976; Ebersole & Hess, 1985). Behavioral changes that indicate withdrawal and paranoid thinking may also manifest themselves as signs of severe stress in the geriatric patient.

There are some general guidelines that can help to minimize stress and maximize patient resources. Change should be kept to a minimum. In the acute setting, this would include such things as maintaining primary caregivers, establishing routines, and avoiding room and unit transfers. Ebersole and Hess (1985) suggest that each individual has a biological time clock that is associated with periods of peak efficiency. Activities that require concentration can be planned to correspond with these periods. Allowing patients to exercise control in their care may also be helpful. Boettcher (1985) documents the need for nursing to act as an integrator in mobilizing sources of support for the elder. Social networks have been documented as having a positive influence on health (Boettcher, 1985; Cole, 1985). It is speculated that they lessen the impact of stress on the individual. Cole (1985) identifies several broad areas that should be included when evaluating the social support system of the elderly. These include the size of the system, its ability to handle a diversity of needs, the geographical location of its members, the amount of collaboration between members, and the extent to which the members are committed to the elder. The nurse can do much to influence the coping ability of the elderly when various family supports are brought together with institutional and agency supports.

Nursing also needs to act as a liaison between the geriatric patient and the hospital system. It can be very exhausting to the elderly to have tests, treatments, and activities scheduled continuously throughout the day. Care for the geriatric patient should be scheduled at the pace of the elder and not at the pace of the institution when at all possible. The elderly patient who will not be going home after acute hospitalization needs special consideration. It is important to discuss the move with the elder as soon as possible. Every means of acquainting the elder with the new placement should be instituted. Amenta, Weiner, and Amenta (1984) suggest the use of brochures, photographs, visits, or phone calls from the new staff and visits to the institution as methods for easing the relocation process.

Value-Belief Pattern

The value–belief pattern relates to individual choices or decisions as they are affected by personal values, goals, and beliefs. In this pattern, as is the case with the role–relationship pattern, the emphasis is on what the individual perceives as important in life and any perceived conflicts in values, beliefs, or expectations as they relate to the individual's health (Gordon, 1985).

Age-Specific Considerations. Each of us is born into a specific cohort that holds its own value orientation. How those values change over time with aging is not well understood. There are obviously a great range of differences among older people. Although some elders are viewed as "a contented leisure class" (Binstock & Shanas, 1976), others struggle from the rages of poverty. In relation to values, although there is a change in the national trend from the work ethic to the expressive "leisure ethic," it is not clear that elders solidly align with either group. It does appear that values shift with age, based on findings documented by Christenson (1977). This work indicated that some values are more prominent during certain decades of life than others. For example, material comfort consistently becomes more important with advancing age, whereas concerns about racial and sexual equality decline throughout life. These value positions are impacted by the individual's ethnic, religious, and family structure as well as inherent personality differences and health status.

Lancaster (1981) notes that social and technological change since the 1950s has occurred faster than ever previously recorded in our history. Some authors propose that rapid change, stress, and urbanization have taken their toll on older people, but the increase in the average life span does not bear this out. If anything, it suggests we are dealing with an extremely hardy cohort that demonstrates remarkable capabilities in

resilience. Crystal (1982) states that "just as one can never step into the same river twice 'old age' is a status occupied by a constantly changing membership." Our knowledge of the value system of our elderly is obsolete almost as soon as we learn it.

Nursing Management. It seems, given the ever-changing status of values exhibited by the elderly, that the key to successful nursing care is sensitivity. The nurse who approaches each patient with no set ideas about how the elder values health, life, and the future will be most prepared for the variety of responses that are likely to ensue. The acute care setting is laden with value questions and issues. Who should get care? For how long? Who should pay? Pay for what? Each question begs an answer that none of us are comfortable supplying without the most critical piece of data—the patient's point of view. Decisions to withhold life-sustaining treatment are painful and difficult. Although some elders are adamant that they do not wish to be subjected to high technology, others are willing to try any treatment that may give them some additional time. Nursing care becomes far more difficult in cases that relate to elders who are unable or unwilling to make such decisions. In such cases the benefit of a thorough evaluation for the appropriate resuscitation status is crucial, and the nurse, as a member of the health care team, can provide valuable insight into the patient's previous patterns of coping and value choices. The principle of justice requires fair and equitable distribution of services among all individuals who may require them, and this means that age as a sole criterion has no bearing on the degree and extent that therapies should be made available to the elderly. The principle of autonomy is being applied when the value of patient self-determination is the primary consideration in the clinical setting. Nursing can facilitate communication among health care team members by gleaning information from the patient that reflects how that patient chooses to be treated.

It seems clear that a major nursing function related to the value–belief pattern is communication facilitator. Educational interventions that describe to elderly patients their right to self-determination as well as the benefit of their input also facilitate patient care. Nurses are also in a key position to communicate with families regarding treatment modality options and elicit their feelings regarding what the patient would want. Family members are often the only source for determining what the life pattern of the elder has been and how that elder usually reacts in her or his normal environment. Successful nursing management, as it relates to the value–belief pattern, means that any perceived conflicts in values, beliefs, or expectations that are health-related are addressed and that the clinical care provisions reflect the choices of the elder.

SUMMARY

In conclusion, it is important to reiterate the interdependent nature of the functional health patterns as they relate to the geriatric patient in the acute care setting. Further, the combination of the primary nursing model with the functional health pattern approach that leads to subsequent nursing diagnoses provides a comprehensive care approach, which is so important for the elderly patient. As elders live longer, become frailer, and are subject to increasingly frequent hospitalizations, it will become more and more important to provide care in a manner that decreases fragmentation, increases individualization, and makes provisions for comprehensive and wholistic continuing care.

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CHAPTER 3

Elder Neglect and Abuse: A Review of the Literature

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The mistreatment of elders is not new. What is new is our awareness that some elders are mistreated by their own families and an interest in examining the problem. Several general reviews of the literature on elder neglect and abuse, based on four to six early research studies, have preceded this one (Douglass, 1983; Franklin Research Center, 1980; Giordano & Giordano, 1984a; Langley, 1981; O'Malley, Everitt, O'Malley, & Campion, 1983; O'Malley, Segars, Perez, Mitchell, & Knuepfel, 1979; O'Rourke, 1981; Pedrick-Cornell & Gelles, 1982). This review focuses on elder neglect and abuse within the family and includes an analysis and summary of 31 research studies, a synthesis of the current status of knowledge, an evaluation of progress to date, and identification of future needs for research and practice. These research studies are presented below.

Study: O'Malley, Segars, Perez, Mitchell, and Knuepfel (1979), Massachusetts

Type of Research: Exploratory descriptive survey

Purpose: Provide preliminary data on the nature of elder abuse. Raise the awareness of professionals and paraprofessionals on the subject of elder abuse.

Definition(s)/Typology: Abuse—"The willful infliction of physical pain, injury or debilitating mental anguish, unreasonable confinement, or the willful deprivation by a caretaker of services which are necessary to maintain physical and mental health."
Neglect—"Refers to an elderly person who is either living alone and not able to provide for him/herself the services which are necessary to maintain physical and mental health or is not receiving necessary services from the responsible caretaker."
Also definitions for exploitation and abandonment.

Sample Type and Size: Convenience sample of 1,044 professionals and paraprofessionals throughout the state.

Response Rate: 32% (332).

Elder Abuse Found? Yes—183 citings by 55% of respondents within the last 18 months.
—most by nurses and social workers.

Research Techniques: Mailed questionnaire.
Findings controlled for male-female ratio and for dependency rate in the general older adult population.

Limitations: Duplication of citings not controlled.
Some opinion information requested.
Subjects' responses based on memory.
Nonrandom sample.

Findings: Most professionals knew of cases of abuse, with visiting nurses, social service workers, and home care staff accounting for the majority of citings.
Third party observation tended to be the primary means of identifying cases: 70%.
Physical trauma constituted over 41% of the reported injuries.
Other types of abuse included verbal harassment, malnutrition, financial mismanagement, unreasonable confinement, oversedation, and sexual abuse.
Victims were likely to be 75 years of age and older and female (80%).
Most (75%) victims had a mental or physical disability, lived with the abuser (75%).
Abuse tended to be a recurring rather than a single event—78% occurred twice or more.
Most (75%) abusers were experiencing some form of stress, and were relatives of the abused (84%).
Often (63%) the victim was a source of stress to the abuser.
A wide variety of intervention strategies were reported.
70% of respondents indicated some barrier to service provision.

Study: Lau and Kosberg (1979), Cleveland, Ohio.

Type of Research: Exploratory descriptive case analysis.

Purpose: Determine the incidence and nature of abuse in cases accepted by the Chronic Illness Center.

Definition(s)/Typology: Physical abuse—direct beatings; withholding personal care, food or medical care, lack of supervision.
Psychological abuse—verbal assaults, threats, provoking fear, isolation.
Material abuse—money or material theft or misuse.
Violation of rights—being forced out of one's home or forced into another setting (self-abuse was discussed in the report but not used in tabulation).

Sample Type and Size: Convenience, purposive, 404.

Response Rate: —

Elder Abuse Found? Yes—in 39 clients within a 12 month period (9.6%).

Research Techniques: Retrospective review of case records of all clients over 60 years old, for a 12-month period.

Limitations: Records reviewed by different workers.
Limited focus on a narrow sample of chronically impaired elders.
Nonrandom sample.

Findings: 77% of abused were women, 75% were white, 54% were widowed, and 66% lived with relatives.
Most (82%) abusers were relatives of the victims.
Most (94%) victims experienced two or more forms of abuse, and most (75%) had at least one major physical or mental impairment.
Types of abuse—physical 75%, psychological 51%, material 31%, and violation of rights 18%.
Victims—46% were institutionalized, 26% refused assistance.

Study: Beachler (1979), Brasoria County, Texas.

Type of Research: Exploratory, descriptive survey.

Purpose: Document the existence, kinds, and frequency of elder mistreatment.
Determine the underlying associated factors, how mistreatment is identified, and the actions taken.

Definition(s)/Typology: Passive neglect—situations in which the elderly person is left alone, isolated, forgotten.
Active neglect—withholding of items necessary for daily living, that is, food, medicine, companionship, bathroom assistance.
Verbal/emotional abuse—situations in which the elderly person is called names, insulted, treated as a child, frightened, humiliated, or threatened.
Physical abuse—elderly person has been hit, slapped, bruised, sexually molested, cut, burned, or physically restrained.
Exploitation—exploitation means the illegal or improper act or

process of a caretaker using the resources of an elderly person for monetary or personal benefit, profit, or gain.

Sample Type and Size: Convenience sample of 208.

Response Rate: 29.8% (62).

Elder Abuse Found? Yes—26 respondents had identified some type of mistreatment of elders.

Research Techniques: Mailed questionnaire to all individuals and agencies whose practices involved contact with older persons—physicians, social service, home health agencies, attorneys, police, and funeral homes.

Limitations: Low response rate with nonrandom sample.
Exploitation included in questionnaire but not in report of findings.
Data from respondents' memories.
Duplication of citings not controlled.

Findings: Four causal factors from the literature included in questionnaire were: dependency, developmental disorder of the abuser, situational crisis of abuser (least frequent) or victim, long-term environmental conditions (most frequent).
Some 92% of 26 respondents who identified mistreatment did so through interviews with the victim or persons close to the victim; 8% observed signs of mistreatment.
Actions included referral to mental health services (50%), nursing home placement (8.3%), and other options. No cases referred to law enforcement agencies.
Responses from the six professional groups involved in the survey did not differ significantly.

Study: Block and Sinnott (1979), Maryland.

Type of Research: Exploratory inferential survey; three parts.

Purpose: Determine feasibility of methods for investigating the national incidence of maltreatment of older persons.
Seek preliminary estimates of the prevalence.

Definition(s)/Typology: Physical abuse—malnutrition; injuries—bruises, welts, sprains, dislocations, abrasions, or lacerations.
Psychological abuse—verbal assault, threats, fear, isolation.
Material abuse—theft, misuse of money or property.
Medical abuse—withholding of medications or aids required.

Sample Type and Size: A. 24 agencies.
B. 427 professionals (random).
C. 443 elders in community (random) in Washington, DC.

Response Rate: A. 4% (1).
B. 31% (134).

C. 16% (73).
Overall 17%.

Elder Abuse Found? Yes—26 cases.

Research Techniques: Retrospective case analysis of records from public agencies.
Mailed questionnaire to elders and professionals.

Limitations: Low response rate.
Three very small samples that were combined to test hypotheses and support findings.
Use of some opinion information.
Unclear if duplication of citings controlled.

Findings: Most victims were "old-old," female (81%), Protestant (61%), middle class (51%), white (88%), lived with relatives (76%), and physically or mentally impaired (96%).
Most abusers were 40 to 60 years old (53%), female (56%), middle class (65%), white (88%), a relative of the victim (80%), and under some form of stress.
Types of abuse—psychological, most common (58%), physical (38%), and material (46%).
95% of cases were reported to some authority, but help seemed not to be obtained.

Study: Douglass, Hickey, and Noel (1980), Michigan.

Type of Research: Exploratory survey.

Purpose: Determine if elder neglect and abuse was of sufficient magnitude to justify investment of resources.
Identify its characteristics and potential case finding procedures.
Relate the findings to the psychosocial literature on domestic violence.

Definition(s)/Typology: Passive neglect—being ignored, left alone, isolated, or forgotten.
Active neglect—withholding of items necessary for daily living: medicine, food, exercise, companionship, bathroom assistance.
Verbal or emotional abuse—Being insulted, frightened, humiliated, intimidated, threatened, or treated as a child.
Physical abuse—being hit, slapped, cut, sexually molested, burned, or physically restrained.

Sample Type and Size: Convenience, 228, professionals in five different community sites.
Also interviews with 36 staff in 12 nursing homes—institutional survey.

Response Rate: —

Elder Abuse Found? Yes—60% of respondents deal with such cases on a weekly basis.
89 cases.

Research Techniques: Personal interview with semistructured interview schedule and analysis of records.
Geographical areas were randomly selected.

Limitations: Nonprobability, nonrandom sample.
Kinds of data collected and method of tabular presentation make quantification difficult.
Used respondents' subjective judgment without reference to case records.
Some respondents were without experience with maltreatment.

Findings: Passive neglect was the most prevalent and physical abuse the least.
No single explanation for mistreatment emerged as predominant.
Most respondents attributed cases to multiple causes.
Domestic mistreatment of elders was familiar to most professionals interviewed.
Most respondents indicated there were no established procedures for dealing with or following up mistreatment cases. Over half reported nothing was done.

Study: McLaughlin, Nickell, and Gill (1980), Maine and New Hampshire.

Type of Research: Exploratory descriptive survey.
Two-phase.

Purpose: Document elder abuse in selected areas of Maine and New Hampshire.

Definition(s)/Typology: Abuse—as per O'Malley et al., can also be self-abuse, as in subintentional suicide behavior in one who lives alone (Lau & Kosberg).
Neglect—the intentional failure to meet basic health/survival needs, primarily of four types, physical, psychological, material/financial, and violation of human and civil rights. (Adapted from Johnson and Lau & Kosberg.)

Sample Type and Size: Convenience, 31 (telephone interviews), 51 (questionnaire).

Response Rate: 100% (investigators were in management positions at two sites surveyed).

Elder Abuse Found? Yes—29 cases.

Research Techniques: Telephone interviews with unstructured schedule of statewide health and social service personnel.
Questionnaire to community health nurses and home health aides.

Limitations: Secondary data sources based on respondents' memories.
Incomplete data to support conclusions.
Nonrandom, small sample.
Duplication of citings not controlled.
No consistency among interviewers in the questions asked.

Findings: Estimated prevalence rate of 4.5% of clients over 65 years old sustained some degree of neglect or abuse over the past 18 months.
Five categories of abuse found.
Most abused elders were female over 75 years old, functionally disabled, roleless, dependent for some basic survival need, lonely, fearful, and lived with the abuser.
Abuse was cyclical and precipitated by stress.
Most abusers were relatives of the victim and experienced a variety of stressors.
In most cases, there was no other incidence of violence or abuse in the immediate family of the abuser.
79% of respondents indicated resolution of the "problem."

Study: Steuer and Austin (1980), Los Angeles, California.

Type of Research: Exploratory case analysis.

Purpose: Alert health professionals to the problem of family abuse of the elderly.
Present possible methods for prevention and intervention.

Definition(s)/Typology: No definitions given.
Neglect, physical abuse, verbal/psychological abuse, misuse of medications.

Sample Type and Size: Convenience, purposive, 12 abused elders.

Response Rate: —

Elder Abuse Found? Yes—criteria for inclusion in study.

Research Techniques: Unclear.
Twelve cases of elder abuse identified when victim was hospitalized for an acute medical problem or, in the majority of instances, when a social worker was requested by home health nurse to intervene with a family.

Limitations: Nonrandom and very small and nonrepresentative sample.
No control group.
Time frame unclear.

Findings: Nine of 12 victims were women (ages 73–86); the 3 men (ages 68–74) were being cared for by their wives.
Abused women cases: Caretaker was daughter in 5 cases, husband 2 cases, and sister or nephew 1 each.
Most abused were Caucasian, but Blacks and Latino families also represented.

All families lived in poverty or middle class neighborhoods.
Common denominator was that the victim had physical or mental disabilities, or both, which caused him or her to be dependent upon the caregiver.
Abuse was primarily of two types: physical and verbal/psychological.
Neglect was the most common form of abuse.

Study: Boydston and McNairn (1981), San Diego, California.

Type of Research: Exploratory survey.

Purpose: Seek preliminary estimates of the prevalence of elder abuse in San Diego.

Definition(s)/Typology: Unknown.

Sample Type and Size: 431, cross-section of human service providers.

Response Rate: 23% (101).

Elder Abuse Found? Yes—by 67 respondents.

Research Techniques: Mailed questionnaire.

Limitations: Nonrandom sample.
Low response rate.
Data from respondents' memories.
Unclear if duplication of cases controlled.

Findings: Most abused elders were women (73%) between ages 70 and 84 (62%) who were disabled (76%).
Physical abuse occurred in 62% of the citings, and psychological abuse in 85%. Most citings indicated more than one type of abuse.
The abuse was a recurrent event and most often by male family members who lived with the victim.
The elder was a source of stress to the abuser, who was experiencing a variety of stressors.
Third party observation accounted for most citings, and a wide variety of interventions were employed, with barriers occurring frequently (76%).

Study: Wills and Walker (1981), Connecticut.

Type of Research: Exploratory case analysis.

Purpose: Learn more about physical abuse; characteristics of the abuse, the abuser, and the abused; and to suggest some causal hypotheses for later research.

Definition(s)/Typology: None given.

Sample Type and Size: 22, selected elderly abuse victims (means and basis for selection unclear).

Response Rate: —

Elder Abuse Found? Yes—22 cases.

Research Techniques: In-depth interviews with 22 selected elderly abuse victims during summer of 1980. Visible injuries noted.
None of abusers were willing to be interviewed.

Limitations: Nonrandom, very small, and nonrepresentative sample.
No control group.
Information based solely on victim responses.

Findings: Most of the physical abuse noted involved the head, neck, and arms.
Abusers—11 out of 20 were 60 years of age or older; 11 were male; 10 were adult children of the victim; and 7 were spouses. Fourteen had a history of psychiatric problems.
Abused—15 of the 22 victims were 70 years of age or older; 17 were female; 12 lived with an adult child; 17 had no mental impairment; only 8 had no physical impairment.

Study: Chen, Bell, Dolinsky, Doyle, and Dunn (1981), Boston, Massachusetts.

Type of Research: Exploratory survey; three-phase.

Purpose: Explore the etiological and prevalent conditions that contribute to elder abuse.
Effects of abuse on abused and abusers.
Identify forms of interventions.

Definition(s)/Typology: Elderly abuse—abusive action inflicted by abusers on adults 60 years of age or older. Abusive action can be any of the following:
Physical—including nonaccidental, willful infliction of physical pain and injury, physical neglect, deprivation of nutrition.
Psychological—including emotional harm, mental anguish, unreasonable confinement, emotional neglect.
Sexual—including rape and attempted rape.
Social/environmental—including deprivation of human services, involuntary isolation, financial abuse.

Sample Type and Size: Cross-sectional purposive, 90 practitioners.

Response Rate: 30% (30).

Elder Abuse Found? Yes—by 29 respondents' cases dealt with directly or indirectly in past year.

Research Techniques: Interviews with experts—telephone, in person, and written.
Questionnaire to practitioners.

Limitations: Nonrandom sample.
Low response rate.
Data from respondents' memories.
Unclear if controlled for duplication of citings.

Findings: The abused was typically a widowed white female of the low socioeconomic class with low income, less than a high school education, with a mean age of 70 years.
The abuser was a married or single white male of the low socioeconomic class and typically blue collar workers with less than a high school education, a relative of the victim, with a mean age of 50 years.
These families were under stress 80% of the time, with the elderly person being the scapegoat for the caregivers' frustrations.
Lack of resources and lack of understanding of the aging process with unrealistic expectations of the victim were also frequent issues.
The public at large was unaware of and unconcerned about the elderly victims of abuse.

Study: Pepper and Oakar (1981), U.S. House of Representatives Select Committee on Aging.

Type of Research: Exploratory survey.

Purpose: Estimate national incidence of elder abuse, exploitation, and neglect.
Explore what is known about elder abuse and its causes.
Explore prevention and intervention strategies.

Definition(s)/Typology: Physical abuse, sexual abuse, financial exploitation, psychological abuse, violation of rights, self-abuse or neglect. (No unified stated definitions.)

Sample Type and Size: Nonprobability purposive; 50 states.

Response Rate: 40% (20 states).

Elder Abuse Found? Yes—50% of complaints of abuse were substantiated.
28,869 cases.

Research Techniques: Questionnaire to all state human service departments, chiefs of police, visiting nurses associations (DC, MD, and NJ), interviews with experts.
Telephone surveys of one-third of state human service departments.
Library research, case histories, hearings, reviewed all state studies.

Limitations: States with most completed information selected.
Data incomplete.
Nonrandom sample.

Findings: Many states had no data with which to answer questionnaire.
Elder abuse is less likely to be reported than child abuse—only 1 out of 6 cases reported.
The "typical" abused elder was a dependent woman of 75+ years.
The "typical" abuser was a male caretaker who was under great stress—drug, alcohol, marriage, or financial.
The abuse was recurrent rather than being a single incident.
One million elders (4%) may be abuse victims.
Physical violence was the most common form, then financial and psychological abuse.
Those abused as children were more likely to abuse their parents.
Elder abuse is a full-scale national problem (4% of pop.), is slightly less frequent than child abuse, and is increasing.
Twenty-six states have adult protective service laws which vary widely in scope, only 16 with mandatory reporting. 20 more states have bills sponsored.
No one theory explains causes of elder abuse.

Study: Hageboeck and Brandt (1981), Scott County, Iowa.

Type of Research: Descriptive, assessment of cases, survey.

Purpose: Call attention to elder abuse by documenting cases, patterns of abuse, and barriers to service.
Recommend policies.

Definition(s)/Typology: Physical abuse—willful infliction of injuries which result in bruises or demonstrable markings, sexual assault, or unnecessarily rough care.
Neglect—deprivation of food, medicine, treatment, physical exercise, personal care, or lack of supervision.
Psychological abuse—verbal assault and threats, provoking fear, and isolation.
Financial abuse—monetary or material theft or misuse of funds.

Sample Type and Size: 238 cases, assessed in 1980.

Response Rate: —

Elder Abuse Found? Yes—41 (17.2%)

Research Techniques: Case studies—community-based system of multidisciplinary assessment of and care planning for functionally dependent adults, most over age 60.

Limitations: Limited focus and population of disabled, high-risk clients.
Small sample.
Data not reported to support some conclusions.

Findings: Of the 41 cases of abuse found, 21 involved physical abuse, 19 neglect, 32 psychological abuse, and 16 financial abuse.

Some victims reported the abuse on interview, other cases picked up by assesser.
Abuse is a recurring event, and victim usually lives with the abuser who is often a close relative—42.5% children, 32.5% spouse.
Some 41% of abuse by children was financial; spouses usually committed physical abuse or neglect usually due to caregiver breakdown after long-term care.
Abused—18 male, 23 female; usually impaired and dependent for long time.
Abuse found in rural, urban, and suburban areas; number of cases increased with age.
Patterns of abuse included families with histories of family violence, long-standing conflict, or mental health problems; and long-term family care of dependent elder with increasing dependency and exhaustion of caregiver.
Major barrier to intervention was victim or abuser refusal.

Study: Crouse, Cobb, Harris, Kopecky, and Poertner (1981), Illinois.

Type of Research: Exploratory survey, two-phase.

Purpose: Study the incidence and characteristics of elder neglect and abuse in Illinois.
Study legislation dealing with elder abuse.
Make policy recommendations.

Definition(s)/Typology: Passive neglect, active neglect, severe neglect, verbal and emotional abuse, physical abuse, severe physical abuse. (No definitions or examples given.)

Sample Type and Size: Convenience, 1,980 respondents.
All persons who work with older persons.

Response Rate: 67% (1,260).

Elder Abuse Found? Yes—11,739 cases of neglect and abuse in seven communities surveyed.

Research Techniques: State divided into five strata from which seven units were randomly drawn.
Interviewers talked with people (in seven communities) about elder abuse and list of service providers.
Second questionnaire sent if respondent knew of abuse.

Limitations: Unknown if list of service providers was biased or incomplete.
It was not random.

Findings: Elder abuse and neglect is a problem of the magnitude of child abuse and neglect.

All six types of abuse and neglect existed in each of the communities studied.
Differences found in different communities, e.g., greater crime in urban areas.
Passive neglect and verbal/emotional abuse were the most prevalent.
Urban and rural areas had the highest incidence, suburban areas the least.
Estimate 4% incidence, with neglect representing 80% of these cases.
Medical ER staff, police, and clergy were the leaders in reporting cases.
The family situation was seen as a major factor contributing to maltreatment.

Study: Wolf, Strugnell, and Godkin (1982), Worcester, Massachusetts.

Type of Research: Community survey, two-part.

Purpose: Determine the nature and extent of elderly abuse in a geographic area.
Assess the effectiveness of education/training/information activities.
Measure the impact of the intervention model.

Definition(s)/Typology: Abuse/neglect definition per O'Malley et al.
Abuse, physical—the infliction of physical pain or injury, physical coercion (confinement against one's will). E.g., slapped, cut, sexually molested, etc.
Psychological—the infliction of mental anguish, e.g., intimidated, isolated, treated as child, etc.
Material—the illegal or improper exploitation and/or use of funds or other resources.
Neglect, active—refusal or failure to fulfill a caretaking obligation, *including* a conscious and intentional attempt to inflict physical or emotional distress on the elder.
Neglect, passive—refusal or failure . . . *excluding* . . . e.g., abandonment, nonprovision of food or health-related services because of inadequate knowledge, laziness, infirmity, or disputing the value of prescribed service.

Sample Type and Size: Convenience, Worcester, 117; Boston, 200; Syracuse, 105; Rhode Island, 225.

Response Rate: Worcester, 74% (86); Boston, 34% (68); Syracuse, 53% (55); Rhode Island, 31% (71).
Overall, 48%.

Elder Abuse Found? Yes—abuse and neglect: Worcester, 94; Boston,

153; Syracuse, 262; Rhode Island, 143.
Over 6-month period.

Research Techniques: Mailed questionnaire with attached individual case report forms to human service agencies.
Name of client requested to control for duplication.

Limitations: Nonrandom sample.
Confusion of meanings for neglect and abuse.

Findings: Physical abuse likely found where victim is female and lives with abuser who suffers from substance abuse or mental illness and is financially dependent on elder.
Psychological abuse occurs when abused is dependent on abuser for help with activities of daily living.
Material abuse occurs when abuser is financially dependent on elder but they do not live together, and abused is not a source of stress.
The profile of the abused—white female, 70 years or older with physical or mental impairments, lives with and is dependent on abuser/caretaker for activities of daily living, companionship, and finances, and is a source of stress.
The profile of the abuser—a male relative under age 60 with a history of mental illness, alcohol or drug abuse, or medical problems, and who had become somewhat financially dependent on the elder.
66% of abuse is recurrent. Elder abuse is intimately tied to the family.
Psychological abuse was most common, with physical abuse and general neglect equally reported.
Material abuse reported the least.

Study: Pennsylvania Department of Aging (1982) Pennsylvania.

Type of Research: Descriptive survey.

Purpose: Collect information on elder abuse:
—occupation of those reporting abuse
—characteristics of the abused elder and the abuser
—agency's response to the abuse report
—the nature of the abuse incidence.

Definition(s)/Typology: Abuse defined per O'Malley et al.
Elder—60 years of age or older.
Phyiscal abuse, psychological abuse, material abuse, violation of rights.

Sample Type and Size: Nonrandom, approximately 2,100 agencies and individuals.

Response Rate: 59% (1,138).

Elder Abuse Found? Yes—467 cases in 12-month period.

Research Techniques: Mailed questionnaire to agencies and individuals providing service to elders.
Given to all representatives of small agency or group, used random selection with large agencies or groups (e.g., police).
One follow-up.

Limitations: Nonrandom sample.
Duplication of citings not controlled.

Findings: Elder abuse is occurring at a significant rate in PA.
Abusers: 52% were male, 58% married, 67% were under stress (drug, alcohol, financial, or medical problem), and 75% were relatives of the abused.
In 61% of cases the abused elder was a source of stress.
Abused: 76% were female, most were 70 years of age or older, 88% were physically disabled, 71% had a mental disability, and 69% lived with the abuser.
Adult Protective Service workers, homemakers, home health aides, and social workers noted abuse most often.
Most cases of abuse were repetitive (85%).
In 90% of cases, the victim required either medical treatment or protective services.
Physical abuse was involved in 44% of the cases, psychological abuse 38%, material abuse 13%, and violation of rights 4%.
Agency responses to reported cases were diverse.

Study: Sengstock and Liang (1982), Wayne State University, Detroit, Michigan.

Type of Research: Descriptive survey, multistage.

Purpose: Five research questions re the profile of abused, abusers, and family situations; dynamics of elder abuse; methods of identification; treatment and prevention.

Definition(s)/Typology: Physical abuse—slaps, punches.
Physical neglect—the failure to provide necessities of life.
Psychological abuse—direct verbal assaults and threats.
Psychological or emotional neglect—isolation or lack of attention.
Material abuse—theft or misuse of elder's money or property without the elder's consent.

Sample Type and Size: Snowball technique, 302 area agencies.

Response Rate: 36% (108).

Elder Abuse Found? Yes—77 cases.

Research Techniques: Mailed questionnaire to agencies, then interviews of personnel, followed by interventions with 20 abused elders.
Last, interviews with 50 nonabused elders.

Limitations: Nonrandom sample.
Low response rate.

Findings: Abused: 33% were 80 years of age or older, 74% were female, 22% with physical and emotional impairment, 80% with incomes of $10,000 or less.
Abusers: 49% were children of the victim (sons 26% and daughters 23%).
Psychological abuse occurred most often (82%), financial (55%), physical (43%).

Study: Gioglio and Blakemore (1983), New Jersey.

Type of Research: Exploratory survey.

Purpose: Study the nature of elder abuse in New Jersey.

Definition(s)/Typology: Financial abuse—the willful, illegal, or improper use or management of an older person's funds, assets, or property by a relative, caretaker, or other person on whom the older person is dependent.
Neglect—acts of omission on the part of a relative, caretaker, or other person on whom an older person is dependent, resulting in the inadequate provision of care or services necessary to maintain the physical and mental well-being of an older person.
Psychological abuse—actions and/or verbalizations on the part of a relative, caretaker, or other person on whom an older person is dependent that together constitute a consistent pattern of behavior designed to humiliate, provoke, intimidate, confuse, or frighten the older person; actual physical violence may be absent.
Physical abuse—acts of physical violence against an older person committed by a relative, caretaker, or other person on whom an older person is dependent that results in physical pain or injury to the older person.
Caretaker—any person who is wholly or partially responsible for the health, well-being, and/or finances of an older person, either informally through a voluntary assumption of responsibility or formally by virtue of a court order, employment status, or contract.
Elder—an individual over 65 years of age residing in a noninstitutional setting, including those living alone, with family, friends, or caretakers.

Sample Type and Size: Stratified random probability, 387.

Response Rate: 88.3% (342).

Elder Abuse Found? Yes; 23 unduplicated cases in last year from 16 respondents.

Research Techniques: Personal interview of elders with a questionnaire —4 vignettes and an attitude scale.

Mailed questionnaire to resistive respondents.
Sample of persons 65 years of age and older living in the community (noninstitutionalized).
Abused's initials or name requested to control duplication of citings.
Questionnaire pretested with elders and professionals.

Limitations: Data only from elders; thus, indicates elders' knowledge of abuse.

Findings: Financial abuse occurred in 50% of all cases cited and occurred with other forms of abuse.
Physical abuse: least reported form of mistreatment. 74% of elders reporting abuse had first hand knowledge of it.
Abused: 70% were female, 56% were 75 years of age or older, 87% reported in poor general health, 47.8% had greatly limited activity, 35% lived with their abuser, 60.9% of victims did not seek help. 70% of those financially abused did not live with their abuser.
Abusers: 72.4% were males, with ages evenly divided from 16–69 years, 60.9% were in victim's immediate family, and 13% in extended family. 25% of cases reported as involving more than one type of abuse.
Patterns:
Financial abuse: Victim was older female, unmarried, with fair to poor health.
Psychological abuse: Victim was under 75, female, widowed, with fair to poor health, but not limited by health status
Physical abuse: victim was an older female, in fair to poor health, greatly limited in health status.

Study: Levenberg, Milan, Dolan, and Carpenter (1983), West Virginia.

Type of Research: Exploratory descriptive survey.

Purpose: Determine the extent and nature of abuse and provide recommendations for elder abuse prevention and protection in WV.

Definition(s)/ Typology: Physical abuse, neglect, mental cruelty, medication abuse, economic abuse.
"Elder abuse is an intentional overt act which entails harm, or threatened harm, or curtailment of physical activities, or emotional battering (mental cruelty) directed at a person *over* the age of 60 years and a non-institutionalized person."

Sample Type and Size: Convenience sample, 385 individuals or agencies.

Response Rate: 20% (80).

Elder Abuse Found? 280 cases in 6-month period.

Research Techniques: Mailed questionnaire to individuals or agencies thought to be involved with problem of elder abuse in the state of West Virginia.

Limitations: Duplication of citings not controlled.
Significant number of missing cases due to respondents failure to answer questions. Data incomplete.
Nonrandom sample.
Low response rate.

Findings: The most frequently reported cause of elder abuse was "frustration of the caregiver due to change in lifestyle and burden of the elder" accounting for 34% of the open-ended responses.
Neglect was the most frequently reported type of abuse followed by mental cruelty, economic abuse, medication abuse, and physical abuse.
The most common relationship of the abuser to the victim was child (son or daughter), followed by spouse and other relatives.
Improving services included education of the public and professionals regarding the incidence of abuse; more "explicitly defined" law to protect both the elderly and the professional; more staff; better follow-up; and better interagency coordination.
Those who were most at risk for elder abuse were females, between the ages of 60 and 75.

Study: Phillips (1983b), three community health agencies.

Type of Research: Ex post facto correlational descriptive survey.

Purpose: To test two hypotheses which predicted the nature of differences between the two groups and four hypotheses that predicted the magnitude and direction of theoretically deduced causal relationships.

Definition(s)/Typology: Abusive relationship—one that was characterized by acts that were committed or omitted that jeopardized the well-being or safety of the elderly individual and that observation by a third party would lead to negative judgments.
A good relationship—one in which no abuse was present and one characterized by warmth, caring, and adequate attention to the subject's needs.
Abuse—the degree to which the elderly individual was perceived by an outside evaluation to be subjected to maltreatment by his or her related caregiver.
Dimensions of abuse—encompass physical abuse, physical neglect, emotional abuse, emotional neglect, emotional deprivation, sexual exploitation and assault, verbal assault, medical neglect, material abuse, neglect of the environment, and violation of rights.
Operational definitions given for all major variables.

Sample Type and Size: Purposive, theoretical, 63 elderly individuals (33 abused and 30 nonabused).

Response Rate: 100%.

Elder Abuse Found? Yes.

Research Techniques: Subjects referred from active caseloads of public health nurses working in one public health and 2 home health agencies.
Elders separated into abused and nonabused groups and compared.
Elders interviewed in own home by one of three trained data collectors with a blind interview technique.
90% interrater and intercoder reliability rates on instruments used.
Multiple regression analysis used.

Limitations: No data regarding differences between participating elders and "refusers."
Nonrandom small sample.

Findings: The significant differences between the good relationship and abusive/neglectful relationship groups included:
Lower expectations among the abused subjects for their caregivers.
Lower perceptions among the abused subjects of their caregiver's actual behavior.
The abused group had significantly fewer friends who call on the phone, people who correspond, and people to call in times of trouble.
More depression in the abused group.
None of the six hypotheses were supported—no support for previous research findings of dependency, social networks, stress, etc.

Study: Gray Panthers of Austin (1983), Texas.

Type of Research: Exploratory, descriptive, statewide survey.

Purpose: To determine the extent, location, kinds, frequency, and underlying factors of elder abuse.

Definition(s)/Typology: Abuse—includes physical abuse, passive abuse (neglect), financial abuse (exploitation), and other forms of mistreatment of the elderly.
Physical abuse—the elderly person has been hit, slapped, bruised, sexually molested, cut, burned, or physically restrained.
Exploitation—the illegal or improper act of using resources of an elderly person for monetary or personal benefit.
Verbal/emotional abuse—the elderly person is insulted, treated as a child, frightened, humiliated, or threatened.
Active neglect—the abuser withholds items necessary for daily living, such as food, medicine, money, or bathroom assistance.
Self-neglect—the elderly person is alone, isolated, forgotten, and without financial and other resources.

Sample Type and Size: Purposive, 1,508 agencies and individuals.

Response Rate: 33.6% (507) from all areas of Texas.

Elder Abuse Found? Yes—by 61% of respondents.

Research Techniques: Questionnaire mailed to agencies and individuals whose practice involves elderly throughout Texas.
Sample of a random number of each category of agencies and provider.
Respondents given definitions of types of abuse to guide them in answering questionnaire.

Limitations: Self-neglect not distinct from abandonment.
Retrospective data collection based on respondents' memories.
No control for duplication of cases.

Findings: Hospital social workers and health care nurses comprised the highest return rates.
Encountered elder abuse in their work—61.9% yes, 29.6% no, 8% unsure. Hospital social workers and home health services reported the greatest percentage.
Elder abuse occurred in all areas of Texas.
Percentage of types of abuse encountered by respondents—self-neglect 82%, exploitation 75%, verbal/emotional abuse 72%, physical abuse 62%, and actual neglect 50%.
Most frequent cause of abuse was reported as long-term environmental conditions, such as crowded living quarters, extreme poverty, and marital conflict.
Respondents with consistent, regular contact with the elderly recognize more abuse than providers without consistent contact.
Recommendations—a centralized, structured system for case finding and reporting, public and professional education on elder abuse, and intensive family counseling for elder care.

Study: Steinmetz (1983), University of Delaware.

Type of Research: Exploratory descriptive survey.

Purpose: To ascertain the stresses, conflicts, abuse, and maltreatment experienced in families who cared for an elderly parent.

Definition(s)/Typology: Caretaker family—the elderly had to reside with and be dependent on their adult children for at least part of their basic survival needs.
Four stages of dependency—independent, reciprocal, asymmetrical, survival.
Categories of dependency (with examples)—household, emotional/social, mental health, financial, personal and health care, mobility.

Sample Type and Size: Nonrepresentative, 77.

Response Rate: 100%.

Elder Abuse Found? Yes—double-direction (forms of coping for conflict resolution noted but geriatric type of abuse/neglect not tabulated).

Research Techniques: Structured format, taped interviews of volunteer adult children presently caring for elderly parent or had done so within past 3 years.

Volunteers screened by telephone to see if met criteria.

Interview questions on three topics: tasks performed for elders, caretaker stress experienced from these tasks, and how often caretaker and elder used certain techniques to resolve problems or carry out their wishes.

Limitations: Nonrandom sample.

Volunteer respondents may differ from nonvolunteering adult children caretakers.

Data based on self-report of caretakers.

Findings: Majority of caregivers (90%) and of vulnerable elderly (more than 82%) were women.

Caregivers were often elderly (60 or older) themselves and caring for a still older dependent.

Double direction violence found in these generationally inversed families—slapped, hit with object, or shook: elder by adult child caregiver once, adult child caregiver by elder 18%. Violence by elders on their adult children has remained hidden.

Caregivers were often caught in the middle between two or more generations.

Caregiving tasks—housekeeping tasks done for elder most frequently (for 90% of elders), with social/emotional tasks second (66%) in frequency, help in mental health tasks (57%), financial management, and personal health care (both over 50%), and mobility tasks (43%). Caretaker stress from tasks—mental health dependency tasks produced the greatest stress; social/emotional dependency tasks (second most frequently performed) also produced an extremely high degree of stress; instrumental/housekeeping tasks produced little stress.

Methods of resolving conflicts—technique most frequently used by elders was to pout or withdraw (61%), followed by imposing guilt (53%), manipulation (43%), crying (37%), and using their disability to gain sympathy (33%), i.e., 71% used some form of psychological manipulation to impose guilt or sympathy. Screaming also frequently used by adult children (40%) and elder parent (36%).

85% of adult children reported talking out problems, many with a raised voice or loud tone; they also sought advice of a third party (65%), considered alternate housing (20%), and threatened to send elder to a nursing home (7%).

Abusive and neglectful methods of control often became the method of last resort. About 10% of elderly had experienced one or more acts of violence or a threat by their adult child, while 18% of elders

slapped, hit with an object, or threw something at their adult child. Data suggest services most likely to reduce stress and relieve burden faced by generationally inversed families would be those such as friendly visitors, day care and respite care, elder "sitters," and support groups for adult children who are doing elder care.

Study: Pratt, Koval, and Lloyd (1983), Oregon.

Type of Research: Exploratory descriptive survey.

Purpose: To assess service providers' and physicians' intervention responses to hypothetical cases of elder abuse.

Definition(s)/Typology: None given for abuse or neglect.
Definitions given for: appropriateness, timeliness, and coordination of referrals.

Sample Type and Size: Nonrandom, 350 social workers, and random, 250 physicians.

Response Rate: Social worker—74% (259) and physicians—25.6% (64).

Elder Abuse Found? Yes—507 cases.

Research Techniques: Mailed questionnaires in which participants responded to vignettes that described four levels of abuse (verbal abuse, pushing, hitting, and severe beating) and gave data on own experience with abuse cases in last year.

Limitations: Nonrandom social worker sample.
Low response rate of physician sample.
Retrospective data on abuse cases based on respondents' memories.
No control for duplication of citings.
No definitional guidelines.

Findings: Severe abuse— ↑ referral, especially to police and safe housing, and ↓ personal interventions and counseling referrals.
Physicians more likely to intervene personally or recommend counseling, while social workers more likely to refer to another agency.
Supervisors and physicians almost twice as likely to report recent experience with elder abuse.
Most common type of abuse reported was verbal abuse; physicians reported more experience with physical abuse.
The victim's age did not significantly affect the chosen interventions, but the abuser's relationship to the victim did.

Study: O'Brien, Hudson, and Johnson (1984), North Carolina and Michigan.

Type of Research: Exploratory descriptive survey.

Purpose: Experience, knowledge, identification, and intervention of elder abuse by primary care physicians and nurse practitioners.

Definition(s)/Typology: Physical abuse, psychological abuse, self-abuse, exploitation, neglect, abandonment.

Sample Type and Size: Random, 3,001 health-care providers (primary care physicians and nurse practitioners).

Response Rate: 33.6% (1,009).

Elder Abuse Found? Yes—of the 731 respondents who provided primary care to elders, 369 had ever seen a case.
1,138 cases were seen by 271 respondents in last 12 months.

Research Techniques: Mailed questionnaire with two follow-ups.

Limitations: Low response rate.
Subjects' responses based on recall.
Duplication of citings not controlled.

Findings: Preliminary—some 84% of the respondents considered detection difficult.
Only 5% of respondents used a standard protocol in detection and among them no respondent reported having a written instrument.
Most respondents were not familiar with state legislation on reporting of cases.
Approximately 50% did not know whether their community had any programs that especially addressed elder abuse.
Some 92% reported that they probed for reasons for the abuse. 80% discussed the abuse with the abused and 57% discussed the abuse with the abuser.
54% of health care providers reported that they went beyond medical treatment in their assistance in elder abuse cases, and most families were willing to accept assistance.

Study: Dozier (1984), Atlanta Regional Commission in conjunction with the Department of Family and Children Services (DFCS), Atlanta, Georgia.

Type of Research: Prospective field test of assessment instrument on 52 clients.

Purpose: Study:
To design an assessment tool that was sensitive enough to distinguish abused, neglected from nonabused, nonneglected elderly.
To train adult protective service workers of the DFCS in implementing the tool.
To evaluate the two processes.
To determine the relevance, extent, and implication of elder neglect and abuse in the Atlanta region.
Tool:
To assess the demographic, psychological, and social circumstances of elderly clients.

Definition(s)/Typology: Physical abuse—malnourishment, bruises, welts, cuts, abrasions, sprains, dislocation, sexual molestation, physical restraints, burns, oversedation, bone fractures.
Psychological abuse.
Exploitation—misuse of money and property.
Self-abuse.
Neglect.
Self-neglect.

Sample Type and Size: Convenience and representative, per number of APS referrals per county in 1982. Sample of referred clients from April through June 1983 for seven counties.

Response Rate: Instruments, 52 (client cases). Evaluation forms, 48.

Elder Abuse Found? Yes—52 cases.

Research Techniques: Assessment tool and evaluation form sent to county supervisors.
In each unit every case worker was assigned at least one case of referred elder neglect and abuse. Assessment tool used in investigation of referred cases.

Limitations: Nonrandom, small sample.
Controls for duplication of cases unclear.
Limited focus on clients referred to DFCS.

Findings: Self-neglect, especially among the elderly living alone, is a major problem. Over 46% of the cases listed it as the primary problem.
Self-referral is very rare in cases of elder neglect and abuse; in only 4 of 52 cases was the victim the person making the referral.
Referrals came from many different sources, but few were from physicians or clergy.
Increase in single person households, especially among the elderly, and a related lack of needed health care was one of the largest concerns of clients.
Many of the elderly were fearful of change; services were refused in 23% of the 52 cases.
More than 90% of the clients had one or more chronic mental or physical conditions, and needed help in transportation, shopping, and cooking.
Where caregiver abuse was alleged, the most frequent abuser was a relative; exploitation was a very common type of abuse by the caregiver. Some abusers were noncaregiver relatives.
Some of the most important stressors were alcohol abuse (41%) and mental illness (26%) found among both the abusers and their victims.
Greatest finding was the need for further and more extensive study of elder neglect and abuse.

Case workers felt the tool was too long, its questions too intensive, and that its use hampered the client-worker relationship.

Study: Giordano and Giordano (1984), Florida.

Type of Research: Exploratory descriptive case analysis.

Purpose: Determine specific patterns of individual and family circumstances that tended to be present in substantiated cases of physical, psychological, financial, and multiple abuse and neglect.
Develop a profile of the abused elder.

Definition(s)/Typology: Physical abuse—violence that results in bodily harm, including assault, restraints, and murder.
Neglect—behavior that is careless, involving a breach of duty that results in injury or violation of rights.
Psychological abuse—provoking fear, anxiety, or isolation.
Financial exploitation—the theft or conversion of money or anything of material value belonging to the elder by their caretaker.
Multiple abuse—more than one type of abuse.

Sample Type and Size: Convenience, total population for time span.
Only nonabused cases were randomly selected.

Response Rate: —

Elder Abuse Found? Yes—600 cases of noninstitutionalized elders.

Research Techniques: Retrospective review of cases reported to Adult Service units in six Florida counties between January 1976 and January 1982.
Sample divided into abused ($N = 600$) and nonabused ($N = 150$) categories.
Structured schedule and cross-validation of data used.

Limitations: Sample limited to cases reported to Adult Service units.
Retrospective data collection.
Nonrandom sample.

Findings: Distinct profile found for each form of mistreatment.
Physical. Abused—66–83 years old, white, and female, income $\leq$ \$7,000/year and lives with abuser. Abuser—white, married male with income $\leq$ \$7,000 year.
Psychological. Abused—66–83 years old, white, female, income $\leq$ \$7,000/year and lives with abuser. Abuser—white, married male with income $\leq$ \$7,000 year.
Neglect Victim—72–89 years old, white, female, with income $\leq$ \$7,000/year and lives with abuser. Perpetrator—white male or female.
Financial exploitation. Victim—72–89 years old, white widower with income $\leq$ \$7,000/year and lives with abuser. Abuser—white male or female.

Multiple abuse. Abused—66–83 year old, white female with income ≤ $7,000/year and lives with abuser. Abuser—white male or female with income ≤ $7,000.
Spouse abuse was a dominant variable in abuse.

Study: Hall and Andrew (1984), San Antonio, Texas.

Type of Research: Exploratory descriptive survey.

Purpose: Provide more systematic information on a statewide basis from validated maltreatment cases.

Definition(s)/Typology: Physical violence. Emotional violence. Exploitation. Neglect. Rights violation. Multiple.

Sample Type and Size: Stratified, random, 288 of 1,477 elder mistreatment cases reported to Texas Department of Human Resources from 9/82 to 8/84.

Response Rate:

Elder Abuse Found? Yes—criteria for inclusion in study.

Research Techniques: Retrospective content analysis of case records.

Limitations: Retrospective data collection with a structured schedule for elder mistreatment.
This resulted in missing data.

Findings: Neglect and self-neglect were common forms of elder mistreatment.
The typical elders were females age 70 or older, 65% were Anglo, and 35% were black.
44% of maltreatment was reported by immediate and extended family members of Mexican-Americans, while third parties report it for Blacks and Anglos.
Exploitation is more common among Mexican-Americans and Anglo females.
33% of mistreated elders denied a problem existed; of the 67% acknowledging a problem, 32% were reluctant to accept services and 18% refused services.
Multiple maltreatment was more common for old women and self-neglect was more common for men.

Study: Andrew and Hall (1984), San Antonio, Texas.

Type of Research: Exploratory descriptive case analysis.

Purpose: Examine alcohol use in elder mistreatment situations.
Identify emerging characteristics of the elder, types of maltreatment, interventions, and outcomes.

Definition(s)/Typology: Self-neglect. Violation of rights. Physical violence. Exploitation. Medical abuse/neglect. Psychological violence. Personal care or immediate living area problems.

Sample Type and Size: 76 cases (39%), subset of a stratified random sample (see Hall & Andrew, 1984).

Response Rate:

Elder Abuse Found? Yes—criteria for inclusion in study.

Research Techniques: Retrospective content analysis of case records indicating elder mistreatment and alcohol use.

Limitations: Nonrandom, small sample with regard to alcohol use.
Retrospective data collection without a structured schedule for elder mistreatment.

Findings: Alcohol use by elder ($N = 25$):
Elder profile—Anglo (72%), widowed (56%), female (60%), lives alone (44%), in communities of 25,000 or less (40%) or rural areas (32%), low income without bank accounts, confusion, and recent memory deficit (63%), and no contact with others (50%).
Medical abuse and self-neglect were main forms of mistreatment.
64% of elders did not have a designated caregiver.
Alcohol use by others ($N = 41$):
Elder profile—Anglo (67%), widowed (50%), female (82%), living with relatives (52%), in communities of 25–100,000, 74–85 years old (46%), confused (51%), and living in dirty and cluttered homes (46%).
Multiple mistreatment (46%), exploitation (43%), and physical abuse (27%) were the main forms of mistreatment.
Alcohol use by both the elder and others ($N = 10$):
Elder profile—Blacks (70%), male (60%), living with relatives (70%) in rural areas (70%), without telephones (90%) or bank accounts (60%), and with recent memory deficits (56%).
Medical abuse, self-neglect, neglect, and material neglect/abuse were the major problem areas.

Study: Rounds (1984), Austin, Texas.

Type of Research: Descriptive survey.

Purpose: To investigate the internal and external environments in which elder abuse occurs.
Look at the physical, psychological, and financial variables in the abuse situation.

Definition(s)/Typology: Abuse—maltreatment by the person(s) with whom the elderly individual is living or a person fulfilling the caretaker role or by the elderly person himself.
Abuse—acts of commission.
Neglect—acts of omission.
Typology: Physical abuse. Psychological abuse. Material abuse. Violation of rights.

Sample Type and Size: 45 cases randomly selected from one agency.

Response Rate: —

Elder Abuse Found? Yes—criteria for inclusion in study.

Research Techniques: Retrospective case review by use of a structured schedule (Elder Abuse Report form).

Limitations: Data from agency records collected by a variety of social workers.
Sample limited to records of one agency.
Small sample size.
Available data do not always fit study needs.

Findings: Neglect and self-neglect were the most frequently occurring forms of mistreatment and violation of rights the least common.
The descriptive characteristics of the abusers were inconsistent, although most were relatives and had no form of support.
The elderly victims were typically widowed females age 70–79 years. Ethnicity was equally divided between blacks and whites. Most lived alone, had chronic illnesses, and low incomes.
The mistreatment was typically reported by a neighbor.

Study: Elderly Abuse Task Force (1984), Toledo, Ohio.

Type of Research: Exploratory survey, two parts.

Purpose: Research incidence of elderly abuse in Lucas County.
Determine present response of professionals.
Determine response of community and knowledge of resource(s).

Definition(s)/Typology: Professional Survey: Abuse—physical/emotional infliction upon an adult 60 years of age or over, by her- or himself or others, of injury, unreasonable confinement, or cruel punishment with resulting physical restraint or sexual molestation, insults, intimidation, or threats.
Neglect—failure of an adult (60 or older) to provide for him- or herself goods or services necessary to avoid physical harm, mental anguish, or mental illness, or the failure of others to provide such goods or services. This could include being isolated, being forgotten, withholding companionship, medicine, exercise, or food.
Exploitation—unlawful or improper act of a person using an adult, age 60 or over, or her or his resources for monetary or personal benefit, profit, or gain such as theft, misuse of money, property fraud schemes, or street crime.
Community Survey: Elder abuse occurs when a person 60 years of age and over is physically harmed or is verbally humiliated or insulted. Abuse can include neglect: when a person's basic needs, such as goods, medicine, and personal care, are not provided by himself/herself or others.

Sample Type and Size: Health and social service professionals—947, Toledo area residents—285 (random).

Response Rate: 32% (303).

Elder Abuse Found? Professional Survey: Abuse—physical and emotional—48% had seen in last 12 months.
Neglect—55% had seen in last 12 months.
Exploitation—38% had seen in last 12 months.
Community Survey: Abuse and Neglect—12% of respondents had known of a case.
Exploitation—38% had known of a case.

Research Techniques: Professional Survey: Mailed questionnaire to preselected group of professionals mandated by law to report elderly abuse.
Community Survey: Telephone interviews of Toledo area residents. Respondents asked to define elder abuse, and assessed their knowledge of instances of abuse, abusers, sources of help, familiarity with relevant agencies and the mandatory reporting law.

Limitations: Nonprobability sampling. Probable duplication of citings. Unclear if interview schedule used.

Findings: Professional Survey: Over 70% of victims in each category were female.
Neglect is main problem (55%).
Abuse seen by 48% of professionals.
Exploitation seen by 38% of professionals.
Females are predominant victims (70%+).
Person causing A/N/E is usually related to victim.
Victim is usually responsible for own neglect.
If residence status is known, victim usually lives alone.
Major motivation of abusers were stress and financial problems.
57% of respondents referred to an appropriate agency.
A significant number of respondents did not know what action resulted from referral.
Community Survey: 12% reported knowing of case of elder abuse or neglect.
In 64% of the cases help was sought.
18% reported knowing of case of exploitation.
Person exploiting was usually a relative.

Study: Pillemer (1985), New Hampshire.

Type of Research: Case-control study, part of ongoing research project (see Wolf, 1982).

Purpose: Test hypothesis that:
(1) Physically abused older persons will be more socially isolated than members of a matched control group.
(2) The increased dependency of an older person causes stress for relatives who then respond with physical violence.
(3) The increased dependency of the abusive relative leads to maltreatment.

Definition(s)/Typology: Physical abuse—the infliction of physical pain, injury, or physical coercion.

Sample Type and Size: Purposive—42 physically abused elders and 42 nonabused elders matched-controls.

Response Rate: —

Elder Abuse Found? Yes—criteria for inclusion in study.

Research Techniques: Researcher did personal interviews with the abused and nonabused elders using open-ended questions and a tape recorder.

Control group matched by sex and living arrangements.

Limitations: Small nonrandom sample.

Findings: Hypothesis was supported—abused elders tended to have fewer social contacts and to be less satisfied with these contacts.

The abused elders were more likely to report that their relationship with the abuser had had a negative impact on their contacts with others. The elder found the erratic and antisocial behavior of the abuser to be threatening.

Elderly victims were not likely to be more dependent, but were instead more likely to be supporting the dependent abuser.

There is a strong association between dependency of the perpetrator and physical abuse.

The typical abused elder was an older woman supporting a dependent child or a disabled spouse.

The abused elders were no more likely to be seriously ill than the controls. The same was true for recent hospitalizations and functional vulnerability.

The control group elders were significantly more likely to be dependent than the abused elders.

Less than 36% of the abusers were financially independent of their victims.

Physically abused elders are more likely to be depended upon than to be dependent.

The familial relationship and few options were reasons given for staying in the abusive relationship.

Study: Phillips and Rempusheski (1985), Arizona.

Type of Research: Exploratory survey.

Purpose: To formulate a conceptual model to describe the decision-making processes that health care providers use to identify and intervene in poor quality elders–caregivers relationships.

Definition(s)/Typology: None given.

Sample Type and Size: Theoretical, volunteer, 29 social workers and home health agency nurses.

Response Rate: —

Elder Abuse Found? —

Research Techniques: Grounded theory technique.
Personal interviews using a tape recorder and open-ended questions.

Limitations: Small, volunteer sample from one geographic area.

Findings: These health care providers assessed the quality of the caregiving situations and not the quality of the elder/caregiver relationships when making decisions about abuse and neglect.
A four-stage model of decision-making was formulated from the data.
The association between the intervention decision and the diagnostic decision was surprisingly low.
The type of intervention strategy chosen often did not match the diagnostic decision. The strength of the intervention strategy chosen did not match the diagnostic decision.

PROBLEM SIGNIFICANCE

One question of concern is who are the elders at risk for elder neglect and abuse. Some statistics can shed light on the answer. Contrary to popular perceptions, at any given time only 5% of persons 60 years or older reside in institutions. Typically these elders are more likely to be at risk for mistreatment by formal caregivers. Most of our elderly (95%) live in the community, either in their own homes or in the homes of relatives. In fact, 75% of older persons live with family members or within a 30-minute distance from them (Butler & Lewis, 1982). Approximately 75% of older adults are physically, psychologically, and financially independent, despite the fact that 85% of them have at least one chronic illness. The other 20% of community-dwelling older adults are disabled to some degree. They are cared for by their own families in 80% of cases (O'Rourke, 1981). These are the elders who are at the greatest risk of mistreatment by family members (informal caregivers). Yet, there is evidence that most family members treat their older relatives with love and respect (Douglass, Hickey, & Noel, 1980; Hoback, 1981; Steinmetz, 1981). Therefore, it is something of a surprise to find research indicating that most abusers, and neglecters, of older persons are members of the victims' families.

Reported estimates of elders who are abused by family members range from 4% to 10% of the older adult population. Yet, there are no accurate statistics to document the scope of elder neglect and abuse because of a lack of uniformity in state reporting laws and record keeping, and because

of definitional, sampling, and methodological differences in current research. Straus, Gelles, and Steinmetz (1980) estimated that 500,000 older adults living with younger family members are being physically abused. The House Select Committee on Aging estimated that 1 million older adults, or 4% of our older population, are abused by relatives, but only one of every six cases of elder abuse comes to the attention of authorities (Abusing the aged, 1981; Elder abuse becoming a national problem, 1981; Pepper & Oakar, 1981); consequently, the committee viewed current estimates as the tip of the iceberg. Block and Sinnott (1979) also estimated that there are 1 million cases of elder abuse and feel that it is probably less frequent than spouse abuse but at least as frequent as child abuse. Crouse, Cobb, Harris, Kopecky, and Poertner (1981) estimated a 4% abuse rate for Illinois elders. Steinmetz (1981) estimated that 10% of the United States older adult population (2½ million) are abused. According to Lau and Kosberg (1979), 9.6% of all older adult clients seen at their agency in one year had been abused. Elder neglect estimates exceed those for elder abuse. These initial estimates are enlightening, but the incidence and prevalence of elder mistreatment still need to be documented.

Since there is no reliable documentation of the prevalence of elder neglect and abuse, it may be premature to speculate about it increasing in the future. However, there are some current indicators that point to the likelihood of an increase in elder neglect and abuse, including the growing number of older adults in our population (Branch & Jeffe, 1981; Monk, 1979; Montgomery, 1982; Palmore, 1980), longer life spans or long-term aging (Brotman, 1977), with a corresponding likelihood of sustained dependence (Safford, 1980; Weissart, Wan, & Livieratos, 1980; Zarit, Reever, & Bach-Peterson, 1980), and limitations in family and material resources (Callahan, 1982). The Pepper and Oakar (1981) survey cites 14 reasons why elder abuse will increase in the future, and other authors also predict an increase (Hickey & Douglass, 1981a,b; O'Rourke, 1981; Rathbone-McCuan, 1980; Steinmetz, 1981). Researchers and health care professionals need to find effective answers to the elder mistreatment problem before it grows. This review provides a foundation for problem-solving by assessing the current state-of-the-art regarding identification, contributing factors, and treatment of elder neglect and abuse.

ANALYSIS OF THE RESEARCH LITERATURE

The research works reviewed here are primarily exploratory, descriptive studies conducted since 1979. The typical objective was to examine the extent and nature of elder neglect and abuse among adults age 60 or older

who lived alone, with family members, friends, or other relatives, or with caregivers in the community. Respondents included paraprofessionals, professionals, elders, and caregivers. The scope of the sample parameters ranged from a single agency, to a metropolitan area, to several counties in a state, to an entire state, to a nationwide state-by-state survey. Most were retrospective studies using convenience samples and were dependent upon voluntary responses, with the result that response rates were relatively low, and information was not representative. Data were gathered by a variety of methods, including retrospective case analyses, mailed questionnaires, telephone interviews, and personal interviews.

The differences in sampling and data collection make it impossible to systematically compare these studies. In addition, there is little agreement as to what is meant by elder neglect and abuse; consequently, findings yield particularized rather than generalized information. Other limitations include lack of control groups, lack of control for duplicate cases, solicited opinions from uninformed respondents, and retrospective data based on respondents' memories. However, despite these severe limitations on the utility of the findings, these pioneering studies have uncovered an important fact about elder neglect and abuse—they are primarily family affairs. Therefore, any effort to identify them, determine causal factors, or develop treatment options should be done within the context of family dynamics. These studies have helped to formulate some of the key questions that need to be addressed: (1) How do families who abuse or neglect their elders differ from those who do not? (2) How can families at risk for elder neglect or abuse be identified? (3) What are the circumstances in family settings that generate elder neglect and abuse? (4) How can families be helped to effectively prevent or control neglectful and abusive situations?

Identification

Definition

Intrinsic Definitions. Basic and critical questions that are yet unanswered are, what is, and is not, elder neglect? elder abuse? Several studies have provided extrinsic definitions (typologies) without formulating intrinsic definitions (conceptualizations). That is to say, they began with an illustration of the concept without first defining it. The assumption seems to be that the intrinsic meanings of elder neglect and elder abuse are understood. However, this creates a tautology in which elder neglect and abuse are often defined as elder neglect and abuse. In addition, studies that begin without an intrinsic definition provide no foundation upon which to evaluate the characteristic behaviors. For example, is it abusive

to strap an elder to a chair? What about the family that has always had unhygienic personal habits? Can we say that its members are being neglectful toward the older member's hygiene needs if they apply their own standards to them?

Other studies provide some kind of intrinsic definition. However, these definitions often suffer from overgenerality, circularity, or obscured clarity when intrinsic and extrinsic components are contained in the same definition.

The O'Malley et al. (1979) definition of elder abuse states that abuse is "the willful infliction of physical pain, injury or debilitating mental anguish, unreasonable confinement or deprivation by a caretaker of services which are necessary to the maintenance of mental and physical health" (p. 2). It has been utilized by other researchers. Although comprehensive in some parameters, the O'Malley et al. (1979) definition narrowly circumscribes elder abuse along other parameters. It applies the label of abuse only when it is clear that the caregiver intended to do harm. It also assumes that the older patient is dependent, thus effectively excluding independent elderly who may also fall victim to abuse. Another concern is that this definition confounds the abuse concept by its inclusion of neglect.

Recently, O'Malley et al. (1983) altered their intrinsic definition, changing "willful infliction" to "active intervention," and the "maintenance of mental and physical health" to "unmet needs;" they also simplified the kinds of abuse conditions to "physical, psychological or financial injury" and developed a new definition for neglect: "the failure of a caretaker to intervene to resolve a significant need despite awareness of available resources." In sum, O'Malley et al. (1983) distinguish abuse from neglect on the basis of intent. Abuse seems to be an act of commission and neglect an act of omission. Their incorporation of the concepts of "unmet needs" and "significant needs" helps to clarify what the intrinsic definition of elder neglect and abuse should contain.

Extrinsic Definitions. In contrast to the relative lack of intrinsic definitions, most of the studies present some kind of extrinsic behavior typology that may be applied to neglect and abuse situations. The extrinsic categories of neglect and abuse in the studies range in number from 2 to 6, and most of the studies include illustrations for each category. Physical and psychological mistreatment are consistently included, whereas inclusion of separate classifications of neglect (active and passive), financial or material abuse, self-neglect, violation of rights, sexual abuse, and medical abuse vary from study to study. On the surface these categories appear to be easily synthesized. However, a closer look reveals that the categories are not illustrated in the same way. For example, Lau

and Kosberg (1979) call "withholding of personal care" physical abuse, and Douglass et al. (1980) and Wolf, Strugnell, and Godkin (1982) call it active neglect, whereas Sengstock and Liang (1982) consider withholding of personal care to be psychological neglect.

This lack of uniformity in the application of the extrinsic behavioral categories may explain why there are contradictions concerning the prevalence of types of abuse. Some researchers found physical abuse to be the most common form (Lau & Kosberg, 1979; McLaughlin, Nickell, & Gill, 1980; O'Malley et al., 1979; Pennsylvania Department of Aging, 1982; Pepper & Oakar, 1981); others found psychological abuse to be the most frequently identified type (Block & Sinnott, 1979; Boydston & McNairn, 1981; Pratt, Koval, & Lloyd, 1983; Sengstock & Liang, 1982; Wolf et al., 1983). Crouse et al. (1981) and Douglass et al. (1980) found passive neglect to be the most common form, and the Elderly Abuse Task Force (1984) and Rounds (1984) noted neglect and self-neglect to occur most commonly; Gioglio and Blakemore (1983) stated that financial abuse was most frequently reported. Of course, such differing results could be accounted for by variations in sampling techniques and other differences in research design. However, when concepts or typologies are defined differently, this particularization constitutes a sufficient cause of incongruity among the findings of research studies. Figure 3-1 shows a proposed typology.

Detection. A major part of identification is detection. This refers to the methods or criteria used by professionals to determine whether older persons have been mistreated. The method may be an unwritten individual assessment, a list of guidelines, or a more formal systematic detection protocol.

Many factors can complicate detection. Signs of physical, psychological, and material abuse can readily be attributed to aging changes, and challenging this can be very difficult (Block & Sinnott, 1979; Long, 1981). For example, visual, hearing, and circulatory impairments and changes in the skin, soft tissue, blood vessels, and bones that occur with aging can result in bruises and pathological fractures with everyday living. This can make it difficult to recognize and prove that the elder was slapped, pushed, or hit. Patterns of injuries must be considered. Psychological abuse can cause confusion and a failure-to-thrive syndrome but so can dementia, delirium, drugs, and chronic illness. Loss of money or possessions can occur as a result of dementia, stress on an elder, or coercion by caregivers.

Reluctance of crime-prevention agencies to incorporate elder abuse as a distinct category of mistreatment limits the available data and, thus, clearer understanding of the problem (Long, 1981). Lack of awareness of

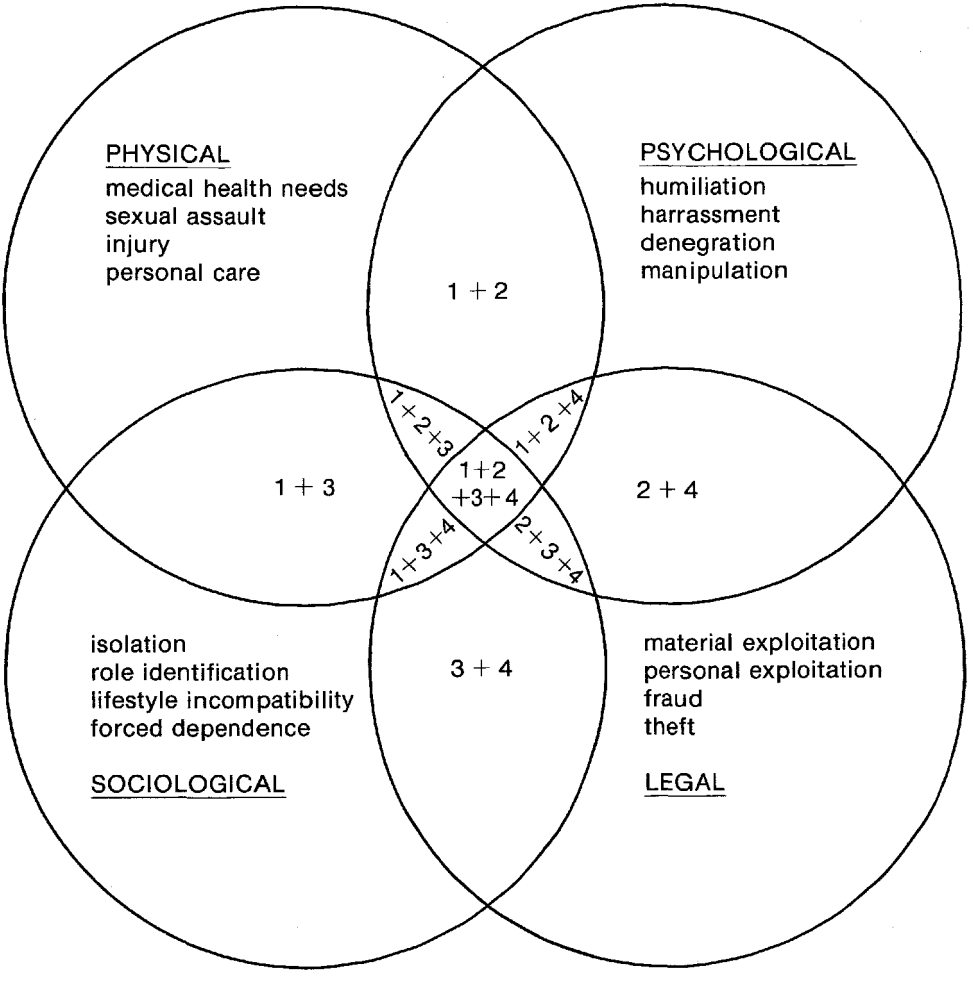

Figure 3-1. Typology of Elder Mistreatment.

elder abuse, of its signs and symptoms, decreases the frequency of recognition (Block & Sinnott, 1979), as does the lack of legislation to protect the frail older adult (Long, 1981; Mancini, 1980). Further, the public belief that the family protects its loved ones, and thus that abuse could not really be occurring, tends to hamper recognition. Investigators often hesitate to depend on secondhand data on elder abuse and are uncomfortable with the lack of guidelines for what constitutes sufficient evidence (Rathbone-McCuan, 1980).

Based on research reports, methods of detection used by professional respondents were either nonexistent or inconsistent from case to case. When Levenberg, Milan, Dolan, and Carpenter (1983), O'Brien, Hudson, and Johnson (1984), and Wolf et al. (1982) actually inquired about whether professionals had written procedures or protocols for detection, fewer than a third said that they did. O'Brien et al. (1984) found that only 16 of their 370 respondents, who had had professional experience with elder mistreatment cases, used a standard detection procedure. None of these procedures were written protocols. This observation, coupled with an average response rate of 40% from those studies reporting detection protocol information, really does not provide substantial data upon which to base definitive conclusions about elder abuse and neglect.

A number of writers in the general elder mistreatment literature have proposed methods of detection ranging from formal protocols to guidelines. Some of these methods are applicable only in the hospital setting; one is for an in-home setting, and others are applicable in any setting. Most are multidimensional assessment tools that elicit data on both the elder and the caregiver, pointing to the fact that family dynamics are a key factor in neglect and abuse.

The methods of data gathering are also diverse. Six protocols seek descriptive information through the use of standard questions (Anastasio, 1981; Falcioni, 1982; Johnson, 1981; Sengstock & Hwalek, 1985; Tomita, 1982; Villmoare & Bergman, 1981). One protocol relies on the professional's subjective observations (Rathbone-McCuan & Voyles, 1982). Four other instruments use Likert-type scaling of behavioral manifestations to measure the severity of elder neglect and abuse (Block & Sinnott, 1979; Daiches, 1983; Ferguson & Beck, 1983; Fulmer, 1982; Fulmer & Cahill, 1984). Mixed forms are used in two other protocols (Dozier, 1984; Wolf & Pillemer, 1984). Finally, one detection protocol focuses on identifying which elders may be at risk for abuse now or later (Kosberg, 1984).

Now that a number of tools are available, two subsequent steps need to occur. First, any effective assessment tool needs to be based on definitions of elder neglect and elder abuse about which there is consensus. Second, each tool's validity and reliability need to be documented.

Reporting. Detection is closely associated with reporting. Reporting may precede or succeed detection, since undetected abuse can be reported by lay persons involved in the abuse situation or documented by a service professional following detection. When reporting does not occur, detection is often impeded. Professional access to elder mistreatment has typically been limited. A concern is that severe cases of elder mistreatment are most likely to be reported and that professional detection is

more likely with families who use health care services, thus probably distorting the profile of the actual nature and extent of elder mistreatment. Recognizing the limitation of using only professionals to identify elder neglect and abuse, Block and Sinnott (1979), Gioglio and Blakemore (1983), Phillips (1983b), Pillemer (1985), Sengstock and Liang (1982), and Steinmetz (1983) decided to talk with caregivers or elders residing in the community. They included respondents from abusive and nonabusive families in order to compare primary data on the dynamics of elder neglect and abuse. However, the general findings from both the surveys of professional and those of community respondents are somewhat similar.

The literature is consistent about self-reporting of elder neglect and abuse. Abused elders characteristically tend to deny (consciously or unconsciously) that abuse has taken place. They refuse to report it because of fear of retaliation, abandonment, or being removed from their home or family setting; some fail to report abuse because they believe that the abuse was deserved, others because they have nowhere else to go or believe that nothing can be done to help, and others because of shame in admitting such treatment by their own children. For example, Beck and Ferguson (1981) observe that elders wish to protect their image as good parents. If their children have abused them, then some elders believe that it must have been their own fault, i.e., that something had to have been left out of their children's socialization.

There is also the elders' fear of institutionalization; many would rather be at home and abused than in a nursing home. Indeed, most elders choose to stay in the abusive situation rather than face an unknown situation (Anderson, 1981; Bahr, 1981; Hall & Andrew, 1984; Hickey & Douglass, 1981a,b; Kimsey, Tarbox, & Bragg, 1981; Lau & Kosberg, 1979; Long, 1981; O'Malley et al., 1979; Renvoize, 1978; Steinmetz, 1978). Steinmetz (1978) believes abused elders are in a double bind since they feel dependent on the abuser for survival and also have feelings of love or kinship for the abuser.

The older adult may be unable to recognize or report neglect or abuse because of severe illness, depression, immobility, or dementia. Further, the myth of senility may cause older adults to hesitate to report abuse and risk having their credibility questioned when they attempt to report it. In either instance an elder's fear of retaliation may be reinforced. The privacy and intimacy norms of the family result in members being reticent to share information about abuse (Long, 1981), and strangers hesitate to violate the norms in pursuit of evidence. Relatives, neighbors, and friends are also reluctant to report suspected abuse out of fear, anxiety about how to handle the problem, and ambivalence about becoming involved (Lau & Kosberg, 1979).

There is evidence that victims and abusers rarely seek outside help. Neglect and abuse usually occur without witnesses, and in few cases is abuse reported to the authorities or help sought (Lau & Kosberg, 1979; O'Malley et al., 1979). O'Malley et al. (1979) found that outside (third party) observation tended to be the primary (70%) means of identifying cases of abuse. Hall and Andrew (1984) found third party reports applied in elder mistreatment cases for Anglos and Blacks, but for Mexican Americans 44% of cases were reported by immediate and extended family members. Yet, only one out of every five cases was reported to some authority (O'Malley et al., 1979). In contrast, in Block and Sinnott's study (1979) 95% of their 26 cited cases were reported to some authority, apparently unsuccessfully. This raises the question of whether elder neglect and abuse are really underreported by elders and other lay persons or whether health service professionals are not recognizing clues or not reporting the abuse because of lack of witnesses, proof, legal guidelines, or available interventions.

Protective service workers and other professionals believe there are many barriers to identifying, reporting, and intervening with elder abuse (Rathbone-McCuan, 1980). For example, moral and legal issues may act as barriers (Lau & Kosberg, 1979; Levenberg et al., 1983; Phillips, 1983a). Currently, most states have some form of elder abuse legislation, some states have legislation pending, and a few are not currently considering any such legislation (state legislators, personal communication, 1984).

Even some professionals in the legal system are skeptical about mandatory reporting and intervention. Both Katz (1979) and Faulkner (1982) warn about the hidden agenda in mandatory reporting and intervention: the law may inadvertently and unintentionally serve to shift the older person's self-control to impersonal authorities.

It appears that accurate reporting of cases is mired in both personal and professional quandaries, and it is likely to stay there until all parties can be convinced that reporting is protective rather than punitive.

The task of identification involves developing theoretical and operational definitions of both elder neglect and elder abuse, a standardized procedure for detection, and a reporting system that helps to maintain the quality of life for caregivers and elders and does not label the family as deviant or communicate a prognosis of family deterioration.

Contributing Factors

None of the studies reviewed here planned to determine the cause(s) of elder neglect and abuse. Most were descriptive, exploratory studies in-

tended to determine the nature and extent of elder neglect and abuse and to describe the demographic characteristics of the victim and abuser. The studies' results, therefore, yield information that is symptomatic (contributing factors) rather than causal.

A recurrent finding was that both the abused and the abuser experienced excessive stress. Although it is not yet clear whether stress is a cause or an effect, the studies to date indicate that stress plays a significant role in elder neglect and abuse and is linked in some manner with other contributing factors. Yet explaining elder mistreatment by using the term "stress" can act as a camouflage. Although stress seems to be an intensifier for potential abuse, it is not a clear predictor, since most families experience stress at one time or other and do not abuse their elders. Stress could easily mask other significant contributing factors. Therefore, researchers need to ask how abusive families differ from nonabusive families with regard to stress and coping skills.

Some researchers have applied an established theory to elder mistreatment without testing the application of that theory to the elder abuse situation. For example, some have referred to social learning theory as an explanation of intergenerational violence. Others, notably Wolf et al. (1982), review the major explanatory psychosocial theories that could be used to test hypotheses about the cause(s) of elder neglect and abuse. In sum, research thus far hovers around correlations and contributing factors rather than causative relationships. With improvements in definitions, sampling, and methodology, we can expect tests of hypotheses from theories such as functionalism, behaviorism, social learning, social exchange, conflict, symbolic interactionism, role theory, etc.

Since the 31 research studies are of limited use in a discussion of potential contributing factors, the more general elder mistreatment literature also needs to be examined.

Physical Conditions. Functional disability, impairment, or dependence seem to be common correlates of elder neglect and abuse (Douglass et al., 1980; Dozier, 1984; O'Malley et al., 1983; Steuer & Austin, 1980). Some researchers found that most abused elders were functionally impaired (physically or mentally), 75-year-old and older women who could not fully care for themselves (Block & Sinnott, 1979; Gioglio & Blakemore, 1983; Hall & Andrew, 1984; Lau & Kosberg, 1979; O'Malley et al., 1979; Rounds, 1984; Steuer & Austin, 1980; Wolf et al., 1982). O'Malley et al. (1979) found that significant disability and being female cut across all subcategories of age and appeared to be present in a much higher percentage of the abused population than of the elder population as a whole. Yet, Phillips's (1983b) study does not support these correlations, and Pillemer's (1985) findings indicate a significant frequency of abusers being dependent on the elder and that the elder victim was no

more likely to be seriously ill than the nonabused control group elders. Thus, the consistency of these antecedents is not yet established.

In some situations the caregivers themselves are functionally impaired. They may be elderly, ill, or demented, and caring for their spouse, sibling, or parent (Block & Sinnott, 1979; Crossman, London, & Barry, 1981; Giordano & Giordano, 1984b; Lau & Kosberg, 1979; O'Malley et al., 1979; Steinmetz, 1981, 1983; Wills & Walker, 1981). Such situations can cause unintentional neglect or abuse because of the caregiver's own limitations; e.g., because of impaired vision or strength the caregiver may have given incorrect medications or cause the care receiver to fall, or dementia may have caused the caregiver to be unaware of his or her own behavior or its effects. In Issac's survey, 75% of the caregivers were over 50 years old, and 20% were over 70 (The elderly—At home or in hospital, 1972). Steinmetz (1981), O'Malley et al. (1979), and Wills and Walker (1981) reported similar findings.

Psychological Factors. The older care receiver may easily find her- or himself in the role of both giver and receiver of stressful stimuli. Douglass et al. (1980) found that aggressive, belligerent, and disoriented behaviors of older persons were significant sources of stress for caregivers. Similarly, O'Malley et al. (1979) found that the abused elder seemed to contribute to the abuse by being nagging, demanding, manipulative, or argumentative. Respondents identified the elder care receiver as a source of stress to the abusive caregiver 63% of the time. The Michigan, Delaware, and Pennsylvania studies concurred (Douglass et al., 1980; Pennsylvania Department of Aging, 1982; Steinmetz, 1983). Caregiver resentment of elder care was the most commonly reported response to the question about the major cause of abuse in the West Virginia survey (Levenberg et al., 1983).

Sudden or unwanted dependency of the parent has been found to increase caregiver stress to crisis proportions if perceived as unexpected, unsolvable, or in addition to other burdens (Block & Sinnott, 1979; Hickey & Douglass, 1981a,b). Clues to caregiver stress include alcohol or drug abuse, long-term financial or medical problems (Andrew & Hall, 1984; Douglass et al., 1980; Dozier, 1984; O'Malley et al., 1979), long-term family conflicts (Steuer & Austin, 1980), or the hasty moving of an elder into the caregiver's home without considering alternatives (Burston, 1978). Steuer (1983) also notes that with prolonged elder care, caregivers begin to lose their own support systems—a loss that exacerbates the frustrations already experienced in the caregiving role. At one time or another nearly all caregivers of dependent elders feel overburdened, overstressed, frustrated, and angry, though most resolve these difficulties without harm to parent or self (Rathbone-McCuan, 1980).

Some caregivers of older adults have a prior history of a mental

condition or substance abuse, such as schizophrenia, retardation, or alcoholism. In such situations, neglect or abuse may be due to the caregiver's inability to make appropriate judgments (Lau & Kosberg, 1979). Some writers have examined the possibility that psychopathological behavior accounts for a good deal of elder neglect and abuse; however, thus far, the research does not confirm this (O'Rourke, 1981; Spinetta & Rigler, 1972).

Sociological Conditions. The research to date has focused on a number of factors in the sociological context of family interaction, especially the use of violence and force as a learned coping mechanism, the complexities of family role relations, and constraints on incorporating the elder into the adult child's nuclear family.

Rosow (1973) commented that the lack of guidelines for appropriate behavior in old age is a major problem for the elderly. The fact that there are also no guidelines to determine the nature of the elder parent–adult child relationship is seen as a contributing factor to elder abuse (Johnson & Bursk, 1977). Johnson and Bursk (1977) see the older adult as being roleless within the family situation. Living with an adult child may accentuate this rolelessness and result in family conflict. The losses of aging such as decreased family and social status, decreased independence and mobility, decreased contact with friends and peers, loss of possessions or property, etc. may make the elder feel useless, less in control, and more dependent. These feelings can lead to negative self-perceptions by the elder, inappropriate dependency or aggressive behavior, and thus create greater vulnerability to neglect and abuse (Block & Sinnott, 1979; Hickey & Douglass, 1981a,b; Steinmetz, 1983).

Blenkner (1965) believes the achievement of filial maturity enables the adult child to become a dependable resource person for the elder family member(s) without taking on the parenting role, thus preventing role conflict and role reversal. Lack of filial maturity, however, can lead to conflict as the elder's dependency increases and can cause the adult child to misperceive the elder parent (Beck & Ferguson, 1981; Simos, 1973). Misperceptions of older adults by younger persons may contribute to abuse (Fitzgerald, 1976).

McGreehan and Warburton (1978) and Ragan (1979) see aging as a developmental crisis for older adults and families that requires a shift in reciprocal role relationships. Because advanced old age is a new phenomenon, our society has yet to help elders and families be prepared for or deal fully with its impact.

Chen, Bell, Dolinsky, Doyle, and Dunn (1981) and Hickey and Douglass (1981a,b) found that families who abused their elders lacked knowledge of the aging process and maintained unrealistic expectations of their

aging parents. Caregivers of older adults need to learn about aging and how to care for an elder. Prolonged caregiving is a new role for adult children, and until recently this responsibility was not recognized as a possible burden (Beck & Ferguson, 1981; Simos, 1973). The caretaker role affects virtually all aspects of the caretaker's life and may lead to caretaker role fatigue (Goldstein, Regnery, & Wellin, 1981). Role conflict may contribute to this role fatigue, or the two can occur independently. Role fatigue may occur as a consequence of differing demands in the life-cycle of the family: the caregiving individual may be caught between two generations—young adult offspring with continuing dependency needs and elderly parent(s) with new and increasing dependency needs (Brody, 1981). Unintentionally competing demands may cause role conflict. Caregiving families also experience generational inversion in which the parent's and child's roles (rights, responsibilities, and expectations) are inverted (Steinmetz, 1979, 1981, 1983).

In some cases the adult child takes on the parenting function and treats the aging parent like the child the caregiver once was when the parent was younger (Blenkner, 1965; Davidson, 1979). This is called infantilization. Gresham (1976) considers infantilization of the elderly by caregivers to be very stressful to older adults. She believes such patronizing behavior causes a cycle of regressive, demanding, selfish and undisciplined behavior, and learned helplessness in the elder, in turn, which cause increased conflict with the caregiver, which can manifest itself in neglect and abuse. Unresolved conflicts between parents and children are also sources of family stress and, thus, potential contributors to neglect and abuse (Farrar, 1955; Langway, 1980; Lau & Kosberg, 1979; Ragan, 1979; Renvoize, 1978; Simos, 1973). Steinmetz (1983) notes that some elders do not treat their caregiving adult children as adults with rights of their own. There may also be power conflicts between parent and child as the elder vies for attention and control over the household (Renvoize, 1978; Steinmetz, 1981, 1983; Treas, 1977). Renvoize (1978) believes the older adult senses family tension and reacts by trying to prove her or his youth and independence, attempting to do things she or he can no longer do. This results in greater interference, tension, conflicts, and stress within the family. All of these types of dysfunctional relationships inevitably produce stress on both the elder and caregiver that could erupt into violence.

Horowitz (1978) found there was less family disruption due to the caretaking role if there was a history of reciprocity and affective interaction, gradually increasing dependency needs of the older adult rather than an acute onset, the existence of secondary rewards from the caregiver role, perception by the caregiver of support from (or lack of conflict with) the caregiver's family, and acceptance of shifting dependency by

both the adult child and the elder parent. This role is seen as difficult when the caregiver perceives mental deterioration in the parent and when caregiving is seen as confining or causing sacrifices for the caregiver (Horowitz, 1978; Robinson & Thurnher, 1979), thus leading to feelings of anger and resentment (Archbold, 1980). Miller, Bernstein, and Sharkey (1973) found a need among some families to deny an elder's illness in order to maintain family homeostasis. Such denial could lead to neglect in meeting the older adult's needs.

A number of studies have found that there is often difficulty in incorporating the elderly parent into the nuclear family. Problems include inadequate space in the home; conflicts in meeting all members' needs (Simos, 1973); additional physical, emotional, and financial burdens; lack of time for self (caregiver); and lack of family or community service support for the in-home caregiver, such as daycare and respite care (Block & Sinnott, 1979; Burston, 1975; Lau & Kosberg, 1979; Rathbone-McCuan, 1980; Steinmetz, 1981).

Legal Conditions. The legal aspects of elder mistreatment are probably the least explored thus far, although several efforts in this area have begun to emerge (Faulkner, 1982; Katz, 1979; Kosberg, 1983; Regan, 1981). Mishandling of an elder's financial affairs appears to be a common form of elder mistreatment (Gioglio & Blakemore, 1983). This is deliberate in some cases, in which the relative or other caregiver wishes to actually steal from the older person. In other cases, money management of the elder's affairs is just too overwhelming, leading to unintentional mishandling.

When a spouse of an older person dies, decisions about the care of the remaining spouse are often made too hastily. Redmond (1980) cites a case of a mother who gave her son power of attorney after the death of her husband, although she gradually became adept at managing her own affairs. Unfortunately, the son had meanwhile taken advantage of his mother's condition and used up her funds. Families also move older members into their homes, to the considerable discomfort of the elder, so that the adult child's family may take advantage of the elder's Social Security benefits or other income (Steuer & Austin, 1980; Tomita, 1981).

The legal rights of elders are very complex and problematic issues, as are the related issues of guardianship, criminal action, and alternative care for older persons. To whom does the older person turn when relatives commit this type of abuse? What are valid indicators of the need for guardianship? Then, too, there is the question of whether one has the right to choose to remain in an abusive situation. The more that questions such as these are examined by legal experts, the greater the likelihood of resolving the problems of elder rights in the family setting.

A key issue is the interpretation of the findings and opinions about contributing factors in elder mistreatment. The question is whether these factors are an artifact of our society's past and present unpreparedness for long-term aging or whether they are clues to causes of elder mistreatment. The answer will have a major impact on whether treatment efforts will be effective in the long run or whether symptoms of elder mistreatment will be dealt with rather than the causes.

Treatment

Treatment is a final dimension of elder neglect and abuse that needs to be explored. If there is little clarity about what constitutes and causes elder neglect and abuse, then it may be difficult to talk about effective treatment. All researchers can do at this point is propose courses of action.

Treatment or intervention consists of protection and prevention. Several studies found that some kind of protective action was taken in cases of elder neglect and abuse. In the Lau and Kosberg study (1979), 46% of the 39 abused elders were institutionalized, 26% refused assistance, and 28% accepted community agency assistance. O'Malley et al. (1979) reported that removal of the elder from the abusive situation was the most typical protective intervention, though in-home services and counseling of the elder and family were also utilized. An interesting feature of these and other reports of direct action is that such resolutions were not fully satisfactory. O'Malley et al. (1979) reported that 45% of the cases were resolved, 36% were not, and 20% were not determined. Block and Sinnott (1979) concluded that 95.24% of their cases were not satisfactorily resolved. In the Chen et al. study (1981), 70% of the 30 professional respondents sampled reported that intervention was ineffective. In the McLaughlin et al. study (1980), professionals reported that 39% of the cases had been resolved but that an almost equal number (36%) had not been resolved. In the three-model study by Wolf et al. (1982), some 45% of the cases cited by professionals had not been resolved. But what constitutes resolution? And to whose satisfaction is a case to be resolved?

The apparent lack of success in treating cases of elder neglect or abuse is the result of a number of understandable circumstances. First, even when assistance is offered, the records show that many elders or families refuse the help (Hageboeck & Brandt, 1981). In the Boydston and McNairn (1981) and the O'Malley et al. (1979) studies, 58% of the victims or families refused help. In the Wolf et al. study (1982), the refusal rate was 77%. Second, if service is given, it is often inadequate or inappropriate to a family's needs, or the intervention chosen does not match the

diagnosis of the situation (Phillips & Rempusheski, 1985). Finally, follow-up of the abused and abuser is not likely to be undertaken, especially in cases where the older person is institutionalized. The family tends to fade out of the picture, with few supports made available to them.

At the community level, Crouse et al. (1981) have identified three treatment models in cases of elder abuse: the child abuse model, the domestic violence model, and the advocacy model.

In the child abuse model, treatment is protective, reporting is mandatory, authority in problem resolution rests with the helping agency, assistance is involuntary, and the victim loses his or her rights to determine the action to be taken. The domestic violence model is a short-term protective intervention strategy that focuses upon crisis resolution in the family setting by treating symptoms rather than causes. Authority in the intervention is given to law enforcement personnel—the police, the courts, etc. Finally, the advocacy model is oriented toward both prevention and protection. Treatment is not attached to any service delivery system, and authority rests with the older person. His or her rights are paramount.

Both Crouse et al. (1981) and Gioglio and Blakemore (1983) observe that all three models can be useful in treating the older person and the family because there must be a balance between family needs and the state's obligation to ensure the well-being of its older citizens.

Preventive treatment is becoming recognized as an important aspect of the problem-solving component of elder neglect and abuse. On a personal level, O'Malley et al. (1983) advise health care providers to use a family systems approach rather than the medical model in treating the patient. This allows observation of family dynamics, and by consulting with the caregivers, as well as the patient, the health care provider may be able to pick up early signs of stress and conflict.

Anastasio (1981), Bragg, Kimsey, and Tarbox (1981), Chen et al. (1981), and Gray Panthers of Austin (1983) recommend better training of professionals, with a strong educational component on the aging process and cues for detecting potential neglect and abuse. The Wolf et al. study (1982) found that four out of five professionals felt training needs exist. Preventive care must also include education of families with older adult members. It has been observed that older persons who are victims of Alzheimer's disease, Parkinson's disease, or stroke are very strong targets for abuse because of the emotional toll they take from their caregivers (Beck & Phillips, 1983; Goldstein & Blank, 1982; O'Malley et al., 1983). Therefore, public education needs to include not only information but recommendations for community and family support services to alleviate feelings of loss and isolation.

Professional researchers are encouraged to devote more effort to the problem of elder mistreatment. Problem solving will, of course, be more effective with more information. Researchers should address the whole spectrum of elder mistreatment—physical, psychological, social, and legal issues. Practitioners in the social services are asked to develop more elder care support programs, the legal system is asked to evaluate the caregiver's and the elder's human rights, and physical and mental health systems are asked to provide more effective counseling and guidance of families who are facing elder care. When addressing the issue of long-term elder care, all of these human service providers need to realistically confront the family's and the elder's needs and the family's and society's responsibilities. For if the family is incapable of elder care or is expected to carry too much of the burden without reasonable support and guidance, then the family will be set up for failure and guilt and the elders for more mistreatment.

SUMMARY

The 31 pioneering studies tell us that elder neglect and abuse occur in various forms and are often inflicted on older women by relatives who are in a caregiving role. Yet, the studies' findings are insufficient to document the prevalence or to identify the cause(s) of elder mistreatment. Given our concern about elders and their families, further research is needed, guided by consideration of some priority issues (Callahan, 1982).

The first question is what is and is not elder mistreatment and by whose definition. Since one's professional orientation has a major impact on one's perceptions, will we see what we expect or fear we will see when confronted with a possible mistreatment situation? Is elder mistreatment a legal problem, a criminal act, or is it one symptom of our society's lack of preparation for the care of its old-old? Research needs to address ways our society can prepare itself (families and communities) to care for our increasing population of old-old citizens.

Second, as researchers, practitioners, and policymakers, we need to be clear about our own motives and incentives for focusing on elder mistreatment. Are our behaviors self-serving or other-serving? How can we each most effectively help our elders and their families and thus prevent the occurrence of elder mistreatment?

Third, we need public and professional education that provides accurate information about aging, elder care, community resources, and elder mistreatment—education that can correct or counterbalance the mass media's misleading accounts.

A fourth issue is the need to respond to the existence of elder mistreatment in reasonable ways so that social benefits will not exceed social costs. Greater effort and money put into programs that provide alternative forms of elder care and that support and assist families providing elder care will be more cost effective (human and monetary) in the long run than will laws that inappropriately decrease family privacy and control. We need to direct our energies and interventions at the causes, rather than the symptoms, of elder mistreatment.

Finally, given the existing data base on elder mistreatment and the access barriers, consideration should be given to determining which research designs would produce the most valid, reliable, and useful findings. Gaining understanding of elder mistreatment—its antecedents, causes, and consequences—is prerequisite to effective and efficient prevention, identification, and treatment.

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CHAPTER 4

Home Care: Process, Outcome, Cost

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INTRODUCTION

In 1821, Josiah Quincy, prior to becoming Mayor of Boston, conducted a study comparing the value of care provided in an almshouse with care at home. In his "Report to the Committee who was Referred in the Consideration of the Pauper Laws of this Commonwealth," Quincy "concluded that providing aid to families in their own homes was the most wasteful, expensive and injurious to the recipient's morales . . . [and recommended that] the almshouse was the most economical mode" (Seidl, 1983). It should be sobering to those who make health policy that the terms of debate have changed little in the ensuing 165 years, although the concept of home care is now faring better than Mr. Quincy may have desired.

A variety of factors contribute to the renewed interest in treating illness at home. Widespread negative publicity in the 1970s about the quality of nursing home care (Moss & Halamandris, 1977; Vladeck, 1980) and the rapidly rising costs of that care—$32 billion in 1984 (Doty, Liu, & Weiner, 1985; U.S. General Accounting Office, 1985a)—are two of the major considerations. But there are a number of others as well. Chief among these is the demographic imperative. Whereas the United States population as a whole is projected to grow by 10% in the current decade, the 75 to 84 age group will increase by 27%, and the 85 and older group

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by 20% (Doty et al., 1985). These are the high-risk groups for chronic dependency (Cornoni-Huntley, Foley, White, Suzman, Berkman, Evans, & Wallace, 1985; U.S. Senate Special Committee on Aging, 1984a).

Surveys of acute care hospitals show substantial numbers of chronically ill patients who are ready for discharge but must remain in the hospital awaiting placement for periods that in many cases exceed 6 weeks (Brown & Learner, 1983; Inui, Stevenson, Plorde, & Murphy, 1981; Shapiro, Roos, & Kavanagh, 1980; Spiegel, 1984). A Massachusetts survey concluded that this would cost $30 million per year in that state alone (Massachusetts Hospital Association, 1979).

The advent of hospital prospective payment based on diagnostic-related groups has accelerated the pressure for early hospital discharges (USGAO, 1985b; U.S. Senate Special Committee on Aging, 1985). At the same time, the usual outlets for placement of the chronically ill—nursing homes—have shown a leveling of growth in recent years (Table 4-1) in response to state pressures to reduce expenditures (Feder & Scanlon,

Table 4-1
Medicare Participating Home Health Agencies and Total Licensed Nursing Home Beds in the United States [a]

Year	*Home Health Agencies*	*Total Nursing Home Beds*
1967	1,753[6]	765,148[4]
1973	2,212[1]	1,107,358[4]
1978	2,496[1]	1 293,417[3]
1979	2,858[6]	1 352,034[3]
1981	3,022[1]	—
1982	3,169[2]	—
1983	3,627[2]	—
1984	4,235[2]	—
1985	5,237[2]	1,472,000[5]
1986	5,983[6]	—
Average Annual Growth in Past 5 Years	20%	2%

[a]Home Care figures are for January of each year except for 1967 (March). Some figures given in the original source as December of a given year were shifted to January of the following year for consistency.

Sources: [1]*Health Care Financing Review, 6*, 97, 1984. [2]*Health Care Financing Review, 6*, 143–146, 1985. [3]USGAO, 1983. [4]Dunlop, B. (1979). *The growth of nursing home care.* Lexington: Lexington Books. [5]Corrected figure for July 1, 1985. Unpublished data. Health Care Finance Administration, Bureau of Data Management and Strategy, January 10, 1986. [6]Unpublished data. Health Care Financing Administration, Bureau of Data Management and Strategy, 1986.

1981; USGAO, 1983). This has created increasing incentives to develop alternative sources of long-term care.

In addition, studies of nursing homes also suggest that 10 to 40% of the residents are receiving unnecessarily high levels of care and that some could be treated in the community if appropriate services were available (USGAO, 1979a). Most of these studies were done in the 1970s. Since that time, the frailty of nursing home residents has increased, and states have instituted programs to reduce inappropriate admissions (Massachusetts Department of Public Welfare, 1983; USGAO, 1983). Thus, the correct figure is probably closer to the lower end, as data in one study intimate (Kavesh, Mark, & Kearney, 1984). However, even if 10% of the 1.4 million currently institutionalized elderly are involved, there is the potential for a significant transfer to community-based services if they are available.

The final reason that home care is receiving renewed attention is perhaps the most compelling: in up to 85% of cases, impaired older Americans simply prefer to stay at home rather than enter institutions (American Association of Retired Persons, 1984; Bell, 1973; Callahan, 1981; Cetron, 1985).

In this chapter, we will focus on the present status of home care services: their scope, limitations, financing, and effectiveness. Although a percentage of certain home care activities is devoted to short-term care and younger patients (e.g., early surgical discharge programs), we will deal primarily with the role of home care as a component of the continuum of long-term care services to the elderly.

HISTORY AND SCOPE

Since its modern origins in this country about a century ago, the traditional image associated with home care has been that of the visiting nurse, making her daily rounds arrayed with black bag and uniform. Such nurses were employed by municipal and public health departments or by visiting nurse associations operated by philanthropic groups. They provided a combination of nursing care, public health surveillance, and health education, which continues with some changes to the present (Spiegel, 1984).

The contemporary era of home care was ushered in four decades ago when the Montefiore Hospital in New York developed a hospital-based early discharge program to provide comprehensive care at home for chronically ill patients who would have otherwise remained institutionalized. Operating with a goal to "provide the best in scientific medicine and

the best in environment," the program offered medical service around the clock, including home visits by medical specialists; home transfusions and other procedures; nursing; physical and occupational therapy; social services; housekeeping services; transportation; medications; and durable medical equipment (Cherkasky, 1966). Some of the innovations in this program have only been rediscovered in the past decade—for example, home care for terminal cancer—or proposed for the future, such as the use of volunteers to assist the disabled at home (Goldstein & Benedikt, 1966; Rossman, 1966). One idea, a vocational training and jobs project for the homebound, which demonstrated impressive psychological benefits, does not yet appear to have been rediscovered (Clarke, 1966). The daily cost of the Montefiore program amounted to about one-fifth the cost of a day in the hospital. However, in a comment that presages contemporary policy discussions on home care, it was observed that it is "not of importance to have a product which is only cheaper. It must be as good or better" (Cherkasky, 1966).

FEATURES OF CURRENT HOME CARE PROGRAMS

Present day home care services include many of the features of the Montefiore program, although one of the key elements of the Montefiore program—coordination—is often lacking. A typical home health agency certified by Medicare, the nation's largest public source of home care funding, offers nursing and social services, therapies, and personal care services by a home health aide (Table 4-2). The latter include dressing, eating, toileting, bathing, grooming, oral hygiene, and skin care. In

Table 4-2
Medicare Reimbursed Home Health Services

Type of Service[1]	*Percentage of Agencies Offering This Service*[2]
Part-time skilled nursing care	100
Physical therapy	79
Speech therapy	55
Occupational therapy	39
Part-time home health aide services	91
Medical social services	41
Medical supplies	—
Durable medical equipment	—

Sources: [1]US DHHS HCFA, 1985b. [2]Spiegel, 1984.

addition, many Medicare certified agencies—particularly the proprietary ones—provide durable medical equipment such as walkers and other assistive devices.

However, if a client requires housekeeping, laundry, or meal preparation, what is known as homemaking, these are not reimbursed by Medicare. It is therefore often necessary for the agency to arrange with another agency to provide homemaker services. The homemaker services are reimbursed under other auspices, commonly Title XX of the Social Security Act (the Social Services Block Grant), Title III of the Older Americans Act, state funds in certain instances, and, increasingly, by the client, as ceilings are imposed on public funding. Chore services such as light maintenance, running errands, and shopping also must be arranged separately with a similar variety of payment options. Medicaid also funds home health care but the services authorized are similar to those offered by Medicare. The characteristics of the major federal programs are summarized in Table 4-3 and described in detail further on.

Certain community-based services also have grown, which, though not strictly in-home care, are adjuncts that permit an individual to remain at home and avoid institutionalization. These include adult day-care, foster care, and respite care.

Adult day-care is a community-based program of services directed primarily toward the frail elderly (Palley & Oktay, 1983e). The most frequently provided service in such programs is nutrition, followed by social services, health services, and transportation. The latter service is particularly important because many recipients of adult day-care need assistance to bring them to the congregate site where services are provided. Other services offered at many sites include recreation activities, supervision of personal hygiene, and rehabilitative and therapy services. In 1980 there were over 800 programs in operation nationwide, funded primarily by Title XX and Medicaid funds. Title III, state, and local funds also are used to finance adult day-care (Palley & Oktay, 1983e).

Adult foster care is another service that appears to forestall nursing home placement for certain dependent elderly without family supports. It is reported to be less costly than nursing home care and provides services of suitable quality (Tolkoff-Rubin, Fisher, O'Brien, & Rubin, 1978). Title XX provides significant funding for adult foster care in a number of states (Palley & Oktay, 1983e).

Respite care is a service that allows overburdened informal care providers to gain some relief from the continual pressures of caring for a frail relative. Respite care may consist of home care, day-care, or short-term residential services at a nursing home or special respite unit (Crossman, London, & Barry, 1981). Such an opportunity to take a break may be

Table 4-3
Comparison of Essential Characteristics of Four Programs Funding In-Home Services

	Social Security Act			*Older Americans Act*
	Title XVIII	*Title XIX*	*Title XX*	*Title III*
Services authorized				
Nursing	yes	yes	no	yes
Therapy	yes	yes	no	yes
Home health aide	yes	yes	yes	yes
Homemaker	no	no	yes	yes
Chore	no	no	yes	yes
Medical supplies and appliances	yes	yes	no	no
Program eligibility requirements				
Client must meet age requirement	yes	no	no	yes
Client must meet income requirement	no	yes	yes	no
Client must need part-time or intermittent skilled nursing care	yes	no	no	no
Client must be homebound	yes	no	no	no
Services to client must be authorized by a physician in accordance with a plan of care	yes	yes	no	no
Services must be included in state plan	—[a]	yes	yes	yes
Administration	Federal	State	State	State
Funding	open-ended	open-ended	capped	capped

[a]Federally administered program—no state plan required.
Source: USGAO, 1981a.

critical to the continued ability of the informal care provider to tolerate the stress of caring for a sick spouse or parent. Respite care may be included in the package of services offered by states under Section 2176 waivers—recently passed legislation that aims to facilitate diversion of Medicaid eligible individuals from nursing homes to community-based services.

ROLE OF THE PHYSICIAN

A review of the features of home care programs would be incomplete without discussion of the role of the physician—a role that is characterized by a fair amount of ambiguity. It has been observed that "house calls are rapidly becoming historical artifacts of 20th century medical practice" (Goldsmith, 1979). Multiple explanations are available: technological obsolescence, changing professional values, inefficiency, and inadequate reimbursement (Goldsmith, 1979; Royal College of General Practioners, 1978; Trager, 1984). At the same time, home health services provided under Medicare and Medicaid must be authorized by a physician. The actual involvement of the physician in supervision of the services provided may be minimal. Some home care agencies have used physicians primarily as sales representatives to drum up business (USGAO, 1979b). Even when the physician's role is not so grossly commercialized, in many settings it often remains remote. The reasons are no doubt partly related to the reluctance of physicians to get involved in house calls. But they also stem from the nature of the institution of home care.

Home care has traditionally been a nursing service. The physician would authorize certain services, such as the application of dressings or administration of medication, often for a short-term posthospital problem. The nurse would carry out the service and report back to the physician. This pattern still is quite widespread. A 1980 study in 17 New York state counties showed that 50% of patients seen by home care agencies still received hands-on nursing services (Balinsky & Rehman, 1984). Increasingly, however, as home care becomes a vehicle for the care of the chronically disabled elderly, nurses have taken on more sophisticated assessment and monitoring functions. The advent of the nurse practitioner has expanded the scope of nursing practice even further. A highly skilled geriatric nurse practitioner can assess and treat complex medical problems at home (Swart, 1983).

Perhaps paradoxically, as nursing becomes more sophisticated, the accessibility of the physician to provide medical backup becomes even

more crucial, especially where hospitalization may be necessary. This has proven frustrating where the nurse may have only a telephone relationship with multiple physicians, for example, in visiting nurse associations. Smoother interaction may occur in coordinated home care programs, where a small number of physicians and nurses share responsibility for a relatively large number of patients, meeting at least weekly to review care plans with an interdisciplinary team. Such arrangements have been reported to be highly effective in providing care to impaired homebound elders (Master et al., 1980; Zawadski & Ansak, 1981; Zimmer, Groth-Juncker, & McCusker, 1985).

Whether these programs will continue to grow remains unclear. Medicare has instituted ceilings on home health agency expenditures for physician services. These no doubt are a response to the type of excesses noted above (USGAO, 1979b). At the same time, Medicare reimbursement for a physician home visit remains far less than the reimbursement for a complete office visit that may take far less time. This combination of disincentives seems unlikely to encourage renewed physician interest in home care.

MEDICAL FEATURES OF HOME CARE SERVICES

Although public policy regarding home care focuses primarily on the provision of comprehensive supportive services to the disabled elderly, a wide-ranging literature exists on short- and long-term medical services that can be provided at home. Until a century ago, in fact, most people who could afford to stayed away from hospitals and other public institutions for the sick. The concentration of technology in hospitals has transformed public perceptions of where health care should be provided (Reiser, 1978).

The current literature on home-provided medical services demonstrates no lessening of interest in technological rigor but adds an awareness that the benefits of the technology do not have to be confined to the hospital. The reduction of bulky equipment to manageable size through miniaturization of electronic components combined with cost consciousness about hospital-based services has spurred the development of a variety of home care alternatives. A good example of this phenomenon is the growth of home-based parenteral nutrition and intravenous antibiotic services. Miniature pumps and sterile delivery systems now permit long-term parenteral home treatment of individuals who have inflammatory bowel disease or resection of major portions of the small and large intestine due to disease or trauma (Dzierba et al., 1984; Gaffran, Flem-

ing, & Berkner, 1980; Levien, Fiallos, Barone, & Taffet, 1985). The same delivery systems can be used to administer intravenous antibiotics for the home treatment of infections such as bacterial endocarditis that would ordinarily require a month or more of hospitalization to cure. Hemophilia is another problem that can be successfully dealt with through home intravenous therapy (Allain et al., 1977; Levine, 1977). Finally, the same scientific advances have made possible home chemotherapy for advanced cancer (DeMoss, 1980). Stimulated by liberal government and insurance reimbursement policies, a major industry has developed to respond to the demand for parenteral nutrition and intravenous treatments. Technology has also spurred the development of other home care services including respiratory therapy (Flenley, 1985; Goldberg & Faure, 1984) and home dialysis (Blagg, 1982; Tousiqnant, Guttmann, & Hollomby, 1985).

Perhaps the most sophisticated array of technically complex equipment has been the mixture of devices used to maintain multiply handicapped persons at home. These individuals are usually young, suffering from quadriplegia or hemiplegia as a result of a spinal cord injury or neurological disorder. They may need complete ventilator support or other assistive devices for mobility and communication. Yet such individuals can be maintained successfully at home with a combination of technically sophisticated equipment and appropriate home care services (Creese & Fielden, 1977; Meyers et al., 1986; Webb, 1979).

At the other end of the spectrum, home care is also advocated by those who wish to escape the highly scientific atmosphere of the hospital. The popularity of home birth is one manifestation of this tendency (Mehl, Peterson, Whitt, & Howes, 1977). Closer to the focus of this chapter on the elderly and chronically disabled are hospice programs for the terminally ill.

The hospice concept of providing comprehensive medical and social support to the dying individual coincides well with the goals of home care. Although there are a variety of models of hospice care, half the hospice services in the United States are home care programs (Amenta, 1985; USGAO, 1979c). Several major demonstrations comparing hospice care with conventional care have now shown impressive cost reductions combined with significantly higher satisfaction for the recipients of hospice services (Brooks & Smyth-Staruch, 1984; Hannon & O'Donnell, 1984; Mor & Kidder, 1985). Whether hospice care will continue to grow under restrictive federal reimbursement mechanisms remains to be seen (Buckingham & Lupu, 1982; Corless, 1985).

Home care is also effective in managing other disorders. Into this category fall chronic conditions like stroke and multiple sclerosis (Fei-

genson, 1981; Smith, 1981), arthritis (Clarke, 1982), dental services (Randell & Culp, 1985), pain control (Casale & Thorogood, 1985), and psychiatric problems (Soreff, 1983; West, Litwok, Oberlander, & Martin, 1980), plus a host of others (Spiegel, 1984). As the Montefiore experience demonstrates, the range of medical services that can be provided at home is likely to grow as the creativity of providers and technological advances permit.

DEFINITION OF HOME CARE

A definition of home care may seem so obvious from the range of services described thus far that it might be unnecessary to attempt a description. However, definitions in the public sector are important for a number of reasons. They may dictate the types of services offered, levels of reimbursement, acceptable providers, and research direction.

In the case of home care, if the goal is to provide relatively brief, medically oriented services to facilitate convalescence after a hospitalization for surgery or an acute medical problem, then the definition of the American Medical Association (AMA) would probably be adequate: "any arrangement for providing, under medical supervision, needed health care and supportive services to a sick or disabled person in his home surroundings" (Weller, 1978). However, much of the care provided to elderly, homebound individuals is directed toward long-term assistance in the performance of basic activities of daily living. While this could be subsumed under the rubric "supportive services" in the AMA definition, there has been considerable debate as to whether a physician needs to supervise these aspects of home care services. Some home care services—for example, chore services, reimbursed under two federal programs—do not require physician supervision. Zawadski distinguishes home health services, with their medical focus, from "in-home services," which he defines as "an array of personal care, supportive, and homemaker services given to individuals in their own homes" (Zawadski, 1983a).

Furthermore, we have already alluded to a category of services that permit the recipient to remain at home and avoid institutionalization but are not, strictly speaking, home based—for example, day-care and congregate nutrition programs. The more comprehensive term "community-based long-term care" is often used to refer to an array of services that includes both home and nonhome-based long-term care.

This presupposes a definition of long-term care. One functional answer that, although cumbersome, is useful for research and current regulatory purposes is the following:

> The long-term care population consists of all persons, regardless of age or diagnosis, who because of a chronic condition, require or receive human help in personal care, mobility, household activities, or home administered health care services. Personal care includes eating, continence, transferring (e.g., moving from bed to chair, or bed to floor), toileting, dressing, and bathing. Mobility includes walking and going outside. Household activities include meal preparation, money management, shopping and chores, excluding yard work. Home-administered health care services include injections, dressings, physical therapy, and other health care services. (Weissert, 1985a)

A simpler definition of long-term home care was proposed by the General Accounting Office: "Long-term, in-home care consists of services for the elderly who, because of chornic functional disabilities, need assistance with the basic activities of daily living" (USGAO, 1981a). However, this ignores the medical aspects of home care. For our purpose, perhaps the most useful way of dealing with the problem of definition is to recognize that the need that has been identified is to develop a system of services to maintain an individual outside of an institution. This might be called "a home care system," which would be defined as "an array of health and social services that permit an individual with an acute illness or chronic disability to remain at home." Within such a home care system, some of the services might be in-home services and others community-based. Such a system would be broad enough to include temporary institutional services necessary for respite care and structural improvements such as congregate housing.

LONG-TERM CARE AND DISABILITY

The preceding definitions of long-term in-home care rely upon the assumption that functional disability can be defined and accurately assessed. There are a variety of ways to approach the concept of disability.

A traditional, medically oriented approach is to determine the presence of a chronic disease or health condition. However, chronic illness is ubiquitous among the aged. More than 80% of the noninstitutionalized elderly surveyed in the 1979 National Health Interview Survey (HIS) reported the presence of at least one chronic condition (Eustis, Greenberg, & Patten, 1984). In the 1981 HIS almost 50% of the elderly reported the presence of arthritis. Substantial percentages also reported having cardiovascular diseases and hearing impairments (U.S. Senate Special Committee on Aging, 1984a).

But the presence of chronic illness does not necessarily imply the presence of a functional limitation. A more useful correlation is measurement of limitations in activity or mobility due to a chronic condition.

About 47% of Americans over 65 report limitation of some activity due to chronic illness (U. S. Senate Special Committee on Aging, 1984a), and 18% note that they can no longer carry on a normal (major) activity due to such a condition. By 85 years old, the percentage of elders reporting limitation doubles (U.S. Department of Health and Human Services, Health Care Finance Administration, 1981).

Limitation in activity is a helpful indicator of disability related to illness, especially job-related disability. However, tying disability to illness can be an imprecise way to determine the need for assistance in overall living supports. Many older individuals have multiple illnesses whose specific contributions to disability are hard to tease out. Therefore, more global determinations of activity limitation have been introduced that respond to these problems. These often deal in terms of dependency—the need for assistance, especially from another person, to compensate for a functional limitation—rather than disability. Although fine distinctions have been made between these terms, we shall use the terms interchangeably to refer to a functional limitation requiring the assistance of another human being (Eustis, 1984).

Two scales of functional limitation are of particular interest in long-term care. The Katz scale of Activities of Daily Living (ADL) measures six personal care functions: eating, toileting, dressing, bathing, transferring, and continence (Katz, Ford, & Moskowitz, 1963). Home management capabilities are determined through the measurement of Instrumental Activities of Daily Living (IADL) such as housekeeping, shopping, meal preparation, and financial management (Lawton & Brody, 1969). Both of these scales have achieved wide acceptance as measures of disability and have become standard assessment tools in the determination of the need for long-term care services (Kane, R. A., & Kane, R. L., 1981).

Weissert has analyzed several national surveys of the prevalence of disability using slight modifications of these criteria. These surveys permit assessment of dependency in four areas: personal care (ADL), mobility, household activities (IADL), and health services (need for assistance with such items as dressing changes and injections). According to this analysis, in 1979–1980, 5.5 million noninstitutionalized individuals, 2.6% of the United States population, were dependent in at least one of these four categories (Weissert, 1985a). If one extrapolates these data by adding the approximately 1.2 million individuals, primarily dependent in personal care, living in nursing homes in 1980, the total number of dependent individuals in the United States amounted to 6.7 million, 3.1% of the total population.

Looking at the over 65 population alone, Weissert's figures indicate

that 16.6% of the aged are dependent. Of these dependent individuals, 29% (i.e., 4.8% of the total elderly) resided in institutions, and 71% (i.e., 11.8% of the total elderly) were community dwellers. This ratio of from two to three dependent community dwellers for each one living in an institution is consistent with figures suggested by others (Doty et al., 1985; Kane & Kane, 1984; Shanas 1979a). With increasing age, the level of dependency rises substantially. One-third of persons 85 and over need help in one or more basic activities (Doty et al., 1985; U.S. Senate, 1984a).

Estimates of dependency in the United States have been made by others. They vary widely around Weissert's calculations. For the country as a whole, estimates of the dependent population range from 5.5 to 9.9 million (Doty et al., 1985; Eustis et al., 1984). For the aged specifically, Palley and Oktay's review of community surveys of disability found levels ranging from 6 to over 30% of all elderly Americans. (Palley & Oktay, 1983d).

A major factor in the substantial variation among these figures is the multiplicity of instruments that have been devised to measure functional limitation. Of the eight studies reviewed by Palley and Oktay, only two used the same scale—the OARS, a multifactorial scale in which level of ADL is only one component (Duke University Center for the Study of Aging and Human Development, 1978). The results of those two studies were quite consistent: 20–22% of elderly community dwellers met the OARS criteria for disability. The other six studies differed considerably in their methodologies and in their conclusions.

The need to reconcile these various measurements of disability might not be so compelling were it not for the fact that the determination of disability plays such a prominent role in the long-term care system. Eligibility for service may be contingent upon a certain level of disability. In rehabilitation programs, accurate measurement of disability is a prerequisite to appropriate clinical planning and outcome assessment (Jette, 1986).

Accurate targeting of long-term care services also requires adequate assessment procedures (Morris & Youket, 1981). For example, according to several studies, severe dependency correlates with nursing home admission (Greenberg & Ginn, 1979; Seidl et al., 1983; USGAO, 1977; Weissert, 1985a). Weissert's data indicated that 26% of dependent older Americans were in nursing homes. However, among those dependent in toileting and eating, 52% were in nursing homes. Among those dependent in bathing and dressing, 30% were in nursing homes. Among those dependent only in mobility outside the house or neighborhood, only 3.2% were in nursing homes (Weissert, 1985a). A General Accounting

Office (GAO) survey in Cleveland using the OARS methodology found that 87% of institutionalized individuals were greatly or extremely impaired. Only 14% of community dwellers had a similar level of disability (USGAO, 1977). Comparisons between community and nursing home residents may be enhanced by looking at the nursing home residents by level of care—skilled or intermediate. One home care population was found to have greater functional incapacity on most dimensions than nursing home residents at the intermediate care level. The home care clients were less mentally impaired, however (Eustis, 1984).

Other factors besides disability have also been implicated in predicting nursing home admission. These include poverty, living alone, being unmarried, being female, night wandering, mental impairment, and lack of social supports (Branch & Jette, 1982; Feltin, Gruenberg, Lovett, & Saltzman, 1981; Morris, Morris, & Sherwood, 1984; Palmore, 1976; Vicente, Wiley, & Carrington, 1979). It has been argued that social supports may be even more important than disability in determining nursing home admission (Butler & Newacheck, 1981), but it is likely that both factors play a major role (Morris et al., 1984).

The final reason for concern with the accurate determination of disability has to do with funding. Policymakers have an interest in determining possible correlations between the level of disability and the costs of long-term care services. In home care planning, it may be particularly important to ascertain the point at which a person is so impaired that the cost of providing services at home exceeds the cost of institutional services. Two studies in this area provide some initial answers. In its Cleveland survey of community elderly, the GAO found that 10% of noninstitutionalized individuals fell above the "break-even point."

Sager examined the question by looking at 45 hospitalized patients about to enter nursing homes—a much more disabled group, on average, than the GAO sample. Using a theoretical model to determine home care costs, he shows that a relationship between costs and disability can be constructed that predicts that up to 53% of this nursing-home-bound group could be diverted to home care at an overall cost savings (Sager, 1983b).

As noted above, the GAO study used the OARS instrument. Sager utilized a different assessment vehicle, a modification of the PACE that was felt to be less lengthy and more suited to a highly disabled, medically ill group than the OARS (Sager, 1983b). Thus, comparisons of the two studies beyond a certain level become difficult, although their conclusions—that home care is a cost-efficient modality for most disabled community dwellers and many nursing home bound individuals—are similar. We therefore see that assessment needs standardization.

In an extensive review of numerous assessment tools, Kane and Kane observe that "the field could profit by the establishment of some common, easily learned and used measure that might provide a common vocabulary for the generalist and the geriatric specialist" (Kane, R. A., & Kane, R. L., 1981). Clinical assessment tools are in need of simplification (Kodner, Mossey, & Dapello, 1983; Skellie, Favor, Tudor, & Strauss, 1982). Yet research needs require a more complex tool. These conflicting goals may require that clinical and research data be collected separately (Kane, R. A., & Kane, R. L., 1981). Nonetheless, agreement upon uniform scales for each of these broad areas would be desirable and, to the extent that information is interchangeable, would benefit researchers and providers alike.

As we have seen in this section, the interplay between disability and other factors affecting utilization of home care services may be complex. This interplay may be better understood by looking in some detail at the two broad categories of home care services: formal services, for which reimbursement is given, and informal services provided by relatives or friends without pay.

INFORMAL SUPPORT SYSTEMS

Despite the rapid growth in publicly reimbursed services, 60 to 85% of care provided to the homebound elderly is delivered by family and friends (Brody, Poulshock, & Masciocchi, 1978; Callahan, Diamond, Giele, & Morris, 1980; Liu, Manton, & Liu, 1985; Sager, Pendleton, Lees-Low, Dennis, & Hoffmann, 1982; Shanas, 1979b). This figure holds true whether the unit of measurement is helper days of care or dollar value of the services rendered (Doty et al., 1985; USGAO, 1981a). The level of support remains unchanged with increasing age, despite an increase in functional vulnerability of the "old-old" population (Morris et al., 1984). Even when formal services are engaged, the family continues to provide the bulk of the care (Greene, 1983; Sager, 1983a). Surveys of the elderly also demonstrate that 70% of the time they would turn first to informal supports for homemaker, chore, and personal care services (Tobin & Kulys, 1980).

In almost 90% of cases support services are provided by family members—spouses (if available), then children and siblings (Morris et al., 1984; Tobin & Kulys, 1980). Men, who usually become disabled before their wives, are most often taken care of by a wife. Women, who often outlive their husbands, are most likely to be taken care of by a daughter (Shanas, 1979a). The myth that the frail elderly are abandoned

by their children finds no support in current literature (Horowitz, 1985; Shanas, 1979b).

Informal supports can run the gamut from homemaking and chore tasks to personal care and assistance with health-related care. However, most commonly, caregivers seem to provide transportation, errands, shopping, and phone calls (Reece, Walz, & Hageboeck, 1983). Emotional support is another feature of informal caregiving, although emotional and/or physical exhaustion ("burnout") may have unexpected deleterious consequences for the provider (Horowitz, 1985).

In recent years policymakers have focused on the informal support system with a mixture of interest and anxiety. The anxiety stems from the fear that the expansion of formal home care support services will result in the substitution of formal, publicly financed services for the informal supports currently provided by family and friends (Spiegel, 1984). Sager, however, showed that when given the opportunity, family members construct care plans that call for less use of formal services than do professionals evaluating the same individuals (Sager, 1983b). Furthermore, one study that calculated the costs and ratio of formal and informal services showed that the percentage and dollar value of informal services rose steadily with increasing impairment of the elderly recipient (USGAO, 1977).

Current thinking has now begun to focus on strengthening the informal support system through measures such as volunteers and service credits (Sager, 1983b; U.S. Department of Transportation, 1984). Systematic efforts to provide emotional support to informal providers are also developing through programs of respite care, counseling, and publication of self-help books and guides to community services (Ragan, 1979).

GROWTH OF FORMAL HOME CARE SERVICES

The number of home health agencies certified by Medicare, the nation's largest public source of home care funding, has doubled in the past 5 years, paralleling but eclipsing the growth spurt of nursing homes that took place in the late 1960s and early 1970s (Table 4-1). More striking, however, has been the increase in costs, which have more than tripled since 1980 to an estimated $2.2 billion in 1985, although they still only totaled 3% of overall Medicare expenses (see Table 4-4). Of this 93% goes for services to the elderly (Health Care Finance Administration, 1985).

Medicaid also pays for certain home care services. Expenditures under this program have also increased more than threefold from $332 million

Table 4-4
Utilization of Medicare Home Health Services

Calendar Year	*Persons Served*	*Home Health Visits (millions)*	*Visits Per Person Served*	*Total Charges ($1,000)*	*Visit Charges (thousands of dollars)*	*Avg. Charge Per Visit ($)*	*Total Reimbursement ($million)*
1967[2]	244	—	—	—	—	—	43
1974[1]	393	8.1	21	147	137	17	141
1976[1]	589	13.3	23	312	293	22	290
1978[1]	770	17.3	23	501	474	27	435
1980[1]	957	22.4	23	771	735	33	662
1981[3]	1,080	26.2	24	—	943[5]	36	—
1982[1]	1,172	30.8	26	1,296	1,233	40	1,105
1983[1]	1,351	36.8	27	1,657	1,596	43	1,398
1984[1]	1,516	40.3	27	1,982	1,844	46	1,666
1985	—	—	—	—	—	—	2,333[4]

Sources: [1]Unpublished data. Table 1. *Trends in the utilization of Medicare home health agency services, 1974–1984.* Bureau of Data Management and Strategy. Health Care Finance Administration, 1986. [2]*Health Care Financing Program statistics. Medicare summary. Use and reimbursement by person, 1976–78.* (HCFA Pub. 03137). Baltimore, August, 1982, p. 8, 9, 18. [3]Callahan, 1985. [4]Unpublished estimate. Bureau of Data Management and Strategy Analysis, Health Care Finance Administration, 1986. [5]Figure calculated from other figures on this line.

in 1980 to $1.1 billion in 1985 (see Table 4-5). Of this total, 51% went for services to those over 65 (US DHHS HCFA OA, 1986).

The other two major federal programs that fund home care services are Title XX of the Social Security Act and Title III of the Older Americans Act. Expenditures under these programs are difficult to tease out because of the lack of detailed reports. However, analysis of these two programs in the following sections of this chapter suggests that their expenditures for home- and community-based services to the elderly can reasonably be estimated to be $1.0 billion and $0.8 billion, respectively, in 1985.

Thus, since 1974, expenditures for elderly services under these four major federal programs have risen from $340 million to almost $5 billion (Tables 4-4 and 4-5; National Association of State Units on Aging, 1985). More than 80 other federal programs plus many state programs also provide long-term care services (U.S. Senate Committee on Labor and Human Resources, 1985), and no current estimates of these expenses are available. However, a detailed analysis of long-term care expenditures by all sources and age groups in 1980 indicated that community-based care cost a total of $6.5 billion, 20% of all expenditures for long-term care in that year (see Table 4-6). If one utilizes Somers' estimate (Somers, 1985) of 12% yearly growth for community-based long-term care programs, by 1985 this figure would have risen to over $10 billion for all age groups.

The private sector contributes heavily to long-term care assistance at home. It is estimated that informal caregivers—relatives and friends of the chronically impaired elderly—provided 2 billion nonreimbursed "episodes of caregiving" in 1985 (Doty et al., 1985). Among reimbursable programs, many are directed toward short-term, posthospital follow-up

Table 4-5
Medicaid Home Care Services

Year	1972[1]	1974[1]	1976[1]	1978[1]	1980[1]	1981[1]	1982[1]	1983[1]	1984[2]	1985[3]
Recipients (thousands)	105	144	319	376	392	402	377	422	434	538
Expenditures (millions of dollars)	24	31	134	210	332	428	496	597	765	1,120

Sources: [1]*Health Care Financing Review. Health Care Financing Trends. Health Care Financing Review*, 1984, *6*, 102–105. [2]Unpublished data. *Statistical report of Medicaid care recipient payments and service, HCFA-2082.* Office of the Actuary, Division of Medicaid Cost Estimates. Health Care Finance Administration, 1986. [3]Unpublished Estimate, Office of the Actuary. Division of Medicaid Cost Estimates. Health Care Finance Administration, 1986.

Table 4-6
Formal Long-Term Care Expenditures in Hospital Care, Nursing Home Care, and Community-Based Care by Source of Funds, 1980[a] (in millions of dollars).

Source	*Hospital*	*Nursing Home*	*Community-Based*	*Total*
Medicare	1,568[b]	455	1,042	
Federal Medicaid	419	5,694	85	
Federal Title XX	—	—	809[c]	
Administration on Aging	—	—	724[d]	
Veterans Administration	1,562	359	723	
Other Federal	104	21	135	
State Medicaid	354	4,788	73	
State Title XX	—	—	420	
Other state aid	198	—	211	
Local government	—	—	17	
Insurance	902	129	740	
Business/philanthropy	29	129	162	
Consumers	209	8,869	1,377	
Total	5,345	20,444	6,518	32,307
Federal	3,653	6,529	3,518	13,700
State/Local	552	4,788	721	6,061
Private	1,140	9,127	2,279	12,546

[a]Includes all age groups. Excludes income maintenance, food stamps, and community housing assistance estimated at an additional $16.7 billion for the same long-term care population. Also excludes informal or nonpurchased care by family or friends.
[b]"Backed up" hospital patients awaiting nursing home placement.
[c]Mostly in New York and Massachusetts.
[d]Mostly for nutrition.
Source: Department of Health and Human Services, Office of the Inspector General, *Long-term care: Service delivery assessment. Report to the Secretary, 1981*, 2 vols., (unpublished). For detailed explanation of estimates see *Vol. II, Technical Report.* Reference: Somers, 1985.

of younger individuals. Of Blue Cross and Blue Shield plans, 90% offered short-term home care services in 1985 (Trubo, 1986). Insurance for long-term care is currently extremely limited, although some insurance companies are testing the concept (U.S. Senate, 1984b). Data based on a recent national long-term care survey suggest that the disabled elderly spent approximately $1 billion out-of-pocket in 1982 for home-based

care (Liu et al., 1985). This does not include expenses for durable medical equipment, which also totaled (public and private) close to $1 billion in 1982 (Williams et al., 1984).

The majority of formal home care services for the elderly are funded under Medicare, Medicaid, Title XX, and Title III. The overlapping jurisdictions of these programs often prove bewildering of the layman and professional alike. Each program has a different legislative history as well as differing restrictions and eligibility requirements (Table 4-3).

MEDICARE

Title XVIII of the Social Security Act (Medicare) has reimbursed health care services since its inception in 1966. Reflecting its focus as an insurance program, providing hospital and medical services to the elderly and disabled, Medicare reimburses part-time, skilled health care in the home. To be eligible for Medicare home health services, a person must be homebound, be under the care of a physician, who authorizes home health services, and require part-time skilled nursing care, physical therapy, or speech therapy. Once these reimbursements are met, Medicare will reimburse all of the services listed in Table 4-2 (US DHHS HCFA, 1985b).

Medicare home care services can only be delivered under the auspices of a Medicare certified Home Health Agency. The variety of agencies is shown in Table 4-7. Visiting nurse associations (VNAs) are community-based organizations, which had been supported by charities, government payments, and some fees prior to the advent of Medicare. Official county, state, and city government agencies also preceded Medicare, as did a number of hospital-based agencies. VNAs and official agencies continued to function under Medicare but with only modest changes in numbers. Hospital-based programs have grown substantially as have the new entrants to the home care field: private nonprofit and proprietary agencies.

Just as the availability of Medicaid reimbursement played a major although not exclusive role in the growth of nursing home care in the 1960s, the advent of Medicare has been a prime influence on the growth of home care. The two big spurts in growth of home care agencies coincide with amendments to the Medicare program designed to expand home health benefits. The first, in 1972, eliminated coinsurance under Medicare Part B and added home care benefits for the disabled. From 1973 to 1977 the number of home care visits increased 250% (Table 4-3). Almost all of this growth was due to increases in services to the elderly.

Table 4-7
Medicare Certified Home Health Agencies [a]

	1967[1]	*1978*[1]	*1980*[1]	*1981*[2]	*1982*[1]	*1984*[1]	*1985*[1]	*1986*[1]
VNA	549	503	511	506	520	523	525	514
Government	939	1,242	1,274	1,253	1,232	1,231	1,217	1,205
Hospital based	133	281	349	401	481	691	894	1,277
Proprietary	—	81	165	230	471	1,255	1,570	1,943
Private, nonprofit	—	309	443	520	587	719	756	832
Other	132	80	116	112	124	265	275	212
Total	1,753	2,496	2,858	3,022	3,415	4,684	5,237	5,983

[a]Figures are for January of each year except 1967 (March) and 1982–1984 (July). Some figures given in the original source as December of a given year were shifted to January of the following year for consistency. "Other" includes combined voluntary/government, rehabilitation and skilled nursing facility based, and miscellaneous agencies.
Sources: [1]Health Care Finance Administration, Bureau of Data Management and Strategy, 1986. [2]Spiegel, 1984.

The percentage of disabled beneficiaries has remained steady at 6 to 7% for over a decade (HCFA, 1985). Growth leveled off in the late 1970s but accelerated again after passage of the Omnibus Reconciliation Act (PL 46-499) of 1980. This law set the stage for an 800% increase over 5 years in the number of proprietary home health agencies by eliminating the requirement that proprietary agencies could participate in Medicare only if they were established in states that had licensure laws for proprietary agencies. Other provisions of the Act eliminated the limit on the number of home health visits, eliminated the requirement for a prior hospital stay, and eliminated a deductible charge previously paid by the beneficiary. As a consequence, the number of visits from 1980 to 1984 doubled; visits per user, which had changed little from 1977 to 1980, began to increase and total costs tripled (Table 4-4). This growth appears to be leveling off again, however (Callahan, 1985), as a result of federal pressures to reduce expenditures.

MEDICAID

Title XIX of the Social Security Act (Medicaid) provides health services to low-income persons. In 34 states, high medical expenses may qualify an individual for Medicaid (US DHHS HCFA, 1981). Although Title XIX services are administered by the states, the Federal government provides 50 to 78% of the funding (depending on state per capita income)

and sets general standards for all state programs. The Medicaid program pays for 70% of all publicly financed long-term care, primarily because it pays for long-term institutional care (Table 4-6).

Although the home health benefit originally began as an optional program with considerable state discretion in setting parameters, amendments to the Social Security Act in 1970 and 1976 plus changes introduced in the Omnibus Budget Reconciliation Act of 1981 have resulted in a program that bears a close resemblance to the Medicare home health program but without some of its restrictions (Eustis et al., 1984; USGAO, 1977). Thus, all the services listed in Table 4-2 are also available under Medicaid as long as the agency delivering them is Medicare-certified and the services are authorized by a physician. But the person receiving benefits does not have to be homebound or require skilled care to be eligible for services under Medicaid.

Thirteen states plus the District of Columbia offer personal care services as a state option under Medicaid. Such services provide assistance primarily in activities of daily living, as noted earlier, although some states have sufficiently ambiguous guidelines that services similar to homemaker and chore services may also be reimbursed. Services must be authorized by a physician and supervised by a registered nurse (US DHHS HCFA, 1981). The Medicaid program also can pay for community care options such as adult day health and foster care.

Most Medicaid home health services have been delivered in New York State. In 1984, New York State accounted for 68% of the entire United States outlay for home care services under Medicaid (US DHHS HCFA, 1985b). The bulk of this was spent in New York City. As Sager observes, "The United States then, can be thought of as having not a national Medicaid home health program, but rather a one-city program" (Sager, 1983b). Several reasons have been advanced to explain the reluctance of other states to develop Medicaid home health services: Medicaid requires state matching funds, whereas Medicare is fully funded by the Federal government; when some states have authorized Medicaid reimbursement for home health services, they have set rates so low that providers have little incentive to serve Medicaid recipients; under Medicaid rules, a person may be income eligible for nursing home care but not home care (Sager, 1983b; US DHHS HCFA, 1981; USGAO, 1981a).

The 1981 amendments to the Social Security Act (Section 2176) encourage states to expand home- and community-based services for Medicaid-eligible individuals who would otherwise be institutionalized. The details of this program will be discussed further in this chapter. The states have also devoted a substantial amount of their Medicaid home care

resources to the population under 65, although this is changing. In 1975 only 31% of Medicaid home care beneficiaries were over 65 (Eustis et al., 1984). In 1984, the figure was up to 51% (US DHHS HCFA OA, 1986).

TITLE XX

In 1975, Congress passed an additional provision to the Social Security Act, Title XX, which authorized grants to the states for social services. Title XX consolidated and expanded Federal social programs to recipients of aid for dependent children (AFDC) and supplemental security income (SSI), which had previously been provided in separate sections of the Social Security Act (Hartnett, 1986). Liberalized in 1981 and officially renamed "Title XX–Block Grants to States for Social Services (SSBG)," the program has received significant Federal funding over the years (US DHHS Office of Policy and Legislation, no date).

Title XX supports a variety of services directed primarily at low income individuals, although the 1981 Omnibus Reconciliation Act gave the states considerable latitude to set their own income eligibility criteria and eliminated specific percentage allotments to AFDC and SSI recipients. Reflecting its origin, the statute authorizes a potpourri of programs for young and old, including family planning, day-care for children, adoption services, and protective services. One of the explicit goals of Title XX is "preventing or reducing inappropriate institutional care by providing for community-based care, home-based care, or other forms of less intensive care" (PL 97-35, 1981). A number of the services authorized by Title XX help fulfill this goal, including adult day-care, transportation services, adult protective services, adult foster care, information, referral, and counseling services (PL 97-35, 1981). Specifically home-based services funded under Title XX include homemaker, home delivered meals, chore, home health aide, companionship, and home maintenance (US DHHS OPL, no date).

Until 1982, Title XX provided Federal funds under a matching grant program whereby the states provided 25% of the funds and the Federal Government 75% up to a federal limit that was fixed by Congress—$2.7 billion for 1981.

The Federal maximum allotment for each state was determined by population. New rules mandated by the Omnibus Reconciliation Act of 1981 changed the Federal contribution to a fixed amount, regardless of whether the states added any money of their own. It also reduced the Federal total by 20% to $2.4 billion for 1982, although by 1985 the figure

had grown back to the 1981 level. State contributions have varied enormously across the country. For example, in 1985, the Federal Government provided 99% of funds to be expended for SSBG services in North Carolina, whereas in Massachusetts the Federal component was only 38% of the total. Based on incomplete figures, total proposed state and Federal SSBG expenditures for 1985 amounted to over $3.8 billion (US DHHS OPL, no date).

For a variety of reasons, determining the amount of Title XX funds expended for community-based long-term care services is extremely difficult. Individual states provide social services in more than 1,000 categories. Some of these are much more likely to be considered long-term care, such as homemaker, chore, and home or congregate meal services. But there is great variation among the states as to which programs they choose to fund. Furthermore, some services that may be considered long-term care services may be provided to individuals who are not elderly or disabled, for example, homemaker services to AFDC recipients. Finally, the Omnibus Reconciliation Act of 1981 further limited the possibility of making utilization and expenditure distinctions by reducing reporting requirements and eliminating eligibility requirements, which served as a basis for gathering statistics (US DHHS OPL, no date).

Despite these limitations, one detailed analysis has been done that provides useful estimates of Title XX utilization (Cohen, 1983). This analysis indicates that, in 1980, total spending by the states and Federal government for Title XX services amounted to $3.6 billion. Of this, 55% ($2.0 billion) went for services in long-term categories. Based upon an examination of the recipient classifications, Cohen estimates that between $723 million and $1.593 billion, that is, between 20% and 44% of total Title XX expenditures, went for long-term care services to the elderly, disabled, and blind who are regarded as traditional targets of home- and community-based services.

The lower figure represents only SSI recipients, all of whom fall, by definition, into the disabled, elderly, or blind long-term care category. In fact, 70% of homemaker services, 68% of adult foster care, 57% of chore services, and 41% of home delivered/congregate meals funded by Title XX go to SSI recipients. The higher figure includes those who meet certain income criteria or other criteria. A percentage of these are also likely to be disabled or elderly but do not qualify for SSI. If all of these are added to SSI recipients, the maximum figure would be 44% (Cohen, 1983).

Other sources have suggested that Title XX funding for home care and elderly services may be at or below the 20% minimum proposed by

Cohen (US DHHS HCFA, 1981; USGAO, 1981a; U.S. Senate, 1982). The lower estimates appear to result from considering a service package limited to home-based services such as homemaker/chore or personal care.

The Omnibus Reconciliation Act of 1981 eliminated all categorical distinctions and reduced reporting requirements, so the 1980 data provided the most useful clue as to what spending and service allotments may be. If, as Cohen suggests, long-term care services are given priority in Title XX spending since 1982 and total proposed 1985 expenditures exceeded $3.8 billion, it may be plausible to assume that at least $1 billion went for home- and community-based long-term care services in 1985 (by applying a conservative 25% estimate based on Cohen's proposed 20–44% range of Title XX expenditures for long-term care services).

It is known that, in their 1985 planning reports, all states indicated that they would provide home-based services. The number of states providing other community-based services is shown in Table 4-8.

TITLE III OF THE OLDER AMERICANS ACT

In 1965, Congress passed the Older Americans Act (OAA), an attempt to introduce a coherent focus to Federal programming for persons over 60. The legislation established the Administration on Aging (Title II) and

Table 4-8
Title XX Community-Based Services to be Provided in 1985 by the States in Rank Order

Service	*Number of states*	*Service*	*Number of states*
Home-based services	55[a]	Health related services	27
Protective and emergency-adults	42	Day-care adults	26
Information and referral	37	Prevention and intervention	26
Counseling	32	Home-delivered/congregate meals	24
Special support services	30	Foster care adult	16
Transportation services	29	Housing services	13

[a]Reporting entities were 50 states, DC, and 4 eligible insular areas.
Source: US DHHS OPL, no date.

authorized it to develop and coordinate a host of services to the elderly, including community supportive service programs (Title III), research into community-based service delivery, and training for employment in the field of aging (Titles IV and V, later consolidated into Title IV). Amendments in 1972 and 1973 expanded OAA to include nutrition services and a program for the creation of multipurpose senior centers. Subsequent amendments in 1978, 1981, and 1984 consolidated nutrition and senior center programs under Title III, allowed states to have greater flexibility in administering the programs, and emphasized coordination and targeting of programs to those who are in greatest economic and social need (NASUA, 1985).

Title III authorizes a variety of community-based services for the elderly (Table 4-9). A significant number of these services are home-based. Some duplicate services provided by Medicare, Medicaid, or Title XX, but others, such as letter writing, escort, reader services, telephone reassurance, and Alzheimer's support services, are unique to Title III. In 1984, in-home homemaker, home health aide, chore, maintenance, telephone reassurance, and other supportive services benefitted a total of 2.4 million persons. Of this total, 40% was telephone reassurance. Some individuals may have received more than one service (US DHHS Administration on Aging, 1985). Like Title XX services, there is no requirement that the recipient be homebound or have a physician's authorization for services.

The Federal Government funds 75% of administrative costs and 85% of service costs of Title III programs. The states pay the remaining expenses and administer the program through the State Units on Aging and local area Agencies on Aging.

In 1985, Federal authorizations for Title III community-based services amounted to about $756 million (USGAO, 1985b). As with Title XX, sorting out the expenditures that went for formal in-home services is difficult. The GAO estimated the figure to be 15% in 1981 (USGAO, 1981a). However, this figure does not include home-delivered meals. The Title III nutrition program is a major source of regular meals for older Americans. In 1980, 168 million meals, congregate and home-delivered, were served to 2.9 million persons—about 8% of the elderly. By 1984, the figures had grown to 216 million meals served to 3.5 million persons. One-third of these meals went to 600,000 homebound elderly (US DHHS AOA, 1985). Since $430 million was authorized in 1985 for Title III nutrition services (USGAO, 1985c), including home-delivered meals as a home-based service raises the overall percentage allocated for in-home services to about 30% of Title III authorization for community-based services.

Table 4-9
Older Americans Act Community-Based Services

Services to facilitate access
Transportation
Outreach
Information and referral
Client assessment and case management
Services provided in the community
Congregate meals
Multipurpose senior centers
Casework, counseling, emergency services
Legal assistance and financial counseling
Adult day care, protective services, health screening
Housing, residential repair, and renovation
Physical fitness and recreation
Preretirement and second-career counseling
Employment
Crime prevention and victim assistance
Volunteer services
Health and nutrition education
Transportation
Services provided in the home
Home health, homemaker, home repairs
Home-delivered meals and nutrition education
Chore, maintenance, visiting, shopping, letter-writing, escort, and reading services
Telephone reassurance
Altzheimer's family supportive services.

Source: NASUA, 1985.

OVERALL USE OF FORMAL SUPPORTS

There is enormous state-to-state variability in the use of home care services funded by the four major federal programs. One study, analyzing 1977 data, noted that North Dakota makes virtually no use of Medicare and Medicaid or Title III services but is among the top ten states in the number of recipients per thousand elderly of homemaker services through Title XX (Palley & Oktay, 1983c). New York State had a negligible number of recipients of services under Title III and Title XX, significant use of Medicare, and a substantial reliance on Medicaid for home health services. The figures also bear little relation to the numbers of chronically ill in the states—72% of Title III homemaker and home health recipients are found in only three states (New York, Connecticut,

and Pennsylvania), which together accounted for only 16% of the national disabled elderly population (Palley & Oktay, 1983c).

Finally, a number of states support very substantial home care programs through state funds. For example, in fiscal year 1985, Massachusetts spent almost $90 million on home care services for the elderly. Of these expenditures, 62% were for homemaker services, but the state also funded other services such as personal care, home-delivered meals, and chore services. In addition, Massachusetts supports an elderly lunch program, congregate housing, and respite care. The total expenditures for all these Massachusetts-funded programs in fiscal year 1985 was almost $100 million, more than Massachusetts Title III, Medicaid home care, and Title XX expenditures combined (Massachusetts Executive Office of Elder Affairs, 1985; *Massachusetts Governor's Budget*, 1985).

Beset with this multiplicity of funding mechanisms, individual community agencies often cope by putting together a program that may have components from a half-dozen different sources. For example, a typical senior center in Boston operates nutrition sites and provides home-delivered meals by using Title III and state funds. It provides adult day health services under Medicaid and private reimbursement and social day care with state funds. A site for homeless individuals is funded with state and Title III funds. Medical services are obtained from an adjacent neighborhood health center with reimbursement under Medicare and Medicaid. Finally, transportation to connect all these activities is supported by city, state, Title III, and Title XX funds, depending on the use to which the transportation is put (Gleason, 1986).

MEASURING THE UTILIZATION OF HOME CARE

Many states fund home care services. In addition, the Veterans Administration has developed a system of home- and community-based long-term care programs (MacAdam & Piktialis, 1984; USGAO, 1981b). A host of other federal programs exist as well (U.S. Senate Committee on Labor and Human Resources, 1985).

Thus, figures based solely on data for the four major Federally funded programs will underestimate the total utilization of home care services. Unfortunately, Federal utilization figures are also not entirely reliable because of the inability to differentiate overlapping utilization across programs and variations in state counting methodologies, among other problems (Palley & Oktay, 1983d). Until more uniform methods are established, measures of home care utilization will remain imprecise.

OVERSIGHT

Assuring quality in the delivery of health care services is a formidable and complex task. Many of the issues remain as knotty as they were a decade ago when Greene pointed out some of the challenges in the field:

> Much of the literature in the quality assurance field focuses on the problem of measuring quality (quality assessment) as opposed to assuring or controlling the quality of medical care . . . Much less information is available on the problems of measuring quality in such areas as nursing care, chronic illness and the care aspects of medicine . . . Information is extremely limited in the crucial area of what can be done to improve suboptimal performance of providers and consumers of medical care. (Greene, 1976)

The unique features of long-term care settings add additional complicating elements, which need to be considered. The recipients of long-term care are usually fragile and dependent. They may have difficulty expressing their needs and have limited resiliency to recover from illness when their needs are not met in a timely manner. The inexorable progression of chronic illness complicates efforts to determine the impact of a treatment or intervention.

Home care settings, in particular, are isolated with relatively infrequent visits by health care providers to monitor care. The impact of informal caregivers is often hard to measure and can complicate assessment of the intervention of health care providers. (U. S. Department of Health, Education, and Welfare, 1976).

The classical standards of reference—structure, process, and outcome (Donabedian, 1966)—may have serious limitations in long-term care. Measures that focus on structure and process, such as organizational arrangements and technical compliance with guidelines, have been faulted for focusing on paper at the expense of patients (National Citizens' Coalition for Nursing Home Reform, 1985). Measurements of patient outcome may be confounded by the progression of chronic diseases.

Quality assurance efforts in home care have generally been directed toward measurements of process (Spiegel, 1984). A typical assessment involves review of a medical chart to determine if services seem appropriate and have been properly authorized (Joint Commission on Accreditation of Hospitals, 1985; Massachusetts Department of Public Health, 1983). The organization and administration of a home care agency may also receive scrutiny. Since Medicare is the largest purchaser of home

care services, the guidelines of the Medicare conditions of participation often serve as minimum criteria for quality assurance programs (US DHEW US DHHS-HCFA, 1985c). Such structural approaches have been criticized for having inconsistent standards (Trager, 1980).

An adjunct to the general problem of determining quality in home care settings is the question of whether the type of organizational arrangement of home care services has any impact on the quality of the services delivered. Some investigations have uncovered evidence of questionable financial practices by private nonprofit and proprietary agencies, including excessive administrative salaries, high-cost fringe benefits, cost-shifting, and other abuses (Stewart, 1979; USGAO, 1979b, 1981a). However, it appears that there is little evidence that proprietary agencies actually provide worse care (Warhola, 1980). Another study suggests that hospital-based home care patients require greater intensity of care than patients in community-based programs and that the costs of such care are higher (Balinsky & Rehman, 1984). However, no comparisons of quality were made, and the subject remains open for further research.

In recent years, more effort has been expended in the evaluation of outcomes and patient-focused measures of quality. This approach has been particularly emphasized in proposals to change federal survey regulations for long-term care facilities. Surveyors will be required to focus more directly on observing actual care received by individual patients and use information supplied by residents to determine if their needs are being met (Federal Register, 1985). Home care monitoring organizations have also begun to focus on outcome-oriented procedures but still rely on a format that emphasizes review of documentation supplied by the home health agency to determine the impact of an intervention (Berner, 1986).

Another approach to outcome-oriented quality assurance with promise for home care is the concept of sentinel health events. Sentinel health events were originally described by Rutstein as "airplane crashes in health"—cases of unnecessary disease and disability in the general population that could have been prevented (Rutstein, 1976). The concept has recently been tested in nursing home settings in New York State (New York Department of Health, 1982). Although the homebound elderly and disabled usually have multiple problems, unsatisfactory outcomes are often readily identified through emergency room visits and hospitalizations. These may serve as a focus for detailed stepwise analysis of failures in the system that led to the admission (Beth Israel Home Care, 1986).

Whether survey procedures for other long-term care settings can be usefully transposed to meet the special requirements of home care remains one of the many questions that will occupy those who work to

improve quality assurance procedures for home care. Analysis of testimony given at Federal hearings on home care reveals that interest in increased and improved quality assurance standards was the issue raised most often by witnesses (US DHEW, 1976).

Developing techniques to respond to such concerns remains an important area for needed research (Skellie et al., 1982). But how this will be done remains an open issue for home care professionals. The state of the art is probably best summed up in the words of one observer who noted "tools to measure the quality of home health care services are mostly in the development stage" (Stewart, 1979).

MATURING OF THE HOME CARE CONCEPT

By the early 1970s, evidence was accumulating that home care was an appropriate and effective health care modality (Hammond, 1979; Hughes, 1985; Seidl et al., 1983). A number of studies indicated that early hospital discharge programs reduced hospital length of stay and saved considerable amounts of money. Many of these studies were uncontrolled and typically relied on estimates by physicians of how long patients would have remained in the hospital if early discharge were not available (Hammond, 1979). However, several controlled studies, including one utilizing random assignment, also showed positive results.

These studies focused on middle-aged to young-old clients recovering from an acute episode such as surgery or a stroke. The results showed that a well-targeted home care program could not only reduce hospital length of stay and save money but also result in a quicker return to normal function and, in the case of the stroke program, reduce mortality (Bryant, Candland, & Lowenstein, 1974; Gerson & Berry, 1976; Gerson & Collins, 1976; Mitchell, 1978).

The publication of these studies contributed to a general enthusiasm for home care among insurers and government officials (Spiegel, 1984). Blue Cross and others included limited home care benefits in some policies, and Congress liberalized home care legislation as noted above. At the same time, however, concerns surfaced concerning the special needs of the elderly. Older Americans have complex disabilities, not discrete illnesses. They require an array of support services, some of which are authorized by existing legislation. However, as we have seen, each of the four major Federal programs has a different focus. Each provides different, sometimes overlapping, benefits. Eligibility criteria vary. Lack of good communication between providers of different services makes responses to changing client requirements sluggish. Some

services are unavailable under any of the programs (Kane, R. L., & Kane, R. A., 1981; USGAO, 1977; Zawadski, 1983a). Income ceilings have a bias toward institutional care (USGAO, 1979a). The average older person in need of assistance is overwhelmed by the lack of information and the fragmentation of services (Figure 4-1).

Policymakers responded to this situation by proposing changes in Federal laws and regulations to encourage the development of coordinated community-based services of the elderly and disabled (Kistin & Morris, 1972). The GAO noted in 1977 that "services are available through so many different programs that effective coordination and delivery of home health and other in-home services seems close to impossible . . . HEW should promote the establishment of a comprehensive single-entry system by which individuals are assessed as to their needs prior to placement in a program" (USGAO, 1977).

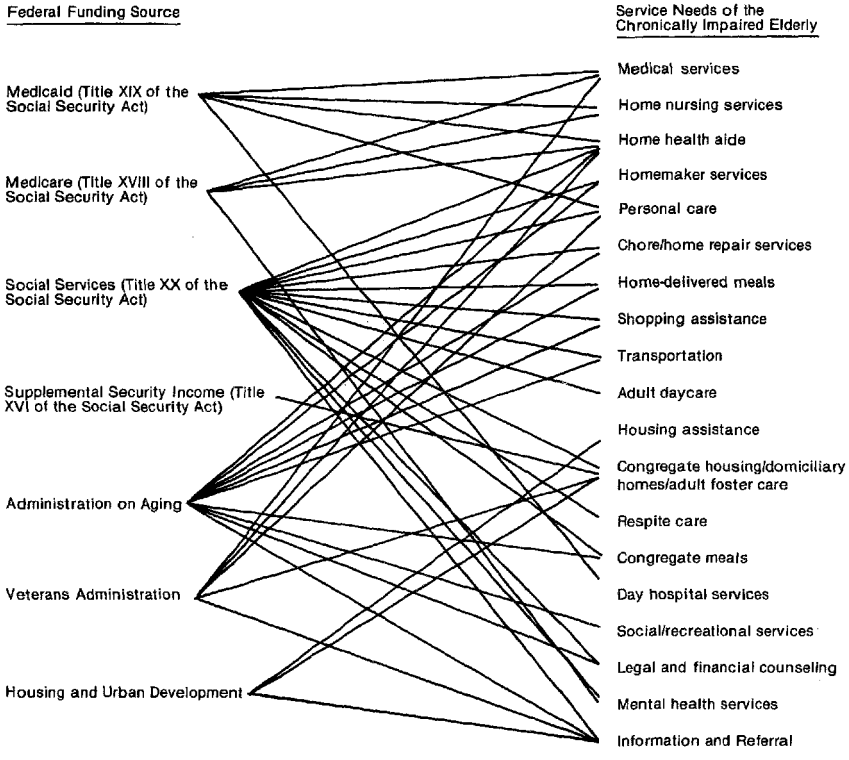

Figure 4-1. Federal funding sources and services for the elderly.
Source: USGAO, 1979a.

The Federal mechanism chosen to facilitate the development of these community-based long-term care programs was the utilization of waivers to Medicaid and Medicare regulations to permit coverage of expanded services and service coordination. Such programs came to be identified by the sections of the Social Security Act that authorized the waivers—Section 1115 for Medicaid waivers and Section 222 (introduced in 1972) for Medicare waivers.

Among the early experiments under Section 222, waivers were relatively narrowly focused demonstrations to measure the effects of adult day health and homemaker services in preventing institutionalization and reducing costs. "The major policy issue of concern in these 222 projects was whether Medicare should cover adult day health and/or homemaker services" (Piktialis & MacAdam, 1984). While adult day health care was shown to reduce nursing home admissions and homemaker services improved longevity, satisfaction, and functioning of recipients, the total costs of these services were increased over those for controls (USGAO, 1982b; Piktialis & MacAdam, 1984). Medicare policy remained unchanged.

Subsequently, attention turned to more comprehensive approaches, emphasizing service coordination or case management. Under this model, a single agency serves as the point of entry for anyone desiring long-term care services. The agency carries out assessment of the client's needs and certifies the individual as meeting the eligibility criteria for the program. The case manager, often with assistance from an interdisciplinary team, develops a care plan. The case manager then arranges services by contacting various providers as well as coordinating with the client and informal providers ("brokerage"). Finally, the case manager monitors the client's progress and modifies the care plan and service package as necessary (Beatrice, 1981).

Most case management programs include intake, assessment, care planning, service arrangement, and monitoring. There is, however, variation among programs in the degree of professionalization and specialization of the case manager. Social workers, nurses, and nonprofessionals are used in different settings. All five case management functions may be allocated to a single individual or divided among various staff (Capitman, Haskins, & Bernstein, 1986). Some case management functions may even be assigned to an outside agency (Eggert & Brodows, 1983; Skellie et al., 1983). Whether these various configurations of case management functions have any impact on the success of community-based long-term care projects is unclear, though Capitman speculates that other factors such as client selection may be at least as important (Capitman et al., 1986).

Table 4-10
Characteristics of Nine Typical Community-Based Long-Term Care Demonstration Projects[a]

Project	*Goals*	*Period*	*Age*	*% ADL Limited*	*Auspices*	*Eligibility*	*Cost Cap*
ACCESS[1]	Reduce NH use Reduce AHD Cost effective	1978–	85% > 65 34% > 85	85%	PNP	NH applicant Medicaid (Medicare)	75% NH Cost
Georgia[2]	Reduce NH use Cost effective	1976–80	90% > 60	95%	State	NH eligible Medicaid	Guidelines
South Carolina[3]	Reduce NH use Cost effective	1980–84	Mean 75	95%	State	NH applicant Medicaid (Medicare)	75% NH Cost
NYC Home Care Project[4]	Reduce NH use Increase HC use	1980–84	All > 65 24% > 85	95%	City	ADL impaired Medicare	20 hr/wk HM/HHA
NH Without Walls[5]	Reduce NH use Increase HC use	1980–84	Mean 77	76% SNF Level	State	NH eligible Medicaid	75% NH Cost
Project OPEN[6]	Reduce NH use Reduce hosp use Increase HC use	1978–83	Mean 80	50%	Hospital	Non-Medicaid Medicare	Guidelines

On Lok[7]	Test consolidated care model	1978–	94% > 65	90%	PNP	NH eligible Medicare (Medicaid)	Prospective capitation
Triage[8]	Cost effective Improve fxn	1974–81	All > 60 58% > 75	83%	PNP	NH risk Medicare	Copayment
Chicago[9]	Test Hosp/PNP model	1977–79	Mean 80	99%	Hospital PNP	Medicare	

[a]%ADL limited Percentage of sample requiring assistance in at least one of the activities of daily living; NH, nursing home; AHD, administrative hospital days; HM/HHA, homemaker/homehealth aide; HC, home care; Fxn, function; PNP, private nonprofit; Hosp, hospital. ACCESS Medicare (222 waiver) component implemented in 1980; South Carolina Medicare (222 waiver) component implemented in 1983; On Lok Medicaid component implemented in 1983.

Sources: [1]Eggert & Brodows, 1983; USGAO, 1982b. [2]Skellie et al., 1983; Skellie et al., 1982. [3]Nocks et al., 1986; Capitman, 1986. Blackman et al., 1985; Brown and Learner 1983. [4]Capitman, 1986; Horowitz et al., 1984; Brill & Horowitz, 1983. [5]Capitman, 1986; Birnbaum, Baumer, Pratter, & Burke, 1984; Kodner et al., 1983. [6]Capitman, 1986; Sklar & Weiss, 1983; Weiss & Sklar, 1983. [7]Capitman, 1986; Ansak & Zawadski, 1983; USGAO, 1982b. [8]Quinn & Hodgson, 1983; Quinn, Segal, Raisz, & Johnson, 1982; USGAO, 1982b. [9]Hughes, Cordray, & Spiker, 1984.

Operating under Section 222 or 1115 waivers, numerous demonstrations of community-based case management programs were mounted in the past decade. Some examples of these are summarized in Tables 4-10 and 4-11. Based on optimistic projections from the highly focused early hospital discharge studies noted earlier, most of these programs set out to show that nursing home or acute hospital utilization and costs could be reduced by proper coordination of any array of community-based long-term care services. These included health benefits traditionally offered under Medicaid and/or Medicare as well as a host of other social services that seemed appropriate for assisting an individual to remain in the community (Table 4-12).

Not all of these services are in-home services—day-care, for example. Not all services were offered by all programs. Since most case-management agencies brokered their services, they were dependent to some degree on what was already available in the community. A major exception is OnLok in San Francisco, which developed, funded, and controls most of its own services much like a Health Maintenance Organization (Ansak & Zawadski, 1983).

As compared to earlier home care studies, community-based long-term care demonstrations were targeted toward the elderly. Most clients were over 60 years old, and several programs had substantial numbers over 85 years old. Most clients were significantly limited in activities of daily living. ACCESS and South Carolina Community Long-Term Care selected their clients only from the pool of applicants to nursing homes, although others such as the Georgia Alternative Health Services Project (AHS), OnLok, and the Nursing Home Without Walls required eligibility for nursing home admission by the standard criteria within their states. In most cases, nursing home eligibility correlated with a high level of impairment in both ADL and other measures of disability (Capitman, 1986). Project OPEN, which was geared to a Medicare-eligible, non-Medicaid recipient population, had a considerably lower level of disability at entry, as did Triage, which also focused on a Medicare-eligible population.

Sponsorship of the different programs varied. In New York, South Carolina, and Georgia, state officials, policy advisors, or legislators were instrumental in developing programs that were then administered at the state level (South Carolina and Georgia) or by delegation to selected providers (New York, Nursing Home Without Walls). In other states, private nonprofit organizations initiated their own programs, as did hospitals. In Chicago, a joint venture was developed between five hospitals, which then spawned a community-based nonprofit corporation to carry out the program.

Table 4-11
Research Design and Outcomes of Nine Typical Community-Based Long-Term Care Demonstration Projects [a]

Project	*Control Group*	*NH Use*	*Hospital Use*	*Costs*	*Satisfaction*	*Survival*	*Fxn*
ACCESS	Comparison	—	>[e]	<[e]			
Georgia	Random	—	—	>	>[b]	>[b]	—
South Carolina	Random	<	—	<[e]			
NYC Home Care Project	Comparison	—	—		>	—	—
NH Without Walls	Comparison	<	—	<>[c]	>	>	>
Project OPEN	Random	—	—	<[d]	>	—	>
On Lok	Comparison	—	—	<[e]	>[e]	—	
Triage	Comparison	—	>[e]	>[e]	>[e]	>[e]	>
Chicago	Comparison	<	—	>	>	—	<

[a]See Table 10 for abbreviations and sources. —, no significant difference in outcome; >, significant increase; <, significant reduction.
[b]Satisfaction and survival were statistically significantly increased at one year but exhibited only a positive trend at two years.
[c]Costs were reduced for upstate New York State enrollees but increased for New York City enrollees.
[d]Costs were significantly reduced at six months but showed only a negative trend subsequently.
[e]Trend only.

Table 4-12
Examples of Expanded Home Care Services Offered by Community-Based Long-Term Care Demonstration

Medicaid 1115 Waiver	*Medicare 222 Waiver*
Case management	Case Management
Friendly visits	Prescription drugs
Heavy chores	Transportation (nonmedical)
Respite	Recreational therapy
Housing assistance	Financial management
Movement assistance	Congregate meals
Social transport	Home delivered meals
House improvement	Adult day health
Adult foster care	Homemaker
Relaxed financial eligibility for home care	Dental care
Boarding house	Companion service
Congregate living	
Adult day rehabilitation	
Medical day care	
Home-delivered meals	
Personal care	
MSW	
Nutrition	
Social day care	

Source: 1. Zawadski, R. (Ed.). (1983). Community-based systems of long-term care. *Home Health Care Services Quarterly, 4,* 1–247. 2. Quinn et al., 1982.

Responding to anxieties about unrestrained utilization of services, many of the programs developed utilization limits of various types—from monetary cost caps to service limits (see Table 4-10). Triage instituted a system of suggested copayments that brought in almost $400,000—10% of the cost of waivered services—during its last 3 years. OnLok operates with the traditional cost reduction incentive of an HMO—financial risk to the provider.

The results of many community-based long-term care projects have become available in the past 5 years through final project reports, journal publication, and a number of secondary analyses (Capitman, 1986; Hughes, 1985; Piktialis & MacAdam, 1984; Seidl et al., 1983; USGAO, 1982b; Weissert, 1985b). Table 4-11 summarizes results of a cross section of many of the more extensively reviewed projects. In only a few were the participants fully randomized. Usually a comparison group was constructed, typically in an adjacent county or section of town.

The results indicate that, in most cases, nursing home and hospital utilization were not reduced. However, this was not a universal finding. Two of the nonrandomized projects (Nursing Home Without Walls and Chicago) showed significant reductions in nursing home use. The South Carolina Community Long-Term Care Program (CLTC), a carefully randomized study, also showed a statistically significant reduction in nursing home admissions (Nocks, Learner, Blackman, & Brown, 1986; Blackman, Brown, & Learner, 1985). A major reason for CLTC's result was the careful targeting of participants, all of whom were chosen from a group of Medicaid-eligible individuals who had already applied to nursing homes rather than simply meeting eligibility criteria for nursing home admission. As a consequence, after 18 months, 59% of controls were in a nursing home, compared to 43% of experimentals (Nocks et al., 1986)—both far higher percentages than in any other study reviewed. In general, the community-based long-term care projects do not appear to significantly reduce costs (Table 4-11). Again, there are exceptions, but these occur consistently only among the nonrandomized groups.

On the other hand, several studies have shown increased survival—including the Section 222 homemaker studies, the Nursing Home Without Walls, and the Georgia Alternative Health Services Project in its first year. Physical and mental functioning is reported as improved in a number of studies. Finally, participant satisfaction consistently increases in the majority of studies reviewed here, as well as studies reviewed by others (USGAO, 1982b). The GAO concluded its review of a number of studies by observing that "clients receiving these services are more satisfied with their lives than others who do not receive them."

Why the demonstrations of expanded home health care did not achieve more impressive cost savings or reductions in utilization of institutional services has been a matter of considerable discussion. A number of critiques have focused on methodological issues, including the following:

1. Noncomparability of sites or control groups (Hughes, 1985; Seidl et al., 1983; USGAO, 1982b).
2. Low rates of institutionalization, ranging from 2.1 to 23% of control subjects in one review (Weissert, 1985b). As a result, differences between rates of admission to nursing home of experimentals and controls were hard to detect due to the infrequency of the event (USGAO, 1982b). From a cost standpoint, home care became an add-on, since the majority of community care recipients were not at risk of institutionalization (Weissert, 1985b). In the one randomized study that showed a statistically significant reduc-

tion in institutionalization, screening criteria were sensitive enough to capture a greater than 40% overall need for nursing home use (Nocks et al., 1986).

3. Selection bias. In one study, the waiting list for experimentals averaged a year in length (USGAO, 1982b). In another, there was a large attrition in the experimental group (Seidl et al., 1983). The most disabled were left out of several studies (USGAO, 1982b).
4. Incomplete data base. One medical study used only Medicaid data and not Medicare hospital utilization data (USGAO, 1982b). There was a great heterogeneity of data collected across the different studies, making comparison difficult (Capitman, 1986; Hughes, 1985)
5. Some study periods were felt to be too short, allowing for insufficient steady state function and efficiency (Hughes, 1985; Seidl et al., 1983; USGAO, 1982b; Zawadski, 1983b).
6. Excessive screening and unit costs were noted, due to limited numbers of community dwelling elderly in the high risk groups for institutionalization (Weissert, 1985b).
7. Imprecise targeting was also faulted (Seidl et al., 1983; Hughes, 1985). A number of programs selected participants with relatively limited levels of impairment (Capitman, 1986; Hughes, 1985), predisposing to low institutional use in both experimental and control groups. This observation is really a variant of issue 2.

In an effort to respond to these criticisms, a national multisite study was designed to measure the efficacy of case managed community-based long-term care. The National Channeling Demonstration was a 10-state research project involving over 5,000 persons sponsored by the Health Care Financing Administration. Participants were randomly assigned to experimental or control groups. Eligibility criteria were carefully designed to select a Medicare population, impaired in at least two ADL or IADL, and with two unmet needs for 6 months. A total of 99% reported having some IADL impairment and 84% some ADL impairment. The program tested two models of community care—one with basic case management services and a second with case management and financial control over community services. Participants were followed for 18 months. Results have recently been reported (Kemper et al., 1985). At 18 months

- The financial control group had significantly more community service visits than its control group. The basic service group had no difference in visits.

- Community care, basic or extensive, had no significant impact on hospital or nursing home utilization at 6 and 18 months.
- Mortality rates were no different for either experimental group at 18 months.
- Client satisfaction was statistically higher at 6 and 12 months for the two case management groups but there was no difference at 18 months.
- Overall costs were slightly higher for experimentals compared to controls, primarily reflecting the effects of case management expenses (Kemper et al., 1985).

Thus, the results of the most extensive case management study to date seem to reinforce the prevailing pattern. Case management, as currently constituted, does not appear to have a consistent impact on utilization of nursing homes or acute care facilities, nor has it thus far been shown to reduce costs. What then are the lessons to be drawn from a decade of research into case-managed community-based long-term care?

Perhaps the single most important conclusion is that the effectiveness of the system in achieving its goals will depend heavily upon what types of individuals are targeted. If the goal is to divert nursing home admissions, then the program must be directed only at nursing home applicants. Even the National Channeling Demonstration failed to meet this targeting goal (Weissert, 1985b). The South Carolina CTLC demonstration results suggest that nursing home use can be significantly reduced when mandatory screening of nursing home applicants is employed (Nocks et al., 1986). The state of South Carolina has chosen to continue this program after its research phase has been completed.

Other community-based long-term care projects continue to function as well, sometimes in modified form, suggesting that significant elements of these programs have gained acceptance beyond the demonstration stage (e.g., Georgia, Project Open, Triage, and the New York City Home Care Project). The popularity of these programs, despite equivocal evidence of their effect on institutionalization, highlights a question that increasingly is raised: Should diverson of highly disabled nursing homebound individuals be the raison d'être of community-based long-term care or the measure of its success (Capitman, 1986; Zawadski, 1983b). Weissert observes that there are 3.5 million elderly individuals who are dependent in various activities or who have unmet needs for health care services but who neither need nor want nursing home care (Weissert, 1985b).

Creative proposals for meeting the care requirements of this large group of individuals need to be devised. Some are now beginning to

emerge. They emphasize encouragement of the informal support system (Sager, 1983a; Weissert, 1985b) and careful matching of the intensity of service to the level of disability (Morris et al., 1984; Ruchlin & Morris, 1983). This area remains ripe for fertile study, since some observers have diametrically opposed recommendations for service allocation based on the presence or absence of informal supports. Hughes argues that frail, impaired elderly with limited or exhausted social supports should receive priority for home care services (Hughes, 1985). Morris and Sherwood suggest that such individuals, lacking an informal support system, are in an untenable position with regard to their ability to continue to live in the community. They achieve the lowest score on Morris and Sherwood's Community Support Potential Assessment Index and presumably would be institutionalized rather than receive formal home support under such a rating system (Morris et al., 1984). Zawadski argues that community-based long-term care sites can serve as community laboratories to test such hypotheses (Zawadski, 1983).

British specialists have also developed interest in case-managed long-term care. Workers have a good deal of discretion in allocating their budgets and may, for example, develop day-care programs in the homes of helpers and clients or recruit "quasi-volunteer" helpers when appropriate. Cost-caps are included as a safeguard (Davies, 1985). Impressive results have been reported in the Kent Community Care Project. Compared to matched controls, the probability of entering a long-term care institution is halved in the first year. The probability of death is also halved over the first year with maintenance of the difference over the subsequent 3 years. Other results include improvement in the quality of life of both recipients and informal care givers and improved retention of functional status. Costs were unchanged. "Community care increased the costs due to admissions to day beds and acute beds as much as it reduced the costs due to admission to long-stay beds." Social services costs were reduced or unchanged (Davies, 1985).

Finally, the value of case-managed community-based long-term care has also been recognized by Congress, which included a provision in the 1981 Omnibus Reconciliation Act to expand home- and community-based services by authorizing an amendment to the Social Security Act, Section 2176. By waiving certain Medicaid requirements, Section 2176 permits states to offer an array of services that a Medicaid-eligible individual needs to avoid institutionalization. (US DHHS HCFA OA, 1985).

By March 31, 1984, 35 states had one or more approved waiver programs. The aged and disabled were most commonly targeted. A host of services offered by the different states include a selection of many of

the services listed in Table 4-12. The most frequently offered service was case management. Other commonly available services include respite care, home health aide, homemaker, and adult day-care. Payments to providers of services can come from Medicare, Medicaid, state and local governments, or the recipients of the services. Strict Federal guidelines require that costs of the program do not exceed institutional costs.

Another innovative mechanism to assist disabled elders to remain at home is congregate housing. It has been suggested that two-thirds of the elderly with chronic functional dependencies could live out their lives with the level of assisted independent living provided by congregate housing and that the cost benefits of such an arrangement would be highly favorable (Heumann, 1985). Another study indicated that congregate units can substitute for some nursing home beds at a considerable savings (Massachusetts Governor's Budget Recommendations, 1985). Despite these studies and suggestions by policy analysts for further exploration in this area (Dunlop, 1980b), Federal support for housing services has markedly diminished over the past 5 years (Massachusetts Governor's Budget Recommendations, 1986).

The evaluations of all of these approaches will require a new look at techniques of patient assessment and outcome (Weissert, 1985b; Hughes, 1985) and a willingness to explore novel ways of providing care. The Social Health Maintenance Organization is one such approach.

SOCIAL HEALTH MAINTENANCE ORGANIZATION

The Social Health Maintenance Organization (S/HMO) is designed to provide comprehensive integrated health and social services to the elderly by combining features of the health maintenance organization with improved case management (Berman, 1981; Diamond, Gruenberg, & Morris, 1983; Kodner, 1981; Leutz et al., 1985).

The S/HMO resembles an HMO in that all necessary services are available on a prepaid basis and are provided or arranged by a single organization. Unlike an HMO, the service package is not limited primarily to short-term ambulatory and institutional services. Rather, through centralized case management, the full array of social and long-term care services currently provided through the fragmented system described earlier would be available to all enrollees.

Unlike the community-based long-term care demonstrations, the S/HMO will not focus simply on the frail elderly but will deliberately be marketed to a spectrum of the elderly population. The premise of this arrangement is twofold: first, replace expensive institutional services with

outpatient and home-based services; second, utilize the HMO model to buffer the increased costs of caring for the more disabled individuals through savings realized from efficient management of the healthier enrollees. Actuarial analysis underlying the S/HMO suggests that the savings will more than cover the additional costs of case management and increased social services as long as the enrollee population is not so heavily weighted with very frail elders that the cost savings evaporate. However, experience in risk-based insurance mechanisms for the elderly is not extensive, and the S/HMO incorporates some limits on coverage for lengthy nursing home stays.

Financing is drawn primarily from Medicare and Medicaid funds plus a private premium that is competitive with Medex or other supplementary insurance plans. Some sites have also integrated other government funding such as Title III and Title XX monies.

The S/HMO concept is potentially a very attractive answer to many of the difficulties facing the elderly who try to obtain adequate home- and community-based services. The current demonstrations at four sites around the country will gather information about marketing and enrollment strategies, organizational integration, provider incentives, and financial feasibility, which are critical to success of the S/HMO concept.

Results of the S/HMO demonstration will be awaited by policymakers concerned with community-based care. HMOs, which have traditionally underserved the elderly, are also likely to have an interest in what can be learned from a prepaid health care model geared to those over 65.

HOME CARE: PRESENT STATUS AND FUTURE DIRECTIONS

In 1986, a coherent national policy for long-term care remains elusive. It is therefore particularly difficult to place the role of home care in a comprehensive perspective. Nonetheless, the accumulating experience of the past decade offers valuable background for future decisions.

What is perhaps most impressive is the sheer growth of home care services. In 1984, home health agencies made almost 40 million Medicare reimbursed visits, an increase of 20% per year since 1980. Home health care (for young and old) was a $6.4 billion industry in 1984, and this figure is expected to triple by 1990 (Trubo, 1986). Looking at the disabled elderly, if both home- and community-based services are included, a conservative estimate of total costs would also exceed $6 billion. Surveys of the elderly continue to show a widespread preference for home- or community-based services as opposed to institutionalization.

Furthermore, despite the mixed record of community-based long-term

care demonstrations in reducing costs, a number of the demonstrations were effective in improving function and client satisfaction. Some were successful at reducing death rates. The one study that most rigorously pursued the nursing-home-bound population showed that it may indeed be possible to divert these individuals away from institutionalization in a cost-effective manner.

It is also clear that their families would welcome the opportunity to keep their disabled elders at home if services were only available, and that they try extraordinarily hard to maintain them at home even in the absence of adequate formal supports. The myth of abandonment has been shattered in the past decade.

The agenda for the near future is dictated by a number of considerations. Continued growth of the elderly population will produce an estimated 6.3 to 9.3 million older Americans in need of long-term care by the year 2000 (Manton & Soldo, 1985; U.S. Senate Special Committee on Aging, 1984a; Weissert 1985b). Only 2.0 to 2.3 million are likely to be in nursing homes (Russell, 1981; Weissert, 1985b). If the remainder are to be adequately served, home care programs will need to be considerably expanded.

But expansion of existing programs will only perpetuate the problems of existing programs: fragmentation of services and inadequate targeting. It has been clear for some time to observers of the long-term care scene that new methods need to be found to alleviate the current fragmentation of services (Master et al., 1980; Morris, 1980). At present, two major payors of long-term care services, Medicare and Medicaid, are pursuing long-term care policies diametrically opposed to each other. The states, faced with rising Medicaid expenditures, have instituted policies that have drastically reduced the growth of nursing home beds. At the same time, Medicare, never conceived of as a long-term care provider in the first place, has instituted rigorous home health claims review procedures that have enormously increased paperwork and left many frail home-bound elderly in the predicament of being rejected if they are too acutely sick for service or cut off at 3 weeks if they become healthy enough to require only chronic service (*Home Health Line*, 1985). Hospital incentives for early discharge under diagnosis-related guidelines have simply aggravated the situation.

Today, several initiatives have been taken to examine the feasibility of coordinated care. The question for policymakers is what the best model for such a system might be. Some measures, such as Medicaid 2176 waivers or the 1984 amendments to the Older Americans Act (Public Law 98-459) provide for increased services and coordination of existing community-based programs. However, these programs are restricted in

scope. The 2176 waivers focus only on individuals eligible for Medicaid. The overall control possible under OAA of all the diverse community-based services is limited.

A more comprehensive proposal of this type was the suggestion for Title XXI, a new section of the Social Security Act that would combine into a single program all noninstitutional long-term care services presently funded under the various titles of the Social Security Act (XVIII, XIX, and XX) (USGAO, 1981a). Title XXI would have excluded the acute hospital component, the most expensive element of all. The proposal did not pass Congress, because even in its limited form, it was viewed as too costly.

A comprehensive case management model that includes the entire gamut of services from acute care to institutional and community-based seems theoretically very attractive. The S/HMO has many of these elements, and the answers that emerge from this demonstration will have important implications for long-term care in this country. The OnLok model also has the element of comprehensiveness that seems appropriate for the future. It includes an additional element—housing—that needs further consideration based on the literature reviewed here.

ELEMENTS OF AN APPROPRIATE HOME CARE SYSTEM

In considering the future directions of home care policy, one proceeds with an awareness that recommendations in this area are prescriptions for further research as much as prescriptions for policy (Dunlop, 1980a). At the same time, as Callahan notes,

> Research findings do not dictate policy choice, nor do they necessarily make the choices easier . . . Research will help shape policy and contribute to the design of programs. The actual allocation of resources to community programs, however, will be the result of political and value choices (Callahan, 1981).

With these caveats in mind, we may sketch the broad outlines of a future home care policy, which can be crafted from knowledge gained in the past decade.

An appropriate home care system for the future must have national scope. Only a policy that is developed and funded at the national level is likely to overcome the enormous bureaucratic and fiscal inertia of the current system (Palley & Oktay, 1983b). At the same time, such a system must have flexibility in assessing needs and allocating resources:

> No attempt should be made to create a single global long-term care system for all. The needs of children, adult disabled, and the very old differ. Although they may draw upon some common services, the character of the problems and the nature of the solutions are different (Callahan, 1981).

A system of national scope does not have to exclude the private sector but would set standards for private sector initiatives.

A simple, single-entry mechanism on the local level is necessary to eliminate the bewilderment that besets the professional or layperson who tries to extract a coherent package of services from the current system.

Consistent eligibility criteria need to be established. Financial eligibility should be flexible so as to exclude neither the poor nor the rich. Eligibility for various services requires an intake procedure with two features: an assessment tool that is reproducible and reliable and a multidisciplinary team with enough discretion to take into account those factors that no assessment instrument can consistently measure without becoming unwieldy.

In order to work well, such a mechanism should be capable of measuring two points that are critical in the allocation of formal services: the point at which someone is disabled enough to require services and the point beyond which the individual can no longer be supported at home. Further research will be necessary to refine these assessment procedures.

The local case management organization must have ready access to a comprehensive package of social and medical services, such as the one listed in Table 4-12. Rigid guidelines that narrowly restrict provider categories need to be abolished, e.g., the artificial distinction between personal and household services, which results in two categories of home helper: home health aide and homemaker. Likewise, rigid separation of the long-term care component from the acute care system is neither appropriate nor likely to be cost effective (Somers, 1985; Master et al., 1980).

Leadership roles must be better defined. Representatives of medicine, social work, and nursing have each laid claim to the coordination or team leader function (American College of Physicians, 1984; Palley & Oktay, 1983a; Mundinger, 1983). However, the nature of the problems in long-term care dictates that neither the social or medical model alone will provide answers to most problems (Kane, 1982). Many community-based services are most appropriately coordinated by a social worker. Chronic home health care is best coordinated by a nurse. When the patient is ill with several medical problems or requires regular hospitalizations the physician needs to take a major role in supervision of care, ideally working closely with a nurse practitioner. Guidelines in the assessment and ongoing review process should determine which professional takes

prime responsibility for leadership at a particular point in the health spectrum of a given individual.

The organizational aspects of home care need increasing attention. The continuum of needs of a frail elder is best met through a team approach to care, where all providers meet regularly to review the service package. Unfortunately, the present system provides little financial incentive for coordinated review. In particular, there is minimal communication between physicians, who hold the key to the acute hospital—the most expensive part of the system—and nurses in home health agencies. Most physicians are unwilling to make home visits, and many people are unwilling to give up their physician. In this situation, the nurse and physician go about their tasks, communicating primarily via a Medicare form: the Home Health Certification and Plan of Treatment. This is filled out every 60 days by the nurse and signed by the physician. It is a ubiquitous but unsatisfactory arrangement. Coordinated home care programs, where a nurse practitioner and physician share a large panel of patients, are an ideal solution to this problem. Families increasingly turn to such programs when a relative becomes homebound, despite the loss of a previous personal physician. The growth of health maintenance organizations as well as the advent of geriatrics as a medical and nursing specialty is likely to accelerate the trend toward comprehensive arrangements.

Reimbursement mechanisms need to be simplified. As noted earlier, at least 80 Federal programs presently assist persons with long-term care problems (U. S. Senate Committee on Labor and Human Resources, 1985). A coherent policy would combine most long-term care expenditures into a single program with flexibility in allocation given to service providers within certain ceilings. Coinsurance payments by the recipient and capped mechanisms of prepayment to providers are likely to be included to reduce undisciplined utilization of services and medical equipment (Sager, 1983b; USGAO, 1985c). Such policies need to be carefully thought out so that the poor are not excluded from receiving services as a result of well-meaning efforts to prevent abuses. A certain amount of reassurance should be derived from one study that showed that family members of a frail elder consistently underestimated the need for formal services compared to professionals evaluating the same person (Sager, 1983b).

In this regard, no policy for allocation of formal services can be successful without increased attention to the support of informal caregivers. Financial incentives, such as tax credits or vouchers have been proposed (Sager, 1983b) and questioned (Doty, 1986; Silverstone, 1985). Eligibility requirements by income and level of disability, cost estimates,

and evaluation procedures will require further research (USGAO, 1982a). Long-term care insurance proposals, currently focused almost exclusively on institutional care (U. S. Senate Special Committee on Aging, 1984b), must be expanded to include home care.

At the same time, the human element in informal care will need increasing attention. Some states such as South Carolina have already begun to emphasize involvement of families in home care as a cost-saving measure (Herbers, 1986). Research to determine what constitutes an intolerable level of stress on informal caregivers will be an important element in setting parameters for such programs. As home care serves an increasingly frail elder population, creative use of respite care will likely be a major factor in determining their success.

The relationship between cost savings and cost effectiveness is another area in need of further exploration. It has been noted that "having an additional benefit worth the additional cost" is as appropriate a definition of cost benefit as one based strictly on cost savings (Doubilet, Weinstein, & McNeil, 1986). Another way of looking at this issue in the long-term care setting is to develop a value framework, which would assist in the appropriate translation of research findings into policy (Callahan, 1981). In such a value framework, the desire of an individual to remain in the community would receive major weighting, along with health status and costs.

Finally, whatever system emerges for home care in the future, we are likely to have pieces of the present system around for a considerable period of time. Education of professionals and consumers as to what is available is woefully inadequate. Creative use of the media, computerized information systems, and similar mechanisms could assist those who need to use the present system while policymakers and researchers attempt to devise its replacement.

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CHAPTER 5

Respiratory Physiology

DAVID SPARROW, D.SC.
NORMATIVE AGING STUDY
VETERANS ADMINISTRATION OUTPATIENT CLINIC
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INTRODUCTION

Lung maturation is a relatively long process extending to early adult life when the lung reaches its maximum size. Shortly thereafter, there is a progressive decline in pulmonary function with advancing age. Evaluation of pulmonary aging in humans presents certain difficulties. First, disease is more prevalent among the elderly making it difficult to identify the influence of "normal" aging on pulmonary function. Second, when lung volumes and flow rates are examined in healthy individuals, there is considerable variation even after correction for age, sex, and body size. Epidemiologic and environmental factors need to be considered to better understand this variation.

This chapter will examine the influence of normal physiologic changes and epidemiologic risk factors on rate of decline of pulmonary function and the development of chronic obstructive pulmonary disease. The areas of physiologic change will include pulmonary mechanics, alveolar gas exchange, regulation of ventilation, and lung defense mechanisms.

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These physiologic data will be integrated with epidemiologic risk factors such as cigarette smoking, atopy, and airways responsiveness.

RESPIRATORY MUSCLES AND CHEST WALL

The respiratory muscles, including the diaphragm, intercostal muscles, and assessory muscles, provide the forces that move the lung and chest wall. It is well established that the strength of the respiratory muscles declines with age. Older individuals have both lower maximal inspiratory and maximal expiratory pressures than younger individuals (Bleeker, Haponik, Walden, Meyers, & Smith, 1984; Cook, Mead, & Orzalesi, 1964; DuBois & Alcala, 1964).

The chest wall is an elastic structure that has a natural tendency to spring outward. With advancing age, this tendency is reduced as the chest wall stiffens (Frank, Mead, & Ferris, 1957; Mittman, Edelman, Norris, & Shock, 1965). Stiffening of the chest wall begins after about age 20 and presumably is due to ossification of the costochondral cartilage (Semine & Damon, 1975). A stiffer chest wall is more difficult to move and therefore requires more work from the respiratory muscles. A 60-year-old may need to exert 30% more effort than a 20-year-old to accomplish the same level of ventilation (Turner, Mead, & Wohl, 1968). During periods requiring high increments of ventilation, the combination of weaker muscles of respiration and a stiffer chest wall in older individuals can result in a substantially reduced pulmonary reserve.

LUNG RECOIL

The lungs and chest wall are bound together by the potential pleural space and function as a bellows. At the end of quiet expiration, the tendency of the lungs to recoil inward from the chest wall is just balanced by the tendency of the chest wall to recoil in the opposite direction. As a result, the entire system is at its resting volume, the functional residual capacity. As the chest wall stiffens and respiratory muscles weaken with advancing age, an opposite and equal process is evident in the pulmonary parenchyma.

Beginning at age 20 to 25, there is a progressive age-related loss of lung elastic recoil resulting in increased lung compliance (Knudson, Clark, Kennedy, & Knudson, 1977; Turner et al., 1968). Because of these observations, attention has focused on the composition of pulmonary connec-

tive tissue. Studies of lung parenchyma have reported that elastin and collagen content do not vary with age (John & Thomas, 1972; Pierce & Ebert, 1965). To date, the exact mechanisms responsible for the age-related decline of lung elasticity are unclear, but they may relate to the remodeling of elastin and collagen rather than change in content (John & Thomas, 1972; Knudson et al., 1977; Wright, 1961). In addition, other as yet undescribed factors may be important, such as changes that occur in pulmonary surfactant with age. Whatever the mechanism, the effects of decreased elastic recoil along with a stiffer chest wall and weaker respiratory muscles with age have important physiologic consequences for the respiratory system, especially lung volume, flow rates, and gas exchange.

LUNG VOLUMES

Lung volumes have been well studied with regard to the influence of aging on pulmonary function. It is conventional to consider the volumes of air that are present in the lungs at certain defined static points. The total lung capacity (TLC) is the volume of air in the lungs after a maximum inhalation. The residual volume (RV) is the volume of air in the lungs at the end of a maximum exhalation. The vital capacity (VC) is the maximum amount of air one can exhale after a maximum inhalation. The volume of air in the lungs at the end of a quiet exhalation is known as the functional residual capacity (FRC).

The influence of age on lung volumes and capacities are shown in Figure 5-1. The TLC is relatively unaffected by age during adult life. In contrast, age does influence subdivisions of the TLC. The FRC, which is the volume at which the outward forces of the chest wall are balanced by the inward lung forces, increases slightly with age as lung recoil forces decline. The RV increases to a greater extent (relative to FRC) with age as a result of airways collapse occurring at higher lung volumes (Jones, Overton, Hammerlindl, & Sproule, 1978). The well-known age-related decrease in VC is a consequence of this increase of RV.

FLOW RATES

Clinical spirometry generally incorporates an analysis of the maximal-effort volume–time curve in addition to VC. In analyzing this volume-time curve, three indexes of airflow can be measured: (1) the forced vital capacity (FVC), (2) the forced expiratory volume in 1 second (FEV_1), and

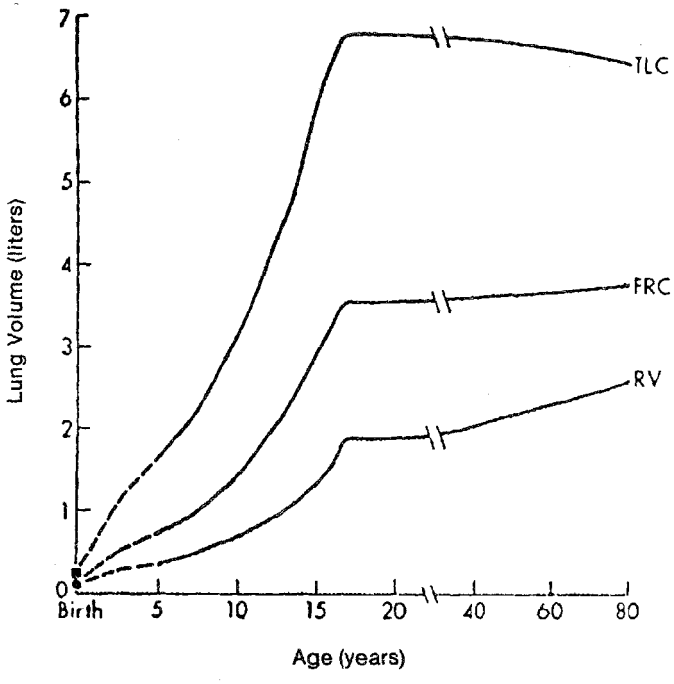

Figure 5-1. Total lung capacity (TLC), functional residual capacity (FRC), and residual volume (RV) as a function of age from birth to 80 years for a male of "average" body build. Reprinted from Murray, 1976, with permission.

(3) the forced expiratory flow$_{25-75}$, (FEF_{25-75}), or the flow between 25 and 75% of the vital capacity. All of these indexes decline with age, although not at equal rates.

The factors that explain the age-related declines in airflow indexes have not been completely delineated. Rate of flow achieved in the lungs is dependent on airway size, airway resistance, muscular strength, and elastic recoil (Murray, 1976; Rahn, Otis, Chadwick, & Fenn, 1946). Flow rates are related to lung volume (Fry & Hyatt, 1960), with higher flows tending to occur at larger lung volumes. Muscular strength and the pressure supplied by the elastic recoil of the lungs both have an important influence on the flow rate when lung volumes are large. Because muscular strength and elastic recoil declines with age, these factors could explain the age-related declines in FVC and FEV_1 (DuBois & Alcala, 1964). With small volumes, the elastic recoil of the lungs is probably the primary determinant of air flow (Mead, Turner, Macklem, & Little, 1967).

Thus, elastic recoil could account for the age-related decline in FEF_{25-75}. FEF_{25-75} declines at a greater rate than either FVC or FEV_1. Total pulmonary resistance has been reported to remain constant with age (DuBois & Alcala, 1964; Pierce & Ebert, 1958) or to increase slightly with age (Frank et al., 1957; Muiesan, Sorbini, Solinas, & Grassi, 1970). Thus, total pulmonary resistance would not appear to contribute substantially to the reduction of flow rates among older individuals. This does not exclude the possibility that increasing resistance could be present in a peripheral section of the airways but remains undetected due to the small overall contribution of peripheral airways resistance to total airways resistance.

As a consequence of age-related decline, assessment of flow rates in the clinical diagnosis of disease requires that the measured values be compared with values expected for healthy subjects of the same age, height, and sex. Dockery, Ware, Ferris, Glicksberg, Fay, Spiro, and Speizer (1985) recently reported on a large reference sample from the Six Cities study that can be used for this purpose. Percentiles of the age-specific distribution of pulmonary function values were computed from among 2,454 white adults 25 to 74 years of age who had never smoked and who reported no respiratory symptoms. These data suggest that decline in FEV_1 after age 65 is nonlinear and accelerates with increasing age. In addition, this and other studies have found that healthy adults exhibit a wide range of flow rates in any given age group. Considerable variation remains even after these rates are corrected for height and sex. Other factors that may explain interindividual variation will be discussed in a later section.

ALVEOLAR GAS EXCHANGE

The prime function of the lung is the exchange of oxygen and carbon dioxide. Adequate gas exchange is dependent on the close matching of ventilation (the amount of air taken into the lungs) and perfusion (the amount of blood flow into the lungs). The relation between the amount of ventilation received in any lung region and the perfusion accomplished there is usually expressed as the ventilation to perfusion ratio ($\dot{V}_A/\dot{Q}$). In the normal young lung, ventilation and, to a greater extent, perfusion increase as one goes from upper to lower regions in the upright lung, resulting in $\dot{V}_A/\dot{Q}$ ratios that are greater than one at the apex and less than one at the base. Although alveoli are smaller at the base than at the apex, there are a greater number of alveoli at this point, offsetting the decrease in alveolar size. This mild ventilation-to-perfusion mismatch

yields an overall $\dot{V}_A/\dot{Q}$ ratio of 0.8 for the whole lung and results from venous admixture (blood not in contact with gas-exchanging alveoli) and physiologic dead space (air spaces not in contact with blood vessels).

As individuals age, loss of elastic recoil causes some airways, particularly at the lung bases, to be closed during all or part of the normal respiratory cycle. When this occurs inspired gas will be preferentially distributed to the apices rather than the bases (Holland, Milic-Emili, Macklem, & Bates, 1968). The resultant ventilation-to-perfusion mismatch appears to have a deleterious influence on arterial oxygenation in the elderly.

As summarized in Figure 5-2, arterial oxygen tension (P_aO_2) in adults decreases linearly by approximately 4 mmHg each decade (Mansell, Bryan, & Levison, 1972; Nelson, 1966; Sorbini, Grassi, Solinas, & Muiesan, 1968). At the same time, alveolar oxygen tension (P_AO_2) remains constant or increases slightly. The most likely explanation for this age-dependent widening of the alveolar–arterial oxygen difference is the functional alteration in ventilation–perfusion dynamics described above. In addition, pulmonary diffusing capacity (DLCO) decreases 5 to 8% each decade of life (Cohen, 1964), and may contribute a small amount to age-related hypoxia.

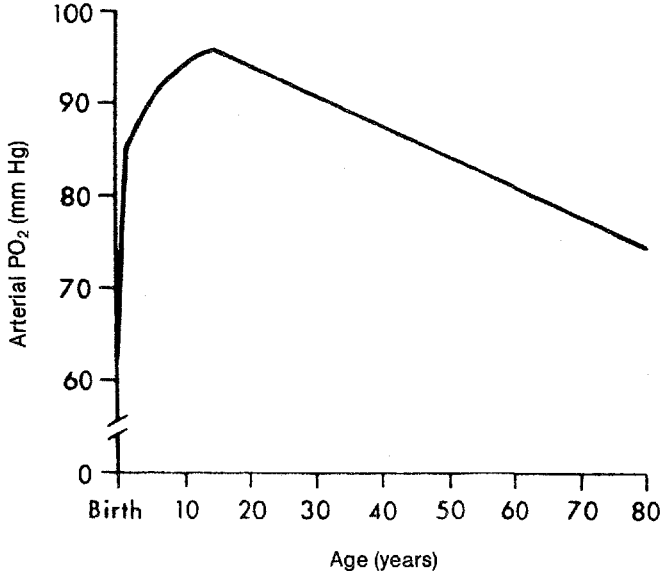

Figure 5-2. Arterial P_{O_2} as a function of age from birth to 80 years. Reprinted from Murray, 1976, with permission.

CONTROL OF VENTILATION

Normally, ventilation is very well matched to metabolic demands. In spite of widely differing demands for O_2 uptake and Co_2 uptake by the body, arterial Po_2 and Pco_2 are kept remarkably stable. This is accomplished by a central controller in the brain which coordinates information it receives from sensors and modulates the activity of the respiratory muscles. The two major sensors are the central chemoreceptors and the peripheral chemoreceptors. The central chemoreceptor is responsible for most of the ventilatory response to hypercapnia. The peripheral chemoreceptors are responsible for all of the increase in ventilation that accompanies hypoxemia ($P_aO_2 \leq 60$ mmHg).

With advancing age, ventilatory responses to hypercapnia and hypoxia have been reported to decrease (Altose, McCauley, Kelsen, & Cherniak, 1977; Kronenberg & Drage, 1973; Peterson, Pack, Silage, & Fishman, 1981). Presently available data suggest that these decreases may reflect diminished neural output to the respiratory muscles (Peterson et al., 1981) or altered mechanical properties of the lung–chest wall apparatus in the elderly (Mittman et al., 1965; Rebuck, Rigg, Kangalee, & Pengelly, 1974). Recently, Tack, Altose, and Cherniak (1982) noted that older subjects had less sensory perception of resistive loads on the respiratory system. These data suggest that abnormal neural processing by the central respiratory center may account for the decrease in ventilatory drive with increasing age.

LUNG DEFENSE MECHANISMS

An important aspect of respiratory activity is defending the lung against toxic dusts, chemicals, and microorganisms contained in the inspired air. Lung defense mechanisms involve the epiglottis and upper airway, which prevent aspiration, and the cough reflex, which expels mucus or unwanted material from the lung. In addition, cellular and humoral immunity are responsible for protecting the lung from microorganisms.

Local defenses appear to break down in the elderly with decreases in both cough and laryngeal reflexes. Older individuals tend to cough less in response to inhaled ammonia than younger individuals (Pontoppidan & Bleeker, 1960). The linkage of this age-related decrease in cough and laryngeal reflexes to increased aspiration is not clear. In addition to the attenuation of reflexes, mucociliary clearance may be adversely effected by age, although few data are available on the subject. Employing radiopaque disks, mean tracheal mucus velocity has been found to be slower in

elderly nonsmokers as compared to young nonsmokers (Goodman, Yergin, Landa, Golinvaux, & Sackner, 1978). Thus, clearance of deposited particles and any accompanying bacteria will be less rapid with advancing age.

There is little evidence for a decrease in humoral immunity among the elderly. Secretory immunoglobulin (IGA) of the nasal and respiratory mucosal surfaces, a major deterrent to viruses, may fall with age (Alford, 1968) but further investigation in this area is required. Although cellular immunity as measured by skin test declines with age (Barbee, Lebowitz, Thompson, & Burrows, 1976; Barbee, Brown, Kaltenborn; & Halonen, 1981), the relationship of this to pulmonary disease in the elderly is unclear at present.

CHRONIC OBSTRUCTIVE PULMONARY DISEASE

The term "chronic obstructive pulmonary disease" is most often applied to patients who have chronic bronchitis, emphysema, or a mixture of the two. Chronic bronchitis is defined as cough and sputum production for at least 3 months of each year for at least 2 consecutive years. Emphysema is a pathological diagnosis, defined as enlargement of the air spaces beyond the terminal bronchioles. The clinical term reflecting the pathologic entity of emphysema is chronic airflow obstruction. Chronic airflow obstruction generally refers to decreased flow rates (an FEV_1 less than 65% of predicted for age, sex, and height) and increased lung volumes (TLC, RV, FRC), indicating loss of elastic recoil. The development of chronic airflow obstruction is determined by (1) maximal level achieved and (2) rate of decline of pulmonary function. Pulmonary function (e.g., FEV_1) tends to reach a maximal level in the early twenties and thereafter declines with advancing age. Risk factors for chronic airflow obstruction may act in childhood to inhibit the maximal attained level of function or in adulthood to accelerate rate of decline of function or over the entire age span.

CIGARETTE SMOKING

Cigarette smoking is the single most important risk factor for the development of chronic bronchitis and chronic airflow obstruction. This is illustrated in a model of lung growth (Figure 5-3) that is modified from work done by Fletcher, Peto, Tinker, and Speizer (1976). As shown in this figure, FEV_1 tends to reach a maximal level by age 20 or 25. An early

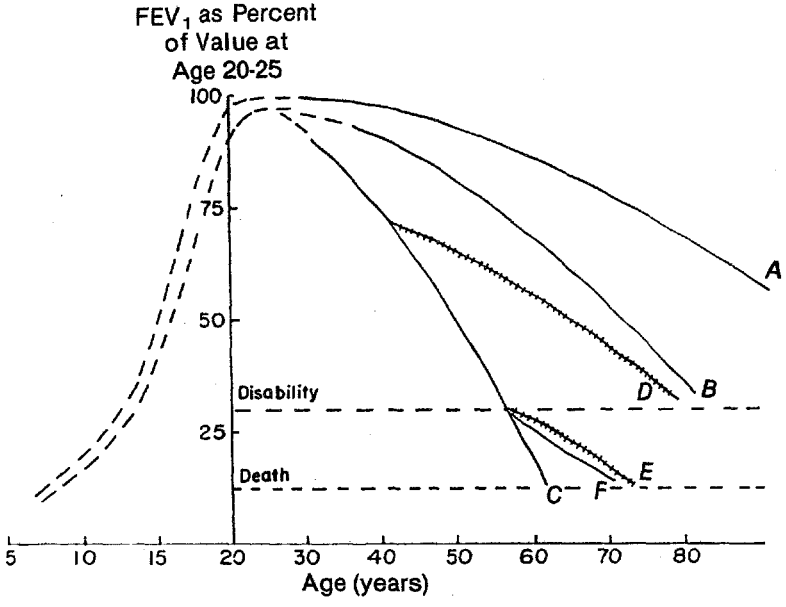

Figure 5-3. Theoretical curves representing varying rates of change in FEV_1 by age. Reprinted from Speizer, F. E., and Tager, T. B. (1979). Epidemiology of chronic mucus hypersecretion and obstructive airways disease. *Epidemiology Review, 1,* 126, with permission.

Note: Curve A depicts normal decline in FEV_1 (forced expiratory volume in 1 second). Curve B represents the accelerated decline in FEV_1 with cigarette smoking. Curve D represents the effect of smoking cessation also seen in disabled individuals (curve E). Often, the disability-related decline continues as a variable rate (curves C and F).

life exposure such as cigarette smoking may inhibit the maximally attained FEV_1 (curve B) and thus increase the individual's risk of chronic airflow obstruction without substantial acceleration of the normal age-related decline in FEV_1.

Studies of children's exposure to involuntary smoke in the home have generally found adverse effects of this exposure on their pulmonary function (Hasselblad, Humble, Graham, & Anderson, 1981; Schilling et al., 1977; Speizer, Ferris, Bishop, & Spengler, 1980; Tager, Weiss, Rosner, & Speizer, 1979; Weiss, Tager, Speizer, & Rosner, 1980). A dose–response relationship has been demonstrated; the greater the number of smokers in the home, the lower the child's level of function (Tager et al., 1979; Weiss et al., 1980). Younger children appear to be

more susceptible to involuntary smoke exposure than older children (Tager et al., 1979; Weiss et al., 1980), and there is a marked added effect if the children themselves smoke (Tager et al., 1979). Studies of children aged 5 to 15 years have also shown a positive relationship between parental smoking and the frequency of chronic cough and phlegm (Bland, Bewley, Pollard, & Banks 1978; Colley, 1974; Lebowitz & Burrows, 1976; Weiss et al., 1980).

In adulthood, cigarette smoking is strongly related to the rate of decline in pulmonary function and the development of symptoms. As shown in Figure 5-3, the normal decline in FEV_1 of 20 to 30 ml per year is doubled or tripled in the smoker (curves B and C). Smokers who quit smoking can alter the progressive rate of decline in FEV_1 as shown in curves D and E. Chronic cough and phlegm production are also strongly related to cigarette smoking. Table 5-1 is a summary of several studies that suggest that the population-attributable risk (amount of chronic

Table 5-1
Attributable Risk for Smoking in Chronic Bronchitis from Various Population-Based Studies

Reference	*Population*	*Population-attributable Risk Percentage*[a] *Based on Group Study*
Anderson and Ferris (1962)	Random sample, 25 years of age	46
Anderson and Ferris (1965)	Random sample, 25 years of age	52
Higgins (1957)	Random sample, 25 years of age	50
Colley (1974)	Cohort of men and women followed from birth to 20 years of age	46
Huhti (1965)	Total population	70
Tager and Speizer (1976)	Random sample 15 years of age	66

Source: From Bossé, R., and Rose, C. L. 1984. *Smoking and Aging*, Lexington, MA: D.C. Heath and Company, with permission.
Note: No female participant smoked more than 0.5 pack per day; therefore, data on women were not calculated.
[a]Population-attributable risk = rate in population − rate in nonsmokers; population-attributable risk percentage = (population-attributable risk/rate in population) × 100.

cough and phlegm in the population attributable to smoking) varies from 46 to 70%.

As indicated by Figure 5-3 many adult smokers fail to develop disabling obstructive airways disease. Conversely, some never-smokers have disease at an early age. This suggests that other factors also play a role in the pathogenesis of airways obstruction and that cigarette smoking is not a necessary condition for development of this disease. Two factors thought to be important are atopy and airways responsiveness. These potential risk factors will be discussed in relation to each other, to smoking, and to the age spectrum.

ATOPY

Atopy is defined as an altered state of reactivity of the host to foreign antigens. This altered state of reactivity is detected with allergy skin tests and serum levels of immunoglobulin E (IgE). Skin tests and serum IgE levels are closely correlated (Barbee, Brown Kaltenborn, & Halonen, 1981; Barbee, Halonen, Lebowitz, & Burrows, 1981).

Skin test positivity increases with increasing age and peaks in early adulthood. Figure 5-4 depicts the age–skin test relationship in a population sample of 3,101 white subjects in Tuscon, Arizona (Barbee et al., 1976). Over all age groups, roughly one-third of the population had at least one positive test. Males and females had similar skin test reactivity.

Although the origins of the atopic state are incompletely understood, they seem to involve both genetic controls and complex environmental influences (Marsh, Myers, & Bias, 1980). Depressed suppressor T-cell function is associated with increased levels of serum IgE. A variety of environmental events are associated with T-cell abnormalities. Viral infections (Frick, German, & Mills, 1979) and chronic cigarette smoking (Ginns et al., 1982) are specific examples. Both of these environmental factors are associated with positive skin tests and increased serum IgE levels. However, the mechanisms responsible and the individuals most susceptible remain unknown.

Studies exist that link the occurrence of the atopic state to a greater occurrence of respiratory symptoms in both adults and children. In adults, the primary symptoms are those of asthma and wheeze. Whether this represents diagnostic bias on the part of physicians, inadequate control for the effects of cigarette smoking, or a true association is unknown. In children, all types of respiratory symptoms (cough and wheeze) and respiratory infections were associated with atopy (Burrows, Lebowitz, & Barbee, 1976). These data strongly suggest that atopy in

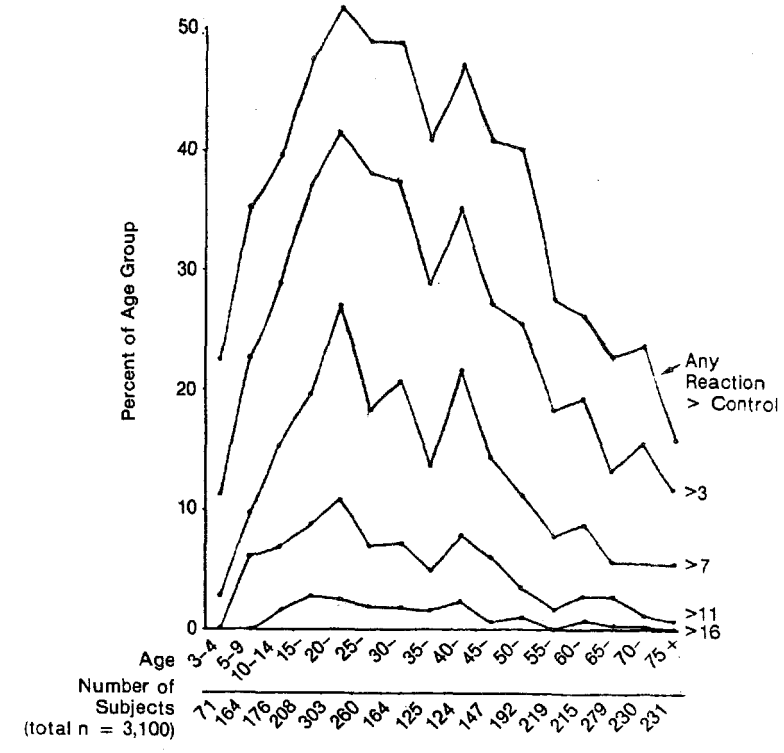

Figure 5-4. The prevalence and magnitude of prick-test reactions as a function of age. Reprinted from Barbee, R. A. Lebowitz, M. D., Thompson, H. C., & Burrows, B. (1976). Immediate skin-test reactivity in a general population sample. *Annals of Internal Medicine, 84*, 131, with permission.

early childhood is an important risk factor for the occurrence of chronic respiratory symptoms in children. The factors predisposing to atopy in childhood are unclear, although passive smoke exposure, respiratory illness experience, and breastfeeding have all been thought to have an influence. Also unclear is the relationship of atopy to the occurrence of increased levels of airways responsiveness.

AIRWAYS RESPONSIVENESS

Airways responsiveness can be defined as the ability of the airways to bronchoconstrict to a nonspecific stimulus such as cold air, methacholine, or histamine. At any given age the distribution of airways respon-

siveness appears to be unimodal and log normal with a tail in the direction of increased responsiveness (Cockcroft, Berscheid, & Murdock, 1983). There is an occurrence of airways responsiveness of roughly 20% in young adult (20 to 30 years) populations. There is no clear difference in airways responsiveness between men and women (Cockcroft et al., 1983; Weiss et al., 1984).

The relationship of cigarette smoking to nonspecific bronchial responsiveness is complex and conflicting in the literature. Physiologic studies of small numbers of selected adults have yielded both positive (Buczko, Day, Vanderdoelen, Boucher, & Zarnel 1984; Gerrard et al., 1980) and no (Brown, McFadden, & Ingram, 1977) association between nonspecific bronchial responsiveness and cigarette smoking. Brown et al. (1977) assessed nonspecific bronchial responsiveness to a single dose (1 mg) of histamine in 22 asymptomatic volunteers comparing nonatopic cigarette smokers with both atopic and nonatopic nonsmokers. No difference in partial expiratory flow volume curves could be appreciated following histamine inhalation in these two groups. However, Gerrard et al. (1980) studied 17 nonsmokers and 17 smokers matched for age, atopic status, and baseline specific conductance. The concentration of histamine required to reduce specific conductance by 35% was significantly lower among the smoking group, indicating increase in nonspecific bronchial responsiveness among cigarette smokers.

Population-based data on the relationship of nonspecific bronchial responsiveness to cigarette smoking status is slightly less contradictory but still controversial. Pham et al. (1984) noted higher frequencies of acetylcholine responsiveness in current smokers compared to nonsmokers (20.0% vs. 2.7%). In addition, the occurrence of increased bronchial responsiveness was associated with a greater number of cigarettes smoked per day. Welty et al. (1984) studied 171 adults (median age, 38) with eucapneic hyperpnea to cold air. Using a 9% decrease in FEV_1 from the initial value to indicate increased responsiveness, 9.4% of the 128 current and ex-smokers had increased responsiveness compared with 2.3% of the 43 nonsmokers. This difference was of borderline statistical significance ($p = 0.095$). Taylor, Joyce, Gross, Holland, and Pride (1985) studied 227 men with a full histamine threshold test. Subjects with a PC_{20} FEV_1 (the concentration provoking a 20% decline in FEV_1 from baseline) less than or equal to 16 mg/ml were considered responders. They found that 29% of the 117 smokers, 24% of the 71 ex-smokers, and only 5% of the 39 nonsmokers were responders.

These data suggest that cigarette smoking may modify intrinsic bronchial responsiveness to a mild degree. Certainly a major influence on underlying bronchial responsiveness seems unlikely from the existing data, although a prospective evaluation of this association would be most

useful. Bronchial responsiveness is likely a continuum (Cockcroft et al., 1983), and smokers are likely to be self-selected from the more hyporesponsive end of this continuous distribution. The degree of association between cigarette smoking and underlying bronchial responsiveness will depend on the magnitude of this self-selection, the age distribution of the population, the type and amount of cigarettes smoked, and the distribution of other endogenous host characteristics, such as the atopic state in the population under observation. Further study will be necessary to elucidate these mechanisms and interrelationships.

In contrast to cigarette smoking, the relationship of age to nonspecific bronchial responsiveness seems more clear-cut. Van der Lende, Visser, Wever-Hes, De Vries, and Orie (1973) have shown that increased levels of nonspecific bronchial responsiveness are present with increasing age in both symptomatic and asymptomatic subjects. The reasons for this finding at a cellular or a physiologic level are unknown.

The occurrence of age-related changes in respiratory physiology are profound, and although well-identified, the origins of these changes at a cellular or biochemical level and their relationship to clinical susceptibility for disease remain obscure. This is the challenge of research into respiratory physiology of aging.

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CHAPTER 6

Geriatric Epidemiology

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INTRODUCTION

The discipline of epidemiology is best employed when it serves two functions: one as a research tool to describe and understand biological and pathological processes in populations and the other as an aid to the planning and administration of programs for research, health maintenance, disease control, prevention, and treatment. In this review we will consider information related to both functions.

NUMBERS AND HEALTH OF THE ELDERLY: YESTERDAY, TODAY, AND TOMORROW

The "graying" of the populations of the developed world is now widely recognized (Brock & Brody, 1985; Guralnik & FitzSimmons, 1986; Rice & Feldman, 1983; Siegel, 1980; U.S. Bureau of the Census, 1983; Vaupel

& Gowan, 1986; World Health Organization, 1982, 1984). The rapid rate at which it is occurring represents a potential health care crisis of variable severity in different countries, with Japan and the United States being among the most dramatically affected. Although the less developed countries have yet to experience these demographic changes, their recent decrements in fertility will produce even more sudden shifts toward an older population in the twenty-first century.

In the United States, the evolution of our national age structure from one with a large proportion of children and young people toward one with a substantially expanded aged segment began in the early and middle decades of this century, and is expected to reach at least temporary stability by the mid twenty-first century. Although principally the result of decreases in birth rate, some of the demographic change has been due to improved survival at all ages. Not only have newborns been more likely to survive through infancy and childhood, but they have also resisted the forces of mortality more effectively in their later years. Life expectancy at every age (average number of years of remaining life expected) has been improving throughout the century, with dramatic improvements in cardiovascular mortality during the past two decades (see sections on heart disease and stroke below). At the turn of the century, when life expectancy at birth was less than 50 years, a person who had reached age 65 could expect to live another 11.9 years, and life expectancy at age 80 was 5.3 years. By 1978 life expectancy had increased to 73.3 years at birth (70.2 for white males, 77.8 for white females, 65 for nonwhite males, 73.6 for nonwhite females), to 16.3 years at age 65 (14 for white males, 18.4 for white females, 14.1 for nonwhite males, 18 for nonwhite females), and to 8.1 years at age 80 (6.7 for white males, 8.8 for white females, 8.8 for nonwhite males, 11.5 for nonwhite females) (Guralnik & FitzSimmons, 1986). Average adult height has also increased slightly this century, children have grown more rapidly and reached adult height sooner, and sexual maturity has come at earlier ages (Angel, 1976; Van Wierigen, 1978).

These observations seem to imply that factors responsible for the improved health, growth, and more rapid development of individuals while they are still children may also benefit health and survival during later years. Alternatively, one could hypothesize that the advantages of a healthy childhood, once established, simply persist throughout life, whether or not exposure to the beneficial factors continues—that optimal early health produces an optimally fit adult with maximal organ system reserves. A third possibility is that improved health and survival in early life (most likely due to fewer infections and nutritional inadequacies) may be coincidental and not causally connected with recent improvements in

late-life survival (which reflect changes in chronic diseases such as atherosclerosis and hypertension). It is interesting that these patterns of changing development and survival offer *no* support for two hypotheses that could reasonably be proposed: (1) that restricted availability of food during childhood is associated with greater longevity than that associated with nutritional affluence (a relationship established in animal studies: McCay, Crowell, & Maynard, 1935; Ross, 1976) and (2) that the survivors of a less challenging childhood (today's elderly) will have been less rigorously selected and will consequently be less fit than the survivors of a more challenging early life (yesterday's elderly).

The influence of lessened mortality added to that of lower birth rates has markedly increased the average age at death and disproportionately expanded the oldest strata of the population. In 1900, approximately one-quarter of deaths occurred in people 65 and older, and few lived to be age 80. Today approximately 67% of deaths occur among persons aged 65 or older, an age group now accounting for about 11% of the population. The population aged 80 and older, representing about one in 40 people in the United States, accounts for over 30% of all deaths (Brock & Brody, 1985). Between 1940 and 1980, the number of the "oldest old" (85 years and older) in the United States increased from 370,000 to 2,271,000. Within the coming two decades the number is expected to more than double and is projected to reach 12,834,000 by the year 2040 (Rosenwaike, 1985).

The burgeoning of the elderly segment of the population leads quite reasonably to questions about our preparedness for what might be a major increase in demand for health care, since the elderly as a group require relatively more care than younger persons (Evans, 1983). Such projections rely on an assumption that the needs of future elderly (today's middle-life adults) will be similar to those of today's elderly; i.e., that little or no "compression of morbidity" will occur (see discussion concerning the predictions of Fries below). Unless future age-specific morbidity rates fall substantially below today's levels, there will be not only a dramatic increase in the demand for health care but also a great increase in the absolute number and proportion of the population afflicted with tragically incapacitating conditions such as dementia, blindness, deafness, and physical disability. This gloomy possibility has been considered by Brody (1985), Gruenberg (1977), Kramer (1980), and Schneider and Brody (1983). Their concerns stand in contradistinction to the predictions of Fries (1980) suggesting "that the average period of diminished physical vigour will decrease, that chronic disease will occupy a smaller proportion of the typical lifespan, and that the need for medical care in later life will decrease." His startling prediction is based largely on an

interpretation of the meaning of the "rectangularization" of survival curves for the United States population over the past several decades. These curves show a progression toward extended, more uniform survival. Although far fewer individuals are dying prematurely (in infancy, childhood, or middle life), the proportion of the population living greatly extended lives has increased negligibly. It is suggested that this discordance implies different mechanisms, with fewer premature deaths reflecting the nutrition, hygiene, lifestyle, and medical care advances of the past century and the apparently fixed upper limits of longevity being the result of fundamental biological limits on the potential human lifespan.

Fries proposes that we have left an era when medicine and health were predominantly influenced by acute illnesses (especially infectious diseases), that we are now in an era of chronic disease (atherosclerotic disease, arthritis, neoplasia, etc.), and that we are upon the threshold of a third era, in which survival and health will be most strongly influenced by the fundamental processes of aging. The result of these processes is an erosion of structural and functional organ system reserves and a diminishing capacity for the maintenance of physiologic homeostasis, with a convergence of increasing susceptibilities to all types of illnesses and injuries. The visualized result is an abrupt increase in frailty (or loss of vitality) as maximum life span is approached, producing an abrupt increase in the likelihood of dying (given an illness or injury), and a reduction in the likelihood of protracted illness (Fries, 1984; Fries, Spitz, & Young, 1982). Thus, Fries' argument proclaims that since people are living longer, their deaths are likely to be sudden, and fewer of their later years are likely to be spent with the disabilities and infirmities that have often accompanied old age.

Age-specific rates for disabilities and infirmities will be lower among today's elderly (compared with the elderly of a few years ago) if Fries' predictions are fulfilled. This expectation seems not to be supported by current observation. While age-specific incidence rates for heart disease and stroke have indeed fallen (corresponding to heart disease and stroke death rates), age-specific rates for malignancies have not declined, and there is little or no support for significant decrements in age-specific prevalence rates for osteoarthritis, diabetes, physical disability, hearing impairment, vision impairment, osteoporosis-related fractures, Parkinson's disease, or other diseases commonly viewed as clearly related to aging (Colvez & Blanchet, 1981; Feldman, 1983; Manton, 1986; Manton & Soldo, 1985; Rice & Feldman, 1983; Verbrugge, 1984; Wilson & Drury, 1984). This does not totally preclude the validity of the Fries prediction, however; during the transition phase between the chronic disease death era and the natural aging death era, the expected decrements in prevalence of these conditions might not be so evident.

There are conceptual weaknesses in the Fries argument. According to his conjecture, the changes in adult life mortality patterns that have occurred over these past several decades reflect the control of those diseases that were powerful factors in the era of acute illness and, more recently, at least partial control of heart disease and stroke—important causes of death in the chronic disease era. Although Fries hypothesizes no associated change in the fundamental processes of human aging, he expects late-life morbidity to be compressed into a progressively shorter interval prior to death as survival curves continue to rectangularize. The assumption that improvements in mortality rates for myocardial infarction, congestive heart failure, and stroke imply improvements in morbidity for these same conditions has face validity and is supported by actual data (Feinleib & Gillum, 1986; Garraway, Whisnant, & Drury, 1983). The assumption that lessened age-specific mortality due to these causes implies lessened morbidity due to different causes of illness and disability in late life has neither face validity nor support from available data sources. Indeed, while any illness may increase frailty, one kind of illness is not usually found to be a risk factor for other age-related diseases: heart disease is not a risk factor for arthritis; arthritis is not a risk factor for deafness; deafness is not a risk factor for cataract; etc. Disabling conditions usually occur independently of one another, save for their mutual associations with chronologic age. Were they to be correlated, one might speculate that biologic age variability between individuals acted as an important risk factor determining susceptibility to all of these diseases. The available information does not support this conclusion.

The debate over Fries' predictions has brought a refreshing enthusiasm for the relevance to public policy of a fundamental understanding of disease and aging and has emphasized the essential role for carefully planned and executed epidemiologic investigations in resolving such crucial issues. It is not yet clear if, as predicted by Fries, the total late life morbidity of tomorrow's elderly will be less than that of today's aged even though the total period of later life is extended or if tomorrow's elderly will suffer illnesses and disabilities similar to those of today's aged but for more years, since they will live longer. The conservative and more widely accepted expectation requires that we estimate the needs of tomorrow's elderly on the basis of the solid data we now have for today's aged. Caution and common sense must make us suspicious of theory-based predictions not yet supported by objective data even while we admire their elegance and hope they are correct. We must be prepared to provide adequate health care for a flood of ill, disabled, and frail elderly over the next four or five decades, and we must focus our research on ways of preventing or deferring those tragic conditions that could negate the value of prolonged life for such a large proportion of us as we age.

WHAT ARE THE MOST COMMON AND MOST IMPORTANT HEALTH CONDITIONS OF THE AGED?

Rates for the ten leading causes of death among Americans aged 65 and older are shown by rank order and by age strata in Table 6-1 (Brody & Brock, 1985). These data illustrate the preeminence of cardiovascular disease as a cause of death in this country.

Of approximately 38.6 million discharges from the inpatient services of short-stay hospitals in the United States in 1982, 8.7 million were of persons aged 45 to 64, 5.2 million of persons aged 65 to 74 (representing 32.4 discharges per 100 persons), 4.0 million discharges of persons aged 75 to 84 (48.5 per 100), and 1.5 million discharges of persons aged 85 or older (60 per 100 persons) (National Center for Health Statistics, 1984). The average length of stay increased continuously from 7.9 days for persons aged 45 to 64, to 11.3 days for persons 85 years or older. Among patients aged 65 and older, nearly one-third of the first-listed diagnoses given at discharge were diseases of the circulatory system including 618,000 for cerebrovascular disease, 126,000 for essential hypertension, 380,000 for acute myocardial infarction, 316,000 for arteriosclerotic heart disease, 369,000 for other ischemic heart disease, and 356,000 for congestive heart failure. There were an estimated 1.35 million discharge diag-

Table 6-1
Death Rates for the Ten Leading Causes of Death, by Age, for 1978

	Death Rate per Age Group (%)					
Causes of Death *Age (yr)*	*65+*	*65–69*	*70–74*	*75–79*	*80–84*	*85+*
All causes	5.23	2.46	3.79	6.02	8.95	14.70
Diseases of the Heart	2.33	0.97	1.57	2.62	4.06	7.08
Malignant Neoplasms	1.00	0.69	0.94	1.22	1.41	1.45
Cerebrovascular Disease	0.62	0.17	0.34	0.69	1.24	2.28
Influenza and Pneumonia	0.19	0.05	0.09	0.19	0.37	0.84
Arteriosclerosis	0.12	0.01	0.04	0.09	0.22	0.64
Diabetes Mellitus	0.10	0.05	0.08	0.13	0.17	0.21
Accidents	0.10	0.05	0.07	0.11	0.16	0.28
Bronchitis/Emphysema/ Asthma	0.06	0.04	0.06	0.09	0.10	0.09
Cirrhosis of the Liver	0.04	0.04	0.04	0.03	0.03	0.02
Nephritis/Nephrosis	0.03	0.01	0.02	0.03	0.04	0.06
All Other Causes	0.70	0.35	0.53	0.82	1.15	1.75

Adapted from Brody and Brock (1985), based on unpublished tabulations from data provided by the National Center for Health Statistics.

noses (as first listed) of diseases of the digestive system for persons 65 and older including 153,000 for cholelithiasis, 132,000 for inguinal hernia, 139,000 for ulcer of the stomach or small intestine, and 118,000 for noninfectious enteritis and colitis. Neoplasms accounted for the next largest diagnostic group (1.1 million discharges), approximately 90% being identified as malignant. There were almost exactly one million discharge diagnoses of diseases of the respiratory system, of which slightly less than one-third were due to pneumonia. The next three most common diagnostic categories among the elderly were diseases of the genitourinary system (748,000 first-listed discharge diagnoses), injuries and poisoning (747,000, about half being fractures, and about half those involving the neck of the femur), and diseases of the nervous system and sense organs (739,000, of which 428,000 were related to cataract and only 16,000 involved in the central nervous system). These were followed by diseases of the musculoskeletal system (578,000, one-third for arthropathies and related disorders); endocrine, nutritional, metabolic, and immunity disorders (426,000, more than half being due to diabetes mellitus); and mental disorders (269,000, of which 113,000 were diagnosed as psychoses).

Most of the procedures mentioned at discharge were less common among persons 65 and older than in patients 45 to 65, although the total number of procedures annually is similar for the two age groups. Specific procedures more common in the elderly included operations on the eye (especially extraction of a cataractous lens and insertion of a prosthetic lens); partial gastrectomy and resection of the intestine; urinary endoscopy, urethral dilitation, and prostatectomy; open reductions of fractures; arthroplasty and replacement of the knee or hip; and computed axial tomography (NCHS, 1984).

The increased morbidity of elderly persons is also reflected in their utilization of ambulatory health care services, as documented by the National Ambulatory Health Care Survey of Visits to Office-Based Physicians (NCHS, 1985b). Of total office visits in the United States in 1980 and 1981, approximately 7% were estimated to have been made by persons aged 75 or older. The proportion of visits resulting in multiple diagnoses was greater than one-half for persons 75 and older and less than one-third for patients under 75. The most common diagnoses mentioned for visits of persons 75 and older were essential hypertension (for 17% of visits); chronic ischemic heart disease (9.5%); diabetes (6.7%); osteoarthrosis and allied disorders (6%); cataract (5.1%); heart failure (4.4%); cardiac dysrhythmias (3.6%); arthropathies, other and unspecified (3.6%); glaucoma (2.8%); hypertensive heart disease (2.6%); angina (2.3%); other disorders of the eye (2.3%); ill-defined heart disease, includ-

ing complications (2%); atherosclerosis (2%); chronic airway obstruction (1.7%); other disorders of the urethra and urinary tract (1.7%); ill-defined cerebrovascular disease (1.6%); anemia (1.5%); neurotic disorders (1.5%); malignant neoplasms of the skin (1.4%); upper respiratory infections (1.4%); malignant neoplasms of the prostate (1.3%); hyperplasia of the prostate (1.2%); retinal disorders (1.2%); and "general symptoms" (1.3%). Of the office visits of persons under 75, 60% were made by women. Among patients older than 75 years, 65% of visits were made by women.

The most common symptoms mentioned by persons 75 or older visiting the offices of physicians are shown in Table 6-2 (NCHS, 1985b). One or more of these was mentioned during about half of all visits. The most

Table 6-2
Symptoms Most Frequently Mentioned During Physician Office Visits, by Persons 75 or Older

Symptom	*No. of Mentions/100 Visits*
Dizziness	3.8
Vision dysfunctions	3.4
Back pain	3.2
Leg pain	3.1
Cough	2.8
Chest pain	2.7
Shortness of Breath	2.6
General weakness	2.6
Knee pain	2.0
Skin lesion	2.0
Abdominal pain	1.9
Headache	1.8
Foot and toe pain	1.7
Tiredness, exhaustion	1.5
Hip pain	1.5
Abnormal sensations, eye	1.4
Head cold	1.2
Shoulder pain	1.2
Anxiety, nervousness	1.2
Palpitations, Abnormal Pulsations	1.1
Nausea	1.0
Urinary frequency/urgency	1.0
Pain, generalized or unspecified	1.0
Fluid abnormalities	1.0
Skin irritations	0.9

Adapted from National Center for Health Statistics (1985b).

common symptom, dizziness, was not clearly linked with any one diagnosis, and fewer than 5% of the instances of dizziness were attributed to cerebral ischemia. A complaint of pain was listed for 21% of the visits of persons 75 and older and for 20% of the younger patients. The pain was associated with a musculoskeletal disease in about one-third of instances and with a disease of the circulatory system in slightly less than one-fifth of the cases. The 25 most commonly mentioned drugs ordered or provided for persons 75 or older by their office-based physicians are presented in Table 6-3. The number of drugs mentioned per visit was slightly greater for women (1.6 per visit for women 75 to 79; 1.8 per visit for

Table 6-3
Drugs Most Commonly Prescribed for Patients Aged 75 and Over in Office Visits

Drug	*No. Times Ordered or Provided/100 Visits*
Hydrochlorothiazide	12.6
Digoxin	10.9
Furosemide	6.9
Triamterene	4.6
Aspirin	4.3
Propranolol	4.2
Methyldopa	3.6
Potassium replacements	3.5
Vitamin B-12	3.2
Nitroglycerin	3.2
Isosorbide	2.9
Reserpine	2.7
Multivitamins	2.5
Acetaminophen	2.3
Chlorthalidone	2.3
Dihydroergotamine	2.0
Ibuprofen	2.0
Meclizine	1.9
Theophylline	1.8
Iron preparations	1.7
Phenobarbital	1.7
Chlorpropamide	1.7
Papaverine	1.6
Spironolactone	1.5
Tetracycline	1.5

Adapted from National Center for Health Statistics (1985b).

women 85 and older) than for men (1.5 per visit for men 75 to 79; 1.6 per visit for men 85 and older).

Until recently, knowledge of the prevalence and correlates of health conditions among older persons, especially those aged 75 or older, was based largely on death certificate data, information generated by health care utilization, and panel studies of limited size and representativeness. This has been remedied by the National Institute on Aging's "Established Populations for Epidemiologic Studies of the Elderly" (EPESE), a coordinated, four-community investigation of approximately 14,000 older (aged 65 and above), noninstitutionalized residents of two counties in Iowa, the city of New Haven, East Boston, and five counties adjacent to Durham, North Carolina. Data collection began in 1982 for the first three EPESE, and in 1985 for the North Carolina project. A full description of the EPESE with initial results from baseline interviews with participants in Iowa, New Haven, and East Boston has been published (Cornoni-Huntley, Brock, Ostfeld, Taylor, & Wallace, 1986).

Data from community or national surveys reflect the health of the entire noninstitutionalized population, rather than just those who have come to medical attention. Although the several studies currently underway have a great potential for generating information related to the common health conditions of community-dwelling elderly, published data are sparse. When NIA EPESE male participants (all 65 or older and living in one of the three participating communities; see section above) were asked about a history of heart attack, 12 to 28% answered affirmatively, with only modest increases noted between age strata 65 to 69 and 85+; comparable figures for female participants were slightly lower. When asked if they had ever fractured a hip, the percentage of men answering "yes" ranged from 1.3 to 8.9, with an approximate doubling or tripling between 65 to 69 and the 85+ age strata. Women participants showed higher percentages of a "yes" answer (2 to 14%) and a greater change with age (4- to 5-fold). When asked about a history of stroke, the percentage answering affirmatively ranged from 5.4 to 13 for men, and 2.3 to 10.3 for women. Figures for the report of angina were between 4.3 and 8.9% for men, and 1.4 and 9% for women, with negligible changes with age (Farmer, Ostfeld, et al., 1986). When asked: "How often do you have difficulty holding your urine until you can get to a toilet," the percentage of female EPESE participants (age 65+) answering "most of the time" or "all of the time" varied between 6.8 and 9.2%; among male EPESE participants, comparable rates varied between 4.3 and 8.37% (White, Kohout, Evans, Cornoni-Huntley, & Ostfeld, 1986). In community surveys conducted as part of the National Institute of Mental Health (NIMH) Epidemiologic Catchment Area program, most psychiatric dis-

orders were substantially less prevalent among the elderly: only cognitive impairment and major episodes of depression associated with bereavement were most common in the 65+ age group. The six month prevalence rates for a major depressive episode among the male participants in the NIMH studies were 0.1 to 0.5%, and among females were 1.0 to 1.6% (Myers et al., 1984). Ten- to twenty-item instruments for the measurement of depressive symptomatology, administered to EPESE participants, consistently elicited more symptomatology in females at every age, with modest increases in both sexes with advancing age (White et al., 1986).

None of the data sources mentioned above provide adequate information on the health problems of the institutionalized elderly. In 1977, this segment of the population represented 1.5% of people of the United States aged 65 to 74, 6.8% of those 75 to 84, and 21.6% of those aged 85 and older (Brody & Foley, 1985). In the National Nursing Home Survey conducted that year, nearly all residents of the surveyed institutions were reported to have one or more chronic conditions, the most prevalent diagnoses being arteriosclerosis (48%), heart trouble (34%), senility (32%), arthritis and rheumatism (25%), hypertension (21%), and diabetes (15%) (NCHS, 1981a). As anticipated, the prevalence of disabilities among the institutionalized elderly was very high, with 89% requiring assistance with bathing, 72% with dressing, 69% with walking, 55% with using the toilet, and 34% with eating.

Prevalence estimates for 15 chronic conditions among persons 65 and older are summarized in Table 6-4 in relation to prevalence figures for the same conditions for Americans aged 45 to 64 (U.S. Senate Special Committee on Aging, 1985).

ARTHRITIS

Arthritis is one of the most prevalent and, for many, one of the most troublesome problems of aging. Although certain of the less common arthritides (such as polymyalgia rheumatica and pseudogout) become more prevalent in later life, the bulk of the joint disease of older persons is osteoarthritis, or degenerative joint disease (Kelsey, 1982; Lawrence & Shulman, 1985; Moskowitz, 1984).

The prevalence of osteoarthritis depends upon how it is defined, since joints are involved semiindependently of one another, and since there is not a consistent relationship between pain, disability, objective changes in the joints by examination, and objective changes as determined by X-ray. Some persons complain of pain or limitation involving a joint but

Table 6-4
Prevalence of Common Chronic Conditions Among Persons Aged 45–64 and 65+

	Persons with Condition (%)	
Age (years)	*45–64*	*65+*
Arthritis	24.7	46.5
Hypertensive disease	24.4	37.9
Hearing impairments	14.3	28.4
Heart conditions	12.3	27.7
Chronic sinusitis	17.8	18.4
Visual impairments	5.5	13.7
Orthopedic impairments (back/extremities/other)	11.8	12.8
Arteriosclerosis	2.1	9.7
Diabetes	5.7	8.3
Varicose veins	5.0	8.3
Hemorrhoids	6.7	6.6
Frequent constipation	2.2	5.9
Urinary system disease	3.2	5.6
Corns and callosities	3.6	5.2
Hay fever	7.8	5.2
Hernia of abdominal cavity	2.5	4.9

Source: National Center for Health Statistics in U.S. Senate Special Committee on Aging. (1985). In: *Aging America, trends and projections*. Washington DC: Government Printing Office.

have little objective evidence of disease, whereas others show substantial joint changes and yet have few or no symptoms. The factors that determine who will complain of pain or limitation given comparable objective changes are uncertain. Most observers have noted that symptoms are more likely in women, with the phenomenon often attributed to either a female proclivity to complain or a male insensitivity. Regardless, most data show osteoarthritis to be more common in women after about age 40 to 50 years whether defined objectively or subjectively. When the subjective/objective gender issue was examined carefully by Davis (1981) using data from a national survey, her conclusion was that gender had a minor influence on determining who would complain of osteoarthritic pain and that the sexes were more alike than dissimilar.

The risk, extent, and severity of osteoarthritis increases continuously with age when one considers the joints collectively, but the association is less consistent if a single joint is considered. In a report from the Tecum-

seh Community Health Study (Mikkelson, Dodge, Duff, & Kato, 1967), the examining physician made the diagnosis of osteoarthritis in 4% of men aged 40 to 59 and in 20.3% of men aged 60 and older; comparable figures for women were 3.9 and 40.8%. Physician diagnoses of osteoarthritis were made in 12.1% of persons aged 25 to 74 who participated in the first National Health and Nutrition Examination Survey (NHANES I), providing an estimate of 158 million people in the United States in this age group as suffering from osteoarthritis (NCHS, 1979a). Radiographic evidence of osteoarthritis has been analyzed for both the NHANES I and an earlier National Health Examination Survey (NCHS, 1966). The prevalence of moderate or severe osteoarthrosis (radiographically defined in the earlier survey) in the hands was found to increase from 0.6 to 33.2% of males between the age strata of 35 to 44 and 75 to 79; for women the prevalence figures increased from 1.1 to 51%. Prevalence figures across the same age span for the feet were 0.4 increasing to 4.8% for men and 0.4 increasing to 14.6% for women. Moderate to severe osteoarthrosis of the knees was identified radiographically in the NHANES I in 0.1% of men at age 35 to 44, increasing to 2.0% at age 65 to 74; comparable figures for women were 0.5%, increasing to 6.6%. Osteoarthrosis of the hip also occurred more frequently among older participants but was less common than for the other joints and did not show the female preponderance. Prevalence figures for moderate or severe hip disease at age 65 to 74 were 2.3% for males and 1.2% for females. Among participants in the Baltimore Longitudinal Study, osteoarthritis of the hand was observed to become more prevalent with age regardless of the joint examined but was less prevalent and less severe in the proximal interphalangeal joints as compared with the distal interphalangeal joints; changes were most common in the small finger and least common in the thumb (Plato & Norris, 1979a, b). Both the strong association with age and higher rates for older women (compared with older men) for all joints—weight-bearing and nonweight-bearing—were also documented in the New Haven Study of Joint Diseases (Acheson & Collart, 1975). These investigators noted osteoarthrosis to be more common in males at a younger age and more frequent in women after the age of 35 to 45. In the New Haven study, osteoarthrosis was found to be associated with elevated C-reactive protein levels, the weight/height ratio, serum uric acid levels, antistreptolysin O titer, and rheumatoid factor (women only). For every factor the associations were stronger in women than in men, controlling for age.

In an especially interesting study, Forman, Malamet, and Kaplan (1983) investigated osteoarthritis of the knee among elderly men and women in senior citizens' centers and hospitals in New York, considering

the person's report of knee pain together with the physician's objective evaluation of knee disease. The percentage of subjects with no complaints of knee pain varied minimally with age (50.8% at age 60 to 69; 54.6% at age 80 to 89). Even severe symptoms increased in prevalence only modestly (from 12.3 to 16.2%). The prevalence of severe objective disease increased from 7.5 (at 60 to 69) to 10.3% (at 80 to 89), whereas the prevalence of moderate objective disease went from 35.9 to 44.8% (as judged by physical examination). Although pain was definitely associated with objective evidence of disease, the correlation was imperfect; of the persons with no objective evidence of disease, 6.7% had severe symptoms, and an additional 9.7% had moderate symptoms; of the subjects with objective evidence of severe disease, only 31.5% complained of severe symptoms, and 13% were totally symptom-free. These observations suggest that osteoarthritis is neither inevitably progressive nor intrinsically a part of aging, that undefined factors in addition to severity of the objective disease influence the occurrence of pain and disability, and that if the disease occurs it is likely to have its onset before age 60.

The total number of people in the United States with arthritis has been estimated to be greater than 24 million, with limitations in activity in about one-fifth (Epstein, Yelin, Nevitt, & Kramer, 1986), mostly due to osteoarthritis in older persons. The close association of the osteoarthritic process with aging has led some to speculate on the possible appropriateness of considering it an aspect of normal aging rather than a disease. It appears that such an interpretation is supportable only if both the number of joints involved and the severity of disease is taken into account. It is also important to note that 5 to 10% of people seem to escape the osteoarthrotic process altogether and that some amount of prevention and amelioration is possible.

In general, the major risk factors that are associated with osteoarthritis are thought to reflect the wear and tear to which the involved joints have been exposed over the lifetime. Genetic, ethnic, occupational, and/or cultural factors may play some role in osteoarthritis of certain joints, but it has often been impossible to separate which factors are truly genetic from those that are reflections of activities and exposures (Hoaglund, Yau, & Wong, 1973; Kelsey, 1982). Obesity has been found to be a risk factor in some but not all studies and may influence the occurrence in non-weight-bearing joints as well as the knee (Goldin, McAdam, Louie, Gold, & Bluestone, 1976; Leach, Baumgard, & Broom, 1973; Partridge & Duthie, 1968; Saville & Dickson, 1968). Occupation and lifetime hobbies may also predispose to arthritis of the most used joints, but such exposures have not always been found to increase disease (Ambre & Nilsson, 1978; Burke, Fear, & Wright, 1977; Puranen, Ala-Ketola, Peltokallio, & Saarela, 1975).

Arthritis is a major cause of physical disability and accounts for a substantial proportion of the hospitalizations and health care utilized by the elderly (Cunningham & Kelsey, 1984). It has been estimated that the annual national cost associated with hip or knee arthroplasty and/or replacement exceeds $1.5 billion, with over 300,000 joint replacements carried out annually (Melton, Stauffer, Chao, & Ilstrup, 1982). Arthritis is the principal cause for a total incapacitation in one million persons in the United States aged 55 and older and is thought to be an important contributing factor for another million (Epstein *et al.*, 1986).

Epidemiologic research on osteoarthritis is currently focused on the definition of disease subtypes, determinants of susceptibility, predictors and correlates of multiple joint disease, reasons for specific joint involvement, reasons for different patterns of progression, determinants of disability (given similar objective severities of disease), and approaches to preventing both the condition itself and the associated limitations of activity.

OSTEOPOROSIS

Osteoporosis is commonly defined as a state of diminished bone mineral mass associated with an increased susceptibility to fracture. Used more casually, the term can also refer to the demineralizing process (which includes both decreasing calcium and osteoid matrix) leading to the osteoporotic state. While rates and extents of demineralization are variable, progressive loss of bone mass seems to be a nearly universal concomitant of aging. It has been estimated that osteoporosis is responsible for at least 1.2 million fractures annually in the United States, with a cost (direct and indirect) of approximately $6.1 billion per year (Holbrook, Grazier, Kelsey, & Stauffer, 1984; Riggs & Melton, 1986).

The underlying pathophysiology of osteoporosis is not fully understood but includes aspects related to decreased absorption of calcium, to the balance between osteoblastic and osteoclastic activity in bones, to hormonal factors in calcium homeostasis, and to other factors involved in calcium balance and bone metabolism—all somehow related to the biology of aging (Horsman, Nordin, Aaron, & Marshall, 1981; Melsen & Mosekilde, 1981; Meunier, 1984; Riggs & Melton, 1986).

Although there are other types and causes of osteopenia and bone loss, none are so common as osteoporosis. In osteomalacia, the adult equivalent of rickets, bone is lost as a result of deficient calcium absorption (usually as a result of vitamin D deficiency) and is replaced by hypomineralized osteoid. Riggs and Melton (1983) and Riggs, Melton, and Wahner (1983) have categorized osteoporosis into two major types,

senescent and menopausal, and have proposed that the former is largely limited to trabecular bone (strongly associated with vertebral fractures). The menopausal type involves both trabecular and cortical bone and is more associated with an increased risk for hip fracture.

When an elderly person fractures a hip with minimal trauma or is noted to have vertebral compression fractures on X-ray the diagnosis of osteoporosis hardly requires the supplemental evidence of a bone density measure; unless some other explanation is observed, the fracture itself suggests that an osteoporotic state exists. In the absence of such clinical evidence, the diagnosis requires one or more measures of bone mass and is defined on the basis of a low value. A major problem involved with the diagnosis of osteoporosis is that bone mass at one site is imperfectly correlated with the bone mass at other sites. This reflects at least two phenomena: differential proportions of trabecular and cortical bone, and differing local influences such as muscle mass, exercise, etc. (Cummings, Kelsey, Nevitt, & O'Dowd, 1985; Johnston, Hui, Wiske, Norton, & Epstein, 1981; Mazess, Peppler, Chesney, Lange, Lindgren, & Smith, 1984; Parfitt, 1984). For example, measures of bone mass in a metacarpal may or may not reflect susceptibility to hip, vertebral, or Colles' fractures. In addition, serial bone density measurements at a specific site may or may not provide reliable information concerning changes in bone mass at other sites. Although the criterion threshold (the level below which the diagnosis of osteoporosis can be made) depends upon the method and the site examined, a level is usually selected that corresponds to a significantly increased fracture risk (Melton, Wahner, Richelson, O'Fallon, & Riggs, 1986). Alternatively, the level may be set by consideration of distribution of the bone mass measure in a normal population. Age-specific bone density norms are generally inappropriate; since we usually wish to examine relationships between age, the extent of osteoporosis, and the current risk of fracture, we must apply the same criterion to all ages. The risk of future fractures, however, depends upon the trajectory of the osteoporotic process, assessed with consideration of age, prior measurements, and other factors.

For population estimates of osteoporosis, the rate of fracture may serve as an alternative to bone mineral mass measures. For example, rates of fracture have been compared between geographic areas with differing levels of fluoride or calcium in the water supply (Madans, Kleinman, & Cornoni-Huntley, 1984; Sowers, Wallace, & Lemke, 1985). There is concern, however, that such studies might not allow valid comparisons of rates of osteoporosis, since fractures are undoubtedly the result of a very complex interaction of factors.

The X-ray methods used for many years for measurement of bone

density were always problematic because of the large reductions in bone mineral content required before the change could be detected. Measurements of cortical bone thickness are more reliable but do not correlate well with other bone characteristics associated with bone strength and resistance to fracture (Johnston, 1983). In recent years, photon absorptiometry has nearly replaced the more conventional X-ray methods, with only computed assisted tomography (CAT) methods retaining a special utility. Dual photon absorption methods are especially useful when the mass of soft tissue around the bone to be measured is substantial. Single photon absorption methods are much less cumbersome, less expensive, and are especially suitable for peripheral appendicular bones (Health and Public Policy Committee, American College of Physicians, 1984).

In a recent analysis of X-rays collected during the 1971–1975 NHANES I, Mangaroo, Glasser, Roht, and Kapadia (1985) utilized an aluminum equivalency standard to compute bone mass values for the middle phalanx of the little finger for 6,030 adults. They calculated a mean bone mass for this site of 0.228 mm (aluminum equivalence) with a standard deviation of 0.042 mm. Using a threshold criterion of 0.200, the prevalence of osteoporosis among white females aged 25 to 34 was estimated at 20%, while the prevalence for white males of the same age was about 13%. By age 65 to 74 these estimates had increased to 44% for white females and 34% for white males. Although low numbers reduced confidence in prevalence estimates for black participants, the same age and sex trends were noted. The prevalence of osteoporosis was estimated by Iskrant and Smith (1969) from spinal X-rays as under 20% for women aged 45 to 49 and 89% for women aged 80 and older, based on vertebral fractures and reduced dorsolumbar bone densities. They described a consistent decrease in density with age and noted that about 70% of the women in whom a fracture (all sites) occurred during a prospective three-year interval of surveillance had initially lower grades of vertebral bone density.

A substantial number of studies have been carried out to examine patterns of bone density variation by sex, age, geographic area, race, and bone site. Virtually all of these have confirmed that women's values are lower than men's and that advanced age is associated with lower levels of bone density (Awbrey et al., 1984; Plato & Purifoy, 1982; Smith, Khairi, & Johnston, 1975). Studies suggest that the usual pattern is one of slow bone loss beginning in middle adult life, accelerating for a few years immediately after menopause, and then continuing the same progressive loss of bone into late life (Mazess, 1982). Peak bone mass at skeletal maturity appears to be an important determinant of bone mass in later life (Heaney, 1983; Johnston et al., 1983; Kleerekoper, Tolia, & Parfitt,

1981) and is apparently the result of many factors, prominently including genetic endowment, physical activity, weight, muscle development, nutrition, race, and sex (Cummings, Kelsey, Nevitt, & O'Dowd, 1985; Heaney, 1983; Parfitt, 1984; Riggs & Melton, 1986).

The relationship between bone mass and age has been carefully examined in cross-sectional studies reported by investigators at the Mayo Clinic School of Medicine using photon absorptiometry applied to different bone sites (Melton & Riggs, 1983; Riggs et al., 1981; Riggs et al, 1982; Riggs & Melton, 1986). Their observations, remarkably consistent across skeletal sites, suggest that the loss of bone mass with age can be modeled as a linear, continuous decline that seems to be established by about age 25 to 35 and that continues into at least the eighth or ninth decade of life. The slopes for bone loss from the femur are slightly steeper for women than men but are substantially steeper for women in the lumbar spine. These cross-sectionally derived regression lines are of additional interest in that they show neither the expected change in slope around the time of menopause nor a higher intercept (higher peak bone mass) in males. In contrast with these observations, Cann, Genant, Kolb, and Ettinger (1985) have described a definite exaggeration of vertebral bone mass loss associated with menopause, whereas Richelson, Wahner, Melton, and Riggs (1984) have noted patterns of demineralization among women with iatrogenic early menopause that resemble those of older women with natural menopause. Patterns of continued bone loss into the eighth and ninth decades may not be linear, and bone densities may actually stabilize or increase due to slowing of endosteal reabsorption coupled with gradual periosteal bone growth (Hui, Wiske, Norton, & Johnston, 1982).

Bone mass at all ages tends to be greater with larger frame size, greater muscle mass, and greater weight. It is not clear how much of the greater bone mass of males (compared with females) or blacks (compared with whites) can be explained by these factors. Exercise, especially in weight-bearing activities, is important in the maintenance of bone mass and may actually produce increases in mass even in later life (Jacobson, Beaver, Grubb, Taft, & Talmage, 1984; Smith, Reddan, & Smith, 1981). Smoking seems to be associated with lower bone mass, and some evidence exists to suggest that alcohol consumption may also be inversely associated with mineralization (Anderson & Tylavsky, 1984; Kleerekoper et al., 1981; Krolner, Toft, Nielsen, & Tondevold, 1983). Individuals likely to become osteoporotic at an early age are those whose peak bone mass (usually achieved between age 18 and 25) was relatively low, and/or whose onset of the osteoporotic process began early, and/or whose rate of loss is accelerated. Rates of bone loss are exaggerated by estrogen

withdrawal, as produced by oophorectomy. The use of thiazides appears to be associated with increased bone mineralization (Wasnich, Benfante, Yano, Heilbrun, & Vogel, 1983). Accelerated demineralization is associated with immobilization, lack of muscular and gravitational stresses on bones, and a variety of metabolic and endocrine conditions. Factors influencing bone mineral mass have been recently reviewed by Cummings et al. (1985) and by Riggs and Melton (1986).

FRACTURES

Fractures occur at increased rates among the aged principally because their bones have become weakened as a result of the osteoporotic process that began years earlier. The medical importance of osteoporosis is almost wholly attributable to its role in the pathogenesis of fractures, and much of the epidemiology of fractures in late life reflects the epidemiology of osteoporosis. It appears that the correlation between increased fracture risk and decreased bone mineral mass is largely uninfluenced by age (Melton & Riggs, 1985; Riggs & Melton, 1986). This implies that the osteoporotic state can be defined without regard for age and further explains our assertion that when the objective is to assess the risk of fracture, age-specific norms are usually inappropriate. Assessment of the risk of future fractures, however, involves estimation of the trajectory of the osteoporotic process and requires consideration of all available information, including age (see conceptual and methodologic issues section).

When participants in the NIA EPESE were asked if they had ever broken a hip, the affirmative percentage increased with age, was higher for females, and ranged from 1.3% among 65- to 69-year-old white males in Iowa to 14% among 80 to 84 year old white females in New Haven (Farmer et al., 1986). When asked about other broken bones since age 50, the affirmative percentage was much higher (most between 15 to 30%), did not clearly increase with age, and was modestly greater for females. Between one-quarter and one-half of these fractures involved the wrist, hand, or arm. Wasnich, Ross, Heilbrun, and Vogel (1985) noted evidence of a prior fracture in 10% of a group of postmenopausal, Japanese ancestry women living in Hawaii, with new fractures occurring in approximately 2.4% during three years of surveillance. The most common preexisting fractures involved the wrist (about one-third), followed by the tibia and/or fibula (27%), foot (17%), or rib (17%). The most common new fractures involved a rib (31%), wrist (23%), tibia and/or fibula (19%), or foot (19%). Data from the National Health Interview Survey, 1970–1977, were utilized by Holbrook et al. (1984) to compare the

average annual incidence of fractures at five specific sites (as well as for all sites) for persons aged 45 to 64, and 65 and older. Their estimates were similar for these two age strata for fractures of the radius or ulna (1.6 and 1.6 per 1,000 person-years), humerus (1.3 and 1.1 per 1,000 person-years), vertebral column (1.3 and 1.3 per 1,000 person-years), and all sites combined 24.5 and 28.8 per 1,000 person-years) but were approximately 20-fold greater among the older subjects for hip fractures (0.2 and 4.3 per 1,000 person-years). Although only a small proportion of the elderly will give a history of vertebral fracture, these are certainly the most prevalent of the osteoporosis-related fractures. Vertebral compression fractures apparently produce few symptoms except perhaps for mild to moderate pain (usually lasting less than three months but occasionally becoming chronic) and the characteristic kyphotic hump (Frost, 1981). Smith and Rizek (1966) reported a compression fracture prevalence of approximately 1.5% in women aged 50 to 59, increasing to 17.9% at 70 to 74 years, followed by a slight fall in prevalence thereafter. Although published data are sparse, it is widely believed that these figures substantially underestimate the true prevalence.

Vertebral bone is approximately two-thirds trabecular, in contrast with femoral bone which is 50 to 75% cortical depending on which part of the femur is considered (Riggs et al., 1982; Schlenker & Von Seggen, 1976). The data of Riggs and co-workers (1982) suggest that nontraumatic vertebral fractures are quite uncommon in persons whose lumbar spine bone mineral mass values exceed 1.4 gram/cm^2 (by dual photon absorption), a level approximating the median value for women at age 70. In a subsequent analysis, Melton and Riggs (1985) described a "gradient of risk," with no vertebral fractures observed among women whose lumbospinal mineralization was at least 1.4 g/cm,^{2} a 7% prevalence of vertebral compression fractures among women with values of 1.0 to 1.39, and 100% among women whose mineralization values were less than 0.5 g/cm^2. In a prospective study of 2,088 women over age 45 who had been previously X-rayed and categorized according to level of vertebral mineralization, an overall annual fracture rate (all sites) of 3.6% was observed, with incidence values ranging from 2% among women with higher vertebral bone densities to 7% for those who had been classified as osteoporotic (Iskrant & Smith, 1969). Vertebral osteoporosis is moderately or poorly correlated with distal radius bone densities, and most investigators have concluded that the correlation is not sufficiently consistent to have clinical value (Awbrey et al., 1984; Mazess et al., 1984; Sowers et al., 1985; Wahner, Riggs, & Beabout, 1977).

Among white women in the United States, the most commonly recognized fracture before age 75 involves the distal forearm (Colles' fracture);

thereafter, fractures of the hip predominate (Alffram & Bauer, 1962; Melton & Riggs, 1983; Owen, Melton, Ilstrup, Johnson, & Riggs, 1982; Owen, Melton, Johnson, Ilstrup, & Riggs, 1982). Only about 18% of the Colles' fractures require hospitalization (Garraway, Stauffer, Kurland, & O'Fallon, 1979). Cummings et al. (1985) have estimated that at age 50, the average woman in the United States has approximately a 15% chance of fracturing a forearm before her death. Although this fracture remains one of the most common into late life, and even though women are at approximately seven times the risk of men, the role of age and osteoporosis in fractures of the forearm are less clear than for the femur and vertebrae (Owen, Melton, Johnston, et al., 1982).

Fracture of the hip is among the most important pathologic events suffered by the aged. More than 200,000 hip fractures occur each year in the United States, most in women, and the great majority in the elderly. Nearly all of these require hospitalization, costly treatment (often surgical), and prolonged convalescent care. An estimate of $2 billion annually as the cost for direct medical care for the immediate treatment undoubtedly underrepresents the actual cost to the nation several-fold (Holbrook et al., 1984; Kelsey, 1984). Cummings et al. (1985) have estimated that the probability of a hip fracture during an individual woman's remaining years of life stays essentially constant at approximately 15% from approximately age 50 to at least 80 years.

Hip fractures can involve the intertrochantic or cervical areas or, least frequently, the head of the femur. There is little to support the contention that fractures at these different sites have different pathogeneses. Although there is some concern that rates of hip fracture may be increasing in Scandanavia and the United Kingdom disproportionate to their changing age structures (Johnell, Nilsson, Obrant, & Sternbo, 1984; Wallace, 1983), evidence from the United States points to a stable age-specific incidence curve (Melton, Ilstrup et al., 1982).

Farmer, White, Brody, and Bailey (1984) utilized the NCHS National Hospital Discharge Survey and data from the District of Columbia Council of Governments to estimate age-specific trajectories of hip fracture incidence by sex and race. These data clearly demonstrate an exponentially increasing incidence beginning before age 40 and continuing at least through age 80 to 84 years. The rate doubles every six years with no apparent change in slope around the time of menopause (Brody, Farmer, & White, 1984). When age-specific incidence values (by sex, race, and five-year age group) were plotted on semilog paper, the expected straight lines were produced; the surprising result, however, was that the lines for white males, black males, and black females were nearly identical in slope and intercept, whereas the line for white women had essentially the same

slope (i.e., the same doubling time) but was displaced five to six years to the left (earlier intercept). This was interpreted as suggesting that the age-associated rise in fracture risk attributed to osteoporosis begins five to six years earlier in white females, giving this group a risk approximately double that of the other three sex/race groups. If hip fracture data are viewed as surrogate indicators for osteoporosis, they are of further interest in that the curves begin their rise before the age of menopause (which occurs at age 49 to 50 in most American women), and in failing to demonstrate either a simple age effect or a simple race effect; no sex difference was apparent for blacks; no race difference was seen for men. These observations contradict the conventional wisdom that many hip fractures are due to postmenopausal decrements in endogenous estrogen and that they rarely occur among blacks because of a racially determined greater bone strength. Although the beneficial influence of estrogens on bone mineralization is now well established, it is interesting to speculate that substantial parts of the effects of race and gender on hip fracture risk might be an indirect reflection of other factors, such as body mass. Black women of the United States in their middle and later years tend to weigh approximately 20 pounds more than white women of comparable age, whereas race differences in weight are minimal for men (White, Kohout, Evans, Cornoni-Huntley, & Ostfeld, 1986).

Most of the established risk factors for hip fractures have already been mentioned: the osteoporotic state itself, advanced age, female gender, low body weight, white race, and smoking. Certain Asian groups are at greater or lower risk, and not all black populations are at low risk (see discussion in Farmer et al., 1984). There appears to be a familial element, but whether this is more environmental or genetic is not clear. Although it is reasonable to expect that diet has some role, it has not been clearly defined. Alcohol intake may be related as well, but problems with confounding make its influence uncertain. A major difficulty with assessing causality is that many of these factors are associated with one another. The epidemiology of osteoporosis and fractures has recently been reviewed by Cummings et al. (1985) and by Riggs and Melton (1986).

The extraordinary public interest in health that has developed in the United States over the past two decades, together with the new technologies for measurement of bone mass, have combined to make the detection, prevention, and treatment of osteoporosis a major part of the health maintenance programs of physicians and clinics caring for older women. For the most part, these seem innocuous. Usual programs for maintaining bone density involve increasing the dietary intake of calcium to a reasonable level (approximately 1.5 grams daily of elemental calcium, either in foods or as a supplement), exercise or other means of increasing physical activity, and sometimes supplementary vitamin D. When the

therapeutic regimen includes the use of estrogens, fluoride, certain forms of "activated" vitamin D, thiazides, or certain other treatments, the hazard of iatrogenic disease becomes much greater.

A very important, unresolved question is whether the measure of bone density by single photon absorptiometry at one of the more accessible appendicular sites can provide adequate information from which to estimate future vertebral and hip fracture risks. Although forearm bone mass is poorly associated with vertebral bone mass, coefficients of correlation between the forearm and the proximal femur are in the range of 0.7 to 0.9 (Mazess et al., 1984; Wilson, 1977). The os calcis also appears to be a promising site (Wasnich et al., 1985). Nevertheless, it would be premature to suppose that either the utility of such tests, or the best site for bone density measurement have yet been fully defined. It is not yet clear that sequential bone density measures need be a part of routine health maintenance care for every woman or that they can be ignored for older men. Adequate prospective studies do not exist in which subjects who are representative of a normal population have been followed with serial bone density measurement, serial anthropometry (arm girth, leg girth, skinfold thicknesses, weight, height, calculated muscle areas, calculated total body fat, muscle, etc.) and surveillance for fractures. Although such studies are very costly, the price of perpetuating our ignorance may ultimately be much greater.

HEART DISEASE AND HYPERTENSION

The increase with age in mortality due to heart disease follows a trajectory parallel to that for all-cause mortality. It is the most common cause of death in the United States and throughout the developed world and is responsible for a very large proportion of the morbidity and disability of the world's elderly.

The great majority of the heart disease mortality is due to atherosclerotic coronary heart disease (CHD). The manifestations of CHD include angina, arrhythmia, congestive heart failure, and myocardial infarction. It has been estimated that CHD was the disease leading directly to death in 32.4% and contributed to the fatal illness in an additional 12.1% of deaths of people in the United States 65 and older in 1982 (Feinleib & Gillum, 1986). Death rates for CHD for white males were 1.29% per year at age 65 to 74, 2.84% at 75 to 84, and 6.2% at age 85+. Corresponding rates for white females were 0.56, 1.7, and 5.05% per year. For black males the CHD mortality rates in these same age strata were 1.1, 1.99, and 4%; and for black females, 0.58, 1.47, and 3.33% per year.

Remarkable decreases in CHD death rates have occurred since the

middle 1960s (Feinleib, Thomas, & Havlik, 1982; Gillum, Folsom, & Blackburn, 1984). Recent data from the National Center for Health Statistics indicate that the improvement has continued in both sexes and is proportionally as great in older (85+) men and women as in the younger elderly (aged 65 to 74) (Feinleib & Gillum, 1986).

Although the prevalence of CHD has been found to increase the age in most studies, observed rates have varied. Based on the 1960–1962 National Health Examination Survey, estimates of the prevalence of CHD (combining definite and suspect cases) among men increased from 7% (age 45 to 54), to 14% (55 to 64), to 17% (65 to 74), and then declined to 13% (at age 75 to 79); corresponding figures for women were 4, 10, 14, and 12% (NCHS, 1965). In the 1972 Health Interview Survey (NCHS, 1974), the self-reported prevalence of CHD among men was 4.8% at age 45 to 64 and 9.6% among those 65 and older. Among women the prevalence rates were 2.3% (ages 45 to 64) and 7.6% (65+). Estimates from the NCHS National Medical Care Utilization and Expenditure Survey of 1980 (quoted by Soldo & Manton, 1985) place the prevalence of CHD among American men at 6.77% at age 55 to 64, 7.03% at 65–74, and 11.68% at 75+, with corresponding prevalence figures for women at 3.49, 5.24, and 6.47%.

In our culture, atherosclerosis begins at a young age (as fatty streaks in arteries, as described by Newman, Freedman, & Voors, 1986) and usually progresses relentlessly until death. Although some pathological evidence of atherosclerosis is nearly universal, there are substantial variations in the type, extent, severity, and location of the lesions (Restrepo, Montenegro, & Solberg, 1966; Tejada, Strong, Montenegro, Restrepo, & Solberg, 1966; White, Edwards, & Dry, 1950). The elderly often suffer with some morbid manifestations of atherosclerosis, the fortunate having few or no clinical signs despite demonstrable disease at autopsy.

We assume that at any age an individual's burden of atherosclerotic disease reflects the rate at which atherogenesis has progressed during his/her prior life, and that this in turn reflects a combination of innate resistance factors (mostly genetic), acquired resistance (such as enhancements of cardiac collateral vascularization), prior and current risk factors, and undefined exposure factors. Most epidemiologic research on the common cardiovascular diseases of adult life has focused on myocardial infarction, angina, intermittent claudication, arrhythmias, congestive heart failure, stroke, or transient ischemic attacks, i.e., discreet events that usually express the existence of advanced atherosclerotic and/or hypertensive disease. Although these are secondary rather than primary manifestations of disease, they represent the most important ways in which the underlying processes reduce the length and quality of

life. Their pathogeneses involve not only the basic processes but also the circumstances leading up to and precipitating the events themselves. Risk factors brought to light by epidemiologic research may involve either the primary processes or the precipitating circumstances, and strategies for prevention may be effectively directed at either.

Risk factors for incident coronary heart disease in Framingham Heart Study participants aged 50 to 82 have been reported to be similar to those already established in middle life, most notably elevated blood pressure, low density lipoprotein cholesterol (LDL-C), and left ventricular hypertrophy (electrocardiographically demonstrated; ECG-LVH) (Gordon, Castelli, Hjortland, Kannel, & Dawber, 1977; Kannel, 1986; Kannel & Brand, 1985). Diabetes has been found to be a risk factor for older women but was not significantly associated with these outcomes for older men, whereas high density lipoprotein cholesterol (HDL-C) was protective for both sexes (Kannel & Brand, 1985). For cardiovascular mortality among subjects aged 65 to 74, significantly predictive factors were hypertension, ECG-LVH, proteinuria, cigarette smoking (in men only), and reduced vital capacity (in women only). In a recent study on clinically diagnosed diabetes and asymptomatic hyperglycemia, the former was found to be associated with increased risk for CHD death in both sexes, whereas asymptomatic hyperglycemia was associated with mortality only for women (Pan et al., 1986). Cardiovascular events appear to be attributable to the same pathogeneses in late as in early life, i.e., those factors that influence the atherosclerotic process and/or hypertension.

Some but not all of the factors that were powerful predictors of cardiovascular morbidity and mortality seem to weaken with advancing age (Barrett-Connor, Suarez, Khaw, Criqui, & Wingard, 1984). It is as yet unclear to what extent the apparent lessening influence of many risk factors with advancing age is an artifact of study design and analysis (see section on methodological and conceptual issues). A possible explanation for the apparent decreasing influence of many risk factors in older subjects is that all are survivors, selected by the forces of mortality, and are thereby more alike than younger cases and noncases. When the end point is incident morbidity in older persons, one is necessarily comparing controls who may well have incipient disease (because of age) with cases who are relatively resistant to the disease (since they have resisted prior morbidity). It is generally believed that the fundamental pathogenesis of atherosclerosis is probably subject to the same determinants in everyone but that individual variation in susceptibility is substantial.

In a study of the personal health habits of 1,223 elderly persons followed up after a period of six years, Branch and Jette (1984) failed to show any significant association between the risk of dying and decreased

physical activity, sleep patterns, alcohol use, regularity of meals eaten, or smoking (never smoked cigarette vs. current or past smoker). These data are in conflict with results reported by Jajich, Ostfeld, and Freeman (1984) from a longitudinal study of 2,674 persons aged 65 to 74, which demonstrated a higher risk of death due to coronary heart disease among subjects who had been smokers at the initial examination. Among those who had quit smoking, the risk for mortality declined within one to five years. The benefits of cessation of cigarette smoking in older persons also appear to include an improvement in cerebral blood flow, as documented by Rogers (1985). Although there are sparse data regarding the ability of increased physical activity initiated in late life to diminish the risk of heart attack, Paffenbarger, Wing, and Hyde (1978) demonstrated a protective effect among older (65 to 74) persons who were more active than their sedentary peers. In a more recent report, Paffenbarger, Hyde, Wing, and Hsieh (1986) provided further data to support the benefits of regular exercise and estimated that by the age of 80, the additional life attributable to exercise in his study group was one to two years or more.

Are the benefits of CHD risk factor modification maintained as an individual ages? the answer—based largely on our understanding of pathophysiology, since there is as yet little objective data on which to base a definite response—is "mostly yes." Clear benefits of blood pressure control and cessation of smoking have been documented in the elderly, and factors directly involved in emobolic and thrombotic phenomena are probably subject to the same influences at any age. As in the parable of the straw that broke the camel's back, the effect of risk factor modification (such as either cessation or resumption of smoking) may be dramatic in an older person, since the consequence of an increment of encroachment on a vessel's lumen is undoubtedly more critical when the lumen is already marginal; eleventh hour changes may either forestall or precipitate an imminent event. Since very small changes may become crucial late in the evolution of atheromatous obstruction of a vessel, an obstructive event might be substantially deferred by arresting the evolution of the atherosclerotic lesion, even in an elderly person with advanced disease. On the other hand, since atherosclerotic vascular disease becomes established over a lifetime, many aspects of prevention must begin early if maximum benefit is to be gained. Until intervention trials have been carried out in the elderly population, the most reasonable position would appear to be that risk factor modification should be encouraged at any age.

In cross-sectional population data for the United States, both diastolic and systolic pressures rise with advancing age to about age 55, at which time the diastolic pressure levels out or decreases slightly, whereas the systolic continues to rise, producing a widening of the pulse pressure

(Farmer, Ostfeld, et al., 1986; NCHS, 1977). Although some of this pattern may be due to selective survival of persons whose diastolic pressures remain fairly low even as their systolic pressures increase, cohort studies suggest that stability or a modest decrease in diastolic pressure is the usual pattern in later life (Kannel & Gordon, 1980).

The increasing systolic blood pressures of advancing age are usually attributed to arteriosclerotic reductions in large artery elasticity and are correlated with the extent of atherosclerotic disease in coronary and cerebral vessels. This implies that part of the epidemiologic association of elevated blood pressure with CHD events and mortality may be mediated by hypertension serving as an indicator for severity of atherosclerosis. However, it is reasonable to assume that elevated blood pressures are simultaneously produced by and cause further aggravation to the atherogenic process, perhaps by magnifying local hemodynamic forces in the area of a plaque and increasing the likelihood of thrombosis at the site. This speculation extends the meaning of hypertension beyond that of an indicator of severity of atherosclerosis and places it in a role of potentiator of the primary atherogenic process and as a contributor to the precipitation of acute events.

The prevalence of hypertension, based on current use of an antihypertensive medication or an elevated diastolic pressure, increases with age to a plateau of 25 to 45 percent at 55 to 65 years (NCHS, 1981b). Among elderly (65+) NIA EPESE participants, the percentage who reported that a doctor had told them that they were hypertensive was remarkably similar between the three committees, varied little with age, was slightly greater for women, and ranged between 35 and 50% (Farmer, Ostfeld, et al., 1986). Of those who reported hypertension, 60 to 80% were taking antihypertensive medication at the time of the survey.

Although hypertension is often treated as an either/or condition most studies have demonstrated a gradual and continuous increase in risk as the blood pressure increases (Kannel & Gordon, 1980; Harris, Cook, Kannel, Schatzkin, & Goldman, 1985; Curb et al., 1985). The justification for treating hypertension this way is related to the establishment of rules for clinical recognition and treatment and the fact that there is a level of pressure below which the hazards of treatment exceed the potential benefits. Elevated blood pressure is a major risk factor of myocardial infarction and heart failure and is the single most important factor known to increase the risk for stroke (Harris et al., 1985; Kannel & Gordon, 1980). Treatment of hypertension at all ages has been shown to be an effective and important means for reducing cardiovascular mobidity and mortality (Hypertension Detection and Follow-up Cooperative Group, 1982a,b).

A contemporary problem is that of isolated systolic hypertension,

operationally defined as an elevated systolic blood pressure (generally above 160) without elevation of the diastolic pressure (below 90). A multicenter, controlled trial is currently underway to determine if lowering of blood pressure in such subjects will affect the occurrence of fatal and nonfatal strokes (Wittenberg, 1985). Although it appears that such persons have a 2- to 3-fold excess in stroke risk, it is not yet certain that the lowering of blood pressure by treatment with drugs can be accomplished without producing more adverse effects than would be justified by the benefits. This trial, cosponsored by the NHLBI and the NIA, is scheduled to involve the screening of approximately 250,000 persons aged 60 or older at the 17 sites selected in order to recruit the needed 5,000 persons with isolated systolic hypertension. Six years of observation and data collection are planned, to be followed by approximately 2 years for analyses. In addition to the specific objectives mentioned, these studies have been widely recognized for the opportunity they offer to examine other aspects of the epidemiology of aging and are certain to yield a wealth of data over the next decade related to many aspects of aging.

STROKE

Stroke is the third leading cause of death in the United States, the most common life-threatening neurologic disease, and is a frequent cause of physical disability and loss of independence in the aged. The immediate cause of half to three-quarters the strokes occurring in this country is occlusion by thrombosis, usually of an already arteriosclerotic and narrowed artery. Approximately 16% of strokes are produced by emboli, as from a mural thrombus formed within a chamber of the heart in association with atrial fibrillation. The remaining 15 to 25% of strokes are hemorrhagic, with the ratio of intracerebral to subarchnoid bleeding varying in different studies from approximately 1:2 to 2:1. (Kurtzke, 1985; Wolf, Kannel, & McGee, 1980, 1986).

Among participants in the NIA EPESE, the prevalence of a history of stroke in most age/sex/site groups varied between 5 and 8% and most said they had been hospitalized overnight for the event. Modest trends toward higher rates in men and in persons of advanced age were seen (Farmer, White et al., 1986). In the National Nursing Home Survey (NCHS, 1979b), 16.4% of institutionalized elderly were identified as having had a stroke. Data from the 1982 Health Interview Survey (NCHS, 1985a) indicated a self-reported prevalence of prior stroke of 4.52% at age 65 to 74 and 7.29% among Americans 75 and older.

Prevalence of a history of stroke at age 60 to 75, compiled and summarized by Ostfeld (1980), ranged from 2% (white females, Michigan) to 15.3% (black females, Chicago). The prevalence of cerebrovascular disease in Rochester, Minnesota was noted to increase slightly between 1960 and 1970 but decreased over the same interval for older residents of that community, with a value of approximately 6% (both sexes) at 75+ years (summarized by Kurtzke, 1985).

Mortality rates provide an indicator for trends in the incidence of stroke, since case fatality rates seem not to have varied greatly over recent years (Garraway, Whisnant, & Drury, 1983; Garraway, Whisnant, et al., 1979). There has been a steady decline in cerebrovascular mortality in North America since at least 1915, with a steepening of the decline about 1967 and again about 1973. The improvement in stroke mortality was more evident in whites and in females until the middle 1970s, with slopes for the four race/sex groups (black females, black males, white females, white males) since that time being roughly parallel. These curves do not support a dramatic national effect of treatment of hypertension until the 1970s. Since control of hypertension probably benefits both the long-term progression of chronic cardiovascular disease and its acute manifestations as myocardial infarction and stroke, we may just now be seeing the combined benefit of these two disease prevention mechanisms. After about age 45, male cerebrovascular death rates are slightly higher than those for females, doubling approximately every five years. At age 80 to 84 the annual stroke death rate in the United States is about 1.2% in men and 1% in women, contrasted with coronary heart disease death rates at the same age of 3.8% (men) and 2.5% (women) (NCHS data, summarized by Kurtzke, 1985; Wolf, Kannel, & McGee, 1980).

There are dramatic differences in stroke death rates and in recent improvements of these rates between countries: the highest rates in 1977 were for Bulgaria, Japan, Czechoslovakia, and Hungary, with the lowest rates in Sweden, Canada, Denmark, and the United States. Between 1969 and 1977 dramatic improvements in death rates occurred in Japan, Finland, Norway, and the United States, whereas rates worsened in Bulgaria, Czechoslovakia, Poland, and Hungary. In Japan, there has been an inverse relationship between stroke (very high rates, largely hemorrhagic but improving) and coronary heart disease (low rates but now getting worse) (Tanaka et al., 1982; Wolf, Kannel, & McGee, 1980). Substantial differences also exist between countries in the relative frequencies of thrombotic versus hemorrhagic stroke (Fratiglioni, Massey, Schoenberg, & Schoenberg, 1983).

Although cerebrovascular mortality rates probably give a fair picture of overall trends, validity of the diagnosis on death certificates is poor. Of

280 deaths due to stroke (verified) among Framingham Heart Study participants, 40% had no mention of stroke on the death certificate; furthermore, the diagnosis was not verified in 21% of the cases in which it had been recorded on the death certificate. To make matters still worse, these figures take no account of errors in classification as to the type of stroke, also known to be frequently in error (Corwin, Wolf, Kannel, & McNamara, 1982). Gittelsohn and Senning (1979) analyzed 1,845 in-hospital deaths occurring in Vermont, with a cerebrovascular disease code listed on the death record, the hospital abstract, or both. They found that 69% of the cases with a cerebrovascular disease code on the death certificate had the corresponding condition coded in the hospital record. In another 22%, the hospital record indicated the diagnosis of a different cerebrovascular condition.

Data on the incidence of strokes from the Mayo clinic for the area surrounding Rochester, Minnesota has echoed the previously mentioned mortality data, with marked decreases (1945 to 1979) in the incidence of cerebral infarction, less dramatic decreases in the incidence of intercerebral hemorrhage, and with no apparent change in the incidence of subarachnoid hemorrhage (Garraway et al., 1983). The actual decline in intracerebral hemorrhage was probably greater than the data suggest, however, since it occurred in the face of increasing use of anticoagulant therapies and since the likelihood of recognizing such strokes was improved during the interval by the availability of CT scans. Recent data from New Zealand (Bonita, Beaglehole, & North, 1983) and Finland (Kotila, 1984) taken together with mortality data from the United States suggest that the incidence of subarachnoid hemorrhage may also have begun to fall in these developed countries, albeit not as dramatically as for the other types of stroke. Ostfeld (1980) collected and tabulated age-specific incidence data on stroke in 14 populations in the United States, Europe, and Japan: estimates of the incidence among white men were in the range of 0.1 to 0.2% per year at age 45 to 54, 0.3 to 0.6% per year at age 55 to 64, 0.7 to 2.7% per year at age 65 to 74, and 1.5 to 3% per year at age 75 to 84. Incidence rates for white women were slightly lower than men at nearly every age. Rates were substantially higher for blacks (male incidence 1% at 45 to 54, increasing to 3% at 75 to 84) and for Japanese. A comprehensive summary of reported incidence rates by age, sex, and geographic area has been recently presented by Kurtzke (1985). Dramatic declines in stroke mortality and incidence have occurred in Japan during the past 10 to 20 years just as in the United States, with substantial differences between communities in Japan (Komachi et al., 1984). As in most other studies, Japanese males appear to be at higher risk than Japanese females (Haberman, Capildeo, & Rose, 1981).

Many Japanese migrated to Hawaii at about the turn of the century, with a second wave going on to California. These events provided the opportunity to examine the influence of factors associated with migration, with differing environments, and with many aspects of aculturation that followed—with genetic factors presumably unchanged. Parallel studies were established in Japan (Hiroshima and Nagaski), in Hawaii, and in California; the conjoint effort was called the NI-HON-SAN study. In an update of that study, focused on a comparison of recent data for incident strokes in men in Japan and Hawaii, the age-adjusted stroke incidence rate for Japan (1972–1978) was 0.74% per year, 2.7 times as high as in Hawaii (1965–1973). It was noted that thromboembolic strokes outnumbered strokes due to intracerebral hemorrhage in both populations, the ratio being 2.2 in Japan and 1.6 in Hawaii (Takeya, et al., 1984).

Recent studies indicate that increased rates of cerebrovascular disease also occur in China and that intracerebral hemorrhage may account for as much as 44% of the strokes in the People's Republic. Blacks in the United States also have increased rates of stroke. Whether these race and ethnicity differences involve genetic factors or are solely due to differences in hypertension is not known (Kurtzke, 1985).

Because subarachnoid hemorrhage, intracerebral hemorrhage, thrombotic, and embolic stroke involve somewhat different pathogenic mechanisms and structures, their risk factors are not necessarily identical. For all types of stroke and at all ages, the preeminent risk factor is elevated systolic and/or diastolic blood pressure (Dyken et al., 1984; Kannel et al., 1981). Next most important are factors related to heart disease, including congestive heart failure, prior CHD, and left ventricular hypertrophy (by electrocardiography). Embolic strokes are assoicated with atrial fibrillation (a common cause in the elderly) and with a prolapsed mitral valve (important at younger ages) (Kurtzke, 1983; Wolf, 1985; Wolf, Dawber, & Kannel, 1978; Wolf, Dawber, Thomas et al., 1978; Wolf, Kannel & McGee, 1986). Certain of the factors that are important predictors for coronary heart disease and that presumably exert their influence at least partially through an effect on atherogenesis seem to have little influence on the risk of stroke—a counter-intuitive observation, since atherogenesis is usually envisioned as an important part of the pathogenesis strokes. That there exists a pathogenic dissociation between CHD and stroke is further evidenced by the incidence and mortality trends occurring in Japan (stroke decreasing, CHD increasing), even while both are continuing to decrease in the United States. In the Framingham study, the highest stroke incidence rates were associated with lower levels of total serum cholesterol, and lowest stroke incidence with intermediate choles-

terol levels. A significant association between higher hemorrhagic stroke rates and lower levels of LDL-C levels has been described among women in the Framingham cohort, as well as in Japanese-American men in Hawaii and in both sexes living in Hisayama, Japan (summarized by Wolf et al., 1986). This association is in the opposite direction for CHD, i.e., more heart disease with higher LDL-C levels.

The association of atherosclerotic brain infarctions (mostly corresponding to clinical categorization as thrombotic stroke) with diabetes is also substantial, is stronger for women, and does not decrease with advancing age (Paffenbarger & Wing, 1971; Schoenberg, Schoenberg, Pritchard, Lilienfeld, & Wisnant, 1980; Wolf et al., 1986). After controlling for hypertension and diabetes, no additional risk has been found to be associated with obesity. Hematocrit levels have also been reported to be correlated with risk for stroke, particularly in men, with values below 40 being associated with approximately one-fifth the risk for stroke as values of 47% or greater (Kannel, Gordon, Wolf, & McNamara, 1972; Wolf et al., 1986). The influence of oral contraceptive use on stroke risk is still in dispute, although there may be a substantially increased risk of subarachnoid hemorrhage for women over 35 who also smoke (Collaborative Group for the Study of Stroke in Young Women, 1975; Longstreth, Koepsell, Yerby, & Van Belle, 1985; Longstreth and Swanson, 1984; Vessey, McPherson, & Yeates, 1981; Wolf, 1985). In general, smoking has not emerged as a predictor of strokes in American studies, except for an association with subarachnoid hemorrhage (Longstreth et al., 1985; Stemmermann et al., 1984; Takeya et al., 1984). Alcohol consumption, also a risk factor, may influence the risk of stroke through mechanisms involving either acute intoxication (Hillbom & Kaste, 1982, 1983) or chronic changes (Stokes, 1982) and has been associated with hemorrhagic stroke among Japanese male participants in the Honolulu Heart Study (Kagan, Popper, & Rhoads, 1982; Stemmermann et al., 1984). Women appear to be at greater risk than men; however, the gender effect could be a reflection of other risk factors (Haberman et al., 1981).

A recent report suggests that snoring may be another risk factor for stroke, perhaps acting through physiologic changes related to blood pressure fluctuations associated with sleep apnea (Partinen & Palomaki, 1985). Carotid bruit, studied prospectively in the Framingham Heart Study cohort, has been shown to predict strokes (not necessarily involving sites served by the ausculted vessel), transient ischemic attacks (TIAs), and myocardial infarction. In asymptomatic persons, carotid bruit may serve as a nonfocal sign of advanced arteriosclerosis (Wolf et al., 1986; Wolf, Kannel, Sorlie, & McNamara, 1981).

The ratio of documented strokes to recognized TIAs is high, roughly 9

to 1 (Wolf, Kannel, & Verter, 1984). In the Framingham cohort, TIAs preceded only about 12% of the atherosclerotic brain infarctions, but 40% of the persons who had TIAs eventually developed a stroke. The age-specific TIA prevalence values calculated by Whisnant (1976) for Rochester, Minnesota, appear to be between one-tenth and one-quarter of the corresponding rates for stroke prevalence in the same community (Kurtzke, 1985). A useful questionnaire for TIA symptoms has been developed and evaluated by Wilkinson, Heyman, Pfeffer, and Birch (1983). Of 10,265 persons evaluated, about 15% reported nonfocal symptoms compatible with TIAs, while an additional 6% reported focal TIA symptoms. In analysis by proportional hazards modeling, nonfocal TIA symptoms were more associated with stroke than focal symptoms and were second only to age, hypertension, and heart disease in significance.

Little information currently exists to provide estimates of the probabilities of the several possible outcomes for persons who have had a stroke. In a follow-up study of 230 stroke patients, Levy, Caronna, Lapinski, & Singer (1985) noted a mortality rate of 13.9% in the first six months. Of the six-month survivors, 37% returned to their previous levels of function, 23% were moderately disabled, 19% required care with daily activities, and 21% died before detailed functional evaluation was possible. As this same group had reported earlier (Levy et al., 1983), recovery was less likely in older patients (above 70 years). Recovery was also less likely if the clinical features on the first day of the stroke included stupor or coma, gaze paresis or visual field defect, dysphasia, loss of the ability to extend the wrist against gravity, focal areas of increased density in the CAT scan, an initial blood sugar above 120 mg/dl, or lower hematocrit values. Diabetes and blood pressures (on admission or prior) had little prognostic value. Data compiled by the Comprehensive Stroke Program of Oregon, New York, and North Carolina indicated poststroke survival rates in the range of 70% at three months and 55 to 65% at the end of one year (data presented by Toole, 1983). Data from the Pilot Stroke Data Bank, representing four centers and operated cooperatively with the Office of Biometry and Field Studies, NINCDS, indicated an 86% three-month survival after ischemic infarction, with the probability of survival being low in patients who had been comatose when initially seen (data presented by Price, 1983). Other information from the Stroke Data Bank Pilot Study (Wolf, Mohr, et al., 1984) suggests that functional assessment, measured by the Barthel index at the time of the stroke, is a useful predictor of functioning six months later.

The frequency of stroke recurrence was compared according to prior atrial fibrillation (AF) status among Framingham Heart Study participants: rates were high (approximately 15%) in the first three months both

with and without AF, and both groups reached almost the same level (approximately 75%) at the end of five years of follow-up. The major difference associated with AF occurred in the interval between the third and the sixth month poststroke, when the rate rose to approximately 50% for the fibrillation group and to only 20% for those whose strokes had not been associated with atrial fibrillation (Wolf, Dawber, Thomas et al., 1978).

The past decade has seen a burgeoning of epidemiologic studies on cerebrovascular disease, initially focused on rates and risk factors, now extending to research on diagnosis, course, and treatment. With improvements in understanding of fundamental processes and public health approaches to prevention, stroke can be expected to continue its decline in future decades.

HEARING

In a national survey of selected conditions of the elderly, hearing loss was identified as the single most prevalent impairment (NCHS, 1981c). The most common cause of hearing impairment in the elderly is presbycusis, a diminished hearing associated with age for which no other cause is apparent. The pathological and functional changes that occur with aging include age-related degenerative changes of the cochlear mechanisms, eighth nerve changes, and changes in central neurologic aspects of sound perception. In addition, the sound transmitting apparatus is often altered in older people by cerumen impactions, changes in the external auditory canal, diminished mechanical responsiveness of the tympanic membrane, and arthritic changes in the ossicles of the middle ear (Gilad & Glorig, 1979; Marshall, 1981).

In the NIA EPESE surveys, the percentages of elderly, noninstitutionalized participants who had used a hearing aid at some time in their lives increased with age, were higher for males, and were lower for nonwhites (data on race available for the New Haven community only). Among participants aged 65 to 69, the percentage reporting that they had never had a hearing aid ranged from 92.5 (Iowa males) to 99.7% (New Haven nonwhite females); at age 80 to 84, the figures ranged from 77.8 (Iowa males) to 96.7% (New Haven nonwhite males). When asked if they could hear and understand a person speaking in a normal voice in a quiet room (with a hearing aid, if one was usually used), the percent answering "yes" at age 65 to 69 varied between 88.2 (white males, Iowa) and 95.1% (nonwhite males, New Haven). At age 80 to 84, affirmative responses ranged between 80.5 (white males, East Boston) and 98.3% (nonwhite males, New Haven) (Foley, Berkman, Branch, Farmer, & Wallace, 1986).

Most studies of older adults have shown an increasing pure tone hearing level threshold (corresponding to the sound energy required for the tone to be heard) with increasing age, especially at higher frequencies (Corso, 1963a, b; Gilad & Glorig, 1979; Moller, 1981). This age-associated decline in hearing is associated with an increasing prevalence of hearing impairment, the actual prevalence figure depending on the criteria. Methodologic difficulties associated with estimating the prevalence of hearing impairment (by examination or by self-assessment) have been reviewed by Leske (1981) and by Ries (NCHS, 1982). Defined conservatively, at a threshold greater than 20 decibels at any tested frequency (usually testing at 0.5, 1, 2, and 3 and/or 4 kHz) in either ear, the national prevalence of a hearing impairment was estimated at 78.4% among people in the United States aged 65 to 74 years in the NHANES I cohort (NCHS, 1980). In their analysis of data from the Framingham Heart Study cohort (mean age 68 years), Moscicki, Elkins, Baum, and McNamara (1985) reported a hearing impairment prevalence of 83% (94% in men and 76% in women) using the same criteria. With more conventional criteria (better ear average for the speech frequencies greater than 25 decibels), the prevalence in the Framingham study was 31%. Decrements in hearing at the higher frequencies, a usual characteristic of presbycusis, are more commonly seen in men, corresponding to a somewhat greater frequency of self-assessed hearing difficulty (Foley et al., 1986; Marshall, 1981). Although presbycusis is generally thought of as a symmetric sensorineural hearing loss, abnormalities were found on otoscopic examination of the canal and tympanic membrane in about 15% of the Framingham subjects (about 12% of the ears had cerumen impactions), corresponding with a higher than expected frequency of mixed losses (sensorineural and conductive) and a difference between the two ears of 15 decibels or greater in about 13% of subjects.

In the Framingham Study, a search for associated risk factors showed age to be the strongest predictor of hearing impairment for both sexes. Other significant factors in Framingham men were a history of hearing loss associated with an illness and history of noise exposure. In women, the significantly associated factors were a family history of hearing loss, a history of Meniere's disease, and hearing loss associated with an illness (Moscicki et al., 1985).

The role of diabetes in hearing loss in later life is uncertain (Gilad & Glorig, 1979). The report of Jorgensen (1961) that a characteristic hearing loss in diabetics resembles that which is seen in presbycusis, and is correlated with retinal and renal vascular changes, remains controversial. Arteriosclerosis, hyperlipidemia, smoking, and hypertension have all been associated with hearing loss (Rosen & Olin, 1965; Rubinstein, Hildesheimer, Zohar, & Chilarovitz, 1977; Spencer, 1975; Weston, 1964)

implicating changes in the blood supply to the inner ear and perhaps other components of the auditory apparatus in the pathogenesis of presbycusis. A genetic component has also been proposed (Lowell & Paparella, 1977; Paparella, Hanson, Rao, & Ulvestad, 1975). The other major pathogenic mechanism that has been proposed, related to the concept of lifelong wear and tear, is that of noise-induced loss (Bohne, 1976). Although epidemiologic support for these hypotheses is largely lacking, it is notable that loss of hearing with aging is not necessarily universal; a small proportion of individuals retain normal auditory functioning into their later years, and certain isolated population groups have been described in which age-related losses are minimal (Kapur & Patt, 1967; Marshall, 1981; Rosen, Bergman, Plester, El-Mofty, & Satti, 1962).

In their excellent and comprehensive review of presbycusis, Gilad and Glorig (1979) state that "Audiometric findings in neural presbycusis show gradual loss with a moderate slope towards the high frequencies with a severe decrease in speech discrimination out of proportion to the relatively preserved pure-tone threshold." Based either on their own experience and/or common knowledge, the same reviewers stated that "Neural presbycusis, because of its central nervous system component, is usually associated with diffuse symptomatology of central nervous system impairment: motor weakness, coordination disturbances, tremor, loss of memory, and intellectual deterioration." The phenomenon of dissociation between puretone thresholds and difficulty with the discrimination of speech is an especially important aspect of the hearing impairment of older persons. This issue is partially addressed by self-assessment instruments for auditory impairment that ask about the respondent's ability to hear and understand speech (NCHS, 1980) and by instruments for assessing hearing handicap (Brainerd & Frankel, 1985; Hawes & Niswander, 1985). A number of methods have been developed to detect and characterize problems involving the reception, discrimination, and meaningful perception of speech, but few have been specifically designed to investigate the changes of aging, and no epidemiologic study has yet been published dealing comprehensively with the changes that occur in normal aging or with age-associated diseases (Danhauer, Garnett, & Edgerton, 1985; Marshall, 1981; Otto & McCandless, 1982).

VISION

Difficulties with vision are common and troublesome in late life. In the NIA EPESE, approximately 90 to 95% of the participants at the three sites wore glasses, used contact lenses, or both. Among East Boston

EPESE men, the percentage reporting that they could not see well enough to read ordinary newspaper print (with glasses) was 5.4% at age 65 to 69 and 13.8% at age 80 to 84; corresponding figures for the East Boston women were 6.4 and 18.21%. Similar figures in the Iowa population were 2.8 (males, 65 to 69) and 9.1% (males 80 to 84); 2.3 (females, 65 to 69) and 13.8% (females, 80 to 84). In the New Haven EPESE population, the rates were 4.8 (white males, 65 to 69) and 7.9% (white males, 80 to 84); 4.7 (white females, 65 to 69) and 17.6% (white females, 80 to 84); 2 (nonwhite males, 65 to 69) and 7.4% (nonwhite males, 80 to 84); 8.4 (nonwhite females, 65 to 69) and 20.5% (nonwhite females, 80 to 84) (Foley et al., 1986).

In the NHANES I (NCHS, 1983), standardized eye examinations demonstrated a dramatic increase with age in eye diseases, with some eye pathology observed in 85.4% of participants aged 65 to 74 (no persons aged 75 or older were examined). The prevalence of visual impairment caused by eye disease was 36.4% at age 65 to 74. The principal conditions causing decreased vision (all ages) were cataract and/or aphakia, esotropia or exotropia, macular degeneration, glaucoma, and corneal opacities. Among participants in the age group 65 to 74, 23.2% had only one eye condition, 23.2% had two conditions, and 39.6% had three or more conditions noted. Age-specific prevalence estimates for selected conditions across three age strata (45 to 54, 55 to 64, and 65 to 74) were as follows: neoplasms (all types): 4, 4, 6.4%; corneal erosions: 2.4, 3.0, 3.6%; corneal gluttata: 2.5, 3.7, 7.8%; healed corneal opacity: 5.1, 4.5, 6.5%; anisocoria: 0.9, 2.3, 2.6%; cataract (other than congenital or traumatic): 2.6, 10, 28.5%; retinal vascular changes: 16.1, 22.1, 36.4%; macular degeneration: 1.9, 3.0, 8.5%; retinal pigment changes: 1.3, 1.3, 2.8%; glaucoma: 1.4, 1.2, 4.9%. Sex differences were minor for most conditions. The prevalence of an intraocular pressure of 20 mm of Hg or greater increased across successive age strata from 2% at age 20 to 24 years to 10% among subjects at age 65 to 74. A need for treatment of an eye condition increased from 3.07% at age 25 to 34 to 9.8% of study participants aged 65 to 74.

During 1973 to 1975 an examination for eye conditions was carried out in 2,631 participants (mean age 65.3 years) in the Framingham Heart Study, as a collaborative effort of the National Eye Institute, the National Heart, Lung, and Blood Institute, and Boston University (Leibowitz et al., 1980). The focus of this population-based study was on four conditions: senile cataract, open angle glaucoma, diabetic retinopathy, and senile macular degeneration. The prevalence of blindness (visual acuity 20/200 or worse) in one eye increased from 2.1% (age 55 to 64) to 4.5% (age 65 to 74) to 13.7% (in participants aged 75 to 84). For blindness

in both eyes the prevalence figures were 0% (55 to 64), 1.0% (65 to 74), and 2.6% (75 to 84). The figures for blindness in one or both eyes were the sum of these, i.e., 2.1, 5.5, and 16.3% for the three age strata, respectively. The great majority of blindness could be attributed to one or more of the conditions mentioned, with the most common cause being cataract, followed by macular degeneration.

The prevalence of diabetes mellitus in the Framingham cohort was 9.7%, based on standardized criteria. In the entire cohort, including those with diabetes, retinal microaneurysms and/or dot hemorrhages were observed in 2.9% (age less than 65), 4.5% (65 to 74), and 7.6% (75 and older) of the eyes (not persons) examined. Among diabetics, the prevalence of retinopathy varied both with age and with the duration of diabetes. Among diabetics who had known of their disease for less than five years, the prevalence (by eyes) figures for retinal microaneurysms and/or dot hemorrhages were 0.0% (age less than 65), 3.4% (65 to 74), and 17.9% (75 or older). Among participants who had known of their diabetes for 10 to 14 years, the figures were 12.5, 13.9, and 27.8% across successive age strata, respectively. Among the diabetics who had known of their disease for 15 years or longer, the prevalence figures were 71.4% (of 28 eyes examined, participants aged less than 65), 43.6% (39 eyes 65 to 74), and 50.0% (32 eyes 75 or older) (Chapter V of Leibowitz et al., 1980). Although the evidence is mixed, it appears that smoking does not alter the risk for development of retinopathy in diabetics (Klein, Klein, & Davis, 1983).

Chronic open angle glaucoma, a major cause of preventable blindness in the United States, is detected by tonometry (to identify elevated intraocular pressure), perimetry (visual field defects), and opthalmoscopy (cupping of the optic disk) (Wright & Henkind, 1983). Estimates of its prevalence in adults have varied from 0.47 to 4% (Carvill, 1932; Hollows & Graham, 1966; Lehrfeld & Reber, 1937; Morgan, 1972; Posner & Schlossman, 1948). Rates are known to be higher in elderly populations (Kornzweig, Feldstein, & Schneider, 1957). In the Framingham Eye Study, definite open angle glaucoma (including blind spot enlargement) was diagnosed in 1.2% of subjects aged less than 65, 2.3% aged 65 to 74, and in 3.5% of those examined at age 75 or older; the condition was suspected (diagnosed as questionable) in an additional 6 to 12% of participants (Chapter IV of Leibowitz et al., 1980). With more age strata and more rigorous case definition (requiring an arcuate scotoma, paracentral scotoma, nasal step, or an advanced field loss), estimates of the age-specific prevalence increased continuously with age: 0.5 (age 55 to 58), 0.7 (60 to 64), 0.9 (65 to 69), 1.7 (70 to 74), 2 (75 to 79), and 4.4% (80 to 84) (Podgor, Leske, & Ederer, 1983). Estimates of the five-year inci-

dence (calculated from prevalence figues, assuming irreversibility and no association with mortality), increased from 0.2 (age 55) to 1.1% (age 75) (Podgor et al., 1983). The pathogenesis of open-angle glaucoma is not understood, since a substantial portion of the visual field defects develops in individuals without intraocular hypertension (i.e., persons with pressures of 21 mm mercury or less) and since elevated pressures may occur without optic disk cupping and do not always lead to visual field defects. Data collected up to 1970 by a multistate registry attributed 7.1% of all blindness in whites and 22.3% of all blindness in blacks to glaucoma, making it the leading cause in blacks and the second most common cause in whites (U.S. Department of Health, Education and Welfare, 1973; Leske, 1983). Geographic variation in glaucoma rates cannot be adequately evaluated because of ambiguities in diagnostic criteria and methods. No variation over time has been documented in the United States. In Iceland, the percent of blindness attributed to glaucoma decreased from over 50% in 1950 to 18% in 1979 (summarized by Leske, 1983).

Although associations with many factors have been suspected at different times, only race, age, and family history can be considered confirmed risk factors for open-angle glaucoma. The greater frequency of glaucoma among blacks does not appear to be associated with sickle cell anemia or trait (Steinmann et al., 1983). Treatment with corticosteroids has been shown to increase intraocular pressure and can precipitate the development of visual field defects (Bernstein, Mills, & Becker, 1963). Both diabetes and hypertension have frequently been considered as risk factors; although statistically associated with intraocular hypertension, their associations with open-angle glaucoma are not certain.

Hypertension has been proposed as both an aggravator of the glaucomatous process leading to field defects and as a protective factor; concern has been expressed that reduction of systolic blood pressures may lead to the development of visual field defects (Leske, 1983). In the Framingham Eye Study, an extensive multivariate evaluation of the usual cardiovascular risk factors and conditions as possible risk factors for glaucoma failed to identify any associations save for increased alcohol consumption. Nonetheless, associations between intraocular pressure and a history of increased heart rate, overall risk for cardiovascular risk, and short stature were noted (Leske, 1983; Leske & Podgor, 1983). Both the fundamental pathogenesis and the epidemiological determinants of visual field loss in glaucoma remain largely uncertain.

Life expectancy appears to be reduced in persons with glaucoma, especially when diagnosed at an earlier age (both sexes); the difference in life expectancy at age 65 has been reported to be significantly different from the expected only for males (Belloc, 1963).

Senile macular degeneration is an opthalmoscopically recognized condition characterized by a somewhat heterogeneous constellation of degenerative changes involving the posterior pole of the eye, including drusen, loss of the retinal pigment epithelium, and subretinal neovascularization involving Bruch's membrane and the choriocapillaris (Wright & Henkind, 1983). The condition has long been recognized as associated with advanced age (Kornzweig et al., 1957). It has been identified as a leading cause of blindness in the United States, Canada, England, and Wales (as summarized by Ferris, 1983). Using a somewhat conservative definition that included a requisite visual impairment (less than 20/30), the prevalence values observed in the Framingham cohort were 0.8% (males, less than 65 years), 1.4% (females, less than 65), 4.3% (males, 65 to 74), 7.9% (females, 65 to 74), 16.9% (males, 75 and older), and 21.6% (females, 75 and older) (Chapter VI of Leibowitz et al., 1980). Using data from the same study but less conservative criteria, Sperduto and Seigel (1980) calculated substantially higher rates (reaching 50% among participants 75 to 84), with less dramatic age increments. These estimates are also substantially higher than those from the NHANES I (see above). Although there is great variation in prevalence estimates between studies and depending on diagnostic criteria, the condition is clearly associated with aging and is of great importance as a cause of impaired vision.

The risk factors that have been implicated in the development of senile macular degeneration include age, sex, a family history of macular disease, occupational exposure to chemicals, blue or medium pigmented eyes, a history of one or more cardiovascular diseases, decreased hand grip strength, hyperopia, smoking, increased diastolic pressure, left ventricular hypertrophy, short height, decreased vital capacity, a history of pulmonary infection, and race (Chumbly, 1977; Delaney & Oates, 1982; Elwyn, 1955; Gass, 1973; Gregor & Joffe, 1978; Hyman, Lilienfeld, Ferris, & Eine, 1983; Kahn et al., 1977; Klein & Klein, 1982; Klien, 1950; Krill & Deutman, 1972; Maltzman, Mulvihill, & Greenbaum, 1979; Paetkau, Boyd, Grace, Bach-Mills & Winship, 1978). In a review of the epidemiology of this condition, Ferris (1983) noted inconsistencies in reported associations of macular degeneration with sex, race, smoking, lung infection, blood pressure, height, and family history. Age, hyperopia, decreased hand grip strength, and possibly cardiovascular disease remain as the factors most consistently associated with senile macular degeneration.

Decreased survival among persons with blindness due to "retinal degenerations" was reported in one study (Rogot, Goldberg, & Goldstein, 1966) but was not found in patients with "degeneratio maculae luteae" in another (Bengtsson, 1984).

Cataracts are one of the most common eye problems of the elderly and are responsible for the bulk of eye-related hospitalizations and eye operations carried out in the United States today (data presented elsewhere in this review). In 1976, the incidence of intracapsular cataract extraction was 1.1% per year for persons 65 and older, and only one-tenth that figure for persons aged 40 to 59 (Nadler & Schwartz, 1980). Incidence rates for this procedure were noted to have climbed gradually between 1968 and 1976 at a rate of increase of approximately 4.29% per year, compared with an annual increase for all hospital discharges of 1.2%, and with an increase for surgical discharges of 3.1% per year. The total increase, amounting to 53% of the base rate in 1968, was unexplained by either an increased number of ophthalmologists or demographic factors.

In the United States, cataracts, excluding those of prenatal origin, account for approximately 9% of all blindness, whereas in Canada and Great Britain they are the cause of blindness in 15 and 22% of cases, respectively (studies summarized by Hiller, Sperduto, & Ederer, 1983; Leske & Sperduto, 1983). With the usual tests, persons with developing cataracts often demonstrate no detectable decrements in visual acuity. Disturbances in functional vision, for example, as related to glare, may nonetheless be present and may interfere with the person's visual activities. As mentioned above, data from the NHANES I indicate age-specific prevalence rates for cataract of 2.6% in persons 45 to 64, 10% at age 55 to 64 years, and 28.5% among participants aged 65 to 74; these data were based on criteria that require the cataract to be accompanied by a reduction in vision to 20/25 or worse in the involved eye. Unpublished data from the same survey, presented by Leske and Sperduto (1983), indicate that if reduction in vision is not required for the diagnosis, prevalence figures increase to 12.2, 27.6, and 57.6%, indicating that most of the cataracts in younger adults are not associated with reduced vision as measured by usual tests of visual acuity and that only about half of those in persons aged 65 to 74 cause detectable vision impairments. With a requirement for reduced vision (20/30 or worse), the prevalence figures (for persons, rather than for eyes) reported from the Framingham Eye Study were 3.5% (males, less than 65 years), 3.6% (females, less than 65), 11.3% (males, 65 to 74), 14.2% (females, 65–74), 33.8% (males, 75 and older), and 46.6% (females, 75 and older) (Chapter III of Leibowitz et al., 1980). With less conservative criteria, the prevalence of senile lens changes reached 91% among those 75 to 85 (data summarized by Leske & Sperduto, 1983).

The factors that have been shown to increase risk for the development of cataracts are age, female gender, diabetes, hypertension, exposure to a variety of drugs, high exposure to electromagnetic radiation (ionizing,

infrared, ultraviolet, microwave, etc.), and (possibly) myopia (Ederer, Hiller, & Taylor, 1981; also see review by Leske & Sperduto, 1983). In a recent case-control study of 300 cataract patients and 609 controls, significantly increased risks were associated with diabetes, glaucoma, renal failure, use of steroids, severe diarrhea, myopia, and use of nifedipine, whereas a reduced risk was associated with a history of regular use of aspirin-like analgesics (Heyningen & Harding, 1986). A substantial geographic variation in cataract prevalence is reported, but its significance is uncertain.

Senile cataract with blindness has been associated with reduced subsequent life expectancy in one report (Rogot et al., 1966) but not in another (Bengtsson, 1984). A particularly interesting report by Hirsch and Schwartz (1983) describes poorer than expected postoperative survival of patients requiring cataract surgery, as compared with patients having other selective surgery at the same institution. The authors speculate that the cataract patients might have been physiologically older and therefore more frail than their chronologically age-matched controls. This idea is well supported by observation and theoretical concepts related to the aggregation and crosslinking of proteins as a fundamental mechanism of aging and as an explanation for the physical and chemical changes involved in cataractogenesis (Bellows & Bellows, 1976; Dreyfus, Banroques, Pokenaru, Skala, & Vibert, 1978; Vaughan, Schmitz, & Fatt, 1979). A recent report from the Framingham Heart Study has confirmed the association of cataracts with an increased risk for death due to heart disease, possibly mediated through a correlation with diabetes (Podgor, Cassel, & Kannel, 1985).

Diminished resistance to glare is an important and common visual change with aging. The phenomenon reflects increased light scattering due to degenerative changes in the lens, including the early stages of cataract formation. It is not detected in tests of visual acuity or accommodation but can be easily measured (Pulling, Wolf, Sturgis, Vaillancourt, & Dolliver, 1980). Studies have shown that resistance to glare decreases slowly between childhood and about age 40, then begins to a precipitous decline. Between ages 75 and 85 the amount of luminescence required to distinguish gaps in Landholt rings under standardized conditions is typically increased 50- to 70-fold compared with that required for persons 5 to 15 years of age (Wolf, 1960).

Prebyopsia, probably the most common age-associated change in the eye, is largely due to a diminishing elasticity of the lens. The result, increasing difficulty with close vision accommodation, is ordinarily easily compensated with glasses and is responsible for the very high prevalence of a need for glasses among the elderly (Vaughan et al., 1979).

BRAIN AGING: COGNITIVE DECLINE AND DEMENTIA

Cognitive functioning over the life course has been the subject of several excellent reviews (Botwinick, 1977; Cohen & Wu, 1981; Fozard, 1985; Robertson-Tchabo & Arenberg, 1985; Schaie, 1983). Performance levels on tests of cognitive abilities often plateau in the third decade of life, remain stable for 30 to 60 years, and then begin a decline that is initially minimal but that becomes progressively greater as the end of life approaches. Although this trajectory is seen as usual, there is insufficient evidence to call it normal or to distinguish the possible influences of age-related diseases, "normal" brain aging, social variables (related to occupation, education, cultural roles and expectations, etc.), and other factors. Relationships between the common declines of aging, the frank impairments and cognitive distortions of dementia, and possible intermediate states such as "benign senescent forgetfulness" (Kral, 1978) are unclear. That the decline is not inevitable is supported by the observation that some individuals retain their earlier levels of functioning into their tenth decade or beyond. Declines in cognition have long been recognized as being asymmetric across the spectrum of cognitive activities, with performance on tests of vocabulary and attention showing greater stability than on tests of learning and memory (Benton, Eslinger, & Damasio, 1981; Birren & Morrison, 1969; Horn & Cattell, 1967; Lorge, 1947; Miller, 1980; Wechsler, 1944). Although it appears that declines may occur with a fairly constant rate, there are as yet insufficient data to define the normal range of slopes and ages of onset of decline for these different measures of cognitive functioning.

It has generally been believed that cross-sectional studies may underestimate the prevalence of cognitive impairment, since one would expect impaired persons to be less likely to participate in such activities. Selective attrition of subjects showing the greatest decrements in cognitive function has been documented in longitudinal studies and supports the impression that the prevalence and incidence of cognitive impairment is usually underestimated in health surveys (Busse & Maddox, 1985; Siegler, McCarty, & Logue, 1982).

The correlates and predictors of different patterns of declining performance on cognitive function tests are largely unknown. Although very strong associations of test scores with education are seen in cross-sectional data, patterns of decline (i.e., slope and age of onset) are not clearly variable across education strata. Separation of the effects of age on tests of cognitive function from those of education is difficult because of the age–education correlation; in the United States, the elderly tend to have completed fewer years of formal schooling (Kittner et al., 1986). In

addition to age and education, the factors that have been found to be associated with diminished or impaired cognitive function in later life include elevated blood pressure (Elias & Streeten, 1980), alcohol intake (Parker & Noble, 1977), diabetes (Perlmuter et al., 1984), immunoglobulin levels (Eisdorfer, Cohen, & Buckley, 1978), and impairments of hearing (Uhlmann, Larson, & Koepsell, 1986), visual perception (Coyne, Liss, & Geckler, 1984; O'Neil & Calhoun, 1975; Schlotterer, Moscovitch, & Crapper-McLachlan, 1982) and olfaction (Warner, Peabody, Flattery, & Tinklenberg, 1986).

Hypertension has been associated with lower levels of cognitive functioning in some but not all studies (Boller, Vrtunski, Mack, & Youngjai, 1977; Farmer, White et al., 1986; Goldman, Kleinman, Snow, Bidus, & Korol, 1974; Hertzog, Schaie, & Gribbon, 1978; Wallace et al., 1985; Wilkie & Eisdorfer, 1971). The possible underlying mechanisms include impaired perfusion directly related to the elevated pressures, accumulated cell damage and loss attributable to the long-term effects of the hypertension, an effect of current or past treatment, or an increased risk for small, unrecognized strokes. Neither the association nor a possible pathogenic mechanism is certain. The association between levels of cognitive functioning and history of alcohol intake is likewise controversial. One especially interesting report suggests that cross-test patterns of performance in subjects with a history of excessive alcohol intake resemble those of older subjects (Parker, Parker, Brody, & Schoenberg, 1982).

Mental status questionnaires, widely used as screening tests for cognitive impairment and dementia, have been studied in institutional and community populations. Test scores in cross-sectional studies are successively poorer with each older age stratum, even if the effect of education is controlled (Anthony, 1985; Cornoni-Huntley, Foley, White, Suzman, Berkman, Evans, & Wallace, 1985; Holzer et al., 1984; Kittner et al., 1986; Pfeiffer, 1975b). Of the several mental status instruments that have been developed to detect cognitive impairment, the Mini-Mental State Examination (MMSE) (Folstein, Folstein, & McHugh, 1975) has become one of the most widely used. The sensitivity and specificity of the MMSE have been estimated as approximately 87 and 82% by Anthony, Le Resche, Niaz, VonKorff, and Folstein (1982), based on data from hospitalized subjects. These descriptors of test performance characteristics have very specific definitions: sensitivity equals the proportion of the "cases" correctly identified by the test; specificity equals the proportion of subjects who are the true "noncases" correctly identified. An important aspect of such screening tests is that, while sensitivity and specificity are unaffected by the prevalence of the characteristic (in this case dementia), there is a strong influence on the positive predictive value (the

proportion of those "failing" the screening test who are subsequently diagnosed as suffering from dementia). The positive predictive value falls rather dramatically as the prevalence decreases. For example, when the prevalence is 30% (for example, among very old subjects), a rather high percentage of MMSE "failures" are actually demented, whereas in groups with a prevalence of 1 to 2% (subjects aged 60 to 64), a much smaller proportion of the MMSE failures will be subsequently diagnosed as actually having a dementing illness (Anthony, 1985).

The efficiency of dementia screening tests may also vary systematically across groups due to variations in sensitivity and specificity, as associated with education (Berkman, 1986; Folstein, Anthony, Parhad, Duffy, & Gruenberg, 1985; Gurland, 1981; Kittner et al., 1986). Lesser educated subjects do less well on almost all tests of cognitive functioning, yielding a higher proportion of the lesser educated who perform at a level below the pass/fail criterion score. Such a test will usually be more sensitive but less specific in persons of lesser education, so that a spurious association of dementia (screening test positives) with fewer years of education may result. One approach to this problem is to adjust the pass/fail threshold according to education to maintain sensitivity/specificity parity across education strata (Kittner et al., 1986; Pfeiffer, 1975a, b). The continued development and evaluation of screening tests for dementia is an important research area in and of itself (Hasegawa, 1974; Henderson, 1986; Henderson, Duncan-Jones, & Finlay-Jones, 1983; Holzer et al., 1984; Khachaturian, 1985; Kittner et al., 1986; Pfeffer et al., 1984; Pfeffer et al., 1981).

Of elderly subjects who come to medical attention because they have suffered intellectual deterioration, 10 to 15% have reversible causes for their clinical dementia syndrome (Katzman, 1986; Larson, Reifler, Sumi, Canfield, & Chinn, 1985; Rocca, Amaducci, & Schoenberg, 1986; Roth, 1986). The most common reversible illnesses that may mimic dementia include depression, drug intoxication, hypothyroidism, anemia, alcohol abuse, metabolic disturbances, systematic illness, chronic subdural hematoma, and normal-pressure hydrocephalus. Of the persons for whom a significant organic dementia syndrome is confirmed, 15 to 30% have sufficient evidence of cerebrovascular disease to justify a diagnosis of vascular dementia, a term often used synonymously with multi-infarct dementia (MID). The largest proportion of cases, approximately 50 to 75%, are usually attributable to Alzheimer's disease (AD), and the final few cases are due to mixed AD/MID or to conditions such as Pick's disease, Parkinson's disease, multiple sclerosis, chronic brain disease due to alcoholism, tumors, or Creutzfeld-Jacob's disease (Cummings & Benson, 1983; Hachinski, 1983; Katzman, 1986; Reisberg, 1983). In the

individual patient, a major focus on the recognition and diagnosis of reversible causes of dementia is appropriate. In epidemiologic research, however, the most troublesome diagnostic problems usually involve distinguishing between MID, AD, and mixed dementia. Although some investigators claim to have developed highly effective methods for discriminating between these diagnoses (Hachinski, 1983; Katzman, 1986), most studies that have systematically examined the issue indicate that misclassifications in the range of 15 to 30% are usual (Liston & La Rue, 1983a, b; Molsa, Paljarvi, Rinne, Rinne, & Sako, 1985; Sulkava, Haltian, Paetau, Wikstrom, & Polo, 1983; Todorov, Constantindidis, & Elston, 1975).

Published estimates of the prevalence of dementia (all causes combined) have generally been in the range of 3 to 9% for moderate to severe dementia among persons 65 and older and have almost always been found to increase exponentially with advancing age (summarized by Henderson, 1986; Mortimer, 1983; Rocca et al., 1986; Sayetta, 1986). Dementia is rare in persons in their forties, can be identified in about 1 to 2% of persons aged 60 to 65, and increases exponentially thereafter. A useful and easy to remember rule-of-thumb approximation of the age-specific prevalence curve (moderate to severe dementia, all organic causes combined) starts with 1% at age 60, and then doubles every 5 years (65: 2%; 70: 4%; 75: 8%; 80: 16%; 85: 32%). These estimates apply to the noninstitutionalized population. Prevalence estimates among institutionalized elderly Americans, mostly in nursing homes, range between 30 and 50% (Brody & Foley, 1985). Applying the approximate age-specific prevalence values mentioned to the current age structure of the United States population yields a dementia prevalance for the United States population 65 and older of approximately 8.5%. Prevalence estimates for MID and AD are most commonly generated by assuming that the proportion of the total dementia cases attributable to these specific causes remains constant at all ages. Sufficient data do not yet exist to examine this assumption critically.

Objective data on the incidence of dementia are very sparse (Hagnell, Lanke, Rorsman, Ohman, Ojesjo, 1983; Molsa, Martilla, & Rinne, 1982; Mortimer, 1983; Sluss, Gruenberg, & Kramer, 1981). The annual incidence is lower than the prevalence because most cases survive for substantially longer than a single year. An estimate of the age-specific annual incidence trajectory for AD, reported by Sayetta (1986) yields values of 0.33% at age 70, 1.3% at age 80, 5.4% at age 90.

Although dementia certainly diminishes life expectancy, the magnitude and quality of this influence is variable (Barclay, Zemcor, Blas, & Sansone, 1985; Kay, Norris, & Post, 1956; Schoenberg, Okazaki, & Kok-

men, 1981). When death occurs as a result of dementia, it is usually related to immobilization, general debilitation, and the gross personal incompetence that appears late in the course of the disease (Chandra, Bharucha, & Schoenberg, 1986). Persons with earlier onset typically show more rapid progression and have a worse prognosis (Seltzer & Sherwin, 1983). A growing impression is that the adverse influence of AD on survival is usually modest, especially in the older subject who will receive good medical care. Vascular dementia may have a somewhat worse survival prognosis than AD because persons who have had one stroke are more likely to have another and to die as a result. This implies that the proportion of dementias due to vascular disease in an incident (new) case series may be higher than in a prevalent (new plus old) case series.

Risk factors for vascular dementia are generally assumed to be identical with those that influence the occurrence of thromboembolic stroke, since MID is thought to occur as a result of repeated strokes (Glatt & Katzman, 1984; Kawas, Katzman, Aronson, & Fuld, 1985). This issue has not been critically examined. Factors of special importance for predicting stroke include age, hypertension, atrial fibrillation, and heart disease (see section on stroke).

Three excellent case control studies of AD have been published in recent years (Amaducci et al., 1986; French et al., 1985; Heyman et al., 1984). In addition to age, the factors most consistently associated with AD have been a family history of dementia and a history of head trauma. Dementia of earlier onset and more rapid progression is especially strongly associated with a positive family history. The association with head trauma was found in all three studies, but the strength of the association was slightly less than needed to achieve statistical significance in the Italian study. The Amaducci study also confirmed an association of AD with older maternal age at the time of birth of the propositus, an observation made first by Cohen, Eisdorfer, and Leverenz (1981) but not confirmed in most other series (Corkin, Growdon, & Rasmussen, 1983; Knesevich, LaBarge, Martin, Danzinger, & Berg, 1982; White, McGue, & Heston, 1986.

An intriguing set of observations suggesting a relationship between AD and Down Syndrome (DS) began when Heston and Mastri (1977) and Heston, Mastri, Anderson, and White (1981) noted that DS and lymphoreticular malignancies occurred more commonly among family members of AD cases than expected. The association with DS has subsequently been confirmed by other workers, whereas the association with malignancies has not (Heyman et al., 1983). That the relationship has pathogenic meaning is further emphasized by the observation that

neuropathological evidence of AD is nearly always found in the brains of autopsied DS patients dying after the age of 40 (Ball & Nuttall, 1980; Burger & Vogel, 1973; Ropper & Williams, 1980). That both conditions might be associated with advanced maternal age (see above) makes the mystery even more tantalizing. Dermatoglyphic patterns in AD that resemble those of DS have also been reported (Weinreb, 1985). Since some investigators have reported an increase in chromosomal abnormalities such as hyperdiploidy, aneuploidy, and chromosome breaks in AD, the link may involve chromosomal instability (Brun, Gustafson, & Mitelman, 1978; Jarvik, 1978; Mark & Brun, 1973; Martin, Kellett, & Kahn, 1981; Ward, Cook, Robinson, & Austin, 1979; White et al, 1981). This possibility is further strengthened by recent studies describing diminished DNA repair capacity in cultured cells from AD subjects (Robbins et al., 1985; Robison, Munzer, Tandan, Bradley, & Bradley, 1985). These observations also suggest that both diseases may be expressed in ways that are consistent with accelerated aging, since other investigators have suggested that diminishing ability of cells to repair damage to their DNA is fundamental to the aging process itself.

Most cases of AD are women, and most series present slightly higher age-specific prevalence estimates for women (Mortimer, Schuman, & French, 1981). Nonetheless, it is not clear if gender directly influences risk. Because of differential survival, the female:male ratio in the population increases with age; there are more old women than old men available to become demented. In addition, mild or moderate dementia may be recognized less readily in older males, who are more likely to have a living, younger spouse to care for them.

Geographic, racial, ethnic, and cultural influences on the risk for dementia are undefined. Prevalence figures for moderate to severe dementia published for many of the developed countries of the world do not support large geographic or cross-national differences (see reviews by Gurland et al., 1983; Henderson, 1986; Mortimer, 1983; Rocca et al., 1986). However, the methods, definitions, and the populations studied are so different or differences have been so undefined that there can be little confidence in the meaning of these comparisons. In Japan, where stroke has long been the leading or second most common cause of death, overall rates of dementia are apparently similar to those for the United States, but the predominant cause of the dementia is cerebrovascular disease (Hasegawa, 1983). The age-specific prevalence of dementia due to AD (estimated by calculating the difference between the total dementia and vascular dementia) in Japan is approximately half that in the United States. Although excellent neuropathological studies exist (Matsuyama, 1983; Matsuyama & Natamura, 1978; Mitsuyama, 1982; Mitsuyama

et al., 1979; Morimatsu, Hirai, Muramatsu, & Yoshikawa, 1975; Wollmann, Mitsuyama, & Webber, 1975), it is not clear if the distribution and density at death of neuritic plaques, neurofibrillary tangles, and granulovacular degeneration (the hallmarks of the Alzheimer process) are different between Japan and the United States. No information is yet available to estimate rates of AD and vascular dementia among Japanese-Americans. Anecdotal reports from mainland China, Nigeria, and Uganda suggest that dementia may also be rare among the elderly in these countries. A recent, preliminary study of dementia among elderly Chinese residents of a New York City nursing home supports lower rates of AD in this group (Serby & Chou, 1986). Comparative studies on the occurrence of dementia in other race and ethnic groups in the United States are not yet available, although the results of a community survey in the southern United States (Schoenberg, Anderson, & Haerer, 1985a, b) and of an autopsy series in Michigan (Miller, Hicks, D'Amato, & Landis, 1984) suggest no differences between blacks and whites. To date, no industrial, occupational, infectious, nutritional, animal, or other environmental exposures have been consistently implicated as pathogenic factors for AD. Although dietary deficiency of calcium, perhaps in conjunction with increased or critically timed exposure to silicon (perhaps in an aluminum compound), has been suggested as the crucial pathogenic mechanism for Parkinsonism-dementia of Guam, no role for calcium, silicon, or aluminum exposures or deficiencies in the pathogenesis of AD has yet been supported by epidemiologic studies (Garruto, 1984; Garruto et al., 1984; Heyman et al., 1984). Nonetheless, the high concentrations of aluminum and silicon that occur in close association with the neurofilamentous cytopathology of AD support some sort of involvement of these elements in the development of the essential disease process (Crapper, Krishnan, & Quittkat, 1976; Perl & Brady, 1980; Shore & Wyatt, 1983).

It is clear that AD occasionally occurs in families with a pattern suggesting a dominant form of inheritance (Goudsmit et al., 1981; Heston et al., 1981). Cases of familial AD tend to begin at an earlier age and to progress more rapidly than the much more common sporadic case. Genetic factors in AD have also been examined in twin studies; although the numbers are small, these suggest that nonconcordance for illness is common among both monozygous and dizygous twins (Broe, Creasey, Henderson, Jorm, & Korten, 1986; Heston et al., 1981; Nee et al., in press). Although nonconcordance for dementia in monozygous twins cannot be taken as conclusive evidence against genetic factors, it is strong evidence at least that nongenetic factors must be important determinants of the time and circumstances of clinical expression of the disease pro-

cess. Studies aimed at identifying histocompatibility antigen markers for susceptibility to AD have been predominantly negative. One group of investigators has emphasized the importance of inheritance and has suggested that language disability (speaking and/or writing) occurs more often as an early sign of dementia in familial and early onset cases (Breitner & Folstein, 1984; Folstein, 1982). These investigators have hypothesized a genetic susceptibility factor that is allegedly present and will allow the disease to occur in the majority of persons who survive into their eighties or nineties. This hypothesis remains unproven.

The several problems which make epidemiologic research on dementia especially difficult include the following:

1. Death certificate and hospital discharge diagnosis data are unreliable sources of information on dementia.
2. Since there are no discrete events to mark the progression or extent of dementia, its recognition is dependent upon whatever circumstances might precipitate the subject's coming to medical attention or upon some threshold measure of behavior or observed level of functioning. Until objective criteria have been standardized, there can be little confidence that precise comparisons across cultures, communities, languages, times, or even between studies in the United States will be meaningful.
3. When we discuss mild, moderate, or severe dementia, we are usually referring to cognitive impairment or behavioral aberration, rather than the extent or rapidity of development of the disease process or the certainty of the diagnosis. This ambiguity further limits comparisons.
4. Surveys in which cases of dementia are sought among noninstitutionalized persons suggests that the great majority of cases are unrecognized by family, friends, and health care providers; although this is especially true of the mildly or moderately afflicted cases, it may also be true even of severely impaired cases. The extent of underrecognition depends upon what is expected of the aged person in his/her family and society, the method of case finding and diagnosis, and factors related to how and where the cognitively impaired person receives care.
5. Diagnostic misclassification is a major problem. With observation and serial testing over months or years, an individual's diagnosis may well change (Kendell, 1974; Mayeux, Stern, Spanton, & Cole, 1985). Even with longitudinal observation, the clinical diagnosis has been reported to be different from the neuropathologic diagnosis for 15 to 30% of cases (Molsa et al., 1985; Sulkava et al.,

1983; Todorov, Constantindidis, & Elston, 1975). All types of misclassification occur, and the probabilities of the several types vary systematically with age. Among older persons without evidence of dementia (i.e., possible controls) who come to autopsy, a sizable proportion will show the neuropathologic signs of AD or evidence of old infarctions. Such misclassification of controls is uncommon at younger ages. The proportion of cases misclassified may well be systematic with regard to such factors as age and education. If the case-finding process is based on in-depth examination of persons selected by population screening, then a systematic misclassification bias may be associated with variation in sensitivity or specificity of the screening test across education strata or with variation in the positive predictive power of the screening test in different age strata.

6. In most communities, it has become nearly impossible to achieve high rates of autopsy. In addition, if the analysis must be delayed until neuropathological diagnoses are available for all or even the majority of subjects, few clinical or epidemiologic studies will be completed.

Of all of the illnesses commonly associated with aging, dementia represents the greatest threat of tomorrow's elderly. If age-specific prevalence and incidence rates remain unchanged as the age structure of the developed world evolves over the next several decades, dementia will rival poverty and hunger as a problem of preeminent global importance. Epidemiologic research plays a central role in the effort to achieve an understanding of the causes of dementia and to develop effective strategies for prevention of the major dementing diseases.

CANCER

A review of cancer, neoplasia, and aging, prepared by Crawford and Cohen (1984), was published in a recent volume of the *Annual Review of Geronotology and Geriatrics*. The reader is referred to this source for a general overview of the subject.

Although there are ties among aging, cancer, the preservation of genomic integrity and expression control, differentiation, and mechanisms involved in cell and life cycle scheduling, no clear understanding of these yet exists (Pullman, Ts'o, & Schneider, 1985). Analyses of cause of death and incidence data suggest that the relationship between aging and cancer is neither as strong nor as consistent as had been thought, and that

the nature of the association varies across the spectrum of neoplastic diseases.

Cancer is second only to the cardiovascular diseases as a cause of death among elderly people in the United States and in 1978 accounted for 19% of the total deaths of persons 65 and older. The age-specific death rate curve for cancer tends to depart from the all-cause and cardiovascular mortality curves late in life. Cancer as a cause of death rises rapidly in middle life; the cancer rate then follows a linear increase between 60 and about 80 years, while cardiovascular mortality increases exponentially. After age 80 to 85, the age-specific cancer death rate continues a linear increase but at an even lesser slope. The smaller proportion of total deaths attributable to cancer today as compared with a few years ago is not due to a lessening of age-specific risks for cancer. Rather, it reflects the demographic shift toward prolonged survival, with death being postponed to older ages and with cardiovascular causes maintaining their exponential age-specific trajectories (Brock & Brody, 1985; Brody, 1983, 1985). Thus, while age-specific cancer mortality curves continue a gradual rise with age into the final decades of life, relative cancer mortality (compared to all-cause or cardiovascular mortality) declines with age. With life expectancy increasing, the relative magnitude of cancer as a cause of death may well continue its decrease into the twenty-first century.

The age-adjusted incidence of cancer increased by an average of 1.3% per year for men and 2% per year for women between 1969 and 1976 (all types, all ages; 1970 U.S. population used as the standard). In 1976, the age-adjusted all-cancer incidence was 0.3% per year for men and 0.30% per year for women. In men, the most frequently occurring cancers involved the lung (0.078% per year), the prostate (0.069% per year), the colon or rectum (0.056% per year), or the bladder (0.026% per year). Among women the most frequent involved the breast (0.084% per year), the colon or rectum (0.043% per year), the uterus (0.042% per year), or the lung (0.024% per year) (data from the third National Cancer Survey and Surveillance Epidemiology and End Results Program, summarized by Brock & Brody, 1985).

Different cancers often have very different age-specific incidence and mortality curves, probably reflecting different pathogeneses. Cancers that exhibit a continuous rise into late life include those of the digestive system, breast, prostate, urinary system, and leukemia. The remaining cancers generally increase with age up to a point and then decline.

Among Americans aged 85 or older in 1976, the annual cancer death rate was 1.4%. Mortality rates at other ages were: 0.69% per year at 65 to 69; 0.93% per year at 70 to 74; 1.19% per year at 75 to 79; and 1.34% per

year at 80 to 84 (data from the National Center for Health Statistics, summarized by Brock & Brody, 1985).

PHYSICAL DISABILITY

Although physical disabilities may have very different causes, their consequences are often similar: a limited ability to be self-sufficient, productive, socially interactive, and to maintain self-esteem. The compromised meaning and quality of those years of an individual's life that are spent with incapacitating disabilities has led to the development of the concept of "active life expectancy" (Katz, et al., 1983). Among elderly persons the most common underlying causes for severe disability are arthropathies and cardiovascular diseases (World Health Organization, 1980).

As Kane and Kane (1981) have noted, the assessment of physical disability is made more difficult by an interaction of structural and functional abnormalities with a host of sociological and psychological factors. Systematic biases also occur as a result of methodologic factors, such as has been reported with different informants (the subject him/herself, a family member, or a professional care-giver) (Rubenstein, Schairer, Wieland, & Kane, 1984). Despite such difficulties, most of the larger surveys have relied upon self-reported disability using structured questionnaires. These have demonstrated that a variety of physical disabilities become progressively more prevalent with advancing age. In her study of a national sample of noninstitutionalized elderly, Shanas (1980, 1982) found 14% to be bedfast, housebound, or with reduced ability to go outdoors. The prevalence of limitations in capacity for personal care increased from 7% at age 65 to 69 to about 25% for those after age 80 years and older, with the most frequently reported difficulties involving walking up and down stairs and cutting toenails. Mobility limitations were most common in elderly black women. Women (all races, all ages) reported more disability than men, but the sex difference diminished with advancing age.

A study on Americans needing home care was conducted as a supplement to the National Health Interview Survey, 1979–1980 (NCHS, 1986). Of adults ages 65 to 74 residing in the community, 5% were found to need the help of another person in one or more basic physical activities, including walking, going outside, bathing, dressing, using the toilet, getting in or out of bed or chair, or eating. Among women the prevalence rose from 5.3% for those aged 65 to 74, to 13.6% for those aged 75 to 84, and to 35.9% for those 85 or older. Corresponding figures for men were

4.7, 10, and 25.9% respectively. A slightly higher percentage needed help with shopping, household chores, handling money, or preparing meals. The percentage needing help with one or more of these household management activities increased from 5.6% for those aged 65 to 74 to 13.8% for those aged 75 to 84, and to 35.9% for those aged 85 and older. Again, the percentage of females needing help with household activities was significantly higher than for males.

In another study, the National Long-Term Care Survey, information was collected from a sample of 36,000 Medicare beneficiaries by telephone interview. The preliminary results (Hanley, 1984; Manton, 1986, Manton & Soldo, 1985) suggest rough comparability with the Home Care Supplement to the 1979 Health Interview Survey but with somewhat higher rates. Some of these same issues were again considered as part of a Supplement on Aging to the 1984 National Health Interview Survey (NCHS, 1986b). The percentages reporting that they had no limitations of physical activity were 61.5% at 65 to 74 and 61.3% at 75 to 84, but then fell to 39.6% among participants aged 85 and older. Inability to perform unsual activities were reported by approximately 11% of those aged 65 to 84 and by 22% by those 85 and older.

As part of the NIA EPESE, noninstitutionalized participants in East Boston, New Haven, and Iowa were asked a series of 14 questions drawn from previously standardized instruments (Jette & Branch, 1981; Katz, Ford, Moskowitz, Jackson, & Jaffee, 1963; Nagi, 1976; Rosow & Breslau, 1966). The prevalence of impaired functioning increased with advancing age and disabilities were more often reported by women than by men in each of the three communities (Cornoni-Huntley et al., 1985). The most common involved limitations in general mobility, with limitations in activities of daily living reported less frequently. When comparing participants of similar age and sex, the prevalence of disabilities in East Boston was more than double that among the Iowa participants, with New Haven subjects reporting an intermediate level. These cross-community differences corresponded to a similar differential for cognitive impairment, as measured by performance on a mental status test. The authors hypothesize that the differences between sites may have reflected differential selection of the elderly noninstitutional community population prior to the survey; in Iowa, elderly who became disabled may have been more likely to move out of the community because of greater financial resources and fewer family members available to provide care, whereas in East Boston (a blue-collar population of large families), the opposite may have occurred.

As has been mentioned, the usual method for assessment of physical functioning consists of asking the individual or a proxy informant what

he/she can or cannot do, with or without assistance. Alternatively or supplementally, physical functioning may be examined directly. The examinations may involve activities such as walking, climbing stairs, and manipulating objects such as latches, door knobs, eating utensils, etc. This approach requires more time and greater skill of the person administering the evaluation but has many advantages. In addition, it offers the opportunity to gather much more observational data than can be obtained in a standardized way during the course of an interview. One especially promising example, a test battery used by Williams, Hadler, and Earp (1982) and Williams and Hornberger (1984) to generate a "performance index," appears to provide an efficient and highly accurate tool for the prediction of subsequent health care needs.

Regardless of the methods used to collect the data, it is usually desirable to describe physical functioning with one or more summary indicators. However, no single, global index of disability has been broadly accepted. The consensus seems to be that the information accruing from interview and/or observational assessment of functioning should be summarized by the use of both categorical (ambulation, body care, etc.) and global measures, created or selected for the specific purposes desired (Charlton, Patrick, & Peach, 1983; Evans, 1984; Fries, 1983).

Although a review of methods for the assessment of physical disability is beyond the scope of this report, it is important to note that several measures of disability have received particularly wide acceptance, including the Index of the Activities of Daily Living (Katz & Akpom, 1976), the Rapid Disability Rating Scale (Linn & Linn, 1982), the Barthel Index (Mahoney & Barthel, 1965), the Kenny Self-Care Evaluation (Schoening & Iversen, 1968), and the Rosow Functional Health Scale (Rosow & Breslau 1966). In some cases, the disability instrument exists as a component of a more comprehensive geriatric assessment tool. Especially worthy of note are the OARS Multidimensional Functional Assessment Questionnaire (Pfeiffer, 1975a), the Comprehensive Assessment and Referral Evaluation (CARE) (Gurland, Golden, Teresin, & Challop, 1984; Gurland et al., 1977; Gurland & Wilder, 1984) and the Philadelphia Geriatric Center Multilevel Assessment Instrument (PMAI) (Lawton, Moss, Fulcomer, & Kleban, 1982).

A standardized nomenclature and coding system, the International Classification of Impairments, Disabilities and Handicaps (ICIDH), is widely used in Europe but has found little acceptance in the United States (WHO, 1980). The ICIDH represents a potentially very useful system, the broader application of which would facilitate international and cross-cultural studies of the occurrence, correlates, treatments, and consequences of physical disability.

ECONOMIC ASPECTS OF AGING

In epidemiological studies, the driving interest is in the distribution of human diseases, etiologic and risk factors, and transmission mechanisms. This information is utilized to develop rational public health policies to improve the general welfare. Economics enters the decision-making process in this later process. As health policies are developed, ignorance of either epidemiologic or economic realities can lead to wasted resources and inequitable policy decisions. In some cases decisions have to be made which have life and death consequences for individuals and groups within society. The economic and social effects of extended life expectancy, further amplified by the increased cost of disease and disability, challenge public health policy-making (Hodgson, 1984).

In a book on the value of biomedical research entitled *Biomedical Research Costs and Benefits* (Mushkin, 1979), death rates stood out as an important criterion for use by the Congress in allocation or research funds to the National Institutes of Health. Since mortality is a principal end point of epidemiologic research and since death is now being postponed into the latter stages of the theoretical life span, the connection between epidemiology and economics has taken on new importance.

A national macroeconomic-demographic model has been developed by the NIA to gain a better appreciation of the ways in which the national economy may be influenced by changes in the health and survival of the nation's elderly (Anderson & Cartwright, 1986). The model, essentially a complex mathematical description of relationships between a large number of demographic and economic variables, allows one to estimate how a change in one variable might affect other variables. Examples of variables in the model include the number and proportion of elderly, the average age, national health care costs, the gross national product, and employment ratios. Since the model allows for projections several decades into the future, it is possible to generate and compare sceneria corresponding to differing possible changes. This approach allows long-term economic trend analysis and may alert planners and policymakers of likely future health care needs and of attendant economic inbalances or opportunities.

Similar demographic–macroeconomic national models have been developed for Canada (Denton & Spencer, 1975) and Japan (Ogawa, 1982).

Another approach shifts from the national population as the unit of study to the elderly individuals themselves. A particularly useful example of such multidisciplinary research is illustrated in the cost analysis of Alzheimer's disease and related disorders (ADRD). A first problem is to determine the relevant cost, in this case related to the notion of marginal

or incremental cost of the disease. The easiest way to understand this concept is to ask what would happen to the costs for society, government, and families if dementia disappeared overnight. The approach involves costing out the additional resources used by victims of the disease in the nursing home rather than the average daily charge incurred. For a nursing home, one would focus on the additional resources used by ADRD patients and the mechanism of how these additional costs are shared. The approach is conservative; it does not assume that the one-half of the nursing home population with some dementia would disappear from the nursing home overnight if the disease disappeared. Hu, Huang, & Cartwright (1986) in a pilot study of 22 cases in the nursing home estimated a 36% increase in staff time required to care for ADRD patients. This approach in a recent comprehensive examination of the annual national cost of ADRD led to an estimate for direct medical costs of $8.3 billion, of which $2.84 billion was for nursing home costs with an additional $6.7 billion as the value of the incremental home care received by noninstitutionalized patients from their care givers (usually family members). In all, the cost of dementia for 1983 was estimated at $38.37 billion.

Recent years have brought an increasing awareness that rational decisions related to local as well as national health care planning and to the most judicious assignment of available resources (monetary, technologic, personnel) must be made from an economic knowledge base built on sound epidemiologic data. This is nowhere more evident than in the field of health care and health research related to the aged.

OTHER TOPICS OF SPECIAL RELEVANCE

Assessment of Health, Functioning, and Needs

Assessment of health, functioning, and needs has become a particularly important aspect of geriatric medicine and epidemiology (Kane & Kane, 1981; Williams, 1983). Most often it involves standardized procedures for the systematic gathering and summarization of information from and/or about a subject, often with instruments designed to facilitate computerization of data, and to allow comparisons over time, between individuals, between groups of individuals, and sometimes even between domains of function or health. The measurements produced by such standardized assessments have been used in epidemiologic analyses as dependent (end points, outcomes), independent (risk factors, correlates), and as control variables. The use of standardized assessment methods, together with

emerging computer technologies for data management and analysis, promises to revolutionize the way epidemiologic research on aging will be done in coming decades.

Health Indices

A closely related area, the development and use of health indices, has occupied investigators for some years (Chen & Bryant, 1975; Jette, 1980; Sackett, Chambers, MacPherson, Goldsmith, & McAuley, 1977; Stewart, Ware, & Brook, 1981; Sullivan, 1966; Wolinsky, Coe, Miller, & Prendergast, 1984), as has the problem of defining and measuring health as a general (not disease-related) characteristic of individuals or populations. The constitution of global health indices has varied with their use (public information, administration, research), orientation to the individual or population, and to type of information summarized (mortality, morbidity, functioning). As an alternative or adjunct to measuring health in terms of specific illnesses, many such indicators have been based on counts (sick days, hopsital days) or descriptions of activities (functioning; also see section on physical disability above), thereby offering the possibility of discriminating not only levels of ill health but also levels of good health. Comprehensive indices of health and functioning have been described by Charlton et al. (1983) and by Belloc, Breslow, and Hochstim (1971), among others. Full-scale indicators of health and functioning could well serve as outcome variables in studies designed to examine the determinants and predictors of late-life good health, offering certain advantages over the more readily available method of using nonoccurrence of morbidity and mortality, as employed by Benfante, Reed, and Brody (1985), to define good health. Another potential use for such indicators involves relationships between health, life expectancy, and biologic age. Perhaps full-scale health indicators could be developed that would reflect vitality and homeostatic resilience sufficiently well to justify their use as outcome variables in epidemiologic investigations of the determinants and correlates of accelerated or slowed aging.

Prediction of Longevity

Prediction of longevity, a subject intimately related to several of the topics already discussed, has been at the center of many studies of the epidemiology of aging and was examined in a previous volume of the *Annual Review of Gerontology and Geriatrics* (Lehr, 1982). Although familial longevity is predictive, to what extent the influence is directly

genetic is uncertain. Other factors found to be associated with longevity have included physical health (disease and disability), self-perceived health, cognitive functioning, education, and other indicators of socioeconomic status (Blazer, 1982; Botwinick, West, & Storandt, 1978; Campbell, Diep, Reinken, & McCosh, 1985; Hodkinson & Exton-Smith, 1976; Kaplan & Camacho, 1983; Palmore, 1980; Siegler, McCarty, & Logue, 1982).

Gender Difference

A gender difference in longevity and late-life health has been apparent in many epidemiologic investigations (Hazzard, 1986; Wingard, 1982). It continues to be an especially intriguing research topic, largely because of the apparent paradoxical relationship between morbidity and mortality: although the average woman lives substantially longer than the average man, many of the illnesses and impairments of aging occur more frequently and/or tend to be more severe in women (see other sections above). Some of the apparently greater morbidity in women may be due to earlier recognition or a greater likelihood for women to seek help for their problems; however, this does not appear to be an adequate explanation for the phenomenon. Lower age-specific mortality rates for women, since they are apparently not attributable to lesser morbidity, could be due to greater age-specific vigor and an associated advantage in maximum potential life span. Alternatively, potential life span could be identical for the sexes, but more nearly realized by actual life span in women. If the last-mentioned hypothesis were true, the predictions of Fries (see section on numbers and health of the elderly above) would lead us to expect greater compression of morbidity and greater rectangularization of the survival curve for women. Neither is evident (Brody, 1985; Brody & Brock, 1985).

Extreme Longevity

The study of persons who have achieved substantial or extreme longevity, including research on the oldest old (defined usually as 85 or older), centenarians, and on communities reputed to be enclaves of persons of greatly advanced age, remains an important topic for epidemiologic research. Special studies of the oldest old are providing important information on the health and health care needs of this dramatically increasing segment of the population (see the spring 1985 issue of the *Milbank Memorial Fund Quarterly; Health and Society*). The study of centenarians, while thus far generating neither insights into the fundamental

biology of aging nor special clues as to what might enhance one's chances for extended survival and good health, has clearly illustrated that it is possible to live to such great ages and yet escape devastating dementia and disability. Autopsy and cause-of-death studies indicate that, while cancer becomes progressively less important and pneumonia more common as a cause of death in the extremely aged, most of the pathologic changes are similar to those in persons dying at younger ages (Brock & Brody, 1985; Brody, 1982; Brody, 1983; Haranghy, 1965; Ishii, Hosoda, & Maeda, 1980; Kohn, 1982; Tanaka, 1984). In large part, extreme longevity appears to reflect little more than the extreme tail of a normal distribution of the human life span. Nonetheless, it can be argued that some very old persons appear to have aged more slowly than their birth cohort peers, since they have reached the same point but after more years of life. This may imply that the frequency with which protracted survival is due to retarded aging (if the phenomenon occurs at all) is greater than the frequency with which accelerated aging is a factor in premature death. This, in turn, suggests that epidemiological research directed at discerning factors that may influence rates of aging per se might be most efficiently conducted with a focus on protracted survival. Although geographic and social enclaves of extreme longevity have been reported (for example, in the Andes and in the republic of Georgia in the Soviet Union), careful investigations have failed to confirm the validity of most claims (Leaf, 1985). Future investigations of the correlates and predictors of great longevity or protracted aging will be most effectively carried out in the context of existing longitudinal studies.

Nutritional Aspects

Nutritional aspects of aging have only recently come under epidemiologic study. Methods for dietary assessment and for the appraisal of the consequence of defined dietary patterns are current topics of epidemiologic research (Kannel, 1986; Munro, 1982; Schneider, Vining, Hadley, & Farnham, 1986; Shank, 1985).

Anthropometric Studies

Anthropometric studies of populations or representative samples of the elderly are few. Recent studies have suggested that survival probability may be best for persons somewhat more plump in late adult life than has usually been considered ideal (Andres, 1985). Problems in the determination and clinical utility of age/health/stature-appropriate norms for such

measures as arm muscle area, arm fat area, lean body mass, etc. are now beginning to receive attention as important topics for epidemiologic research in later life (Frisancho, 1984; Morgan et al., 1986).

Parkinsonism

Parkinsonism increases in prevalence exponentially with advancing age and seems intimately associated with neurologic aging (Kurland, Kurtzke, Goldberg, Choi, & Williams, 1979; Rajput, Offord, Beard, & Kurland, 1984). In a recent survey described by Schoenberg, Anderson, and Haerer (1985a), a prevalence of approximately 1% (definite plus possible cases) was found among residents of Copiah County, Mississippi aged 75 and older. A substantial proportion of the elderly with this condition also have some degree of dementia, and the relationship between AD and parkinsonism is an important research issue (Boller, 1983; Stern, Gur, Saykin, & Hurtig, 1986). This is partially because of the occurrence among the Chamorro people of Guam of a syndrome of parkinsonism with dementia that has a neurofibrillary cytopathology bearing some resemblance to that of AD's and which may have an environmental etiology (Garruto, 1984; Garruto et al., 1984; Reed & Brody, 1975). The possibility that environmental exposures to toxins related to MPTP (a byproduct of the synthesis of mepiridine) might be involved in the pathogenesis of the common forms of parkinsonism is not supported by epidemiologic analyses (Eldridge, Rocca, & Ince, 1986). Geographic and rural–urban patterns seem to exist, isolated foci of particularly high incidence and prevalence have been studied, and cigarette smoking seems to be mildly protective, but no clear risk factors for the common form of Parkinson's disease have emerged (Kurland et al., 1979).

Urinary Incontinence

Urinary incontinence is a common problem among the elderly and has important implications related to independence, self-esteem, social functioning, skin conditions, pressure sores associated with prolonged immobilization, and the precipitation of institutionalization.

Participants in the NIA EPESE were asked: "How often do you have difficulty holding your urine until you can get to a toilet?" The prevalence of a "most of the time" or "all of the time" answer varied between 6.8 and 9.2% for men and between 4.3 and 8.4% for women (White, Kohout et al., 1986). These prevalence estimates are somewhat lower than has

previously been reported for elderly, noninstitutionalized populations (Yarnell & St. Leger, 1979). A much more focused survey of urinary incontinence, recently completed by Diokno, Brock, Brown, and Herzog (in press) at the University of Michigan, generated substantially higher prevalence figures. The approximately 2,000 Michigan study participants (60 and older, all noninstitutionalized) were asked about episodes of involuntary loss of urine in the prior 12 months. If episodes occurred on six or more days or if further questioning elicited a description of typical incontinence episodes, the person was counted as having a urinary incontinence problem. If involuntary loss of urine was denied in response to the initial query, additional probing questions were asked because of the expectation that some false negative responses would result from embarrassment; this expectation was substantiated by a significant increase in positive responses to probing. The prevalence of an incontinence problem among the Michigan men was 18.7% and 37.6% among the women. With categorization into clinical type (urge, stress, mixed urge/stress, other), the most common type among men was urge incontinence (34.9% of the men with an incontinence problem), the least common was related to stress (7.9%), and the other cases were equally divided among the mixed and other causes. Among women with an incontinence problem, slightly more than half were categorized as mixed urge/stress (55.5% of the women), the next most common type was stress incontinence (26.7%), and the remaining cases were approximately equally divided between urge and other types of incontinence. When asked if they had told their physician about the incontinence, nearly 60% answered that they had not.

As might be expected, the prevalence and causes of incontinence among persons referred to a urologic evaluation unit are somewhat different from those occurring in the general population. In a series of 263 consecutive elderly patients referred for urologic evaluation, 81% of the women and 60% of the men presented with symptoms of incontinence, most commonly of the mixed type (Ouslander, 1986). The most frequent finding to explain the incontinence was urodynamic evidence of sphincter weakness and detrusor motor instability, with multiple urodynamic findings being common.

Oral and Dental Health

The need for epidemiologic research on oral and dental health in the elderly was recently underscored by the first words of a report summarizing the conclusions of a collaborative effort involving the Veterans Ad-

ministration, The National Institute of Dental Research, and The National Institute on Aging to define *A Research Agenda on Oral Health in the Elderly*:

> The lack of current epidemiologic data on a broad range of oral and craniofacial disorders that affect older Americans is striking. No adequate national data exist for this population on the scope of dental caries, periodontal diseases, oral cancer and other soft tissue lesions, chronic facial pain conditions, salivary gland disorders, and tooth attrition, abrasion and loss (Veterans Administration, The National Institute of Dental Research, and The National Institute on Aging, 1986).

Investigations of these issues have been few and most have been carried out in high-risk or unrepresentative populations (Baum, 1984; Beck, 1984). Because of the dramatic changes in dental health that have occurred over the past few decades, the meaning of age-associated differences observed in cross-sectional studies is frequently unclear, and there is a special need for longitudinal studies to discriminate the effects of aging from those attributable to different exposures over the life course (Beck & Hunt, 1985).

Drug Use

The investigation of patterns of both prescription and over-the-counter drug use is well suited to the epidemiologic method. Iatrogenic illness related to drug use is relatively common among the elderly because of their frailty, the usualness of polypharmacy, and the large number of medical contacts and procedures involving older patients. Of these issues, the most epidemiologic attention has been given to the use of prescription drugs (Moore & Teal, 1984).

Falls

Falls by elderly persons are associated with a variety of conditions, and falling is the most common immediate cause of hip fracture, the underlying cause being the osteoporotic state (see sections on osteoporosis and fractures above and section on methodologic and conceptual issues below). The problem has many facets and is of special importance because of the need to base strategies for prevention of fall-related injury on a full understanding of the events, predisposing conditions, and situations associated with falling (Radebaugh, Hadley, & Suzman, 1985).

Opportunities for Epidemiologic Research

Other important opportunities for research in gerontology concern long-term care (institutionalization and its alternatives), impairments of taste and olfaction, tinnitus, dizziness and vestibular dysfunction, benign prostatic disease, dry and atrophic skin conditions, infectious diseases and immune function, causes and correlates of reduced renal function, causes and correlates of age-related changes in respiratory functioning, hiatus hernia, atrophic gastritis and esophagitis, diverticulosis and diverticulitis, sleep problems, accidents and trauma, social networks and the role of alternative social supports, depression and other aspects of mental health, alcoholism and other types of substance abuse, patterns and determinants of outcome following relocations or transitions in residence, patterns and determinants of recovery following bereavement, determinants of the quality of life (especially with disability, pain, chronic illness, and during the final days of life), emotional and social adaptation to imminent death, and the determinants of self-esteem in late life. This does not represent a complete list of topics appropriate for epidemiologic research but is intended to indicate areas for which adequate epidemiologic information is most obviously imcomplete.

METHODOLOGIC AND CONCEPTUAL ISSUES

Selective Survival. All older subjects are survivors, selected from a larger, preexisting population by the fact of their survival. The distribution of any variable that was associated with either increased or decreased survival may be different among the elderly as compared with their peers at a younger age. This is true for risk factor exposures, prior diseases themselves, and characteristics reflecting resistance or susceptibility to disease or the ill effects of an exposure. The elderly population tends, then, to be enriched in individuals who were either not exposed to factors associated with increased mortality or who were resistant to the increased mortality ordinarily associated with factors to which they were exposed.

It is often not possible to determine if a difference between the distributions of a characteristic in older as compared with younger persons exists because of selective survival, or for some other reason.

Selective survival can also influence the composition of cohorts of similar age, but which were exposed to different risk factors and diseases and/or with different resistance characteristics. Thus, differential selec-

tive survival should be considered in cross-cultural, comparative, or ecologic studies.

Selection Related to Medical Care Utilization. Persons who come to medical attention are often not representative of the general population or even of the ill members of the population. Estimates of prevalence and incidence based on population or community surveys are often higher than estimates based on contacts with physicians, clinics, or hospitals. In addition, the clinical features and patterns of progression among cases found as a result of a community survey may differ from those of cases identified through regular health care system contacts. Those individuals who come to medical attention are likely to be more severely affected, to have illnesses that concern others, and are often from higher socioeconomic strata.

Selection Related to Residence. Health and the availability of medical care influence where a person lives. Findings generated from the study of a population defined on the basis of a residential characteristic are often not generalizable to the entire elderly population; a population defined by residence (for example the noninstitutionalized elderly of a retirement community) is not representative of the larger population of elderly.

Understanding and Motivation. Older persons are likely to hear less well, to have more difficulty with vision, to have impairments of cognitive functioning, and to become fatigued more easily than younger subjects. These factors influence both the quality and quantity of information obtained from the elderly during the course of epidemiologic surveys.

Nonresponse and Attrition. In cross-sectional surveys, those elderly who do not participate may well do so for reasons that are somewhat different from those of younger members of the population, including reasons related to ill health. In longitudinal studies, attrition is also likely to reflect health status. For these reasons the health of study participants may not accurately represent the health of the larger population. The usual bias that results is toward underestimation of morbidity.

Medical Records Are Often Inadequate. Information from death certificates and institutional records often give little information of the person's chronic diseases and concommitant illnesses or conditions. The missing information may be systematically biased with regard to age, socioeconomic, and health characteristics.

Heteroscedasticity. The variance of many variables increases with advancing age and can introduce certain types of statistical artifact, to say nothing of possibly diminishing the researcher's ability to detect statistically meaningful differences (Bornstein & Smircina, 1982).

Misclassification of Controls. The probability that a person who has been identified as having no disease (a control) may actually be in a subclinical or imminent disease state is often greater for elderly controls than for younger controls. When present, this phenomenon will diminish differences between cases and controls.

Sensitivity, Specificity, and Predictive Values of Tests. Although the sensitivity and specificity of procedures for the identification of disease may vary with age, the more usual situation occurs when sensitivity and specificity are stable across age strata but with the prevalence of the condition increasing with age. Under these conditions, the positive predictive value of the procedure also increases with age, while the proportion of persons in whom the procedure has incorrectly identified a disease (false positives/total positives) decreases with advancing age (Hlatky, Pryor, Harrell, Califf, Mark, & Rosati, 1984).

Diseases of Aging as Pathological Processes. Conditions such as osteoporosis, atherosclerosis, and degenerative joint disease are pathologic processes that occur in the great majority of persons as they age, and that eventually express themselves in some but not in all persons as pathologic states or events such as vertebral fracture, myocardial infarction, or osteoarthritis. The determinants of the states or events include all of the determinants involved in the pathogenesis of the underlying pathologic processes, as well as other factors more immediately related to the precipitation of the states and events themselves. Prevention of the diseases of aging must be based on an understanding both of the process (prevention strategies focused on delaying or slowing the process—intervention early in life) and the precipitated state or event (intervention in later life). It is the central objective of geriatric epidemiology to illuminate the entire pathogenic chain in order to intelligently undertake prevention of these conditions. This task requires that we separate the pathogenic sequence into its two basic parts and then that we conduct research in the most efficient way possible to better understand the pathogenic chain.

Conventional epidemiologic methods are well suited to the second part of the pathogenic chain, when the subject can be classified as "having" or "not having" the condition, state, or event. These same methods are, however, less satisfactory for the study of the developing pathological processes, largely because the processes do not easily lend themselves to measurement and classification in simple dichotomous or polycotomous terms, and transitions from one stage/level of the process to the next are often ambiguous. The resolution of the problem often requires novel measurement methods, serial observations, and complex analytic methods, such as those developed by Manton and Woodbury (1983) and

Manton and Soldo (1985; also Woodbury & Manton, 1983). The basic problems inherent in classifying individuals according to differential trajectories of declining function have been examined by Fletcher and Peto (1977) in their studies of obstructive airway disease. In theory, a process such as osteoporosis could be similarly represented by a trajectory of bone mineral mass (BMM) measures, with individuals classified according to peak level, age at onset of decline, and slope of declination. Such a three-dimensional classification would allow for the analysis of associations of risk factors with each of these three aspects of osteoporosis either independently or conjointly in ways that would reflect the possibility that the osteoporotic state in some individuals might be largely attributable to an early onset (oophorectomy), in others to lower peak levels (asthenic habitus), and yet in others to accelerated loss (decreased physical activity). If patients whose osteoporotic states have resulted from such diverse pathogeneses are aggregated for analysis, the true influence of risk factors acting on only one of the three pathogenic mechanisms will be difficult to discern. Similar difficulties may well exist for AD, cardiovascular diseases, and the arthritides.

We often have only one or two measurements or observations from which to infer the trajectory of the pathologic process. In this situation, it is quite likely that many subjects will be misclassified as to the patterns of their trajectories. When two data points are available, change over time can be calculated to provide an estimate of slope; however, the statistical problems are so complex and opportunities for inappropriate interpretation so great that such analyses are often not justified (Chronbach, 1970; Fletcher and Peto, 1977; Anderson et al., 1980). The problems involve such phenomena as regression to the mean, the race horse effect, level-specific constraints on change, differential bias associated with stratum-specific prevalence differences, and the superimposition of treatment or pathogenic influences on "normal aging" curves. The most certain method for avoiding most of these difficulties is to gather information repeatedly over time, i.e., to conduct a longitudinal study with repeated observations and measurements.

Weakening of Risk Factors with Advancing Age

As has been mentioned above, the association of risk factors with disease states is often stronger in persons in their fifties or sixties than at older ages. The explanation probably varies with each risk factor/disease association but may well involve several of the methodologic phenomena that have been described as well as biologic phenomena.

An example of a risk factor of accepted relevance being weakly associated with a disease in later life is represented by measures of osteoporosis in relation to hip fracture. Although osteoporosis is widely accepted as the usual underlying cause for hip fractures in older women, attempts to establish the association epidemiologically by comparing measures of bone mineral mass in cases with those in controls have not been persuasive. The problem, recently clarified by Melton et al. (1986), can be attributed to the very high prevalence of osteoporosis in older women; by controlling for age, one simultaneously controls for osteoporosis, since age and bone mineral mass are so highly correlated. The weakening of the association between fracture and the measure of bone mass when controlling for age does not mean that osteoporosis is an unimportant element in the pathogenic sequence leading to the hip fracture; indeed, the risk of a fracture would be more accurately assessed with knowledge of the bone mass than with knowledge of age alone. From a biological point of view it is far more reasonable to understand the fracture as occurring because of diminished bone strength secondary to osteoporosis rather than because of advanced age per se. Nonetheless, the weakening of the risk factor (bone mass) with age tells us that the osteoporosis, a necessary or very important precondition for fracture, is not a sufficient explanation. A second factor, perhaps a fall, is necessary to complete the pathogenic sequence leading to the fracture. In this case, a careful analysis of complex relationships among risk factors and with the disease end point considered with a fundamental biological understanding of the phenomena is essential to understanding the pathogenesis of hip fracture and planning strategies for prevention.

FUTURE DIRECTIONS

Epidemiologic methods and approaches were initially developed for the investigation of infectious diseases, evolved in response to the special problems of cardiovascular disease and cancer, and are currently applied to a broad range of population phenomena. The special problems of aging now present an opportunity to develop new epidemiologic methods in order to facilitate our understanding of the multiple, converging, dynamic phenomena and mechanisms that determine longevity and health in later life. The challenge comes at a moment when we are already in a communication and information revolution, with potential computer technologies that seem almost unlimited. The effective application of these new methods and technologies to research involving concurrent change over time in multiple independent and interdependent variables

will depend on the existence and accessibility of unbiased longitudinal data for definable populations. Novel investigative methods for both collection and analysis will be developed to resolve key research and policy questions. As noted at the outset, epidemiology is better able than most scientific disciplines to simultaneously serve the needs of the scientist, the health care provider, and those who plan and make policy. These diverse functions will be nowhere better utilized than in the fields of gerontology and geriatrics over the next several decades.

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