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Introduction

This volume of the *Annual Review of Gerontology and Geriatrics* seeks to continue the pattern of contributing to the research of the multidisciplinary science characteristic of the best gerontology without compromising the integrity of highly developed specialty areas. Early volumes comprised chapters that represented a wide array of disciplines active in gerontological research and practice, with topics from biology to clinical practice dealing with either active areas of research or areas thought to be in need of research attention. Later volumes were somewhat more specialized, dealing with such areas as clinical health, social gerontology, psychology, and social structure.

The present volume represents a combination—the first two sections deal with geriatrics (geriatric health and psychiatry), while the third section (psychosocial interventions) is more eclectic. This volume begins with the notion that virtually every attempt to apply gerontological knowledge through intervention requires informed people who not only have their own core of expertise and a general scientific knowledge of aging but who have a broader sphere of knowledge of and respect for related disciplines as well. Scientists and leaders in their fields, the authors identify major issues and gaps in knowledge and review existing knowledge in appropriate critical fashion from the point of view of theory, methodology, and practice. Each author was asked to go an extra mile and not only explain the significance of the scientific issues treated in the chapter but to keep in mind that readers in different disciplines—whether researchers or practitioners—should be able to comprehend the major messages of the chapter.

Looking ahead, Volume 10 of the *Annual Review*—edited by one of the founding consulting editors of the series, Vincent Cristofalo—will be the first explicitly devoted to the biological aspects of aging. In keeping with the multidisciplinary mission of the *Annual Review* series, the volume will provide the latest answers to a series of contemporary scientific questions about the study of the biology of aging. At the same time, the high scientific quality of some of the authors' presentations over a period of years on the topic "Biology of Aging for Nonbiologists" will be called upon as a model to make this volume a resource for all gerontologists.

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Vincent J. Cristofalo, Special Volume Editor

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PART I

Geriatric Health Issues

Part I Introduction

This longest section of the volume exemplifies its multidisciplinary theme; each chapter is concerned with a biomedical event, problem, or process, explicated in a psychological or social context. Specifically, the chapters deal with osteoporosis, diabetes, incontinence, neurophysiology, and medical diagnosis. Yet a broader view of each chapter could characterize their topics as lifestyle, self-monitoring and medical compliance, health maintenance, and functional health assessment—all of these considerably broader than the core topic.

Clearly, the overall practice of interventions in each of these areas must necessarily involve a physician, whether as supervisor, direct-care provider, or major contributor to the research. In everyday practice, however, the contributions of a great variety of disciplines are necessary and sometimes overshadow the physical presence of the physician.

Bales's chapter on nutritional aspects of osteoporosis introduces a highly cogent topic in geriatric health in such a way that program planners and "distant" professions gain an appreciation of its significance and the major facts about this disease in the older population. Nonmedical staff in community agencies or residential settings, as well as researchers in health, will gain a very clear picture of the major lifestyle, nutritional, and therapeutic approaches available for geriatric populations.

The treatment of diabetes by Anderson and Halter exemplifies the multidisciplinary approach to a chronic disease as remarkable for its effects on everyday behavior as on somatic manifestations. As in Bales's chapter, this one provides an unusually clear description of the clinical aspects of the focal illness; virtually anyone reading this section will emerge with at least enough basic knowledge about diabetes to be able to work knowledgeably with such patients in a variety of settings. The bulk of the chapter identifies how broadly management and treatment reach into the provinces of health education, social work, clinical psychology, and nursing. Especially valuable is the authors' use of theory and research in behavioral medicine to increase our understanding of such phenomena as compliance to regimens, self-determination of clinical course, and medication errors. Finally, an exhaustive compendium of behavioral approaches found to be useful in management programs has been assembled, all of them usable by staff of many different professional backgrounds.

Herzog, Diokno, and Fultz continue this line of elaborating the medical, social, and behavioral aspects of a focal condition to display the many possibilities for positive management and intervention. Unique in this chapter is an exhaustive survey of epidemiological data on incontinence (carefully differentiated into functionally meaningful subtypes). This section organizes a set of benchmarks against which findings from any new research may be compared. Like the other contributors, these authors note multiple causes, interventions, and management strategies, all of which involve contributions from multiple disciplines. The concise summary of clinical facts about incontinence will be valuable to both the specialist and the newcomer.

In contrast to osteoporosis, diabetes, and incontinence, physical fitness is a much more diffuse concept. Bashore's chapter, however, focuses on just one of a great many features of fitness, central nervous system functioning, and on a very limited aspect of such functioning, one element of electrical brain activity that is an indicator of cognitive function. Bashore anchors this highly focused treatment within the larger context of current social attitudes toward exercise and fitness. A broader treatment of fitness will have to be provided elsewhere. The special significance of Bashore's chapter is that the research on evoked brain potentials gives some indication that even a basic function like reaction time may be plastic in the right type of intervention. The usual appeal of physical fitness programs has been their hope of maintaining physical function through practice or perhaps providing an increment to subjective quality of life. If intellectual acuity also turns out to be a fair target for intervention, an additional potent motivation for participation will be available. Because this area of research is highly specialized, details of some of the research are necessary, but again, the author is concerned to portray to the nonspecialist the relevance of his expertise to the larger area of fitness.

The last chapter in this section turns even further from a single focal problem to a management task common to every medical and behavioral condition, the task of assessing the nature of the problem. Rubenstein and Wieland provide an exhaustive overview of the characteristics and assessed outcomes (where available) of an immense number of geriatric assessment programs. Although such programs have a long history, which is reviewed by these authors, our contemporary attention to the potential gains in efficacy of treatment consequent to proper problem identification began in a study by Rubenstein and colleagues (1982).

Briefly, geriatric assessment seeks to identify as early in the medical contact process as possible the most promising treatment and especially the ideal locus for the treatment (e.g., hospital, residence, outpatient). Given the high prevalence of chronic diseases and their multiple presence in older people, it is not surprising that the medical element is central to many such treatment-planning situations. Yet, as in the case of the chapters dealing with more specific impairments, much of the assessment technique deals with functional, behavioral, and social aspects of the older person's life. Thus geriatric assessment, necessarily under the direction of a physician, has many near relatives in the types of assessment activities conducted in nonmedical settings such as psychological counseling clinics, information and referral centers, nursing-home screening centers, and many other places where older people with very diverse problems may appear.

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CHAPTER 1

Nutritional Aspects of Osteoporosis: Recommendations for the Elderly at Risk

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In the midst of growing interest in osteoporosis, the degree of emphasis placed on the role of nutrition has been a continuing source of controversy. In some instances, the importance of diet in the prevention of osteoporosis has been overemphasized by those who stand to benefit from the marketing of certain dietary supplements. In other situations, the role of nutrition in both prevention and treatment of osteoporosis has been underrecognized.

The relationship of nutrient status and metabolism to the prevalence and severity of osteoporosis is obviously complex and is difficult to ascertain in clinical studies because of the multidimensional nature of the disease. Although the exact cause of primary osteoporosis is unknown, it is unlikely that the dietary deficiency of a single nutrient constitutes a predominant cause of either type I (postmenopausal) or type II (age-related) osteoporosis. However, it is clear that nutrition may play an important role in the prevention and treatment of both types of this disease.

Although much has been written concerning osteoporosis and its relationship to past and present nutriture, the state of the art remains in transition. This chapter represents an attempt to summarize current understanding of clinical nutrition and osteoporosis. As already implied, prevention and treatment of the disease are two distinct and equally important considerations. Because this book targets issues relevant to

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geriatrics and gerontology, the following discussion emphasizes nutritional concerns for elderly individuals with a current diagnosis of osteoporosis or with a high risk of developing the disease. This chapter is not intended to provide a complete review of all relevant research, but to bring into focus nutritional issues relevant to the elderly.

SIGNIFICANCE OF OSTEOPOROSIS IN ELDERLY AMERICANS

The debilitating nature of osteoporosis and its striking prevalence among older adults has been previously reported (Consensus Development Conference, 1987). Little additional comment is needed to underscore the significance of this painful and incapacitating disease, which is responsible for approximately 1.3 million bone fractures in adults over age 45 each year. Included in this total are an estimated 250,000 hip and 170,000 Colles' fractures, resulting in significant morbidity and mortality. The medical costs associated with these fractures are now estimated at $7 to $10 billion each year (Culliton, 1987). Many vertebral fractures go unreported, but it is estimated that 40% of all women will have at least one spinal fracture by age 80 (National Osteoporosis Foundation, personal communication, January, 1988).

In future decades the numbers of the population affected by osteoporosis, as well as the associated medical costs, are predicted to skyrocket. The combination of gradual increases in life expectancy [by 27 years in this century (National Center for Health Statistics, 1988)] and the graying of the "baby-boom" cohort will result in a doubling of the number of individuals over 65 by 2030 (Spencer, 1984). The National Osteoporosis Foundation predicts that if the present incidence of osteoporosis continues, the annual rate for hip fracture in the United States will exceed 600,000 by the year 2040 (National Osteoporosis Foundation, personal communication, January, 1988). Thus osteoporosis constitutes a serious and growing threat to the health and well-being of Americans—particularly the elderly, who have the highest incidence of hip fracture and associated mortality.

CHARACTERIZATION OF OSTEOPOROSIS

Established risk factors for osteoporosis include older age, early menopause or premenopausal oophorectomy, corticosteroid use, extreme inactivity, petite build, being white or of Asian descent, and being female.

The diagnosis and characterization of specific types of osteoporosis have been detailed elsewhere (Riggs & Melton, 1988).

Types of Osteoporosis

Primary osteoporosis is an age-related disorder in bone metabolism characterized by a reduction in bone mass and an increased susceptibility to atraumatic skeletal fractures. Considerable pathophysiological heterogeneity among patients is commonly noted. Thus osteoporosis is often divided into subtypes (Riggs & Melton, 1983).

Type I osteoporosis (sometimes called postmenopausal) occurs predominantly in women and is characterized by an accelerated and disproportionate loss of trabecular bone. Fractures of the vertebra and distal radius are most common (Johnston, 1986; Kleerekoper, 1986). Type I osteoporosis is associated with increased bone resorption, reduced production of parathyroid hormone, and altered activation of vitamin D, thus leading to signficant impairment of calcium absorption and homeostasis (Lyles, 1989).

Type II ("age-related") osteoporosis may commonly occur in both men and women and typically has a later age of initial onset than type I. This type of osteoporosis is characterized by a relatively proportionate loss of cortical and trabecular bone. Typical fractures involve the hip, proximal humerus, proximal tibia, and pelvis (Johnston, 1986; Kleerekoper, 1986). In this case, levels of active parathyroid hormone are elevated, while osteoblast function may be impaired. Calcitriol synthesis may also be adversely affected. With time, the loss of bone may gradually slow and even stop in some elderly individuals (Riggs & Melton, 1986). Bone mineral density may not be a good predictor of fracture risk in type II osteoporosis since the increased incidence of falls in aged adults confounds studies of fracture incidence.

The overlap of types I and II is apparent when a patient presents with low bone density resulting from cessation of gonadal function followed by age-related bone demineralization. In this case, an individual may experience bone loss resulting from both types of osteoporosis.

INFLUENCE OF SUBOPTIMAL NUTRITION ON BONE MINERAL DENSITY

The prevention of osteoporosis by optimizing maximum bone density is preferable to any treatment alternatives currently available for the disease.

However, the degree to which nutritional status affects peak bone mass has not been unequivocally established in humans. Evidence from studies in experimental animals (Schaafsma, van Beresteyn, Raymakers, & Duursma, 1987) as well as limited observations in humans (Kanders, Lindsay, Dempster, Markhard, & Valiquette, 1984; Picard et al., 1988) indicate that low calcium intake prior to menopause may affect bone density. A study by Matkovic et al. (1979) indicates that even subtle differences in lifelong calcium intake may alter bone density. This relationship may have an important impact on the future incidence of osteoporosis since calcium intakes have been estimated to be less than the RDA in more than 67% of young women (at a time when bone mass is still developing). The reader is referred to other discussions of this important issue in the literature (Anderson, 1988; Heaney, 1988; Raisz & Smith, 1987; Schaafsma et al., 1987). In keeping with our focus on geriatric nutrition, however, the remainder of this chapter will emphasize potential nutritional intervention in the progression of age-related bone loss.

Calcium

The cause of age-associated bone loss is clearly more complex than one of pure calcium deficiency (Riggs et al., 1987b). However, the intake, absorption, and utilization of calcium is essential for the maintenance of bone mineral. Despite a general consensus that adequate calcium intake may delay bone loss, evidence for a direct relationship between dietary calcium and bone density is limited. Disagreements in the research literature concerning the value of calcium in reducing osteoporotic fractures are discussed later in this section. Differences in research protocols, age of subjects, and methods of measuring bone density and calcium intake make comparison of results difficult. In addition, subject variability in adaptation to a low calcium intake may alter net response to calcium supplementation.

The Calcium Requirement

The optimal dietary intake of calcium for bone health has not been definitively established. The Food and Nutrition Board of the National Research Council (1980) has recommended an RDA (Recommended Dietary Allowance) of 800 mg/day for calcium in nonpregnant, nonlactating adults. However, calcium intakes in the United States are typically low, especially in older adults, as indicated by the results of national studies (HANES I = 602 and 495, and HANES II = 597 and 475 mg of dietary calcium per day in males and females over age 64, respectively [Heaney et al., 1982]).

As energy needs and intakes decline progressively with age, so do the intakes of calcium and other essential nutrients (Munro, 1986). It is estimated that after age 35, 75% of females have calcium intakes below the RDA (Ramazzotto, Curro, Gates, & Patterson, 1986).

To compound the previously described inadequacies in dietary calcium intakes, it appears that amounts well above the published 800 mg RDA may be necessary to maintain calcium equilibrium, at least in postmenopausal women. Heaney, Recker, and Saville (1978) have estimated that menopause, together with age-related changes in calcium homeostasis, results in a negative shift in calcium balance of 25 mg per day. Based upon the research of these workers, which consistently indicates an increased calcium requirement with age (Heaney, 1988), a Consensus Conference on Osteoporosis (1984) sponsored by NIH approved a recommended intake of 1000 and 1500 mg calcium per day for estrogen-replete and estrogen-deprived women, respectively. This recommendation was reiterated at another recent consensus conference (Culliton, 1987; Consensus Development Conference, 1987).

Dairy products are by far the best dietary source of calcium, supplying 75% of calcium intakes in the United States. When these foods are omitted from the diet because of food preference or milk-intolerance, calcium intakes are typically quite low—in the range of 200 to 300 mg per day (Schaafsma et al., 1987). Thus the need for additional calcium in supplemental form is apparent for some elderly Americans. The potential effectiveness of regular calcium supplementation is still a matter of debate and will be discussed in a subsequent section.

Calcium Absorption and Metabolism

Calcium is actively absorbed in the upper small intestine and may also be passively transported when active mechanisms are saturated. Active transport of calcium is dependent upon the presence of 1,25-dihydroxyvitamin D (calcitriol) and is indirectly influenced by parathyroid hormone as well. Calcium absorption is typically more efficient in individuals adapted to a low-calcium diet. However, it is clear from previous research that a lower limit of calcium intake exists, below which one cannot sufficiently compensate (Allen, 1982).

Significant reductions in the efficiency of calcium absorption have been documented in both men and women over age 60 (Heaney et al., 1982). The ability of individuals aged 70 to 90 to absorb calcium is estimated to be about one-third of that in young adults. Furthermore, the ability to adapt to low intakes of calcium by increasing absorptive efficiency is thought to be attenuated in the elderly (DeLuca, 1974). Reductions in calcium absorption and in the ability to compensate for calcium deficiency have been attributed to lower circulating levels of calcitriol or the indirect effect of estrogen deprivation on calcitriol production (Gallagher et al., 1979; Slovik, Adams, Neer, Holick, & Potts, 1981).

A number of other factors may influence the degree of calcium-absorptive efficiency, including nutrient-nutrient, drug-nutrient, and disease-nutrient interactions. These considerations may be especially important in older patients who must often cope with a number of chronic conditions. For example, it has been estimated that as many as 40% of postmenopausal and elderly women experience relative achlorhydria and may produce free gastric acid only after ingestion of food (Riggs, 1988). The calcium in food, as well as that supplied in supplemental form, must be solubilized before its absorption can occur. In order for this to take place, an acid pH is necessary. In the absence of an acid medium, the absorption of calcium from a salt such as calcium carbonate could be greatly diminished. Recker (1985) has demonstrated impaired absorption of calcium carbonate in achlorhydric subjects, who were better able to absorb calcium from a pH-adjusted calcium citrate form. However, calcium citrate contains only about 24% of elemental calcium. It may therefore be most practical to advise individuals who retain some acid production to take calcium carbonate but to enhance its absorption by timing it to coincide with meals.

The RDA for calcium is based upon results of metabolic experiments in which calcium balance between dietary intake and normal losses (in feces, urine, and integument) is calculated. Despite inherent problems with the performance and interpretation of balance studies, this technique has been the one most commonly used in studies of calcium absorption and requirement. Alterations in calcium balance have been directly correlated with changes in bone density, reflecting the fact that 99% of body calcium is present in bone (Schaafsma et al., 1987). Thus calcium homeostasis is a major determinant of bone mineralization.

Calcium and the Maintenance of Bone Mineral

There is no question that calcium is necessary to build and maintain bone. However, the potential effectiveness of high dietary (and/or supplemental) intakes of calcium in the prevention and treatment of osteoporosis is a matter of much debate. The disagreement among study results may stem partly from differences in research protocols and the amount of calcium supplementation provided. Some studies examine the relationship of habitual calcium intake to bone density, while others intervene with controlled clinical trials of calcium supplementation.

Generous intakes of calcium (that is, approximately 1500 mg per day from diet plus supplements) may improve calcium balance and decelerate bone loss. This observation obtains when individuals with deficient intakes of calcium switch to higher amounts of the nutrient. Thus it has been suggested that there is a specific threshold such that below a certain level of intake, improvements in dietary calcium are likely to benefit mineralization of the spine (Dawson-Hughes, Jacques, & Shipp, 1987).

However, not all clinical and intervention studies indicate a clear relationship between low calcium intake and bone loss. In some studies, calcium intake has been found to be associated with bone mass (Matkovic et al., 1979; Yano, Heilbrun, Wasnich, Hankin, & Vogel, 1985). Osteoporosis patients generally report lower calcium intakes than controls (Heaney et al., 1982). However, other investigators have not found this relationship (Angus, Sambrook, Pocock, & Eisman, 1988; Sowers, Wallace, & Lemke, 1985). Positive (but modest) effects of calcium supplementation on calcium balance and bone density of older women have also been demonstrated (Horsman, Gallagher, Simpson, & Nordin, 1977; Recker, Saville, & Heaney, 1977; Smith, Reddan, & Smith 1981). In other cases, however, calcium supplementation has been found to have little or no effect on bone density (Christiansen et al., 1980; Nilas, Christiansen, & Rodbro, 1984). The impact of calcium on bone loss is clearly less dramatic than that of estrogen (Horsman et al., 1977; Recker et al., 1977). For example, calcium cannot compensate during the transmenopausal period of accelerated bone loss (Nilas et al., 1984). However, for women who cannot take estrogen, calcium supplementation may offer some benefit. The ability of calcium to retard age-related bone loss may also vary with the skeletal site, even within the same person. Thus, generous calcium intakes may protect cortical bone in specific skeletal sites but do little to slow the rate of trabecular bone loss at another site (Riis, Thomsen, & Christiansen, 1987).

The lack of a strong relationship between calcium intake and bone density may be partly explained by differences in dietary consumption over a lifetime. Self-chosen diets always vary in more than one constituent, thus making it almost impossible to detect a causal relationship from epidemiological studies of calcium and bone density. The potential impact of other dietary constituents, such as protein, phosphorus, and sodium, on calcium homeostasis may be important and is discussed subsequently.

Lack of agreement among intervention studies may relate to differences in prestudy calcium intakes of the subjects, as well as the amount of calcium administered. Supplements of 500 mg calcium per day had no effect on bone density of the radius in a study of postmenopausal women (Christiansen et al., 1980). However, supplementation with more than 1000 mg of calcium per day may be more beneficial. Freudenheim, Johnson, and Smith (1986) supplemented 99 women with 1500 mg of calcium daily during a four-year clinical trial and reported a decrease in the rate of humerus bone loss.

Postmenopausal osteoporosis has been studied more frequently than Type II (senile) osteoporosis. However, extrapolation of data from peri- and early-postmenopausal women to older women may not be valid (Resnick & Greenspan, 1989). For example, interpretation of the effects of calcium intake may be complicated by the decline in calcium absorption typically observed with advancing age. Further studies are needed before questions concerning the relationship of dietary calcium to senile bone loss can be answered. Future investigations should place more emphasis on reduction fracture incidence than upon changes in bone mineral density per se.

Potential Value of Calcium Supplements

When recommended calcium intakes exceed 1000 mg per day (for example, according to current recommendations for postmenopausal women and elderly individuals with osteoporosis), many patients find it impossible to consume the full amount of calcium from natural food sources. Poor appetites, milk intolerance, and restrictive therapeutic diets may so limit food consumption that the target calcium intake can be achieved only with calcium supplements.

The bioavailability of different forms of supplemental calcium has thus been studied, with sometimes divergent results (Allen, 1982). Calcium carbonate has become the most widely recommended form of calcium supplement because it is one of the least expensive available forms and a relatively small number of tablets is required to provide suitable amounts of calcium. However, recent investigations indicate that the intestinal uptake of calcium from calcium citrate may be superior to that from calcium carbonate (Harvey, Zobitz, & Pak, 1988).

Calcium supplements should be taken with meals in order to capitalize on the fact that gastric acid secretion is elevated immediately following a meal. Contrary to popular belief, it is not recommended that calcium supplements be taken at night, since gastric acid production is minimal in the evenings, at least in hypochlorhydric individuals. In addition, a recent report indicates some cause for concern about the disintegration times and dissolution rates of available calcium carbonate products. In one test, 11 of 21 supplement tablets tested did not meet disintegration criteria, and 6 remained undissolved after 60 minutes. This problem appears to be more common with "private" or "house" labels (Carr & Shangraw, 1987). A word of caution should also be issued regarding calcium provided as dolomite or bonemeal preparations. Both may contain a variety of other elements, including toxic heavy metals (lead, arsenic, cadmium).

Calcium supplements can occasionally cause constipation or gaseousness. Otherwise, appropriate amounts of calcium (up to 2.5 g per day) are generally considered harmless unless there is a history of urinary calculi, hyperparathyroidism, or sarcoidosis (Heaney et al., 1982). As a precaution, urinary calcium levels should be monitored and maintained below 250 mg per 24 hours (Lane, Healey, Vigorita, & Werntz, 1986).

Despite the relatively innocuous nature of calcium supplements, some concerns exist. Dependence upon routine calcium supplementation should not be allowed to lull patient or physician into complacency. Bioavailability of calcium from supplements is probably less efficient than that from food, unless taken with meals, and the possibility of noncompliance is always present. The potential interaction of calcium supplements with other nutrients may also be a concern during long-term calcium supplementation. For example, recent studies indicate that the bioavailability of trace elements such as zinc, iron, and copper may be reduced by high calcium intakes (Champagne, 1988; Dawson-Hughes, Seligson, & Hughes, 1986).

Other Nutrients Affecting Calcium Balance

Vitamin D

A central role for vitamin D in the regulation of mineral and bone homeostasis is well recognized (DeLuca, 1986). Vitamin D is responsible for maintaining adequate concentrations of calcium and phosphorus in the extracellular fluid. Along with parathyroid hormone, this vitamin regulates calcium movement across the gastrointestinal tract, at bone surfaces, and in the kidney (Bales & Drezner, 1989). Although present in human diets, vitamin D (cholecalciferol) may also be synthesized and activated within the body.

Dietary and Dermal Sources. Dietary sources of vitamin D are few and may contain significant amounts of saturated fat and cholesterol; they include vitamin D–fortified milk, fatty fish, cheese, butter, eggs, and liver. Most other foods provide minimal quantities of this vitamin. In skin exposed to UV irradiation (sunlight), previtamin D (7-dehydrocholesterol) can be converted to provitamin D. Thus endogenous synthesis of vitamin D often contributes far more to vitamin status than dietary sources. Determinants of dermal synthesis include geographical location, typical sunscreen use, and skin pigmentation. Plasma concentrations of vitamin D metabolites have been found to vary with the season of the year and the amount of sunlight exposure (Allen, 1982).

Vitamin D functions as a hormone which must undergo obligatory metabolism in the liver and kidney to be fully active. Cholecalciferol from dietary sources and skin synthesis is transported to the liver, where it is metabolized to 25-hydroxy-vitamin D (calcidiol). Calcidiol is the major circulating form of vitamin D, being transported in the blood linked to vitamin D–binding protein. Normal serum levels vary somewhat between laboratories but in general, range from 8 to 55 ng/ml in adults (Holik, 1986b). Calcidiol circulating in the serum must undergo an additional hydroxylation step in the kidney to form 1,25-dihydroxy-vitamin D (calcitriol). Calcitriol is the active endproduct of the vitamin D cascade and is responsible for the physiological activity of the vitamin.

Age-Related Alterations in Vitamin D Status and Metabolism

Considerable evidence indicates that the elderly may be at risk for poor vitamin D status (Suter & Russell, 1987). In addition to reduced sun exposure, the ability to synthesize vitamin D in the skin may be reduced by as much as twofold in the elderly (Holick, 1986a). There is also evidence that dietary intakes less than the RDA (400 IU per day) may be common (Suter & Russell, 1987). Plasma concentrations of calcidiol have been found to decrease with age by more than 50% (Eastell, Heath, Kumar, & Riggs, 1988), although levels generally remain within the normal range. In some studies, diminished calcitriol concentrations have also been reported (Gallagher et al., 1979).

Although osteoporosis is not caused by vitamin D deficiency, subnormal levels of vitamin D metabolites may impair calcium absorption and result in negative calcium balance. Osteoporosis patients often have serum concentrations of calcidiol within the "normal" range. However, it may be that their vitamin D levels are marginally low, thereby preventing a normal adaptive response to low calcium intake (Heaney, 1986b). In addition, the suggested role of vitamin D in muscle function could interact with the potential for instability and falls in the elderly (Boland, 1986).

As previously noted, decreases in calcium absorption with age have been attributed to reduced synthesis of calcitriol. More specifically, age-related changes such as diminished renal function may decrease the activity of the renal enzyme responsible for the 1-hydroxylation of calcidiol (Lyles, 1989). Thus vitamin D requirements of the elderly may be substantially higher than those of young adults (Parfitt et al., 1982). Low plasma calcitriol levels have been frequently reported in studies of the elderly from Europe and Great Britain, where sunlight exposure may be minimal and fortification of food products with vitamin D is limited. The potential value of vitamin D in the treatment of osteoporosis is addressed in a subsequent section of this chapter.

Phosphorus: Potential Effects of Low Dietary Calcium:Phosphorus Ratio

More efficiently absorbed from the diet and present in larger quantities than calcium, phosphorus (P) has been suspected of competitive inhibition of normal calcium homeostasis. Indeed, convincing evidence from animal studies demonstrates the negative impact of a low dietary calcium:phosphorus ratio (Ca:P) on bone mineralization (Draper & Bell, 1979). The potential cause for concern is clear since the typical P content of Western diets is 1500 mg per day, while calcium intakes are substantially lower (Schaafsma et al., 1987). However, conclusions about the risk of low Ca:P are founded almost entirely upon results from studies of rapidly growing animals. There is no direct evidence that diets high in phosphorus adversely affect bone health in humans. The discrepancy may be related to differences in the ratio of P to body weight, which is substantially higher in the animal studies than would be likely ever to occur in man.

A look at the current literature indicates that a wide range of phosphorus intakes has little or no influence on net calcium balance in humans (Heaney & Recker, 1982; Spencer, Kramer, Rubio, & Osis, 1986). It has been shown that increasing dietary P intakes of adult males from 800 to 1200 mg per day (at calcium intakes ranging from 200 to 2700 mg per day) does not significantly alter calcium balance (Spencer, Kramer, Osis, & Norris, 1978). In fact, Goldsmith et al. (1976) actually found a slight improvement in calcium balance as a result of phosphate therapy for osteoporosis. Freudenheim et al. (1986) report a positive relationship between phosphorus intake and bone density in women aged 35–65 years. Elevated dietary phosphorus decreases urinary calcium excretion and may partially counteract the calciuric effect of dietary protein (vide infra). An exception to this general observation may be the phosphorus supplied in phosphate form in carbonated drinks, which is unaccompanied by natural dietary constituents (Spencer, Kramer, & Osis, 1988).

High Protein Intake

For many years it has been well known that protein intake alters calcium requirements by increasing urinary losses; this topic has been recently reviewed (Yuen, Draper, & Trilok, 1984). High protein intakes increase the filtered calcium load. In addition, sulphate resulting from oxidation of sulphur-containing amino acids may counteract calcium reabsorption by kidney tubules. Negative calcium balance has been reported in response to increased dietary protein in some studies (Heaney & Recker, 1982). However, Spencer and her coworkers (1988) found high-protein foods unlikely to reduce calcium balance, especially in the long term.

To date, no detrimental effect of elevated protein intake on bone mass has been demonstrated in experimental animals or in humans. It appears that other constituents of natural protein sources (such as phosphorus in meats) may blunt the effect of high dietary protein on calcium excretion. Thus studies of mixed diets reveal milder effects of protein on calcium balance than when the response to isolated nutrients is studied. The hypocalcuric effect of phosphorus may at least partially offset the hypercalcuria associated with a high-protein diet. However, Heaney and Recker (1982) found a phosphate-stimulated elevation in calcium content of digestive juices which essentially canceled out the hypocalcuric effect of the phosphate level present in most protein sources (Heaney, 1986). Interpretation of the literature (Cummings et al., 1979; Marsh, Sanchez, & Mickelsen, 1980; Spencer et al., 1978) is hindered by the fact that the protein effect may depend upon its source (i.e., animal versus vegetable).

Despite the lack of definitive evidence, it remains likely that excessive protein intake may negatively alter retention of absorbed calcium. Marsh et al. (1980) have reported a higher rate of postmenopausal bone loss in omnivorous as compared to vegetarian women. Furthermore, it has been hypothesized that high protein intakes may partially explain the observation that humans in developed countries often require more calcium to maintain equilibrium than their third-world counterparts. It has been estimated that a doubling of protein intake from natural sources produces a 50% mg increase in urinary calcium above baseline (Heaney & Recker, 1982). Until more is known, it seems prudent to recommend moderation concerning high-protein–low-calcium foods such as meats in diets of the elderly.

High-Fiber Diets

Because of recent reports that diets high in fiber may be beneficial in preventing cancer and lowering serum cholesterol and/or glucose levels, the use of food products providing substantial amounts of dietary fiber is on the rise, particularly in the elderly, who may also be advised to increase fiber intakes because of intestinal complaints such as diverticulosis and constipation. Thus the potential impact of a regular intake of high dietary fiber on calcium bioavailability may be of some concern.

Dietary fibers, as well as oxalic (spinach, rhubarb) and phytic (wheat bran) acids, may chelate calcium, thus reducing its availability for absorption and decreasing calcium balance (Sandstead et al., 1979; Southgate, 1987). This idea is borne out by studies such as the recent report by Heaney and coworkers (1988) indicating a very low bioavailability of calcium from spinach, presumably because it is complexed with oxalate. Kelsay, Behall, & Prather (1979) report that a high-fiber diet produced negative calcium balance, with an average calcium loss of 122 mg per day, in middle-aged men fed the diet for 26 days. Thus short-term studies indicate a definite negative effect of high fiber intakes on calcium balance. Although not yet determined experimentally, adaptation to high fiber intakes could partially compensate for this effect in the long term.

Specific effects of fiber on calcium balance may vary with the fiber source, and most have not been well defined. Wheat bran, the most extensively studied, has been associated with negative calcium balance (Reinhold, Faraji, Abadi, & Ismail-Beigi, 1976). However, it is not clear if portions of the cell wall or the presence of phytate is responsible for reductions in calcium absorption (Schaafsma et al., 1987). Phytic acid may elevate fecal excretion of vitamin D metabolites (Omaye, Chow, & Betchart, 1983). However, recent evidence indicates that dietary fiber is more likely to jeopardize calcium absorption than phytates and oxylates (Allen, 1982).

The effects of consuming a high-fiber diet on bone mass are, as yet, unknown. Thus the most practical conclusion at present is to recommend that fiber consumption of individuals at risk for osteoporosis be limited to moderate amounts and that calcium supplements be taken separately from very-high-fiber foods such as high-fiber breakfast cereals.

Mineral Interactions. The mineral phase of bone consists primarily of hydroxyapatite [$Ca_{10}(PO_4)_6(OH)_2$]. However, a number of other mineral nutrients are present as minor constituents of bone, including fluoride, zinc, and manganese. It is believed that the skeleton may function in the metabolic regulation of these and other trace constituents. The affinity of fluoride for bone is strong, and the important therapeutic implications of this relationship are addressed in a subsequent section. Although little is known about the role of other trace elements in the human skeleton, results from animal studies indicate that several may serve a role in bone integrity. For example, Nielsen, Hunt, Mullen, and Hunt (1987) have reported the potential interaction of boron with calcium loss and osteoporosis.

Another concern is the possibility that excessive intakes of certain minerals may threaten calcium status. For example, zinc supplements decrease calcium absorption when intakes of calcium are low (Spencer & Kramer, 1987). In addition, increased ingestion of sodium chloride has been shown to enhance urinary calcium loss. The practical impact of sodium on bone health has not been ascertained; the calciuretic action of sodium may vary with renal glomerular filtration rate, state of hydration, or parathyroid status. Although there is little hard evidence of sodium risk to bone mineral, a moderately low-sodium diet (no added salt, exclusion of high-sodium foods) may be a safe and beneficial goal for elderly individuals.

Summary on Calcium Homeostasis and Osteoporosis. The primary goal of nutritional intervention for advanced osteoporosis should be to reduce the risk of fractures. The degree to which this can be achieved by dietary means is uncertain. Both calcium and vitamin D must be present in optimal quantities for normal bone mineralization to occur and to be maintained. However, neither of these agents can increase bone mass. Calcium, and possibly vitamin D, may slow the rate of bone loss in patients with mild to moderate osteopenia. When obligatory calcium losses exceed net calcium absorption, bone mass is lost. Thus, an osteoporotic individual may benefit from an increased calcium intake, even if dietary calcium deficiency was not the original defect in skeletal homeostasis. At present, calcium supplementation is widely endorsed as an adjuvant to therapeutic regimens for osteoporosis. It is reasonably safe and relatively inexpensive, and it has the potential to benefit at least some patients.

With regard to other dietary factors, modifications in diet should be limited in number and applied with a "commonsense" approach. As

Spencer et al. (1988) rightly observe, advising patients who already have poor appetites to limit foods rich in phosphorus and protein may lead to undernutrition and thus pose a greater risk to bone density than permitting a moderate or relatively high proportional intake of those nutrients. With these considerations in mind, highly individualized nutritional-care plans must be developed for each patient seeking medical therapy.

Other Dietary Risk Factors

Space does not permit a comprehensive discussion of other diet-related risk factors for osteoporosis. However, some of these factors will be briefly described, since many treatment protocols for osteoporosis include modification of risk factors (see Table 1.1).

Alcohol abuse is often associated with an accelerated rate of bone loss, even in young alcoholics (Allen, 1982; Dalin & Lamke, 1976; Spencer & Kramer, 1987). Consumption of alcohol has been reported to decrease absorption and increase urinary losses of calcium (Allen, 1982; Ramazzotto et al., 1986; Schaafsma et al., 1987). In addition, alcohol may affect the bone directly by inhibiting bone remodeling (Bikle et al., 1985). Chronic alcoholism often reduces dietary intakes of calcium and vitamin D and may enhance the likelihood of fractures via an increased propensity to fall. Thus alcoholism has been linked with decreased bone-mineral density and a greater-than-expected incidence of femoral neck fracture (Spencer et al., 1986). Discrepancies reported in the literature concerning alcohol abuse and bone loss are likely due to the confounding effects of general malnutrition and altered vitamin D status (e.g., impaired hydroxylation of vitamin D by cirrhotic liver) on bone mineralization.

Prescription and over-the-counter drugs that are commonly used by the elderly and may aggravate calcium balance are numerous but include

Table 1.1 Diet-Related and Environmental Risk Factors for Negative Calcium Balance and/or Osteoporosis

Vitamin D deficiency	Lifelong marginal calcium nutriture
Alcohol abuse	Adverse drug-nutrient interactions
Lactose intolerance	High caffeine intake
High protein intake	Very-high-fiber diet
Cigarette smoking	Immobility/Inactivity

corticosteroids and aluminum-containing antacids (Reid & Ibbertson, 1986; Riggs, 1988; Spencer & Lender, 1979). Potentially harmful diet-drug interactions are of significance since 85% of adults over 65 have one or more chronic diseases, many of which may require drug therapy. Thus the medical history of osteoporosis patients should be carefully reviewed and polypharmacy reduced whenever possible.

It has been theorized that lactose intolerance, a relatively common disorder caused by deficiency of the enzyme lactase, may reduce calcium absorption and/or intake via milk intolerance and thus increase the incidence of osteoporosis. It is well established that lactose (or "milk sugar") stimulates intestinal uptake of calcium independently of vitamin D–activated transport (Schaafsma et al., 1987), although the mechanism for this effect is unknown. Thus calcium status may be impaired in individuals with pronounced lactose intolerance because of avoidance of dairy products as well as the inability to benefit from the stimulating effect of lactose on calcium absorption. A number of studies have indicated a greater tendency for low calcium intakes and reduced bone density in lactose-intolerant individuals, although this effect may be due to differences in dairy-product consumption rather than calcium absorption (Horowitz, Wishart, Mundy, & Nordin, 1987). Studies of calcium absorption in such subjects is complicated by the effects of other intestinal impairments that often accompany lactose intolerance. Although I am unaware of reports linking the use of lactose-hydrolyzed dairy products to improved calcium balance, it is likely that these products may be used to improve calcium intakes of milk-intolerant individuals.

The association of caffeine intake with increased levels of urinary and fecal calcium excretion has been reported (Heaney, 1986a; Heaney & Recker, 1982; Massey & Wise, 1984). However, the effect is apparently a moderate one. The amount of caffeine in one cup of coffee (150 mg) has been estimated to increase urinary calcium by about 8 mg per day, equivalent to an increased calcium need of 30–50 mg when allowance is made for absorptive efficiency.

Two "nondietary" considerations are included in our list of environmental risk factors. Smoking is cited because of its effect on calcium excretion and menopause. Smokers who are encouraged to cut down or abstain from smoking because of osteoporosis may subsequently need dietary counseling if increased appetites lead to undesirable alterations in body weight. Inactivity is also clearly associated with accelerated rates of calcium loss from the bone (Ramazzotto et al., 1986). It follows that recovery of bone mineral after a period of inactivity depends upon adequate calcium status. The corollary of disuse-related bone loss is the use of exercise to improve calcium balance and even increase bone density (Aloia et al., 1978; Smith, Reddan, & Smith, 1981). In fact, exercise and a high-calcium diet can be mutually complementary in maintaining bone health.

NUTRITIONAL THERAPIES FOR OSTEOPOROSIS: TREATMENT OF BONE LOSS AND PREVENTION OF FRACTURES

It should be emphasized at the outset of this section that the effectiveness of dietary modifications in delaying the progression of osteoporosis has not been unequivocally established (Marcus, 1987). Indeed, only a limited number of therapeutic regimens, nutritional or otherwise, are currently known to benefit those individuals who already experience advanced disease. However, nutrition plays a critical supportive role in the clinical regimens currently prescribed for the treatment of osteoporosis and/or prevention of its rapid progression.

Calcium as an Adjunct to Estrogen Replacement Therapy

Controlled trials have unequivocally demonstrated the role of estrogen withdrawal in postmenopausal bone loss and the potential effectiveness of estrogen prophylaxis in preventing this loss (Ettinger, Genent, & Cann, 1985). Calcium cannot substitute for estrogen in the early years of menopause since the primary cause of bone loss during this period is estrogen deficiency (Christiansen et al., 1980; Marcus, 1987). For most geriatric patients, however, the period of peak effectiveness for estrogen therapy has passed. In cases where estrogen replacement is judged still to be of some benefit, complementary nutritional therapies (including calcium and fluoride) may significantly enhance the clinical response (Horsman et al., 1977; Recker et al., 1977; Riggs, Seeman, Hodgson, Taves, & O'Fallon, 1982). The therapeutic usefulness of estrogen plus supplemental calcium in preventing osteoporosis has been cited at a recent consensus conference (Peck, 1984).

Sodium Fluoride Therapy for Osteoporosis

Fluoride is an essential micronutrient, required in trace amounts for normal development of bones and teeth. In addition, its potential usefulness in pharmacologic amounts for the treatment of osteoporosis has recently become apparent. The results of clinical studies to date indicate that treatment with fluoride (as sodium fluoride, NaF) has the potential to produce a sustained improvement in trabecular bone volume (Eriksen, Hodgson, & Riggs, 1988; Harrison et al., 1986). Corresponding improvements in calcium balance (Charles, Mosekilde, & Taagehoj Jensen, 1985) and reductions in incidence of fractures have also been reported (Minaire et al., 1974). In fact, sodium fluoride was deemed "the only agent capable of producing a sustained anabolic effect on trabecular bone, both at appendicular and axial sites" at a recent International Conference on Osteoporosis (Consensus Development Conference, 1987).

Fluoride produces an increase in bone apposition, most likely by means of osteoblastic stimulation (Budden et al., 1988) and favorable "uncoupling" of bone formation and resorption (Harrison et al., 1986). Histologic examination of fluoride-treated bone indicates an increase in trabecular bone mass in association wtih hyperosteoidosis as well as a slight increase in bone resorption (Briancon & Meunier, 1981; Budden et al., 1988). The net effect of these changes (normally seen within two to four years of treatment) is an improvement in the total amount of bone. Although the bone initially formed is mainly woven bone, under ideal conditions it is eventually remodeled to lamellar bone.

The beneficial effects of fluoride therapy appear to be exerted mainly on trabecular (lamellar) rather than cortical (osteonal) bone. Thus NaF therapy is appropriately reserved for patients with vertebral osteoporosis. Because of the number of Americans affected by osteoporosis of this type, the potential exists for widespread use of sodium fluoride if FDA approval is granted. (The drug is already authorized for use in several European countries and is currently being considered for use in the United States.)

However, a number of disadvantages limit the potential widespread usefulness of NaF therapy for osteoporosis. One of the most significant problems is the potential for mineralization defects to occur in fluoride-treated bone (Briancon & Meunier, 1981). This effect is mitigated when supplements of calcium and vitamin D are simultaneously administered, although problems may still be encountered when the fluoride dose is very high. A second major concern related to fluoride therapy is the marked interpatient variation in responsiveness to NaF therapy (Charles et al., 1985; Riggs et al., 1982). Approximately 30% of patients treated with the drug show little or no positive response.

Therapy is also associated with several adverse side effects. Periarticular (transient arthralgias of feet and ankles and areas likened to stress fractures when examined by bone scan [O'Duffy et al., 1986]) and gastrointestinal side effects are reported in a substantial subset (30% to 50%)

of treated individuals (Harrison et al., 1986; Riggs et al., 1980). Iron-deficiency anemia secondary to gastrointestinal bleeding has also been reported (Riggs et al., 1980). In some instances, the treatment protocol and/or form of drug administered may be successfully modified to improve drug tolerance.

It is almost always necessary to administer fluoride tablets at mealtime in order to minimize nausea and gastric irritation. Yet the presence of various dietary constituents may affect the net uptake of fluoride from the gut. Of special concern is calcium, which is an essential component of the therapeutic regimen for patients receiving fluoride but which, paradoxically, may also inhibit fluoride absorption (Briancon & Meunier, 1981; Budden et al., 1988).

To summarize, NaF treatment may be used to increase trabecular bone mass in patients with severe osteoporosis (who can also tolerate and respond to this drug). NaF administration should be accompanied by an individualized regimen of calcium, estrogen, and/or vitamin D. This treatment is still regarded as experimental, and thus its use is limited to major medical centers with the facilities to assess its effects on cortical and trabecular bone density over time. Future studies that address appropriate individualization of NaF treatment protocols, including the possibility of cyclic administration, may enhance the practical utility of this therapeutic agent.

Therapeutic Usefulness of Vitamin D

The value of vitamin D in the treatment of osteoporosis is open to debate. At a recent conference on osteoporosis, vitamin D and its analogues were not recommended for the prevention and therapy of this disease (Consensus Development Conference, 1987). The use of supplements to correct marginal vitamin D status, however, is clearly necessary. Sowers and coworkers (1985) report a positive relationship between vitamin D intake (from food and supplemental sources) and bone density in a group of postmenopausal women. Thus marginal vitamin D status may be a concern in some elderly and housebound individuals.

Elderly patients with osteoporosis have been reported to have lower-than-normal blood levels of calcitriol (Slovik et al., 1981). In addition, supplemental vitamin D has been used, along with calcium therapy, to increase net calcium absorption (Francis & Peacock, 1987; Riggs, 1988) and to increase metacarpal (cortical) bone mass (Nordin, Baker, Horsman, & Peacock, 1985). Gallagher et al. (1982) administered 0.5 μg per day of calcitriol to postmenopausal women and found an increase in bone mass, calcium absorption, and calcium balance. However, Aloia and coworkers (1988) found no indication that calcitriol increases bone formation. Large-scale intervention studies using calcitriol are currently in progress.

Because of the risk of hypercalcemia, calcitriol can be given only if calcium intakes are not excessive. The utility of this vitamin D metabolite is thus complicated by the significant likelihood of hypercalcemia, and it is contraindicated when there is a history of renal calculi or any impairment of renal function. This being the case, serum and urinary calcium levels must be regularly monitored when vitamin D or its metabolites are being routinely administered.

To summarize, vitamin D metabolites deserve further investigation concerning their usefulness in the treatment of osteoporosis. Although it is unlikely that vitamin D can prevent early postmenopausal bone loss due to estrogen deprivation, its effects on senile or age-related osteoporosis need to be studied (Consensus Development Conference, 1987). The interrelationships of vitamin D, parathyroid status, and bone-mineral density in the elderly are poorly understood (Marcus, 1987). Until more is known, moderate amounts of vitamin D may be useful when vitamin status is marginal or when combined in a therapeutic regimen including calcium and fluoride.

CONCLUSIONS AND PRACTICAL RECOMMENDATIONS

The aim in clinical management of osteoporosis is to retard bone loss and prevent fractures. The role of nutrition in this process is not precisely known, due in part to the "morphologic heterogeneity" of the disease. Fracture rates vary considerably among individuals, an observation only partially explained by the degree of bone loss. It is now hypothesized that differences in bone elasticity or microstructure may interact with changes in bone mineral to determine the likelihood of mechanical failure (i.e., nontraumatic fracture) (Heaney, 1988; Heaney, 1989). The possibility that nutrition may interact with changes in bone fragility has not yet been explored.

The administration of calcium and vitamin D may delay age-related resorption of bone. However, these and other therapeutic measures intended to slow bone loss may be marginally beneficial for the elderly individual whose bone loss has slowed or possibly ceased altogether. At this point, the patient may already be at high risk for fracture, and therapies which merely delay further bone deterioration may offer little benefit. Experimental therapies with the potential to increase bone density, such as sodium fluoride, may offer hope to these individuals in the future.

Changes in bone mass occur slowly, and long-term studies of nutritional intervention are few. Therefore, the optimal diet for prevention and treatment of osteoporosis is unknown. However, certain principles have emerged as "safe bets" for slowing the rate of bone loss and delaying its ramifications. These recommendations are summarized in Table 1.2. A well-varied diet based upon moderation and sound nutritional principles should be the goal.

With the choice to initiate therapeutic regimes comes the need for responsible monitoring of clinical progress and potential side effects. Thus the use of calcium supplements should be preceded and subsequently accompanied by dietary and biochemical evaluation (including 24-hour urinary calcium analyses). Follow-up evaluation is even more important when supplemental vitamin D is prescribed. In this case,

Table 1.2 Practical Dietary Recommendations for Osteoporosis Patients

Calcium:	Food sources are recommended, but calcium supplement usually necessary to bring dietary intake up to 1500 mg/day. A calcium carbonate perparation with acceptable disintegration properties is a good choice. Dietary assessment by Registered Dietitian highly recommended.
Vitamin D:	Recommend 10 to 15 minutes in sun, 2 to 3 times/week. Supplement 400 IU/day unless deficient or in the case of sodium fluoride therapy*. Assessment of vitamin D metabolites (calcidiol and calcitriol) advisable.
Protein:	Limit intakes of high-protein–low-calcium foods.
Sodium:	Sodium intake should be moderate in order to minimize calciuretic effect.
Phosphorus:	No apparent reason for concern when P intake is moderate. Avoid aluminum-containing antacids.
Dietary Fiber:	Moderation is advised until specifics are known.* Avoid taking calcium supplements at same meal with very-high-fiber foods, such as high-fiber breakfast cereals.
Other factors:	Calcium requirement may be increased by lactose intolerance, high caffeine consumption, alcohol abuse or other drug-nutrient interactions.*

*Case-by-case individualization will be necessary.

serum levels of calcium should additionally be measured. Skeletal response to sodium fluoride must also be carefully monitored; thus its use is generally limited to medical centers equipped to measure changes in bone density.

The nutritional aspects of osteoporosis are complex, and the interaction of essential nutrients with bone health in the elderly patient is not fully understood. Thus the formulation of nutritional-care plans individualized for each osteoporosis patient must depend upon the somewhat fragmentary information available from the clinical literature. Interested practitioners must continue to keep informed of new research outcomes in order to provide the best available nutritional therapies for their osteoporotic clients.

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CHAPTER 2

Diabetes Care in Older Adults: Current Issues in Management and Research

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Diabetes mellitus in older adults is a serious and complex health problem. The increased challenges of treating and managing diabetes in late life are heightened by the expanding numbers and proportion of older adults in the United States. The prevalence of diabetes is over 8% in the United States population over the age of 64, and 70% of all patients with non-insulin-dependent diabetes are older than 55 (Herman et al., 1984). The heterogeneity of the elderly population further underscores the importance of attending to the clinical and psychosocial impact of diabetes among older adults.

Meeting the needs of older adults with diabetes requires an understanding of the multiple factors that interact to determine adherence to the treatment regimen, metabolic control status, and adjustment to the disease. Diabetes treatment has become increasingly sophisticated with the use of technological advances such as self-monitoring of blood glucose (Anderson, Hess, Davis, & Hiss, 1988). Patient management is particularly complex because it requires that individuals (a) master numerous at-home management tasks, including behaviors such as meal planning, monitoring blood glucose, caring for one's feet, and perhaps taking medications, and (b) adjust to the disease, requiring the maintenance of psychosocial functioning and reduction of the impact of diabetes on daily life. Thus, diabetes care requires personal self-management behaviors by the individual or significant other(s).

This paper is divided into three major sections. In the first section we discuss the clinical management of diabetes mellitus. We present the current classification of diabetes and review epidemiological evidence regarding the prevalence and incidence of diabetes. Next, we examine acute and long-term complications of diabetes. Finally, issues regarding the diagnosis and treament of diabetes for older patients are described. The second major section focuses on the contributions of the social and behavioral sciences to the study of day-to-day management of diabetes. We review empirical research on patients' at-home management of their treatment regimen as well as psychosocial coping tasks related to diabetes. The third section focuses on major intervention strategies aimed at promoting effective diabetes management. Given the dearth of empirical data on older adults with diabetes, it is hoped that this review will encourage further research on diabetes management among older adult populations.

CLINICAL ASPECTS OF DIABETES CARE

Classification of Diabetes Mellitus

Diabetes mellitus is a disorder characterized by abnormal carbohydrate metabolism and is also associated with altered fat and protein metabolism. An elevated blood glucose level is the most widely recognized metabolic marker. The clinical syndrome also includes an association with a number of serious complications affecting large and small blood vessels throughout the body, leading to damage in multiple organ systems. In 1979, the National Diabetes Data Group presented a new classification of diabetic conditions and other related disorders of glucose intolerance. This classification established currently accepted diagnostic criteria for diabetes mellitus, which are summarized in Table 2.1. A definitive diagnosis of diabetes mellitus is established when there is overt fasting hyperglycemia *or* a grossly abnormal oral glucose tolerance test. It is noteworthy that the National Diabetes Data Group criteria are based on prospective epidemiological evidence linking abnormal carbohydrate metabolism to glucose tolerance and risks of developing diabetes-related complications (National Diabetes Data Group, 1979). The syndrome of diabetes mellitus is currently recognized to consist of two major types: insulin-dependent diabetes mellitus (IDDM) and non-insulin-dependent diabetes mellitus (NIDDM).

Insulin-dependent diabetes mellitus, also referred to as Type I diabetes, appears to be related to genetic, acquired, and environmental

Table 2.1 Diagnostic Criteria for Diabetes Mellitus in Nonpregnant Adults[a]

	Oral Glucose Tolerance Test[b]	
Fasting Plasma Glucose	*One Hour*	*Two Hours*
1. > 140 mg/dl on 2 or more occasions	Not required	Not required
2. < 140 mg/dl	> 200 mg/dl[c]	> 200 mg/dl
3. Elevation of plasma glucose in addition to classic diabetes symptoms, such as polyruia, polydipsia, ketonuria, and rapid weight loss	Not required	Not required

[a] Any one of these criteria is considered overt diabetes mellitus.

[b] Criteria are based on 75 g glucose load, except for gestational diabetes for which a 100 g glucose load is used. All values are venous plasma glucose.

[c] One value > 200 mg/dl at 30, 60, or 90 minutes meets the criterion.

Source. National Diabetes Data Group, 1979, *Diabetes, 28*, p. 1049. Adapted by permission.

factors (Bennett, 1984). It is associated with loss of the capacity to produce insulin and with autoimmune destruction of the insulin producing Beta cells of the endocrine pancreas. Clinically, IDDM is generally characterized by an abrupt onset of symptoms, proneness to ketosis, and dependence on insulin therapy throughout life. This characterization of IDDM is applicable to the majority of persons who develop diabetes prior to age 30, but IDDM can occur at any age (National Diabetes Data Group, 1979).

Non-insulin-dependent diabetes mellitus, also referred to as Type II diabetes, appears to have a more frequent familial pattern of occurrence than IDDM. The capacity to secrete insulin is maintained in NIDDM, but this capacity is considerably impaired (Ward, Beard, Halter, Pfeifer, & Porte, 1984). Resistance to insulin action is also a prominent feature of NIDDM. Although insulin is often used to treat hyperglycemia in NIDDM, persons with NIDDM do not require insulin for survival. The majority of patients with NIDDM are diagnosed after age 44, but NIDDM, like IDDM, may occur at any age. The most prevalent type of diabetes mellitus in older persons is NIDDM. However, it should be recognized that increasing numbers of persons with IDDM are surviving into old age. Thus, classification of diabetes in an elderly person who is being treated with insulin may be difficult if there is inadequate information about the person's earlier clinical history (Madsbad, in press).

A number of age-related factors may contribute to older adults' susceptibility to the development of diabetes mellitus. These factors include (a) primary aging effect on insulin secretion and/or insulin action,

(b) changes in body composition resulting in relative adiposity and reduction in physical activity due to immobility, which may contribute to insulin resistance, (c) dietary alterations, including reduced intake of total calories and carbohydrates, which may lead to reduced insulin secretion and insulin resistance, and (d) comorbidity and concomitant drug-drug interactions. Such age-related changes should be considered in order to provide optimal care for older patients with diabetes.

Epidemiology

The prevalence of known diabetes among various population groups around the world ranges from about 6 to 60%. For example, among people in the United States, both the prevalence and incidence of diabetes mellitus are considerably higher among the elderly than among the young. Certain ethnic gruops, such as Mexican-Americans and southwestern Indian tribes, appear to be particularly susceptible to the development of diabetes (Bennett, 1984).

Prevalence

One of the earliest studies to provide information on the prevalence of diabetes in the United States was the Health Interview Survey (1979). Data from the Health Interview Survey reveal that about 2.4% of adult Americans had known diabetes. Among those 65 years or over, 8% had known diabetes.

Another national survey providing prevalence data was the Second National Health and Nutrition Examination Survey (NHANES II) (Harris, Hadden, Knowler, & Bennett, 1987). This study documented a progressive increase in the prevalence of known diabetes as a function of age. Applying the criteria from the National Diabetes Data Group, the prevalence of known diabetes was 1.1% in persons 20 to 44 years old, 4.3% in those 45 to 54, 6.6% in those 55 to 64, and 9.3% in those 65 to 74. There was also an age-related increase in the prevalence of undiagnosed diabetes. The overall prevalence of known and undiagnosed diabetes was estimated to be 17% in the 65 to 75 year age group.

In addition to the high prevalence of diabetes among community-dwelling populations, the prevalence of diabetes in long-term care facilities is twice that of community-based populations. The National Nursing Home Survey (National Center for Health Statistics, 1979) estimates the prevalence of diabetes to be about 15% in long-term nursing-care facilities. Moreover, there were 146 (per 1,000) nursing-home residents with diabetes mellitus in 1977. The average length of stay for persons with diabetes is 85 days in a nursing-home facility, averaging 13 days longer than for persons without diabetes. These data suggest the importance of attending to both community-dwelling and institutionalized populations of elderly persons with diabetes.

An age-related increase in the prevalence of people meeting the National Diabetes Data Group criteria for impaired glucose tolerance has also been noted. Although many persons with impaired glucose tolerance do not subsequently develop overt diabetes mellitus, impaired glucose tolerance has been associated with an increased risk of cardiovascular mortality (National Diabetes Data Group, 1979).

Incidence

Numerous reports document the dramatic increase in the incidence (i.e., the rate of new cases) of NIDDM with age (Bennett, 1984; Herman et al., 1984). Age-specific incidence of diabetes increases as a function of age. For example, Melton, Palumbo, and Chu (1983) reported the following incidence rates of NIDDM: 147 (per 100,000) for persons aged 40–49; 231 for those 50–59; 442 for those 60–69; 593 for those 70–79; and 663 for those aged 80 and over. Collectively, these studies corroborate that the prevalence of diabetes is quite high among the elderly and that there is an increased incidence of diabetes with age.

Complications

Acute Metabolic Complications

Elderly people with diabetes mellitus may be at risk for acute complications arising from problems with blood glucose control. These acute complications include hypoglycemia as well as hyperglycemia-related disorders such as hyperosmolar hyperglycemic nonketotic coma and diabetic ketoacidosis. Hypoglycemia (i.e., low blood glucose) is of particular concern among elderly patients being treated with oral hypoglycemic agents or insulin (Morley, Mooradian, Rosenthal, & Kaiser, 1987). Although there is concern that hypoglycemia in older patients with diminished cardiac and cerebral circulation could cause serious tissue damage (Lipson, 1986), there is little available data on the overall risk of hypoglycemia in this population.

Diabetic ketoacidosis is relatively rare among the elderly, whereas hyperosmolar coma is a particularly prevalent concern among older adults. Hyperosmolar coma usually occurs in patients with modest abnormalities of glucose metabolism who also have a major precipitating acute illness. Hyperosmolar coma is characterized by insulin deficiency, elevated stress hormone levels, marked hyperglycemia, and intravascular volume depletion. Mortality rates range from 12 to 50% (Morley et al., 1987). Therapy for hyperosmolar coma involves aggressive fluid replacement, use of insulin, and intensive management of any associated precipitating acute illness.

Long-Term Complications

Elderly patients with diabetes are subject to the same set of long-term complications of diabetes mellitus as those for other age groups. The decline in functional reserve of many organ systems in the elderly and the possibility of underlying organ system impairment from other coexisting conditions make the recognition and prevention of complications particularly important in elderly patients with diabetes. The clinical appearance of many diabetic complications appears to relate to the duration of the disease. Therefore, the older age population tends to include many patients who have accumulated multiple complications. It is likely that the pathogenic mechanisms of long-term diabetes complication in elderly patients are not different from those of other populations, although there is little information related specifically to the roles played by these mechanisms in elderly patients (Greene 1986).

Macrovascular disease. Atherosclerotic disease affecting major blood vessels increases dramatically with age, and the presence of diabetes appears to accelerate this process. Coronary artery disease is the single most common cause of death in patients with diabetes, and the rates of both peripheral vascular diseases and stroke in the elderly are influenced by the presence of diabetes mellitus. There also appears to be an important interaction with other risk factors such as hypertension, cigarette smoking, and hyperlipidemia.

A number of studies document that persons with diabetes are at increased risk of cardiovascular mortality. Kleinman et al. (1988), for instance, compared the risk of mortality between nationwide samples of persons with and without diabetes. Using data from the NHANES I conducted in 1971–1975 and participants traced in the NHANES II Epidemiologic Follow-up Study in 1982–1984 age-adjusted death rates for persons with diabetes were found to be twice that of persons without diabetes. The relative risk of death was 2.3 for men and 2.0 for women with diabetes, after adjustment for age, smoking, systolic blood pressure, serum cholesterol, and body-mass index. These findings support other well-known studies in this area (e.g., Barrett-Connor & Wingard, 1983; Kannel & McGee, 1979).

Capillary microangiopathy. Renal disease and diabetic retinopathy are most strongly linked to duration of diabetes, rather than to age per se. Elderly patients with diabetes have an increased risk of end-stage renal disease, perhaps reflecting an interaction between diabetic nephropathy and other factors that may affect the kidneys in the elderly. These include the age-related decline of renal function and the high prevalence rate of hypertension in this age group. The manifestation of retinopathy that is the major cause of visual loss among older patients with NIDDM is macular edema. This lesion, which may be difficult to detect by physicians who have not had advanced ophthalmological training, is often present with accompanying proliferative retinopathy, and frequently occurs within the first few years after the initial diagnosis of diabetes is established (Herman, Teutsch, Sepe, Sinnock, & Klein, 1983). For these reasons, a thorough ophthalmologic exam is recommended at the time of initial evaluation of an elderly patient with diabetes. Both cataracts and glaucoma are common in elderly persons without diabetes but appear to be more prevalent in elderly people with diabetes.

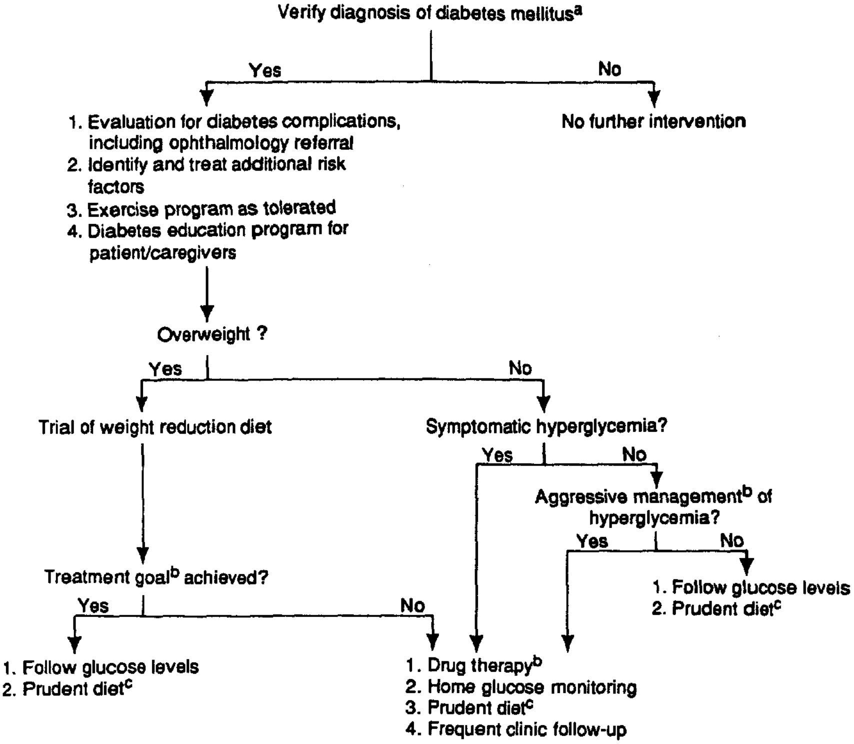
Neuropathy. Precise figures regarding the epidemiology of the various aspects of neuropathy among elderly patients with diabetes are not currently available. Somatosensory neuropathy (i.e., loss of sensation, particularly in the feet and hands) is common and is an important contributing factor to the high risk for amputation in the older age group. Sexual and bladder dysfunction are common in patients with diabetes and may reflect an interaction of autonomic neuropathy with an age-related decline of sexual function and other causes of urinary incontinence or recurrent urinary-tract infections in the elderly. Impaired blood-pressure regulation due to autonomic neuropathy may be an important factor contributing to orthostatic or postprandial hypotension in these patients.

Management of Hyperglycemia

There is little information on which to base recommendations for the optimal degree of hyperglycemia control for preventing atherosclerotic, microvascular, or neuropathic complications in an elderly patient with diabetes mellitus. Marked hyperglycemia associated with protein catabolism and muscle wasting, fat mobilization, excessive glucose production, and urinary loss of glucose calories should clearly be treated with insulin replacement. However, patients with whom this goal is achieved may still have considerable hyperglycemia that is relatively asymptomatic. How aggressively should asymptomatic hyperglycemia be pursued in an elderly patient? Until more information is available, the decision about goals for diabetes management should be individualized. There are, however, several general factors to consider: (1) elderly patients are at risk for a number of major diabetes complications; (2) undiagnosed hyperglycemia may be present for many years in an elderly person; (3) there is no evidence that chronic hyperglycemia is any *less* deleterious in an elderly person than in a younger individual; and (4) older people still have considerable additional life expectancy during which diabetic complications may develop or progress.

Figure 2.1 presents a decision tree for the general approach to the management of diabetes in elderly patients. In addition to verifying the diagnosis of diabetes, an initial evaluation should review the patient's status with regard to diabetes complications and identify other risk factors, such as hypertension, cigarette smoking, and hyperlipidemia. The initial management should also include a diabetes education program for the patient and appropriate caregivers. The American Diabetes Association Task Group on Goals for Diabetes Education (1986) identified the following areas as critical for the management of NIDDM: dietary management, knowledge of acute and long-term complications, health-care utilization, community resource use, skin and foot care, oral health care, activity behaviors, urine and/or blood monitoring, medication management (as required), and psychosocial adjustment to the disease.

With regard to dietary intervention, a trial of an appropriate calorie-restricted diet is appropriate for any person who is overweight. A supervised exercise program may also benefit the general health of an elderly patient with diabetes, although the role of exercise in management of hyperglycemia is currently unclear. If the initial dietary and exercise plan is not completely successful, then a major decision must be made about the degree to which aggressive management of hyperglycemia is warranted. Given that there is currently no scientific basis for establishing guidelines for aggressive management of hyperglycemia, this decision must be individualized and involve a discussion with the patient, family, other caregivers, and the health-care team. Patients who have achieved a modest goal for control of hyperglycemia by a weight-reducing diet and exercise or who have asymptomatic hyperglycemia may simply be followed with a prudent weight-maintaining diet and close monitoring of



[a] National Diabetes Data Group Criteria (1979)

[b] Decisions about treatment goals, aggressive management, and type of drug therapy must be individualized, and made by the health care team in conjunction with the patient/caregivers

[c] Relatively low fat, low cholesterol weight maintaining diet (as recommended by the American Diabetes Association and American Heart Association).

Figure 2.1 Decision Tree for the Management of Diabetes in Elderly Patients

Source. *Non-insulin-dependent diabetes mellitus in the elderly: A roundtable discussion,* (p. 23), 1988. Upjohn Company (#8524). Adapted with permission.

blood glucose levels. The diet should be designed to reduce saturated fat and cholesterol intake. Patients who have persistent symptomatic hyperglycemia or who have established a more aggressive goal for hyperglycemia management should be placed on drug therapy with home blood glucose monitoring and frequent clinical follow-up. A trial with a sulfonylurea agent may be worthwhile, but failure to achieve the desired goal should be an indication for insulin therapy rather than a trial with another oral agent.

Management of hyperglycemia in an elderly patient requires a long-term treatment program that is often complex. The regimen may include dietary alterations, an exercise program, other lifestyle changes, pills, or an even more complex regimen involving injections of insulin and home blood glucose monitoring. It is important to note that older adults are more likely to have multiple health conditions that introduce competing demands for contending with complex diabetic-treatment regimens. The psychosocial and behavioral factors that must be considered in the implementation of diabetes-related regimens are the subject of the rest of this paper.

PSYCHOSOCIAL ASPECTS OF DIABETES MANAGEMENT

In this section we focus on the contributions of the social and behavioral sciences to the study of diabetes management among older adults. Research on diabetes management among the elderly is scarce; therefore, we also present research on middle-aged adults. The studies illustrate the variety and breadth of research contributing to our understanding of diabetes care among older adults.

We begin by reviewing patients' problems in managing their diabetes. Specifically, we examine common errors patients make in managing their treatment regimens, compare adherence rates across various aspects of the diabetic regimen, and determine whether similar or distinct management problems emerge between younger and older adults. Second, we present investigations on the influence of health beliefs, perceptions of control, and social relationships on treatment-adherence behavior and other outcome variables such as metabolic control. Finally, we examine studies related to coping with and adjustment to diabetes mellitus.

Magnitude and Scope of Management Problems

Problems in managing long-term treatment regimens exist for all chronic diseases (Sackett & Snow, 1979; Sackett, Haynes, & Tugwell, 1985). In their comprehensive literature review of regimen adherence, Haynes, Taylor, and Sackett (1979) revealed that adherence to long-term medication regimens ran around 50%; adherence to dietary advice was around

30%; and fewer than 10% of cigarette smokers stopped smoking on the advice of their clinicians.

Rosenstock (1985) suggests that adherence to diabetic regimens may be even poorer than adherence to treatment regimens for other chronic conditions. Studies conducted over the past two decades have attempted to quantify the magnitude of management problems in adult populations and to delineate factors that affect diabetes management. One of the earliest studies was conducted by Watkins, Williams, Martin, Hogan, and Anderson (1967). This study included 60 patients, ranging in age from 18 to 74, who were using insulin. Observational data revealed that more than 50% of the patients made errors in obtaining a correct insulin dose, and more than 80% were judged to perform unacceptably in insulin administration. A subsequent study (Williams, Martin, Hogan, Watkins, & Ellis, 1967) found that knowledge of diabetes was related to better performance of management tasks. However, knowledge was inversely related to metabolic control. One explanation for the inverse relationship between knowledge and control may be that poorly controlled patients were given more attention and thus received greater information about the disease (Fisher, Delamater, Bertelson, & Kirkley, 1982). Research has generally shown that knowledge is a necessary but not sufficient condition to ensure regimen adherence or metabolic control (Haynes et al., 1979).

Other studies document the importance of assessing and monitoring patient-management skills. Watkins, Roberts, Williams, Martin, and Coyle (1967) demonstrated that patients' skills in insulin administration showed declines after a 12–18-month follow-up period. Similarly, declines in patients' performance skills for taking medications, urine testing, and foot care have been documented by Lawrence and Cheely (1980). Patients made a significant number of errors, even when they performed the task correctly at a previous educational session. Major difficulties involved drawing up a correct dose of insulin, storing urine-testing materials, and accurately carrying out the the urine test procedure. Taken together, these studies document that continual monitoring of patients' management skills is essential.

Another study on medication errors was conducted by Hulka, Kupper, Cassel, Efird, and Burdette (1975). This carefully conducted community-based survey involved 46 physicians and 234 patients with diabetes and 123 patients with congestive heart failure. Patients' ages ranged from 30 to 65. The purpose of this study was to determine the extent of concordance and discordance between medications prescribed and consumed. The error rate was found to increase when the number of prescribed drugs and the complexity of the medication schedule increased. They found that medications most critical to the patients' health—in this case, antihyperglycemic agents for persons with diabetes—were subject to less error than the overall set of medications.

It seems logical that management problems would vary depending on the nature of the task. Adherence is generally higher with medication regimens than with behaviorally oriented treatments (Haynes et al., 1979). Numerous studies reveal that dietary alterations pose the greatest adherence problems. Cerkoney and Hart (1980), for example, found that 81% of the patients studied adhered to their insulin prescriptions, but only 65% reported that they adhered to dietary recommendations. Reports by Daschner (1986); Glasgow, McCaul, and Scafer (1987); Lockwood, Frey, Gladish, and Hiss (1986); and Pendleton, House, and Parker (1987) corroborate that adherence rates are highest for taking medicines and lowest for dietary and exercise regimens.

These studies provide evidence that many patients lack the knowledge and/or skills necessary to carry out their treatment regimens. It may be beneficial for practitioners to assess as well as monitor and reinforce regimen-specific behaviors. The considerable variability in adherence within and across components of a treatment regimen for persons with diabetes suggests that adherence behavior should be viewed as a multidimensional process rather than a none-or-all phenomenon.

What about the effects of age? Evidence relating age to poorer knowledge or skills is somewhat equivocal. With few exceptions (Miller, Goldstein, & Nicolaisen, 1978), age has rarely been found to be associated with patients' knowledge of diabetes or management errors (Hulka et al., 1975; Watkins et al., 1967). However, there is some evidence to suggest that older adults receive less time (Keller, Solomon, Beck, Mendenhall, & Kane, 1982) and may have more difficulties obtaining information from health-care professionals when compared to middle-aged adults (Greene, Adelman, Charon, & Hoffman, 1986). Miller et al. (1978) found that older patients indicated receiving less information about their diabetes than younger patients and that 62% of older patients (aged 51 to 81) failed all the diabetes-care skill modules compared to only 31% of younger patients.

It is uncertain whether the magnitude or scope of management problems is really different for younger and older adult populations because of the dearth of available data on self-management among older adults with diabetes mellitus. Furthermore, research findings may appear contradictory and confusing if an individual's prescribed treatment regimen for all health problems is not taken into account. The presence of multiple chronic illnesses among the elderly population (Lipson, 1986) and the resultant complexity of the treatment regimen may significantly affect diabetes care in the elderly. For example, age is often positively associated with poor knowledge and recall of medical instructions. When the number of medications is controlled for, however, the relationship between age and poor recall is mitigated (Rost & Roter, 1987). Future research designed to evaluate treatment regimens should evaluate adherence and adaptation to diabetes as important outcomes within the context of overall health conditions, including the presence of multiple chronic illnesses.

Among the most important findings to be gleaned from the adherence literature are that the characteristics of the treatment (e.g., complexity and side effects) and situational demands (duration of behavior and interference with other activities) have a negative impact on treatment adherence. Other critical areas that have not been adequately addressed by this research include (a) the psychological processes underlying patient's treatment adherence and adaptation and (b) the effect of social factors (including health-care providers and family influences) on adherence and adaptation. Documentation of patients' problems in following their treatment regimens has led to the need to know more about the psychological and social factors that influence treatment adherence (Dunbar & Stunkard, 1979; Fisher et al., 1982).

Psychosocial Factors

Theoretically based research is imperative in order to understand treatment adherence and move forward in developing effective intervention programs. Although much of the compliance research was not based on theoretical propositions, more recent research on diabetes management has been conceptually oriented and has attempted to develop an explanatory basis for patient adherence. The following sections review several major models and theories applied to diabetes management; we attempt to highlight their positive contributions and point to some of their deficiencies. We will also indicate other perspectives that hold promise for understanding diabetes management but have yet to be given extensive attention in the literature.

Health Beliefs

The health-belief model has been the model most heavily applied to understanding diabetes management (Becker & Janz, 1985; Janz & Becker, 1984). Based on an expectancy-value perspective of behavior, the health-belief model seeks to explain specific decisions made by individuals with respect to health behavior (Kirscht & Rosenstock, 1979). Within the framework of the health-belief model, adherence is viewed as being influenced by an individual's perception of the *threat* (severity × susceptibility) posed by the condition and the *value* (benefits − barriers) of the treatment. Incorporated within the model are internal and external factors that serve as "cues to actions" (e.g., reminders) and moderating factors (e.g., demographic factors).

Numerous studies have examined health-belief variables and treatment adherence as well as other treatment outcomes such as metabolic control. Alogna (1980), for instance, studied patients' perceptions about the severity of diabetes. Study participants included 50 adult patients with NIDDM who were obese. Participants were classified into "compliant" and "noncompliant" categories according to prior weight loss and blood glucose levels. Those patients classified as compliant rated their diabetes more severely than those classified as noncompliant.

Other studies have examined health-belief variables and adherence among patients with IDDM. Cerkoney and Hart (1980) interviewed 30 patients (aged 18 to 73) 6 to 12 months after these patients had attended education classes for diabetes at a community hospital. A total compliance score was constructed to gauge the degree of adherence across insulin administration, urine testing, diet, hypoglycemia management, and foot care. Applying an overall score for adherence as well as health beliefs, health beliefs were found to account for about 25% of the variance in treatment adherence. Brownlee-Duffeck et al. (1987) examined diabetes-specific health beliefs and treatment adherence among two patient populations—a pediatric and private-practice clinic. Among the 89 patients in the private-practice clinic (ages ranged from 13 to 64), health-belief variables accounted for 41% of the variance in self-reported adherence and for 19% of the variance in glycosylated hemoglobin levels. The only health-belief variable that explained a statistically significant proportion of adherence and hemoglobin level was perceived benefits of treatment. Modest correlations were found between better adherence and metabolic control.

This body of research provides support for modest correlations between some or all of the major elements of the health-belief model and treatment adherence and metabolic control. Given the varied relationships between health beliefs and adherence, however, other factors appear to influence diabetes adherence. Therefore, several research projects have *expanded* the health-belief model to include factors related to the type of diabetes, type of treatment, and social support.

Davis, Hess, Harrison, and Hiss (1987) examined the relationship between psychosocial adjustment and disease type (IDDM and

NIDDM), treatment mode (patients using insulin versus those not using insulin), and several indexes of diabetes control (glycemic control, hospital admissions frequency, and percentage of ideal body weight). The study sample comprised patients randomly drawn from primary-care physician offices in eight Michigan communities. The sample included 372 patients with NIDDM and 56 patients with IDDM, determined by age of onset and ideal body weight. The Diabetes Educational Profile was used to assess the psychological and social adjustment of study participants (Davis, Hull, & Boutaugh, 1981); Hess, Davis, & Harrison, 1986). This measure, based on the constructs of the health-belief model, consists of six subscales that yield scores on patients' perceptions of risks of diabetes complications, barriers to regimen adherence, benefits of the regimen, complexity of the diet regimen, control problems, and the social impact of the disease on daily life.

Three major findings emerged from this study. First, psychosocial adjustment was correlated with disease type and treatment mode. Second, disease type and treatment mode were related to diabetes control. Third, psychological adjustment variables were associated with diabetes control. For patients with NIDDM who were using insulin, the following relationships were found: (a) perceived problems with controlling diabetes (i.e., control problems) were positively related to glycemic control, and (b) perceived social and control problems were positively correlated with hospital admissions. For patients with NIDDM who were not using insulin, (a) perceived control problems and regimen complexity were positively related to hospital admissions, and (b) control problems, social problems, barriers to adherence, and regimen complexity were positively associated with ideal weight. These findings clearly point out the importance of attending to the heterogeneity of treatment regimen and psychosocial factors in persons with diabetes.

Davis, Hess, and Hiss (1988) also examined the relationships among psychosocial adjustment, diabetes control, and patient survival. Data were collected from 343 patients with NIDDM who were initially involved in a questionnaire survey in 1981–1982 and in a follow-up study in 1985–1986. Predictor variables included demographic, clinical, psychosocial, behavioral, and physiologic measures. Mortality data were acquired through death certificates. The variables most strongly related to mortality were patient age, social impact of diabetes, complexity of diet regimen, history of smoking, and renal function. Moreover, these five predictor variables were more strongly associated with mortality than was diabetes control (measured by blood glucose levels, previous hospital admissions, previous heart attacks, and other physiologic measures). As indicated by the authors, it is of interest that the perceived social impact of the disease was a stronger predictor of mortality than indexes of diabetes control. Further research is required to replicate these findings. On the whole, these studies document the importance of psychosocial variables in understanding adherence.

What about the effects of age on health beliefs? Jenny (1984) studied diabetes adherence and metabolic control in 245 patients. Study participants were divided into four age groups (young: mean age 20; middle: mean age 36; old: mean age 57; and old-old: mean age 72). No differences were found in regimen adherence or metabolic control status across the four age groups. Older adults expressed a lower degree of concern with the consequences of diabetes and perceived value of medication and exercise compared to middle-aged adults.

At first glance it may seem as though diabetes is not a major concern among older persons. Caution in this inference is warranted, however, because age appears to be highly confounded with the type of treatment regimen prescribed for different age groups. Features of the regimen, many of which are correlated with age, are also related to perception of diabetes. This is demonstrated by the subsequent findings of Jenny (1986) when her sample was divided into insulin-using and noninsulin-using groups (mean ages 49 and 62, respectively). Patients who were using insulin expressed more concerns about diabetes and indicated stronger beliefs in the benefits of the regimen than patients who were not using insulin.

Compared to the earlier findings on age differences and perceptions of diabetes, it is difficult to disentangle the possible effects of age from other factors such as complexity of the treatment regimen. For example, older adults with NIDDM may be initially prescribed a regimen of diet therapy, whereas persons with IDDM are prescribed a regimen of insulin along with various combinations of dietery and physical modalities of treatment. Thus, different groups may develop distinct beliefs about their condition by the labels applied to the illness (e.g., mild versus severe) and the regimens prescribed to control them (insulin versus noninsulin). Research in this area would benefit from investigations derived from perspectives such as the self-regulatory model of illness behavior developed by Leventhal and colleagues (Leventhal & Cameron, 1987; Leventhal, Safer, & Panagis, 1983), which attempts to explain how people construct illness representations (i.e., identify that they have a problem and its causes and consequences) and develop plans to cope with the problem.

Conceptual models such as the health-belief model serve an important function by providing a framework for examining the many hypothesized linkages between patients' beliefs and behavior. Findings concerning health beliefs suggest that health-care professionals should elicit and deal with patients' perceptions of regimen effectiveness and address patients' concerns about the social impact of the disease. In addition to the important relationships among health belief variables and adherence, several investigations document that it is essential to attend to the nature of the prescribed treatment regimen and its possible effect on adherence and other treatment outcomes. This research underscores the importance of patients' diabetes-specific health beliefs, the situational demands of the regimen, and the social impact of diabetes on adherence and other outcomes.

It should be noted that the majority of these investigations involve concurrent reports of health beliefs and adherence behaviors. Such accounts can demonstrate that there are relationships among these variables, but they cannot indicate the directionality of their effects. Prospective studies, such as those being reported by Davis et al. (1988), are critical in order to shed light on how psychosocial factors and outcomes interact over time.

A major problem in synthesizing evidence of the effects of health-belief variables and adherence is the lack of consistent operationalization of health-belief variables. Numerous definitions and instruments have been constructed. Although prediction using various operationalizations may enhance the validity of a theory, it makes comparisons across studies difficult (Wallston & Wallston, 1982). This is particularly problematic when attempting to determine why particular expected relationships are not found. The use of carefully developed and psychometrically sound measurement tools, such as those of Davis et al. (1981; 1988), may help to surmount this difficulty.

Regarding outcome variables, readers should take care to distinguish between process variables, such as treatment adherence, and treatment outcomes, such as metabolic control and mortality. As demonstrated by the studies that attempt to establish linkages between adherence and metabolic control (e.g., Browless-Duffeck et al., 1987) as well as associations between metabolic control factors and mortality (e.g., Davis et al., 1987), these relationships are extremely complex. Findings such as those reported by Davis et al. (1988) suggest the importance of psychosocial variables for treatment outcomes, and it would be premature to dismiss their effects on such outcomes. Metabolic control is a complex issue, and accumulating evidence suggests that it is influenced by numerous factors such as age and acute illness as well as adherence.

Perceptions of Control: Expectancies and Preferences

Another line of inquiry into understanding health behavior stems from Rotter's social-learning theory (Rotter, 1954). Of all the social learning theory constructs, locus of control has received the most research attention. *Locus of control* refers to the generalized expectancy that one's behavior (internal control) or forces outside one's control (external control) affect outcomes. Rabkin, Boyko, Wilson, and Streja (1983) found a positive relationship between internal locus-of-control beliefs (assessed by Rotter's locus of control scale) and short- and long-term weight loss (an outcome indicator) among 40 patients with NIDDM less than 65 years of age. In contrast, Edelstein and Linn (1986) found that external locus of control was associated with better control of disease at 6 and 12 months. Participants were men (mean age 51) who had been on insulin for at least one year prior to entering the study. They suggest that externally oriented individuals may be more receptive to medical instructions and comply more readily with medical recommendations than internally oriented patients who may seek to take charge of their lives through self-controlling behaviors.

Other investigators agree that an externally oriented, health-specific locus-of-control beliefs may have a beneficial effect in chronic illness management. For example, Harris, Linn, and Pollack (1984) found that men with more internal health locus-of-control orientations felt less susceptible to the complications of diabetes and less threatened by its severity than externally oriented individuals. Thus, an external belief orientation among persons with diabetes may be viewed as having a potentially favorable impact on adherence because greater beliefs in threat of illness (severity and susceptibility) would lead individuals to comply with the therapy.

The work of Wierenga (1980) provides additional insights into the importance of external health locus-of-control beliefs. Using a multidimensional measure of health locus-of-control beliefs (i.e., external dimensions of control are separated into chance and powerful-others beliefs), Wierenga found that powerful-others beliefs were positively related to diabetes adherence among 50 newly diagnosed patients. In general, the variance accounted for by health locus-of-control beliefs has been modest. However, a more thorough understanding of health locus-of-control orientation is necessary to design programs that may assist patients with diabetes in managing their illness.

One important aspect of locus-of-control beliefs may provide insight into how interactions with the medical care system alter health locus-of-control beliefs, which may in turn affect adjustment. Evidence from numerous studies reveals that patients with chronic illness express greater beliefs in powerful-others compared to healthy adults, whereas internal and chance beliefs are similar across populations (see Nagy & Wolfe, 1983; Wallston & Wallston 1982). As a result, patients may come to believe that health-care professionals have considerable influence over health outcomes. More attention needs to be paid to how individuals differ over time from early to long-term adaptation to diabetes with regard to health locus-of-control beliefs and their relationships with adherence and treatment outcomes.

Some attention has been paid to the notion of tailoring treatment programs to an individual's locus-of-control orientation or his or her preferences for involvement in health-care processes. Ruzicki (1984) examined health locus-of-control orientation and preference for an educational approach in 80 patients with diabetes (ages ranged from 18 to 80), both hospitalized and ambulatory. More than 60% of the patients indicated that they preferred a prescriptive educational approach. Those who preferred a prescriptive approach were older and more likely to be hospitalized, whereas those who preferred a participatory approach were younger and received formal diabetes instruction. No significant relationship was found between health locus of control and preference for an educational approach. The design and application of instructional programs may benefit from attending to patients' preferences for particular approaches as well as the situational context in which the program is given.

Some of our own research (Anderson, DeVellis, Boyles, & Feussner, 1988) is concerned with understanding patients' preferences for control in interactions with health-care professionals. Using factor-analytic techniques, preference for control items yielded three subscales assessing patients' preferences for (a) self-control, (b) clinician control, and (c) shared control in clinical interactions. In a subsequent study, we administered this scale to 109 male patients with NIDDM (mean age 61) prior to seeing their physicians and subsequently assessed their satisfaction with the interactions. Two of the control dimensions were found to relate to satisfaction: preference for self-control was found to be negatively related to satisfaction, whereas preferences for clinician control was positively related to satisfaction. Individual difference variables, such as desired role relationships, may be helpful in understanding the variability in outcomes found in many intervention studies.

Self-efficacy

Self-efficacy is derived from Bandura's social learning theory (Bandura, 1986). *Self-efficacy* refers to an individual's judgments of how well she can initiate and carry out tasks (Bandura, 1982). For instance, patients may believe in the benefits of the treatment but still not adhere to it if they believe that the behavior is too difficult for them to manage.

Social learning theory was used to develop psychosocial predictors of regimen adherence among persons with IDDM (84 adults and 23 adolescents) in a study by McCaul, Glasgow, and Schafer (1987). Four categories of predictors were developed: knowledge, skills (problem solving and social), expectancies (self-efficacy and outcome beliefs), and environmental support. Multimethod assessment procedures were used to measure four aspects of the treatment regimen: insulin injections, glucose testing, diet, and exercise. For adults, participants' expectancies and environmental support were better predictors of current adherence than either knowledge or skills. For the total sample, expectancies and, to a lesser degree, environmental support for adherence were significantly related to adherence behaviors. The present research points strongly to attending to both types of expectancies (beliefs) in educational programs: patients' beliefs regarding executing the behavior (self-efficacy expectancy) and patients' beliefs that behavior is linked to positive outcomes (outcome expectancy). Perceived self-efficacy is a construct that deserves much more attention in diabetes management.

Social Factors

Social factors are clearly implicated in diabetes management and treatment outcomes. There are several frameworks within which these social factors can be viewed. One is by social support among family and friends. A second is the interactions between patients and health-care providers.

Social Support. There are two primary approaches to studying social support: social networks and social support. The term *social network* is often used to refer to interpersonal transitions, including the structure, reciprocity, and social roles and contacts among network members. The term *social support* refers to an individual's perception of the emotional, physical, and/or informational support received through formal or informal contacts with individuals or groups (Wallston, Alagna, DeVellis, & DeVellis, 1983).

Research on social support among adult populations with diabetes is scarce, but there have been several studies that attest to the importance of patients' perceptions of their family environment and diabetes control. Edelstein and Linn (1985) used a measure of family functioning (i.e., perceptions of patterns of relationships within the family; dimensions of personal growth; and family interactional styles, including organization and decision-making activities). Ninety-seven men with diabetes were compared to an age-matched sample of patients without diabetes (ages ranged from 18 to 76). First, no significant differences were found between persons with diabetes and those with other chronic illnesses concerning perceived family functioning. Second, among patients with diabetes, men who perceived their environment to be high in achievement orientation but low in organization and conflict had better metabolic control.

Cardenas, Vallbona, Baker, and Yusim (1987) also examined patients' perceptions of family functioning (adaptation, partnership, growth, affection and resolve). The sample was largely made up of women aged 25 to 93 who were on insulin treatment. Patients were categorized by their level of diabetes control by fasting blood glucose levels (good, fair, or poor) and into "functional families" or "dysfunctional families." No differences were found in family functioning for age, ethnicity, or size of family. Among functional families, 92% of participants were found to be in good metabolic control. In contrast, only 50% of those in poor control were classified in functional families.

Heitzmann and Kaplan (1984) examined two aspects of social support—perceptions of the support network (mean number of persons in social network) and satisfaction with availability of persons in the network (37 patients with NIDDM, mean age 55). They found no association between size of social networks and diabetes control. Regarding satisfaction with availability of social networks, women who expressed greater satisfaction had good glycemic control, whereas men who expressed greater satisfaction were found to be in poor glycemic control. In a subsequent study, Kaplan and Hartwell (1987) examined the relationship between social support and diabetes control over the course of 18 months among 32 men and 44 women with a confirmed diagnosis of NIDDM. At the initial assessment, high satisfaction was associated with good glycemic control among women; among men, high satisfaction was related to poor glycemic control. At 18 months, support satisfaction was not correlated with changes in glycemic levels; however, social networks variables were related to glycemic control. Men with larger social networks had increases in glycemic levels (indicating poorer control). Similar trends were found for women. The relationship between network size, satisfaction with support, gender, and glycemic control is clearly complex. Explanations for the differential effects of social network for men and women remain highly speculative.

It is impossible to infer the causal effects of family functioning (or social support) on treatment outcomes because most of these data are retrospective. This is particularly problematic in studies of the type reported here where presence of supportive others is often confounded with the person's ability to elicit or make use of the support that is available (Wallston et al., 1983). More work needs to be done to identify what components of social networks or social support are implicated in treatment adherence and metabolic control. Future research should examine how social network composition and different types of social support (e.g., expressive versus instrumental) may impact on diabetes treatment, and for what people.

Patient–Provider Relationships. The quality of patient–provider relationships has been demonstrated to be an important factor in achieving adherence to medical advice (see Inui & Carter, 1985; Roter, Hall, & Katz, 1988 for recent reviews). Studies on communication by health-care providers to patients have made clear the importance of such factors as construction, organization, and comprehension of information on patient adherence (Ley, 1983). It appears that inconsistent or one-sided communication from health-care professionals to patients may allow patients to develop an incorrect representation of their illness and inhibit treatment adherence. Mazzuca, Weinberger, Kurpius, Froehle, and Heister (1983) conducted one of the few studies to examine patient–provider communication in diabetes care. Participants included 29 patients with a median duration of diabetes for 10.5 years. The average age of the sample was 52, and 81% had been prescribed insulin therapy. They found that a high frequency of physicians' statements that included sharing medical data, providing regimen instructions, and justifying their medical advice were significantly related to patients' comprehension of their diabetes regimen.

Although research on patient–provider interactions has indicated potential linkages between information exchanges and treatment adherence, there is a dearth of information on how antecedent variables (such as patient expectancies) may influence actual communication processes or how providers reinforce or dissuade patient adherence through the messages they send. Knowledge of patients' beliefs may help to ensure that information is appropriately targeted toward patients' perceived difficulties with the regimen. House, Pendleton, and Parker (1986) compared patients' and physicians' perceptions of diabetes management difficulties. Physicians indicated that patients' lack of motivation was the major reason for patients' adherence difficulties. In contrast, patients indicated that situational factors and somatic factors were predominant reasons for noncompliance. More research is required to understand the supportive elements of patient–provider interactions and methods for providers to sustain complex adherence behaviors over the long term.

Summary—Psychosocial Issues in Diabetes Management

Research findings are converging that document the importance of psychosocial variables in diabetes management and treatment outcomes. Our review of existing data documents the importance of psychological processes underlying patient's treatment adherence and outcomes, and the effect of social factors on treatment adherence and metabolic control. Several consistent findings have been noted regarding diabetes management among adults.

A number of studies have emphasized attending to the demands placed on patients as they attempt to integrate diabetes management into their everyday lives. There is substantial evidence to suggest that for many patients, adhering to the different components of the diabetes regimen poses significant problems. Several studies reveal the importance of assessing and monitoring patients' skills regularly. Although knowledge and skills are necessary, they do not ensure adherence to the regimen. It is also noteworthy that adherence to one aspect of the regimen is not related to adherence to other components of the regimen. In general, patients are more likely to follow their medication regimens than to adhere to behavioral recommendations. The relationships between the prescribed regimen, treatment adherence, and diabetes control is more complex than early investigations hypothesized.

The most established evidence regarding the importance of psychosocial research comes from the literature on treatment adherence. It should be apparent that practitioners need to have an understanding of the situational demands of the prescribed regimen, patients' beliefs about diabetes and its treatment (both self-efficacy and outcome expectations), and patients' social environment in order to provide optimal care. More integrated models, which take into account situational, social, and cognitive factors, are required to advance our understanding in this area.

Limitations of the research to date should be noted. The majority of studies are retrospective in nature. Such accounts can demonstrate only that there is a significant relationship betwen psychosocial variables and behavior. Presently, they do not indicate the directionality of such effects. Longitudinal investigations like those of Davis et al. (1987) are critical in order to shed light on determining how psychosocial factors and behavior interact over time.

Another problem has been that behavioral variables, such as treatment adherence, are not clearly differentiated from clinical indexes of metabolic control. It is not surprising that psychosocial variables would be more strongly related to behavioral variables than to physiologic variables such as glycemic control. Future research should attend more closely to the relationship between treatment adherence and treatment outcomes.

Coping with Diabetes

Living with diabetes can impose enormous challenges on the individual and on significant others. Psychological studies present no consistent evidence that diabetes causes major alterations in personality or increased risk of psychiatric illness prior to onset of major complications (see Dunn & Turtle, 1981; Skyler, 1981 for complete reviews of this literature). There is some indication that older adults with diabetes are more likely to accept chronic conditions as a natural part of the aging process (Linn, Linn, & Stein, 1982). Likewise, Jenny (1984) found that middle-aged adults expressed more concerns about diabetes complications and fears for their family than older adults. With only a few available studies on psychosocial coping, there is little information that can explain the reasons for these differences. Studies of coping strategies and adjustment relative to diabetes management will be reviewed.

There is also some indication that adjustment differs by chronic illness and that some conditions require more coping effort than do others. Felton and Revenson (1984) studied 151 middle-aged and older adults (aged from 18 to 80) with various chronic diseases (diabetes, hypertension, cancer, and rheumatoid arthritis). They found that patients with cancer or rheumatoid arthritis experienced more negative affect and were less accepting of their illness than patients with diabetes or hypertension. Coping strategies were not found to differ between the groups; however, type of coping strategy was related to adjustment. Given the limited amount of data concerning coping strategies employed by adults with diabetes, further research is required.

Effective coping is often described as actions that eliminate, modify, or avoid problem situations (Hamburg, Elliott, & Parron, 1982). Findings from several studies suggest that psychosocial coping and metabolic control are related, yet the sizes of the relationships are modest (Linn, 1976; Peyrot & McMurray, 1985). Areas in need of investigation include the burdens of multiple chronic illnesses, limited or fixed economic resources, and functional declines that may tax existing coping abilities and resources of older adults (Holvey, 1986). General statements concerning older adults' coping abilities may be hazardous and premature because of heterogeneity of the population's health status, the diversity of burdens older adults may confront, and variability of their coping abilities and resources. On the whole, determining how patients attempt to cope with diabetes has been a neglected area of great potential importance.

Adjustment to diabetes is an important area in need of additional clinical and research attention. As indicated by several studies, diabetes care may result in considerable demands on patients' coping resources. Separation of the day-to-day management of diabetes from adjustment to diabetes may result in narrowly focused empirical descriptions that provide only limited insights into the achievement of good metabolic control while ignoring well-being and quality of life among older adults. For these reasons, both self-management tasks and coping are important variables affecting the collective health and well-being of patients with diabetes.

There is an immediate need for clinical, behavioral, and psychosocial studies to determine the impact of diabetes on the lives of the elderly. Despite the fact that the prevalence of diabetes is highest in the seventh decade, the problems of diabetes in the elderly have been the subject of few empirical investigations. Presently, the management of elderly persons with diabetes is largely based on clinical impressions and extrapolations of management strategies based on young or middle-aged adults. It is unclear whether findings from young and middle-aged populations generalize to older adults. Therefore, it is important to begin to focus our research efforts on diabetes management among older adults.

INTERVENTION STRATEGIES

A major challenge confronting clinicians and social scientists is to find ways to improve diabetes care. This section will summarize intervention strategies revelant to diabetes care. We have selectively chosen examples that illustrate the range of intervention strategies applied to diabetes care among adults. This selection should not be taken as an exhaustive review. These interventions are cited because they demonstrate how principles from the social and behavioral sciences have been employed in an attempt to enhance diabetes management and treatment outcomes. Rosenstock (1985) indicates that interventions can be categorized in a variety of ways, depending upon the target of the intervention. Applying this framework, we discuss intervention strategies targeted at patients, the health-care system, and health-care providers.

Patient-Directed Interventions

We noted previously that there does not appear to be a direct relationship between disease knowledge and treatment adherence. Attempts to provide factual information about diabetes have generally not facilitated adherence (Haynes et al., 1979).

Information. Educating patients about their regimen, either alone or combined with behavioral strategies, has met with mixed results. Whitehouse, Whitehouse, Smith, and Hohl (1979) found no significant difference in the rate of hospital admissions for diabetes-related reasons (e.g., ketoacidosis) between those who attended a follow-up educational session and those who did not. Using a small group of hospitalized patients ($N = 35$), the majority over age 50, Howard, Barnett, Chon and Wolf (1986) studied the effects of an intensive in-hospital patient education program. Knowledge and self-care skills improved from admission to discharge. Additionally, better knowledge scores were maintained over a 12-month period. However, no significant relationship was found between knowledge and fasting blood glucose levels. Although fasting blood glucose levels improved during hospitalization, they were found to return to admission levels at the follow-up evaluations.

Another group of investigators, Rettig, Shrauger, Recker, Gallagher, and Wiltse (1986), conducted a randomized-controlled trial comparing an in-home instructional program on diabetes self-care ($N = 180$) to a control condition involving only routine clinic care ($N = 193$). Six months following the intervention, participants in the experimental group showed significantly greater self-care knowledge than patients in the control group. No differences were found in the number of diabetes-related hospitalizations, emergency-room visits, physician visits, or metabolic control.

Mazzuca et al. (1986) reported on an experimental trial to enhance patients' knowledge, self-management behaviors, and selected physiologic outcomes. The sample consisted of 275 patients with a mean age of 58 years. The experimental program comprised an array of strategies, including educational diagnosis, knowledge and skills instruction, goal setting and contracting, self-monitoring behaviors, and reinforcement. Self-management topics included knowledge of acute complications, wearing diabetes identification, dietary and activity behaviors, foot care, urine testing, and medication-taking behaviors. After the intervention, significant differences were found between the experimental and control groups in some knowledge, skills, and behavior variables. A small but significant improvement in metabolic control was noted at a 12-month follow-up. It is difficult to separate the effects of particular components of the intervention or to identify the appropriateness of the interventions for the patient's needs because multiple intervention strategies were employed.

Self-monitoring. This has been shown to be variably effective in promoting patient adherence. A number of investigations, including studies of adolescents and adults, indicate that blood glucose self-monitoring programs can bring patients using insulin under better metabolic control (e.g., Mazze, Pasmantier, Murphy, & Shamoon, 1985). Presently, self-monitoring for patients not using insulin remains equivocal (e.g., Allen, Feussner, & DeLong, 1987). Studies of blood glucose monitoring document that both patient reports and equipment variations are important factors in using self-monitoring and in interpreting the results (Gonder-Fredrick, Julian, Cox, Clarke, & Carter, 1988). Southam and Dunbar (1986) describe a number of factors that should be considered before implementing self-monitoring programs, including assessing patients' functional abilities and personal preferences. A major prerequisite for self-monitoring interventions, such as home blood glucose monitoring, is determination of the patient's functional capacities. For example, persons who are physically restricted may not be able to use some monitoring techniques or equipment. Health-care providers need to give systematic attention to the monitoring results brought in by patients to maximize the potential clinical and motivational benefits of self-monitoring.

The acceptability of self-monitoring to patients needs to be assessed. An individual's prior experiences with self-monitoring may influence her willingness to participate. Some do not want to be involved in self-management strategies (Nessman, Carnahan, & Nugent, 1980). Acceptance may be enhanced by matching patients' needs and goals with the type of program (Eisenthal, Emery, Lazare, & Udin, 1979; Ruzicki, 1984). In addition, family support may be required, particularly for persons with functional limitations. The willingness of the family to provide such support may need to be established prior to initiating self-management programs. Further research on the circumstances in which self-monitoring strategies are effective is required among elderly adults.

Cuing or Reminders. Cuing has been used to assist patients in remembering to carry out the behavior (Becker & Maiman, 1975). Persons with memory problems may benefit from strategies such as cuing or reminders. Although no studies have been conducted with older persons with diabetes, a pilot project by Becker, Janz, DeTullio, Marcoux, and Billi (1988) revealed that the majority of patients (65%) who were randomly assigned to receive an alarm pillbox with an instruction sheet indicated that the alarm pillbox reminder was helpful. In contrast, only a small number of persons who received just an instruction sheet indicated it was helpful (16%). Persons in the age range 55–65 were more likely than younger or older patients to report that the alarm pillbox was a helpful reminder.

Contingency Contracting. Agreements between patients and health-care providers is an example of another set of strategies aimed at modifying psychological factors to promote adherence. *Contracting* refers to a written agreement between the provider and patient regarding a treatment goal and the parameters for accomplishing that goal (Janz, Becker, & Hartman, 1984). The patient-provider contract has been employed to enhance patients' follow-through on treatment recommendations and to promote patients' confidence regarding their ability to manage the regimen (Schulman, 1979). Contracting in diabetes management has met with varied success. Morgan and Littell (1988) compared a teaching program alone to contracting plus teaching to determine their effects on diabetes control among 60 patients with NIDDM who were overweight. After the program was carried out for eight weeks in patients' homes, knowledge levels increased, and patients achieved some weight loss. No significant differences were found between the two treatment groups in glycemic control. There were several study limitations, including the absence of measures to assess regimen adherence, making it impossible to determine whether patients adhered to the contract or modified their behaviors in response to the intervention.

A problem with contracting has been the ambiguity of the contracting process. Further research is required to specify what components of contracting influence patient behavior. It is not known whether it is the written specification of tasks and goals, the public commitment to comply, or the increased provider attention that is responsible for the effects of contracting. Furthermore, the behaviors selected for intervention must be of concern to both patients and providers. As demonstrated by a study by Steckel and Swain (1977) on contracting and medication compliance, less than 2% of the patients were interested in altering medication behaviors and would have selected other behaviors to work on if given a choice.

Social-Support Enhancement. This may be another key area for intervention. There are two types of studies regarding social support: studies of informal support where help is received from family and/or friends and studies of formal support where interventions involve health professionals. The development of peer groups and strategies for strengthening existing networks are examples of natural support interventions. In one of the only studies specifically to target diabetes management among older adults, Pratt, Wilson, Leklem, and Kingsley (1987) compared the impact of two experimental conditions (i.e., a series of educational sessions or educational sessions plus peer-group support) with a control condition on participants' perceived support, weight loss, and glycemic control. Study participants were 79 elderly persons with NIDDM. Study results revealed that at the completion of the intervention, participants in the education-plus-peer-support group had more weight loss and reduction in blood glucose levels than either the education or control groups. Future research should attend to the types of support that participants give as well as receive from one another.

Although intervention studies across a variety of physical disorders produce rather consistent evidence that naturally occurring support is beneficial (Rounds & Israel, 1985), studies of interventions by health-care professionals are more difficult to interpret because they contain a mixture of intervention strategies. Hooper, Miller, Birge, and Swift (1984) conducted a randomized-controlled trial of the impact of home health aides on diabetic control and utilization patterns among 227 low-income patients using a diabetes clinic (mean age 58). Patients were assigned to routine clinic care or were offered home-aide services. Of the patients offered home-aide services, only 38% (44 people) accepted them. Those accepting the aide services were slightly older, had significantly less knowledge about diabetic treatment, and were generally more disabled. After 18 months, significant differences were found in fasting blood glucose levels between the control and treatment groups. However, on the average, patients had relatively poor metabolic control at the conclusion of the study (mean fasting blood glucose 225 mg/dl for those in the control group and 215 mg/dl for those in the experimental group). Further work in this area with persons with functional limitations may prove fruitful.

Relapse Prevention. This offers a most promising means to deal with long-term maintenance of adherence behavior (Rosenstock, 1985), a topic generally bypassed in most intervention studies. Developed by Marlatt and Gordon (1980) to prevent relapses in addictive behaviors such as alcoholism or cigarette smoking, the model also appears to have great applicability to maintaining lifestyle behaviors. More specifically, relapse prevention may be useful in maintaining dietary behaviors and weight loss. It is important to note that relapse prevention comes into play once the behavior has been initiated or achieved (i.e., stopped smoking or lost weight). In brief, the model requires patients to identify high-risk situations for relapse and learn new coping skills to deal with them. The relapse-prevention model draws heavily on self-efficacy theory. Strategies to teach or promote coping skills, whether cognitively or behaviorally oriented, focus on increasing one's sense of mastery and ability to cope with high-risk situations and day-to-day problems to avoid relapse.

The methods described here demonstrate the variety of approaches for intervening in patient management of diabetes. As indicated by this brief overview of intervention strategies, there are numerous avenues for developing intervention strategies that evolve from the various models and theories of health-behavior change.

Health-Care Provider Interventions

Effective Communication. Communication between patients and health-care professionals, as well as among health-care providers, is an important avenue of intervention. As demonstrated by the work of Ley (1983), patients require explicit directions and instructions regarding their regimens and should be provided with a clear rationale of the purpose of the regimen. Essential points should be reviewed and reinforced through both oral and written instructions (Becker, 1985).

Modifications in Prescribing Practices. These may also increase adherence with medication regimens. Helpful strategies to prevent or reduce medication errors include taking appropriate clinical steps to reduce the cost, complexity, and the degree of behavioral change required by patients to follow the treatment regimen (Becker & Maiman, 1975). Health-care professionals have long recognized the importance of patient education in diabetes management. However, in addition to the new information and skills, patients must acquire and modify complex patterns of behavior in order to adapt to the disease. In some cases, psychosocial interventions require skills for which many practitioners lack time or training.

Formal Education. Education in medical and professional schools is another area where training may improve the patient education practices of health-care providers. For example, the growing inclusion of formal instruction on health education in the curricula of many medical schools suggests that a new generation of physicians will be better versed in patient education strategies (McCellan, 1986).

Continuing Education. Education for staff members in diabetes care is yet another important approach. In 1986, Mazze, Deeb, and Palumbo reported on a comprehensive evaluation of the Clinical Education Program of the American Diabetes Association on noninsulin-dependent diabetes. The program reached nearly 17,000 health-care professionals in the United States. Although the program was determined to be successful in meeting its objectives to inform health-care professionals about NIDDM, the extent to which the program altered practice patterns is unknown. Several studies on continuing medical education stress the importance of intensive educational programs. For example, Inui, Yourtee, and Williamson (1976) found that physicians who received special tutorials on hypertension mangement were observed to spend a greater proportion of the clinical encounter on patient teaching. Those patients exhibited a higher level of knowledge and "appropriate" beliefs about hypertension and its treatment. Moreover, more patients of the tutored physicians adhered to the prescribed regimen and demonstrated better blood pressure control than patients of nontutored physicians. The tutorials emphasized both adherence difficulties experienced by patients with hypertension and possible strategies for altering patient beliefs and behaviors.

Interdisciplinary Team Development. In diabetes management, this area has had considerable support but little empirical study. A diabetes education team (composed of a diabetologist, nurse, nutritionist, social worker, and educator) was established to assess and follow up patients with diabetes (Wylie-Rosett, Villeneuve, & Mazze, 1985). Chart audits, staff interviews, and observations were used to evaluate care standards. Initial assessment revealed that none of the charts included thorough evaluations of patients' skills, knowledge, or adherence related to care of diabetes. Postintervention assessment of the model care unit was completed at 6 and 24 months. Alterations in diabetes care practices were found, with more of the charts meeting the standards of monitoring and recording of diabetes care activities. Future studies would benefit from the use of experimental designs and appropriate control groups.

Needs Assessment. As an element of intervention programs, needs assessment is well recognized (Davis et al., 1981; Windsor, Roseman, Gartseff, & Kirk, 1981). An effective needs assessment can provide the basis on which programs can be designed to meet the specific needs of patients. A careful and comprehensive assessment tool like the Diabetes Education Profile (Hess et al., 1986) can provide data regarding patients' current knowledge about the regimen as well as psychosocial and environmental factors that may enhance or impede adherence. As indicated by the findings of Lawrence and Cheely (1980), careful attention must be paid to periodic monitoring of patients' skills and knowledge of the regimen.

Health-Care Delivery System

The system may require alteration to improve diabetes care. One successful way to intervene is to alter the policies and procedures of the health-care delivery system related to diabetes care. Hamman, Michael, Keefer, and Young (1984) developed an intervention program targeted at directors of nursing, in-service program directors, dietitians, food-service supervisors, and administrators in long-term care facilities in Colorado. The frequency and duration of hospitalizations were the major dependent variables of interest; hospitalization data on residents with diabetes were abstracted from medical records for a one-year period prior to the intervention and a corresponding period two years later. The number of diabetes policies and procedures were found to increase significantly after the intervention. No significant reduction occurred in the frequency of hospitalizations. However, hospital days decreased by 33%, and average length of stay decreased by 4.7 days from preintervention to postintervention. As indicated by the authors, interventions targeted at altering policies and procedures of long-term-care facilities appear to be an effective way to reduce hospital days for residents with diabetes. Additional work is required to determine what patterns of care may be altered through changes in policies and procedures and how this impacts directly on other patient-care outcomes.

CONCLUSIONS

Considerable evidence has been amassed showing that patients of all ages have difficulties in every circumstance where some form of self-administration is involved. Research on management problems suggest several areas where the knowledge and skills need to be improved and monitored. Relationships among psychosocial variables on process of care and other outcomes have been reviewed. Historically, the early search for correlates of adherence was descriptive rather than explanatory. The introduction of theoretically based research has assisted in understanding diabetes management, but current research is fragmented, and we still have a long way to go before we can make definitive statements about diabetes management in older adults.

Despite the steady growth of information about diabetes management in adult populations, several methodological limitations are apparent. These problems have contributed to the limited replication of individual studies and uncertain generalizability of findings to older adults with diabetes. It has proven difficult to disentangle the effects of age from other factors that affect diabetes management and treatment outcomes. We need additional research on the clinical management of diabetes in older adults, and we need to learn more about the psychosocial needs of elderly patients with diabetes. Our review of the literature clearly points out the urgent need to integrate studies on patient-management behaviors and psychosocial-coping tasks to understand better the impact of diabetes on the lives of older adults.

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CHAPTER 3

Urinary Incontinence: Medical and Psychosocial Aspects

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The view that urinary incontinence is an unfortunate but inevitable concomitant of aging is being dispelled by the growing research effort directed to this condition. Many causes are readily identifiable and reversible. Along with more sophisticated techniques for diagnosing and treating involuntary urine loss comes increasing interest in the epidemiology of the condition and its potential impact on quality of life. The topic of urinary incontinence has become truly multidisciplinary—as evidenced in this review by the addition of psychosocial factors to the medical aspects emphasized in the previous *Annual Review* chapter (Krane & Siroky, 1981).

As the scope of research on incontinence broadens, studies are targeting diverse populations—clinical, institutionalized, and community-based. This review is primarily concerned with incontinence in noninstitutional settings although selected findings from nursing homes are discussed. Additional information about the prevalence, correlates, costs, and treatment of incontinence in all settings can be found in a special issue of the *Journal of the American Geriatrics Society* (Ouslander & Resnick, in press), which contains papers presented at the NIH Consensus Development Conference, "Urinary Incontinence in Adults," and in a recent issue of *Clinics in Geriatric Medicine* (Ouslander, 1986b).

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This review begins with a discussion of the definition of urinary incontinence and a presentation of its epidemiological characteristics in the older noninstitutionalized population living in the United States. Next, the physiological mechanism of normal micturition and continence are presented, and medical and other causes of its malfunctioning are reviewed. The physical, psychological, social, and economic consequences of urinary incontinence follow. Diagnostic procedures and intervention strategies are discussed in the final part of the review.

DEFINITION OF INCONTINENCE

The International Continence Society Standardization Committee has defined incontinence as "a condition in which involuntary loss of urine is a social or hygienic problem and is objectively demonstrable" (Bates et al., 1979, p. 551). The development of a standard definition of urinary incontinence is laudable and was long overdue. A standard definition provides the basis for cumulative research. Indeed, inconsistency in working definitions has been blamed for the variation in prevalence estimates reported in the literature (Mohide, 1986). Therefore, several aspects of defining incontinence are discussed first.

Types

The International Continence Society Standardization Committee provided definitions for four types of urinary incontinence as they present clinically: stress, urge, reflex, and overflow (Bates et al., 1979). Briefly, *stress incontinence* is characterized by urine leakage during exercise, coughing, sneezing, or laughing (i.e., when intraabdominal pressure is suddenly increased). *Urge incontinence* is involuntary urine loss immediately preceded by the desire to void. *Reflex incontinence* is defined as the sudden loss of large volumes of urine without any sensation of urgency or bladder distension. *Overflow incontinence* is manifest as frequent or continuous loss of small amounts of urine together with a distended bladder.

At least three additional types of urinary incontinence are mentioned in the literature. The terms *complex* or *mixed incontinence* are often used to describe findings of combined urge and stress symptoms. *Functional incontinence* is sometimes used to refer to urine loss associated with mobility restrictions, cognitive impairment, or environmental barriers, without associated pathology or dysfunction of the lower urinary tract.

Iatrogenic incontinence is physician-induced urine loss—often due to prescribed medications.

Transient versus Established Incontinence

A distinction is sometimes made between transient and established incontinence (Ouslander, 1981; Resnick, in press; Resnick & Yalla, 1985). While transient incontinence is associated with episodic events like acute illness (e.g., urinary tract infections), sudden mobility impairment (e.g., due to a hip fracture), fecal impaction, or medication use (e.g., sedatives, diuretics), established incontinence is a more chronic condition that is usually caused by some pathophysiologic process. That distinction is not always clear-cut, because a potentially transient condition can be long-lasting if not treated as such, but it does serve as a reminder that many causes of incontinence are readily identifiable and reversible. It further underscores the need for a thorough assessment of the incontinent patient in terms of physical, psychosocial and environmental factors. (For useful discourses on the nursing assessment of urinary incontinence, see Jirovec, Brink, & Wells, 1988, and Wyman, 1988.)

Severity

Although the International Continence Society's definition specifies that the urine loss must be a social or hygienic problem and thus, by implication, rather severe, others define incontinence as *any* involuntary urine loss (e.g., Diokno, Brock, Brown, & Herzog, 1986; Yarnell, Voyle, Richards, & Stephenson, 1981). The severity of urine loss is obviously a critical dimension in determining the psychological and economic impact of incontinence, as well as the management approach. In epidemiological studies, severity typically has been operationalized by the frequency of incontinent episodes or by the frequency of difficulties with controlling urine (e.g., Campbell, Reinken, & McCosh, 1985; Harris, Guralnik, & Madans, 1986; Thomas, Plymat, Blannin, & Meade, 1980; Vetter, Jones, & Victor, 1981; White, Kohout, Evans, Cornoni-Huntley, & Ostfeld, 1986). A few studies operationalized severity by quantity of loss (e.g., Diokno et al., 1986; Milne, Williamson, Maule, & Walace, 1972). The frequency of loss during a 12-month period and the quantity lost over a 24-hour period, although related, are not redundant (Diokno et al., 1986). More effort to use a multidimensional conceptualization of severity is needed in future work.

Time Frame

The time frame over which incontinence is assessed is another aspect of the definition that varies from study to study. Presumably based on the notion that incontinence represents a chronic condition, some define incontinence as involuntary urine loss at any time during adulthood. Following epidemiological tradition, others ask about the past 12 months (or another well-specified time frame) to obtain "period prevalence." One problem with a rather long time frame is that interim changes in incontinence status might be missed. (See the later section on incidence and remission.) Still other studies leave the time frame unspecified, apparently referring to the current situation.

Controlled Incontinence

An unresolved issue in the definition of urinary incontinence is whether or not successfully controlled—but not cured—urine loss should be considered incontinence. For example, community-dwelling elderly who experience symptoms of urgency might visit the bathroom frequently and always stay close to home. In this way they may prevent actual urine loss, even though they have anatomical and neurological defects that predispose them to urine loss. Similarly, in institutions, incontinent residents are sometimes catheterized, and if this is done successfully, they might not lose any urine.

Popular Perceptions

Some studies have utilized anthropological approaches or survey methods to investigate the ways in which incontinent persons, the general public, and health-care professionals perceive urinary incontinence.

Although the Continence Society's definition of incontinence is difficult to implement in epidemiological research because of its qualifier, "a social or hygienic problem," this qualifier is clearly reflected in popular thought about the topic. People who experience involuntary urine loss do not necessarily view themselves as incontinent. For example, incontinence can be subjectively redefined to mean public accidents rather than the loss of urine at home or leakage into an absorbent garment (Mitteness, 1987a). In a community survey in Washtenaw County, Michigan (MESA), about 7% of the respondents who reported losing urine resisted identifying their urine loss as a "condition." This resistance was more likely among those with milder incontinence (Herzog & Fultz, 1988). The relationship between severity and self-definition is confirmed by two studies of community-residing adults in Britain (Thomas et al., 1980; Yarnell et al., 1981).

The tendency to discount mild incontinence is bolstered by two perceptions that are widely shared—that involuntary urine loss is embarrassing and that it is a normal part of aging (Herzog & Fultz, 1988; Mitteness, 1987a; Ory, Wyman, & Yu, 1986; Wells, 1984). Unfortunately, negative and inaccurate perceptions about incontinence appear to be common among caregiving professionals (Mitteness & Wood, 1986) as well as the general public. It has been suggested that one result of such perceptions is to discourage the seeking of health care for urinary incontinence (Ory et al., 1986). However, in a study of community-dwelling older adults, perceptions about incontinence were not strongly related to the use of medical care for urine loss or to personal-care strategies (Herzog, Fultz, Normolle, Brock, & Diokno, 1989).

EPIDEMIOLOGY OF URINARY INCONTINENCE

Prevalence of Urinary Incontinence

Prevalence indicates the probability of being incontinent within a defined population (e.g., the entire adult population or the older population). Prevalence estimates are important for projecting the need for health and medical services, but they are not well suited for studying the onset and course of a disease. Early epidemiological work on urinary incontinence in the community was conducted primarily in Europe. More recently, several studies of the noninstitutionalized elderly in the United States and in New Zealand have been carried out, although some of them have not been formally published. The following discussion includes only studies published or conducted since 1970. These are the Established Populations for Epidemiologic Studies of the Elderly [EPESE] studies (White et al., 1986); the EPESE follow-up (Resnick, Wetle, Scherr, Branch, & Taylor, 1986); the National Health and Nutrition Examination Survey 1 Follow-up [NHANES follow-up] (Harris et al., 1986); the Medical, Epidemiological, and Social aspects of Aging [MESA] study (Diokno et al., 1986); a study conducted by Campbell et al. (1985); the Supplement on Aging [SOA] sponsored by the National Center for Health Statistics; the Americans' Changing Lives [ACL] survey conducted by the University of Michigan's Survey Research Center in 1986; the Michigan Generations Follow-up [MG2] survey conducted by the Survey Research Center in 1987.

Prevalence of Any Urinary Incontinence. Most of the studies reviewed here used a definition of incontinence that included at least stress and urge types, although the measures rarely have been formally validated. All included older respondents, but the lower boundary of the age range varied. Prevalence estimates for both sexes combined ranged upward from the 8 and 9% obtained in two studies (SOA and ACL, reported in Herzog & Fultz, in press). Several studies reported estimates betwen 12 and 17% (Campbell et al., 1985; MG2, as reported in Herzog & Fultz, in press; Resnick et al., 1986; Vetter et al., 1981; Yarnell & St Leger, 1979). The highest reported estimates were between 30 and 34% (Diokno et al., 1986; Harris et al., 1986; Milne et al., 1972).

The observed variation in prevalence rates is not readily explained by the factors on which the studies most obviously differ (i.e., the definition of incontinence, the type of population, or the age range or other sample characteristics). Differences in the extent of underreporting the condition have not been considered in the literature, but might provide an explanation for the varying prevalence estimates (Herzog & Fultz, in press).

Prevalence of Severe Urinary Incontinence. Most studies that estimated the prevalence of severe incontinence defined severity by measuring the frequency of urine loss; the cutoff ranged from several times a month to several times a week to daily. Prevalence rates for severe incontinence ranged from 2 to 10%, with most falling between 4 and 6% (Campbell et al., 1985; Diokno et al., 1986; Harris et al., 1986; Milne et al., 1972; Resnick et al., 1986; Vetter et al., 1981; Yarnell & St Leger, 1979). Again, the different definitions do not provide an obvious explanation for the variations in rates. But what is more critical is the finding of a smaller variance for rates of severe incontinence than for rates of any urine loss. It is likely that respondents cannot deny, forget, or otherwise underreport severe incontinence as easily as they might with milder loss. Less variation in response errors would produce more consistent rates.

Prevalence of Types of Incontinence. Among the types of incontinence, stress incontinence can be differentiated relatively easily in personal interviews by asking about the circumstances of urine loss. Five studies (Diokno et al., 1986; Harris et al., 1986; Milne et al., 1972; Resnick, Wetle, Scherr, Branch, Evans, & Taylor, 1988; Yarnell et al., 1981) asked questions phrased to measure stress incontinence, and reported prevalence rates for it. The prevalence estimates for simple stress incontinence mostly fall between 10 to 20% and represent about one-quarter to one-third of the entire prevalence identified in those studies.

Urge incontinence is typically operationalized in personal interviews by questions probing the uncontrollable need to void and the difficulty of getting to the bathroom on time. Three studies (Diokno et al., 1986; Resnick et al., 1988; Yarnell et al., 1981) show a 5% and 12% prevalence of urge incontinence among older adults, representing about another quarter to a third of the entire incontinence prevalence. Another major part of the prevalence among older adults is represented by complex urge and stress symptoms (Diokno et al., 1986; Resnick et al., 1988; Yarnell et al., 1981).

Demographic Correlates of Urinary Incontinence

Among demographic characteristics, sex is most clearly related to experiencing incontinence. Almost all studies that have investigated sex differences find substantial differences, with women reporting 1.5 to 2 times higher prevalences (Herzog & Fultz, in press). For example, in the MESA study, the prevalence of incontinence among women (38%) was about twice that among men (19%) (Diokno et al., 1986). Similarly, in summarizing findings from the three EPESE surveys, it was noted that the percentage of respondents who reported difficulty holding their urine until they can get to a toilet "most of the time" or "all of the time" was about 1.5 times more for women (White et al., 1986). Findings from the NHANES follow-up were consistent with this pattern (Harris et al., 1986). The NHANES follow-up (Harris et al., 1986), the East Boston EPESE follow-up (Resnick et al., 1988), and the MESA study (Diokno et al., 1986) showed that the sex difference is particularly pronounced for stress incontinence. The MESA study and the East Boston EPESE follow-up further indicated that complex incontinence is more prevalent among older women than older men, while urge type is more prevalent among older men.

It is somewhat less clear whether the prevalence of incontinence increases with advancing age. While many of the reviewed studies reported a relationship between incontinence and age for both older men and older women (Feneley, Shepherd, Powell, & Blannin, 1979; Resnick et al., 1986; Vetter et al., 1981; Yarnell & St Leger, 1979), others noted it only among older men (Harris et al., 1986; Thomas et al., 1980) and another only among older women (White et al., 1986). Finally, no significant relationship between incontinence and age was found for either sex in two studies (Diokno et al., 1986; Milne et al., 1972).

Although racial differences in incontinence are suggested from clinical experience, very little epidemiological information is available to date.

Incidence and Remission

Incidence is the probability of becoming incontinent during a defined period of time; often, one-, two-, or five-year incidence rates are reported. Incidence is the appropriate measure for studying the onset of incontinence and its risk factors. Only two studies of the incidence of urinary incontinence are currently available. A study by Campbell et al. (1985) of people aged 65 and over living in a community and institutions in New Zealand suggested that about 10% of continent older adults develop incontinence over a three-year period. One-year incidence rates of 10% for men and 20% for women were observed in the MESA study (Brown, Lin, Normolle, & Herzog, 1988). The second estimate is much higher than the first, which parallels the differences in prevalence between the same two studies.

These and two additional studies (Thomas et al., 1980; Yarnell & St Leger, 1979) further document that some originally incontinent respondents become continent over time. Estimates of the remission rate also vary, with a maximum rate of about 33%. Whether such remission is part of the natural course of urinary incontinence or is a consequence of medical intervention has not been determined. However, the latter possibility is less likely because of the general reluctance of patients to discuss incontinence with health providers, and because even when it is reported incontinence may go untreated by medical professionals (see the later section on physician care for more information about these points).

Self-Report Measurement of Urinary Incontinence

Although the definition by the International Continence Society calls for "objectively demonstrable" urine loss, it can be impractical to attempt clinical measurements of incontinence in the large-sample surveys that are needed for establishing prevalence and incidence estimates. Moreover, not all forms of incontinence can be reliably reproduced in the clinic. Therefore, self-reports of urine loss are a major ingredient in the assessment of incontinence.

The underlying definition of incontinence varies among the existing self-report measures. Some measures seem to tap mainly urgency or urge incontinence by asking, for example, "How often do you have trouble getting to the bathroom on time?" Stress incontinence might not be captured by a question that focuses on urinary urgency. Moreover, such questions ask about difficulties controlling urine without establishing whether actual loss occurs. The time frame also varies among these measures. Some ask about current incontinence, others about incontinence during the past 12 months.

Unless special efforts are made, all measurement of urinary incontinence risks underreporting bias because of the potentially embarrassing nature of the condition. Cannell and his colleagues found that presumably embarrassing health conditions were more often underreported than others (Cannell, Fisher, & Bakker, 1961). A trait measure of social desirability was related to reporting continence of urine (Herzog, Fultz, Brock, Brown, & Diokno, 1988), suggesting that respondents more concerned about the impression they made were less likely to report urine loss.

While some respondents may be unwilling to discuss their incontinence with an interviewer, others may be unable to remember it. Particularly with recall periods of 12 months or more and with minor losses of urine, underreporting due to memory loss could occur. It is well known that accuracy of reporting in surveys declines with increasing recall period (Sudman & Bradburn, 1974) and that memory performance declines with age (Craik, 1977). Moreover, as we discuss later, urinary incontinence appears to be associated with cognitive impairment. Thus, the respondents who are more likely to be incontinent may also have more difficulty remembering and accurately reporting it.

Proxy responses introduce another possible source of measurement error into estimations of the prevalence and incidence of incontinence (Moore, 1988). When an eligible respondent cannot participate in an interview because of cognitive or other health problems, some studies allow a close relative or friend to answer factual questions for him or her. In studies of older adults as many as 5–10% may be represented by a proxy (White et al., 1986). While an older adult's caregivers may be able to provide excellent information on his or her urine control, those who are not involved on a daily basis may be less accurate.

The level of error in the measurement of urinary incontinence can be assessed by standard techniques for estimating reliability, concurrent validity, and construct validity. A self-report measure of any incontinence was tested for test-retest reliability in a small study of 30 older adults (Milne, Hope, & Williamson, 1970); agreement between classifications at the two times was not very high. Test-retest reliability was also assessed for a measure of incontinence asked at the beginning and end of a larger survey of older adults in Detroit. High reliability of any incontinence was found (Herzog & Fultz, in press). In another study, a measure of any self-reported involuntary urine loss within a 12-month period was compared with an assessment of incontinence during a clinical examination. The clinical evaluation included a standardized history, a physical examination, and a simple provocative stress test without invasive procedures. For each sex there was an 83% agreement between the self-reports and the clinician's assessment, suggesting satisfactory validity (Diokno, Brown, Brock, Herzog, & Normolle, 1988).

Study Design for Prevalence of Urinary Incontinence

The accuracy of prevalence and incidence estimates depends not only on the use of a valid measure but also on an adequate study design, including a representative sample and survey procedures to obtain high response rates and to control nonresponse bias. In addition to the problems of definition and measurement of incontinence previously discussed, studies of incontinence often do not have adequate samples. Particularly, they rarely represent both older adults living in the community *and* those in institutions. They also do not always reach high response rates and if faced with lower response ratres, do not present information on the extent of the possible nonresponse bias. An exception is a paper by Milne, Maule, and Williamson (1971) that showed that urinary tract infections were rarer among older female nonrespondents than among older female respondents. Similarly, Brown et al. (1988) showed that continent older female respondents were more likely to refuse reinterviews than were their incontinent counterparts. In brief, there are suggestions that continent and incontinent persons differ in their willingness to participate in an interview or reinterview.

Data-quality issues are even more important for establishing change and stability of incontinence over time. Unreliability of measurement could be mistakenly interpreted as true change in incontinence status; stability of measurement bias could appear as true stability of status; and differential attrition of respondents with stable or changing continence status could bias the degree of change or stability in the sample. Little information on these issues is currently available in the incontinence literature; future work should pay more attention to design and measurement.

Summary

Considerable variation in prevalence of any urinary incontinence is observed that cannot be explained easily by characteristics of study design or measurement; but given the tendency toward underreporting, an estimate of 30% seems reasonable. Rates for severe incontinence appear to be more consistent, at around 4 to 6%. This is presumably because severe urine loss cannot be as easily denied or forgotten as mild loss and so is measured with greater validity. Future research should pay careful attention to measurement issues. Particularly important are the measurement of mild loss and particular types, and the documentation of data quality.

PHYSIOLOGY OF MICTURITION

Continence—the storage function of the bladder—and micturition—the evacuation function of the bladder—are dependent not only on the integrity of the lower urinary tract but on an intact and functioning nervous system (Lapides & Diokno, 1976). The three major parts of the lower urinary tract essential to continence and micturition are the detrusor muscle, the internal sphincter, and the external sphincter. The detrusor and urinary sphincters are under the control of the various micturition centers located along the cerebrospinal axis.

The cerebral center for micturition is located in the frontal lobes (Bradley, Timm, & Scott, 1974). Before ages 2–4, micturition occurs in an uncontrolled fashion. Once the cerebral center assumes control, it is thought to modulate the pontine mesencephalic center (De Groat, 1975). The pontine center is believed to provide a coordinated detrusor reflex of adequate temporal duration to assure complete bladder emptying. The pontine center, in turn, is also believed to modulate the spinal cord micturition center, which is located at the sacral spinal cord segments 2, 3, and 4. Because both the parasympathetic and the pudendal somatic neurons are located in this region, the coordination between the detrusor and the external sphincter activities are modulated at this spinal center. This means that when the parasympathetic detrusor motor neurons are stimulated, the pudendal somatic neurons are inhibited.

The peripheral nerves of importance to the lower urinary tract include the pudendal somatic nerves, pelvic parasympathetic nerve, and the presacral sympathetic nerves (Lapides & Diokno, 1976). The pudendal nerve innervates the external sphincter. It supplies the motor impulses to the voluntary periurethral striated muscles as well as the sensory perception to the perineum and genitalia. The pelvic nerve supplies the motor impulses to the detrusor muscles, whereas the afferent fibers carry pain, temperature, and distension perception from the bladder. The presacral nerve has two distinct actions in the bladder. The efferent receptors at the bladder body respond mainly to beta sympathetic action, which mediates relaxation of the bladder wall. The trigone and the internal spincter respond mainly to alpha adrenergic effect, which is stimulation and increased tone (Awad, Bruce, Carro-Ciampi, Downie, & Lin, 1974).

For the bladder to maintain continence and store urine, the detrusor must be relaxed through inhibition of parasympathetic activity and increased action of beta sympathetic activity. At the same time, the internal and external sphincters must be active by virtue of their intrinsic properties and the action of the pudendal and alpha adrenergic nerves. During micturition, the external sphincter muscle relaxes, the detrusor contracts, and the internal sphincter opens. A strong continuous stream of urine is produced until the bladder is totally emptied (Diokno, 1983). See Wein (1986) and Williams and Pannill (1982) for more detailed discussions of these processes.

CAUSES OF URINARY INCONTINENCE

Physical Causes

What are the mechanisms underlying urinary incontinence? Urine loss develops whenever intravesical pressure overcomes the maximum urethral pressure. This can be the result of an active or passive increase in the intravesical pressure, a fall in the intraurethral pressure, or a combination of both. An increase in intravesical pressure may be observed in patients with involuntary detrusor contractions (unstable bladder, detrusor hyperreflexia, or noncompliant bladder). Because they imply an inability to empty the bladder, detrusor areflexia and/or detrusor atonicity may lead to chronic urinary retention, bladder overdistention, and consequently an increase in intravesical hydrostatic pressure, enough to overcome the urethral pressure. A decrease in urethral pressure may be observed in patients with unstable urethra, incompetent internal sphincter, noncompliant urethra, defective or damaged urethra, or neurogenic sphincters.

Urge incontinence and reflex or precipitate urinary incontinence are usually attributed to detrusor overactivity. Stress incontinence is usually attributed to pelvic relaxation or urethral wall weakness. Constant dribbling can be attributed to overflow incontinence, a defective sphincter, a poorly compliant detrusor, or a small capacity overactive bladder.

Urologic or neurogenic causes are possible for detrusor overactivity. Urologic causes that have been established, primarily by clinical studies, are urinary tract infection, bladder outlet obstruction such as benign prostatic hyperplasia, prostate carcinoma, and urethral strictures, bladder calculus radiation cystitis, and interstitial cystitis. The association between incontinence and such urinary tract problems as painful urination and weak urine flow was confirmed in a sample of older community residents (Diokno, Brock, Herzog, & Bromberg, in press).

Neurologic conditions that are highly associated with urinary incontinence include cerebrovascular accident, brain tumors, spinal stenosis, herniated discs, multiple sclerosis, Parkinson's, and spinal cord trauma and tumor. Evidence presented by Snooks and Swash (1984) and by Tapp, Cardozo, Versi, Montgomery, and Studd (1988) suggested that damage to the perineal branch of the pudendal nerve may contribute to the development of urinary incontinence in postpartum women. Such an injury may explain why some women develop stress incontinence following multiple pregnancies while others do not. Although a relationship between incontinence and parity is often hypothesized, it did not appear in two recent studies (Diokno, Brock, et al., in press; Hørding, Pedersen, Sidenius, & Hedegaard, 1986).

Urethral dysfunction may be due to pelvic relaxation, urethral trauma, and neurogenic sphincters. The finding that incontinence is associated with genital surgery among older men and women raises the possibility that such surgery can weaken or harm the bladder and surrounding tissues, but more likely, the condition for which the surgery was performed may have been causing the incontinence in the first place (Diokno, Brock, et al., in press).

Although there is no evidence that normal aging causes urinary incontinence, there are several changes in the lower urinary tract as a consequence of aging that may directly or indirectly predispose older adults to develop the condition. Several studies have shown that the urethral closure pressure is reduced with age (Henriksson, Andersson, & Ulmsten, 1979; Rud, 1980). Atrophic urethritis is a well-known sequela of age-related estrogen deprivation (Smith, 1972). Atrophy, in turn, causes thinning of the urethral mucosa, which presumably reduces its ability to produce a good water seal to the lumen of the urethra. In addition, atrophic urethritis is associated with irritative voiding symptoms such as urgency and urge incontinence. Similarly, the weakening of the pelvic muscle that is common in older women is expected to reduce support to the bladder neck during periods of exertion, making incontinence likely.

Functional Impairments

The relationship between incontinence and mobility and/or functional impairment has been reported in several European and American studies. In a study of persons 70 and over selected randomly from two general medical practices in Britain by Vetter et al. (1981), about one-quarter of the household respondents were incontinent daily, while only 3% of the fully mobile persons lost urine that regularly. Using EPESE data on adults 66 and over living in East Boston, Resnick and his colleagues (Resnick et al., 1986; Wetle, Scherr, Branch, Resnick, & Taylor, 1986) reported a significant relationship between urinary incontinence and problems with at least one of the Katz Activities of Daily Living (ADL) items (Katz, Downs, Cash & Grotz, 1970; Katz, Hedrick, & Henderson 1979). There was also a significant relationship between incontinence and the inability to perform one or more of the Rosow-Breslau instrumental activities (IADL) (Rosow & Breslau, 1966). Among older adults admitted over a six-month period to the geriatric and long-term-care units in Göteborg, Sweden, incontinence was associated with various ADL and IADL functions (Ekelund & Rundgren, 1987). Findings from the MESA survey support the idea that persons with mobility problems and functional disabilities have a higher rate of incontinence than those without such limitations (Diokno, Brock, et al., in press; Herzog et al., 1988).

A strong association between functional disability and incontinence has also been shown for nursing-home populations. In a study comparing 50 incontinent nursing home residents with 50 continent residents matched on age, sex, and level of care (Ouslander, Morishita, Blaustein, Orzeck, Dunn, & Sayre, 1987), continent participants were significantly better able to dress, toilet, transfer, ambulate, and travel to the dining room without assistance; the groups did not differ in performing six other activities. Moreover, incontinent residents took significantly longer to complete four of the five functional tasks particularly critical to toileting functions. Similar findings are reported by Ouslander, Ulman, Urman, and Rubenstein (1987) and by Resnick, Baumann, Scott, Laurino, and Yalla (1988). The consistency of the relationship is impressive, particularly because most studies are based on a relatively homogeneous population of either community or nursing-home residents and thus can investigate only a restricted range of functional impairment.

While the relationship between functional impairment and incontinence appears well established, the underlying mechanisms are less clear. It is possible that neurological mechanisms, which are critical for control of both physical functions and continence, are impaired because of conditions like stroke or Parkinsonism. It is also possible that difficulties in locomotion and in the fine-motor coordination involved in toileting may make it difficult to react promptly to urgency. The study by Ouslander, Morishita, et al. (1987) supports the latter hypothesis, as does a study of stroke victims by Brocklehurst, Andrews, Richards, and Laycock (1985).

Cognitive Impairment

Several studies have reported a relationship between urinary incontinence and cognitive impairment. Campbell et al. (1985) studied 559 older adults living in the community and in institutions in New Zealand and concluded that those with dementia were more likely to be incontinent than those without cognitive impairment. Similar results were reported by Ekelund and Rundgren (1987) on admissions to a long-term-care institution. Noelker (1987) collected data from 559 caregivers of older relatives who reported that those older persons who were incontinent showed more signs of cognitive impairment and needed more help with personal care than the continent older persons. Ouslander, Uman, et al. (1987) found that their four mental function measures were related to continence status among VA nursing-home residents.

Psychosocial Causes

Some researchers have argued that psychosocial factors contribute to the development and maintenance of urinary incontinence. From one perspective, urine loss due to detrusor instability without anatomical or neurological disorder is viewed as a physical manifestation of emotional stress, personality disorders, or an unsupportive environment. Fliegner & Glenning (1979, p. 44) concluded that "urge incontinence is one of the commonest psychosomatic conditions in gynaecology, and its treatment must be oriented with this in mind." Freeman, McPherson, and Baxby (1985) found that women with idiopathic detrusor instability without anatomical findings rated higher on anxiety, neuroticism, hostility, and depression than women with stress incontinence, which has an anatomical basis. The authors suggested that underlying this relationship is a personality type that is unable to express emotions but prone to somatic conversion, which could take the form of urinary incontinence. However, their design does not allow rejection of the possibility that incontinence caused psychological distress. Similar findings were reported by Macaulay, Stern, Holmes, and Stanton (1987). Caregivers interviewed by Noelker (1987) reported more disruptive behavior among incontinent than continent older persons. This finding is consistent with the hypothesis that incontinence could be part of an "acting-out" syndrome.

Success in treating incontinence through various behavioral therapies or psychotherapy has also been considered support for such an argument (cf. Frewen, 1978; Macaulay et al., 1987). However, Oldenburg and Millard (1986) found that depression and feelings of lack of control had decreased after behavioral treatment, irrespective of whether the continence status had improved. These authors interpreted their findings as inconsistent with the notion of psychosomatic causes of incontinence. Unfortunately their study (as well as that of Frewen) did not include a control group, a limitation in design that jeopardizes the internal validity of their findings. More detail about these and similar views is provided in Ory et al. (1986) and Wells (1984).

Summary

Most of our knowledge about the causes of urinary incontinence is based on data from small cross-sectional studies of clinical and volunteer subjects. However, such data are of limited use for establishing causes because they do not represent the entire population and they confound cause with effect. Population samples are needed to generalize findings beyond a select group. Longitudinal or prospective designs are needed to identify the temporal ordering of risk factors and outcomes. Specifically, potential causes of urinary incontinence should be measured before the onset of the condition, and respondents should be followed to compare those who remain continent with those who become incontinent.

CONSEQUENCES OF URINARY INCONTINENCE

Physical Consequences

Skin irritations or infections are commonly mentioned physical consequences of urinary incontinence (cf. Diokno, 1983). Findings from a project conducted by Hu and associates (Hu, 1986) indicated that about half of incontinent patients have a rash or skin redness. Another study found that incontinent nursing-home residents were more likely to suffer from pressure sores and skin irritation than their continent counterparts (Baumann, Resnick, Laurino, & Yalla, in press), although the level of these problems appears to be lower than that found by Hu. Hu noted that national data on the extent of skin conditions as an outcome of incontinence are not available.

Falls are another possible (albeit indirect) consequence of urinary incontinence. In a study of the circumstances of falls among older adults, it was found that about 44% were associated with going to or returning from the toilet (Ashley, Gryfe, & Amies, 1977). Barker and Mitteness (1988) speculated that nocturia might be an important explanation of nighttime falls. A need to rush to the bathroom due to urinary urgency or frequent toileting to avoid incontinence could increase the potential for a fall.

Social and Behavioral Consequences

Involuntary urine loss may lead to a reduction of social activities and interactions because of embarrassment about smells and concerns about possible accidents. Norton (1982) recounted the embarrassment in social situations described by 55 women seeking care for urinary incontinence. Mitteness (1987a) interviewed incontinent older adults living in residential facilities for the elderly who rarely left their apartments for fear of having a public accident. Moreover, her observations indicated that those who did not adequately control wetness and smells in public were excluded from social groups (Mitteness, 1987a). A British study that compared incontinent with continent older adults found that older adults with urine control problems were no more likely to live alone than their peers but were three times more likely to average less than one social contact per day. Forty-one percent of those experiencing urine control problems felt that it disrupted one or more social activities (McGrother, Castleden, Duffin, & Clarke, 1987).

About half of the women in Norton's study (1982) thought that incontinence had affected their intimate relationships. Urine loss during intercourse is not uncommon among women and appears to influence sexual functioning (see Cardozo, 1988, for a brief review of findings and suggested treatments).

On the other hand, several studies could not confirm a relationship between incontinence and social activities. For example, the levels of social activities and social resources reported by incontinent community-dwelling older respondents were not significantly different from those reported by continent respondents (Herzog, Fultz, Brock et al., 1988). Nor was a consistent relationship between continence status and several measures of social activities found for a nursing-home sample (Ouslander, Morishita, et al., 1987). One explanation for this may lie in two competing processes and in measures that are too general to permit differentiation between the two. While severely incontinent older adults may withdraw from certain types of social contact, they may also require more assistance because of their incontinence (and associated health problems), thereby increasing other types of contact. Some support for this hypothesis is found in a study by Vetter et al. (1981) showing that frequency of contact with relatives increased with incontinence but that contact with friends decreased. In the Ouslander, Morishita, et al. study (1987), the few measures that showed higher levels of social integration among continent residents were questions on friendship relations.

There are reports from incontinent women that they shy away from participation in physical activities (Norton, 1982), but Herzog and her colleagues (Herzog, Fultz, Brock et al., 1988) could not confirm such an effect when they compared continent with incontinent women on a number of physical activities. It is also suggested that preoccupation with controlling urine loss can evoke seemingly bizarre behaviors, as the person constantly checks clothing for wetness, attempts to mask smells with excessive perfume, or frequently visits the bathroom (Wells, 1984). Mitteness (1987a) described the elaborate strategies used by one woman to hide her incontinence. Much of the woman's day was occupied with doing the laundry, consulting doctors, monitoring her social activities, and using pads to absorb urine.

Psychological Consequences

Severe urinary incontinence, especially if not effectively controlled, may lead to psychological reactions. Anxiety and tension have been suggested as reactions (Bartol, 1980; Norton, 1982; Sutherland, 1976; Wells, 1984). Incontinent persons may never feel at ease but must always be on guard, since an incontinent episode may hit without much forewarning. Lowered self-esteem and self-confidence have also been mentioned as potential outcomes of urinary incontinence (Bartol, 1980; Norton, 1982; Wells, 1984). The potential embarrassment and shame associated with their condition is likely to leave incontinent individuals feeling vulnerable and self-conscious. Feelings of control and mastery may be negatively affected by urinary incontinence (Bartol, 1980; Wells, 1984). Such feelings can be affected by experiencing a lack of control in critical life situations, and urinary incontinence represents an almost prototypical example of losing control over an aspect of one's personal life. While all of these psychological effects of urinary incontinence sound intuitively reasonable, little rigorous evidence is currently available to elevate them above interesting hypotheses.

Somewhat more evidence is available to support the next hypothesis. Psychological distress and depression are frequently named as likely outcomes of incontinence (Bartol, 1980; Norton, 1982; Sutherland, 1976; Vetter et al., 1981; Wells, 1984). Incontinent persons may become saddened by perceptions that their health is worsening and, since incontinence is viewed by many as a concomitant of aging, by the realization that they are aging. They may interpret incontinence, particularly if it is not controllable, as an indication of growing incompetence. They may experience demoralization due to incontinence-induced restrictions in social activities and contacts, anxiety, loss of feelings of control, and self-esteem.

Using cross-sectional data from the MESA project, Herzog, Fultz, Brock et al. (1988) observed a weak but statistically significant relationship between incontinence and psychological distress. These authors found that the relationship was partly due to incontinent persons' poorer general health. Incontinence-related modifications in a sense of control and in social activities did not further explain the relationship. Miller (1985) used data from the New Haven EPESE study to test the hypothesized relationship between urinary incontinence and depression. Respondents who reported difficulty holding their urine "all of the time" or "most of the time" scored the highest on a scale of depressive symptoms, followed by respondents who had difficulty "sometimes" or "hardly ever." Completely continent respondents scored the lowest of the three groups. This pattern was less pronounced but persisted when functional disabilities and chronic disabilities were controlled.

Wyman and her colleagues (Wyman, Harkins, Choi, Taylor, & Fantl, 1987) interviewed 69 older incontinent women about the self-perceived impact of involuntary urine loss on their daily lives. The respondents were asked to rate the extent to which incontinence affected daily living, social interactions, and self-perceptions. Responses were summed into an index that ranged from 0 to 78, with high scores indicating greater impact. The mean score was 14.9 (*SE* = 1.48), indicating some impact. However, scores were only weakly related to objective measures of severity of incontinence, indicating that the severity of the condition did not contribute to the outcome.

Investigations in long-term-care institutions have not been supportive of this proposition. Incontinent residents and matched continent residents studied by Ouslander, Morishita, et al. (1987) did not differ on self-reported morale. The authors raise the possibility that their lack of signficant findings may be due to the failure to recruit the most severely incontinent residents. To summarize, the studies to date do not support the notion of debilitating effects of incontinence on psychological well-being in the older population. However, a weak relationship has been reported by two studies. By drawing respondents from either a nursing-home or a community population, most studies deal with relatively homogeneous groups of older adults in whom relationships would tend to be weaker because of the restriction in the range of values.

Economic Consequences

It is likely that considerable expense is associated with urinary incontinence. At a minimum, cost estimates for the condition must include the direct costs of evaluation, management, and treatment—including costs of labor, supplies, laundry, and medical procedures. More complete estimates also consider costs associated with the consequences of incontinence, such as medical care for skin breakdown. The most comprehensive estimates further assess the indirect or opportunity costs of incontinence; for example, income forgone due to premature retirement. For discussions of the components of cost analysis, see Hu (1986) and Ouslander and Kane (1984).

Calculation of the total costs of incontinence is limited by a lack of sufficient information on the extent, consequences, and management of the condition in the community. Depending on the assumptions made about these parameters, estimations will vary considerably. Hu (1986) estimated the total economic costs of incontinence for the United States in 1984 at about $8.1 billion—$6.6 billion in direct costs and $1.5 billion in indirect costs. According to his estimates, nursing homes incurred about $1.8 billion in direct costs, while the community incurred the remainder ($4.8 billion in direct costs and $1.5 billion in indirect costs).

Precise cost analyses are more feasible in institutional settings and for specific procedures. Ouslander and Kane (1984) estimated that the management of incontinence in nursing homes accounts for between 3 and 7% of all nursing-home costs. Standard health insurances reimburse only some procedures in the diagnosis and treatment of incontinence (e.g., catheterization, urodynamic testing, and surgery), and this may have implications for the selection of management strategies—for example, catheterization might be preferred over behavioral therapies. However, because the costs for routine care of incontinence are generally not reimbursed, individuals and nursing homes are bearing 60% of the total direct costs of the condition (Hu, in press). Recent studies that evaluate the economic consequences of various methods for managing incontinence in nursing homes include Schnelle, Sowell, Hu, and Traughber (1988); Schnelle, Sowell, Traughber, and Hu (in press); and Sowell, Schnelle, Hu, and Traughber (1987).

Institutionalization and Death

It has often been suggested that incontinence leads to institutionalization because the burden of managing the condition in a private home creates stress for caregivers. A number of studies provide indications that incontinence leads to institutionalization, but none provide conclusive evidence. In a British study, older adults living in hospitals and nursing homes had a much higher prevalence of urinary incontinence than those living in the community (Yarnell & St Leger, 1979). Likewise, a comparison between independently living older persons and applicants to long-term-care institutions revealed that the latter were more likely than the former to be incontinent of urine or bowels and to be receiving extensive help from family members (Kraus et al., 1976). Smallegan (1985) reported that incontinence was a cause of admission for 13% of the 288 newly admitted nursing-home patients whom she analyzed. Forty-four percent of the caregivers interviewed by Johnson and Werner (1982) mentioned incontinence as a contributing factor in their decisions to institutionalize family members. The evidence presented by these studies is limited because they were not longitudinal and in some cases not even correlational designs. Two studies that were longitudinal (Ekelund & Rundgren, 1987; Lewis, Kane, Cretin, & Clark, 1985) showed that being continent was related to discharge from nursing home to home.

Other research tempers the claim that urinary incontinence leads to institutionalization. For his cost estimations, Hu (1986) assumed that only 5% of incontinent residents would not have been institutionalized if they had been continent; this assumption was based on data from six nursing homes. Noelker (1987) found that caregivers for incontinent persons reported feeling burdened by the task. However only those caring for persons with combined fecal and urinary incontinence were more likely to consider institutionalization. Sanford (1975) concluded that urinary incontinence was "well tolerated" (p. 472) among the caregivers she studied, although the sleep disturbances associated with toileting assistance were troublesome.

When discussing institutionalization in the context of relieving care providers from the stress created by the condition, it should be remembered that incontinence may add to the burden and stress experienced by staff in long-term-care institutions (Yu & Kaltreiter, 1987).

Incontinent persons may also be at a greater risk of death than others. According to a life-table analysis conducted by Donaldson and Jagger (1983), in British hospitals and nursing homes, the mortality rate for frequently incontinent older adults appears to be higher than that for continent older people. Similar findings were reported quite a few years ago for the United States by Goldfarb (1969) and more recently for several Western countries by Berrios (1986), Ekelund and Rundgren (1987), Lewis et al. (1985), and Campbell et al. (1985). However, the latter authors noted that the relationship of incontinence to death is "probably a marker of conditions such as dementia, poor mobility and poor physical health rather than a risk factor in its own right" (pp. 69–70). Unfortunately, except for the Lewis study, none of these studies controlled other health factors to test this latter hypothesis. The effect in the Lewis study remained significant for mortality in the short run but not mortality in the longer run when such controls were used.

Summary

Much of the research on urinary incontinence and its consequences is based on small samples that are not representative of the general population because they are drawn from patients of medical practices, residents of nursing homes, and the like. In many of these studies, the consequences of incontinence are assessed by asking incontinent people for their perceptions about its impact on their lives. Not many studies contrast incontinent with continent persons on direct measures of hypothesized consequences. The majority of studies, even those that performed such contrasts, are cross-sectional rather than longitudinal. Thus, the direction of causation cannot be empirically investigated, although a causal sequence is often hypothesized or at least implied by the discussion. Furthermore, data are often analyzed by establishing bivariate relationships between incontinence and the consequence of interest. Because incontinence is related to many illness factors and other personal characteristics, multivariate analyses are required to establish the unique role of urinary incontinence as cause and to avoid interpreting spurious relationships.

EVALUATION AND DIAGNOSTIC PROCEDURES

Medical History

Although a medical history alone is not sufficient in the evaluation of urinary incontinence, it should be the first step. Specifically, it is important to obtain details of recent and past urine loss and of urologic, gynecologic, neurologic, and related medical and psychological illnesses. The use of medications such as diuretics, adrenergic and cholinergic agents, and tricyclics should be determined. (See Glezerman, Glasner, Rikover, Tauber, Bar-Ziv, & Insler, 1986, and Wyman, Choi, Harkins, Wilson, & Fantl, 1988, for comparisons of medical-history data with other methods of assessing incontinence.)

Voiding Diary

A helpful noninvasive method of assessing bladder function is the use of a self-recorded bladder diary (Wells, Brink, & Diokno, 1987). The diary should record the times of voiding, the voided volumes, the times of incontinent episodes, the character or description of the urine loss, the volume of urine lost, and times and volumes of fluid intake. These data will be helpful in assessing the functional bladder capacity, voiding habits, and character and severity of urinary incontinence. Test-retest correlations of information collected from a one-week diary indicated that this is a reliable method for assessing frequency of voluntary urination and of involuntary urine loss (Wyman et al., 1988).

A recent study showed that the average daily voided volume and the maximum voided volume correlate well with the maximum cystometric capacity and the clinical type of urinary incontinence (Diokno, Wells, & Brink, 1987). Because a small voided volume is highly correlated with uninhibited detrusor contractions on cystometry, the diary may be used to identify individuals who are suffering from overactive bladders. These individuals may be identified from the diary if the voiding interval is two hours or less, the maximum voided volumes are less than 150 ml, and the urine loss is preceded by a desire or urge to void. Certainly, before any intervention is started for an overactive bladder, a urine analysis and postvoid residual urine volume should be obtained to eliminate patients with urinary infection or those suffering from an overflow type of urinary incontinence.

Diaries or other monitoring instruments can also be used to set up and assess progress through various treatment regimens. Ouslander, Urman, and Uman (1986) tested two versions of an incontinence monitoring record (IMR) that they designed to overcome the inadequacies of the typical bladder record used in long-term-care settings. Both versions of the IMR covered a 24-hour period; contained sections for instructions, bladder and bowel status, and comments; and required few language skills (one version used symbols to indicate continence status and toileting behavior; the other used colored circles to convey this information). Results suggested that an instrument like the IMR might be considered for use by nursing-home staff.

Pad Test

The pad test is an inexpensive, noninvasive, and simple procedure that could be helpful in elusive cases where documentation of urine loss is needed. This test typically involves having the patient drink a measured amount of liquid, asking him to perform a series of activities while wearing a preweighed pad, then weighing the pad to measure the amount of urine lost. Variations in the specific conduct of the test are common in the literature. Also at issue is the value of the information gained. A comparison of pad-test results with uroflowmetry and videocystourethrography findings (taken as the standard) showed that the pad test had a false negative rate of 32%, making it unacceptable as a screening tool (Versi, Cardozo, & Anand, 1986). The authors of that study concluded that the pad test is more promising as an adjunct to cystometry. Sutherst, Brown, and Richmond (1986) reported that the pad test gave information about the severity of incontinence that was difficult to obtain from patient interviews and examination. A couple of studies found high test-retest correlations for the pad test (Fantl, Harkins, Wyman, Choi, & Taylor, 1987; Klarskov & Hald, 1984).

Urine Analysis and Postvoid Residual Urine

Further simple tests that are appropriate in the initial evaluation of a patient with urinary incontinence are urine analysis and postvoid residual (PVR) urine volume measurement. Urine analysis and urine culture, when indicated, will be helpful in identifying urinary infections as a possible cause or effect of incontinence. Postvoid residual urine measurement may be helpful not only in assessing the mechanism of incontinence but also in developing the plan for treatment. However, a recent study of continent and incontinent subjects showed that PVR urine at any volume was not associated with incontinence status (Diokno, Brown et al., 1988). This suggests that PVR urine may not be directly responsible for urinary incontinence but could serve as a predisposing factor when combined with other causal factors. In measuring PVR urine volume, one should emphasize that PVR urine should be measured only after the patient has voided with a full bladder.

Physical Examination

A physical examination is another essential part of the initial evaluation. It should include pelvic, rectal, and neurologic examinations. A major finding during the pelvic examination is the presence or absence of atrophic vaginitis. Because atrophic vaginitis is due to estrogen deprivation, it can be assumed that when atropic vaginitis is present, atrophic urethritis is also present. This latter condition is usually associated with urge incontinence or with symptoms of bladder irritation like urinary urgency and frequency (Walter, Wolf, Barlebo, & Jensen, 1978). The presence of cystocele or cystourethrocele, while not necessarily related to incontinence (Ouslander, 1986a) or the type of incontinence, may affect the choice of treatment because the presence of a large cystocele may necessitate a vaginal rather than a suprapubic approach to incontinence repair. During the rectal examination, one should look for evidence of fecal impaction, test the anal tone, and check the status of the prostate gland. Sensory testing of the perineum should also be performed. The finding of a unilateral or bilateral saddle anesthesia or hypesthesia could be the only physical sign of a neurogenic cause of incontinence (Diokno, Normolle, Brown, & Herzog, in press).

Provocative Stress Test

For patients complaining of stress urinary incontinence, or when stress incontinence is suspected, a full bladder provocative stress test, either in the lithotomy or standing position, is very specific (specificity of 98.5%). Although only approximately 40% of patients complaining of stress incontinence will develop a positive test (Diokno, Normolle et al., in press), a positive stress test is highly suggestive of the presence of stress incontinence. A negative stress test in the absence of complaints of stress incontinence gives assurance that stress incontinence is not present. It should be remembered, however, that the specific cause of stress incontinence cannot be determined solely from the provocative stress test. Information from other sources is needed to arrive at an accurate assessment of cause.

Urodynamic Tests

Cystometry is a relatively simple test to confirm the suspected presence of uninhibited detrusor contractions (Lapides & Diokno, 1976). It is performed by filling the bladder with fluid while measuring intravesical pressure and volume. However, one should be cautious in interpreting findings of uninhibited detrusor contractions because these contractions are sometimes observed in continent people who do not have any bladder symptoms (Diokno, Brown, Brock et al., 1988). For patients suspected of having overactive bladders (and in the absence of residual urine and significant outlet obstruction), a pharmacologic trial of a bladder relaxant (anticholinergic–antispasmatic agent) might be considered. Such a trial has the dual effect of treating the symptom and possibly diagnosing the condition. By measuring the postvoid residual urine before the pharmacologic trial, one eliminates the possibility of overflow incontinence secondary to a hypotonic decompensated bladder with or without obstruction. It also eliminates the possibility of treating detrusor hyperactivity with impaired contractibility (DHIC), a condition recently described by Resnick and Yalla (1987). This abnormality, DHIC, will need independent confirmation by other investigators as well as further elucidation of its pathophysiology.

There are several other urodynamic tests that are available for the evaluation of urinary incontinence. Many are useful in research and in understanding the pathophysiology of the bladder and urethral dysfunction. However, their utility in clinical practice is still being debated. Passive and dynamic urethral profilometry, lateral stress cystography, and uroflowmetry are not indicated as "routine tests" for diagnosing any specific type of urinary incontinence in the elderly. Rather, they should be used only in selected cases because their value appears to be in evaluating treatment options and outcomes (Diokno, Normolle et al., in press; Fantl, Hurt, Bump, Dunn, & Choi, 1986; Fischer-Rasmussen, Hansen, & Stage, 1986; Resnick & Diokno, 1986). Uroflowmetry, for example, was not able to distinguish between continent and incontinent subjects, nor was it able to distinguish the different clinical types of incontinence (Diokno, Normolle et al., in press).

INTERVENTIONS

Physician Care

As will be obvious from the following discussion of interventions, medical treatment for urinary incontinence is increasingly sophisticated and effective. However, treatment for an incontinent person requires bringing her condition to the attention of health-care professionals. Only half of the incontinent respondents in the MESA survey had discussed their urine loss with a physician (Herzog, Fultz, Normolle et al., 1989). A similar percentage of unreported incontinence was found in a small volunteer sample studied by Simons (1985). One-third of the incontinent older adults interviewed by Mitteness (1987a) had never mentioned their condition to a physician. Thomas et al. (1980) found that only 16 of their 158 incontinent respondents (10 of 34 with moderate or severe incontinence) were receiving nursing, social work, or laundry services for the problem. The majority had never sought help. As a consequence, many people experiencing involuntary urine loss go untreated or attempt self-care.

The reasons given for not reporting incontinence include embarrassment, the seemingly trivial nature of the problem, and a belief that urine loss is inevitable and/or cannot be cured (McGrother et al., 1987; Mitteness, 1987a; Simons 1985). However, even when incontinence is reported to a doctor, there are suggestions that the patient's concerns may be ignored or dismissed (Mitteness, 1987a). Clearly, a responsibility for detecting and treating incontinence must be accepted by physicians and other practitioners. Questions about urine control should be a standard part of routine medical visits, to be initiated by the physician because of the embarrassment and denial on the part of the patient. Continuing medical education should focus on the epidemiology, impact, and management of the condition. (See Colling [1988] for discussion of an educational program designed for nurses in nursing homes; and Brocklehurst [in press] for comments on professional and public education.)

Drug Interventions

Pharmacotherapy for urinary incontinence is now a well-accepted approach, either alone or in combination with other modalities. For urge urinary incontinence, secondary to uninhibited detrusor contractions, several agents are available. One of the most widely studied and used drugs approved specifically for the control of uninhibited bladder contractions is oxybutynin chloride, an anticholinergic and antispasmodic agent. The dose is 2.5 mg to 5 mg orally, up to four times per day. In the elderly 70 to 94 with a mean of 84, Ouslander and his colleagues demonstrated pharmacokinetically that oxybutynin is safe among octogenerians (Ouslander, Blaustein, Connor, Orzeck & Yong, 1988). The dose is 2.5 mg to 5 mg orally, up to four times per day. Other drugs available to relax the bladder are propantheline, at a dose of 7.5 to 15 mg orally four times per day, and imipramine, 10 mg to 150 mg per day (Ouslander & Sier, 1986; Resnick & Diokno, 1986). Patients should be warned before initiation of therapy about the usual anticholinergic effects, such as dry mouth, blurred vision, and constipation. Anticholinergic agents should be used with extreme caution in confused or demented patients because the most dangerous side effect in the elderly is exacerbation of cognitive impairment. In addition, bladder relaxants may not work as well in functionally impaired patients (Ouslander, Blaustein, Connor, & Pitt, 1988).

Recently, a few studies have suggested the value of terodiline, an anticholinergic and calcium-blocking agent that is not yet available in the United States, in the treatment of urgency and motor urge incontinence. Gerstenberg, Klarskov, Ramirez, and Hald (1986) and Lukkarinen, Gröhn, Wilén-Rosenqvist, Juusela, Sotarauta, and Lehtonen (1987) performed double-blind cross-over studies using terodiline and placebo (Gerstenberg et al., 1986) and emepromiun (also not available in the United States) (Lukkarinen et al., 1987). Although both research groups concluded that terodiline should be considered as an alternative drug in the management of motor urge incontinence, its effects appeared to be of marginal significance when compared to those of the other drugs. In the Gerstenberg et al. study, terodiline was subjectively superior to placebo, in that it was preferred by 14 of the terodiline-treated patients and by only 1 of the placebo-treated patients. Although the 24-hour frequency was reduced with terodiline by one episode, a significant difference ($p < .05$), further analysis of the data showed that after eliminating one subject who improved dramatically, the difference might not reach a significant level. Other differences, such as first sensation of fullness and volume of detrusor contraction, each had a mean increase of only 20 ml. The detrusor contraction pressure was not signficantly affected, nor were the results of the pad test and the bladder volume measurement.

In their study comparing terodiline to emepromiun, Lukkarinen et al. (1987) found no significant differences in the reduction of voiding frequency, urinary flow rate, postvoid residual urine, and patient preference between the two active drugs. Emepromiun, but not terodiline, produced a significant increase in bladder capacity in the supine position at the point of the first desire to void. However, there was no increase in the bladder volume at the point of a strong desire to void for both terodiline and emepromiun. Side effects of terodiline were noted in 60% of patients, of emepromiun in 45%, and of placebo in 20%. Side effects of terodiline that were not observed with emepromiun and placebo included headache, nausea, and dizziness.

Taken altogether, these studies suggest that terodiline is no better than emepromium and that its effects are marginal at best. More studies would be needed to convince practitioners of the value of this drug over drugs now firmly established in practice.

Pharmacotherapy for stress urinary incontinence includes the use of estrogen and alpha-adrenergic agents. Cyclically administered estrogen (0.3–0.6 mg daily for 21 of 28 days) is useful for women with atrophic vaginitis. Alpha-adrenergic agents such as phenylpropanolamine (25–100 mg orally, twice a day, and ephedrine, 25 mg orally, three times a day) are effective in certain cases of stress incontinence. These alpha-adrenergic agents are contraindicated in patients wtih hypertension, coronary heart disease, and thyroid disease.

Although the effect of alpha-adrenergics in the treatment of stress urinary incontinence was recently confirmed (Lehtonen, Rannikko, Lindell, Talja, Wuokko, & Lindskog, 1986), the use of estrogen as a treatment for postmenopausal women with genuine stress incontinence is being questioned. Wilson, Faragher, Butler, Bu'Lock, Robinson, & Brown (1987) conducted a double-blind prospective trial using oral estrogen and placebo for three months and found no statistical difference between the two in subjective or objective assessments of urodynamically proven genuine stress incontinence. They concluded that in view of the possible risks of estrogen therapy, its use in genuine stress incontinence is limited. These findings are similar to those from the double-blind trial by Walter et al. (1978). In that study, no changes were found in either stress incontinence or the urethral pressure profile with estrogen use, although a significant reduction in frequency and urgency was noted. Similar conclusions emerged from a well-controlled study of a small number of subjects that assessed improvements only subjectively (Samsioe, Jansson, Mellström, & Svanborg, 1985). Currently, then, there is no convincing evidence that stress incontinence can be improved by estrogen, although symptoms of urgency and frequency might be improved. Fantl, Wyman, Anderson, Matt, and Bump (1988) hypothesized that estrogen supplementation may modulate the sensory threshold of the urinary tract. Additional studies to clarify this issue are needed.

Surgical Interventions

For stress urinary incontinence, the standard approach is the bladder suspension procedure (Burch, 1968; Lapides, 1971; Marshall, Vaughan, & Parnell, 1986). The conventional approach is through suprapubic incision, where the urethra and bladder neck are relocated to their original positions in the pelvic cavity behind the symphysis pubis. Another approach that has gained acceptance in recent years is the combined vaginal and suprapubic approach advocated by Pereyra and Lebherz (1978), Stamey (1980), and Raz (1981). This approach involves a primary vaginal approach to apply the suspending sutures at the vicinity of the bladder neck, then retrieving them at the suprapubic area where they are fastened anteriorly to suspend the bladder neck and urethra.

Spencer, O'Conor, and Schaeffer (1987) compared retrospectively the efficacy of the Stamey endoscopic vesical neck suspension with the Marshall Marchetti-Krantz (MMK) vesicourethropexy in the correction of stress urinary incontinence. Their cure rate for the Stamey procedure was 61% and 57% for the MMK procedure, with a follow-up period of at least 21 months. However, complications were observed in 37.5% of the Stamey and 18.5% of the MMK patients.

In a study comparing the endoscopic suspension with the suprapubic suspension approach in terms of hospital stays, Green, McGuire, and Lytton (1986) showed that the average hospitalization was 4.04 days and 6.0 days, respectively. The Green study found that the short-term success rates were equivalent, whereas the retention rate was higher with the endoscopic approach (34%) than the suprapubic approach (19%).

Mundy (1983) compared the suprapubic colposuspension technique with the Stamey endoscopic technique in the treatment of stress urinary incontinence. With one year of follow-up, subjective and objective improvements with the colposuspension operation were 89 and 73%, respectively. With the Stamey operation, these improvements were 76 and 40%. Mundy concluded that the endoscopic procedure was quicker and simpler but had higher postoperative difficulties.

The surgical treatment of intractable urge incontinence has proven disappointing. The neurosurgical approach includes selective sacral rhizotomy and bladder transection. Although sacral rhizotomy was initially shown to be effective, its long-term results have been less encouraging. Müller, Frohnberg, Schwab, and Thüroff (1986) reported their using selective sacral denervation with phenol injection. Their immediate success rate at two–seven weeks was 70% in terms of bladder capacity and first desire to void. On long-term follow-up (77 months), the success rate had decreased to 16%.

Lucas and Thomas (1987) reported the results of their endoscopic bladder transection technique in the management of intractable detrusor instability. They reported abandoning their procedure because only 2 of 18 patients were completely relieved of their symptoms.

The use of the AS 800 artificial urinary sphincter for the treatment of urinary incontinence secondary to defective urethra has gained widespread use (Goldwasser, Furlow, & Barrett, 1987). In men with intractable urinary incontinence following prostatectomy secondary to an incompetent sphincteric urethra, the use of the AS 800 is now widely accepted. The acceptance has been due to the simplification of the device and its high success rate. Another indication for an artificial urinary sphincter is in women who have intractable incontinence secondary to a defective urethra. A success rate of over 90% in several series of women who had previously had one or more conventional operations for their incontinence is very encouraging (Diokno, Hollander, & Alderson, 1987).

Another option for women with poor or nonfunctional urethral sphincter is the sling operation. For this technique, the reader is advised to read Schmidbauer, Chiang, and Raz (1986).

Another method available for nonfunctional urethra is the use of silicone paste injected directly into the region of the defective urethra. Since the introduction of this technique by Politano and associates (Lewis, Lockhart, & Politano, 1984), other centers have used it with mixed results. There are two drawbacks to this technique. One is the fact that the material is not approved for use as an injectable material into the urethra. Second, animal studies have shown that the injected silicone can migrate to distant organs such as lungs and brain.

In summary, several surgical procedures are available that seem to have good success. However, evaluation of the procedures is difficult because of limitations in many of the relevant studies: the follow-up period is too brief, results are measured only through self-reports; and unintended outcomes of the surgery (e.g., voiding difficulties) are not assessed.

Nonmedicating/Nonoperative Interventions

There are several strategies for treating or managing urinary incontinence that provide an alternative (or complement) to surgery and medication. Among these are pelvic floor muscle exercises, electrical stimulation, behavioral therapies, absorbent products, catheterization and collection devices, and modifications to the living environment. Given the availability of many excellent recent reviews (Brink & Wells, 1986; Burgio & Burgio, 1986; Gregory & Purcell, 1986; Hadley, 1986; McCormick, Scheve, & Leahy, 1988; Morishita, 1988; Ouslander, Kane, Vollmer, & Menezes, 1985; Resnick & Yalla, 1985; Snow, 1988; Warren, 1986; Wells, 1988; Williams & Pannill, 1982), this section will highlight selected research questions and findings rather than describe each method in depth.

Strengthening the perivaginal muscles through repeated contractions and relaxation has been advocated as a treatment for women with stress urinary incontinence (e.g., Benvenuti, Caputo, Bandinelli, Mayer, Biagini, & Sommavilla, 1987; Kegel, 1951). This exercise is a relatively inexpensive and safe procedure that appears to be effective among healthy, cognitively competent women of all ages, although perhaps more so among younger women (Henderson & Taylor, 1987; Wilson, Al Samarrai, Deakin, Kolbe, & Brown, 1987) and those with less severe leakage (Klarskov et al., 1986; Wilson, Al Samarrai et al., 1987). While Kegel (1951) advocated the use of the perineometer (a vaginal chamber attached to a manometer) as an aid in learning the exercises through immediate feedback, this aspect of instruction has often been omitted (Burgio, Robinson, & Engel, 1986). There is renewed interest in the use of biofeedback for teaching Kegel exercises (cf. Burns, Marecki, Dittmar, & Bullough 1985; Taylor & Henderson, 1986), and at least two studies have demonstrated its superiority over more conventional methods of instruction (Burgio, Robinson et al., 1986; Shepherd, Montgomery, & Anderson, 1983; but see Castleden, Duffin, & Mitchell, 1984, for conflicting findings). In addition to determining the most effective training procedures, future work must be devoted to specifying the most effective exercise regimen. The optimal amount/duration of exercise has not been agreed upon (Wells, 1988).

Electrical stimulation of the pelvic floor muscles is another method of improving urethral closure to reduce stress incontinence. Electrical pulses are transmitted through vaginal or anal plugs, causing muscle contractions that are, in principle, similar to Kegel exercises. Apart from the muscle-strengthening effect of electrical stimulation, inducing contractions of the pelvic floor muscles might help women identify those muscles during Kegel training (Burgio & Burgio, 1986). However, a comparison of subjects practicing pelvic floor exercises with and without electrical stimulation showed little difference in outcome (Wilson, Al Samarrai et al., 1987). Interestingly, electrical stimulation appears simultaneously to contract the pelvic floor muscles *and* relax the bladder. Thus, it has been found effective in treating urge and urge/stress incontinence, as well as the pure stress type (Eriksen, Bergmann, & Mjølnerød, 1987, is a recent example). Another recent study suggested that intravaginal electrical stimulation might be even more successful for patients with detrusor instability than for those with genuine stress incontinence (Fall et al., 1986). Although these are favorable findings, patient tolerance for aspects of electrical stimulation is not always high. Nakamura and associates have investigated methods that shorten the treatment period and avoid problems associated with anal plugs (Nakamura & Sakurai, 1984; Nakamura, Sakurai, Sugao, & Sonoda, 1987; Nakamura, Sakurai, Tsujimoto, & Tada, 1986). The acceptability and practicality of electrical stimulation for older people is questionable; studies to date have not focused on this population.

Behavioral therapies other than pelvic floor exercises include biofeedback regimens and scheduling regimens. In addition to the application discussed above, biofeedback may be useful in helping patients gain control over urinary urgency and urge incontinence (Burgio, Whitehead, & Engel, 1985; Cardozo, Abrams, Stanton, & Feneley, 1978). (See Ehrman, 1983, for a discussion of methods employed at the National Institute on Aging's Gerontology Research Center.) Scheduling regimens involve toileting at planned intervals; the intervals are fixed or flexible, depending on the program. One variant, "prompted voiding," has produced encouraging results in a nursing-home population (Petrilli, Traughber, & Schnelle, 1988), although a similar intervention was less successful in another study (Ouslander, Blaustein, Connor, & Pitt, 1988). Another variant, "bladder training," is a promising strategy for treating incontinence in community residents (Fantl, Wyman, Harkins, Taylor, & McClish, in press).

The use of absorbent products is one of the most common methods for managing incontinence, both in the community (Brink, Wells, & Diokno, 1987; Herzog, Fultz, Normolle et al., 1989; Mitteness, 1987b) and in nursing homes (Starer & Libow 1985). Included here are products specifically designed to absorb urine (e.g., washable or disposable protective garments) and those that have another primary purpose (e.g., sanitary napkins, paper towels). Health professionals caution that these products should be used as a last resort (Diokno, 1983; Starer & Libow, 1985; Williams & Pannill, 1982) because premature use could keep an incontinent person from seeking treatment for a correctable condition. However, the popularity of absorbent products suggests that incontinent people may be choosing them as a first intervention. To address this issue, studies that examine patterns of treatment selection over time are needed. We need to identify how incontinent individuals decide upon a particular management strategy, how they assess its effectiveness, and how they act upon that assessment.

In patients with overflow urinary incontinence due to inadequate bladder emptying, the use of intermittent catheterization should be seriously considered if surgical relief of obstruction is not possible or the surgical approach has failed. In a series of elderly men and women with voiding difficulties, Bennett and Diokno (1984) reported that self-intermittent catheterization can easily be mastered and that the technique is safe for short- and long-term use. For the procedure and results and complications of intermittent catheterization, the reader is advised to read Diokno (1988).

If other methods of management fail, collection devices that direct urine from the urethral opening into a storage bag can help an incontinent person remain dry. Because of the complications associated with indwelling urethral catheters (Kennedy, Brocklehurst, & Lye, 1983; Ouslander, Greengold, & Chen, 1987a), an external device is preferred (Warren, 1986). External condom catheters are widely available for men (see Ouslander, Greengold, & Chen, 1987b, for a study of external catheter use and urinary tract infection), but external devices for women are still very new. Another possible alternative to indwelling urethral catheters is suprapubic catheterization. However, careful long-term evaluation is needed before its success in managing incontinence will be known. Also needed are studies of the pathogenesis of complications of bacteruria, because of the risk of bacteruria posed by catheterization (Warren, in press).

SUMMARY AND CONCLUSION

Recognition has been growing over the past two decades that urinary incontinence is a rather widespread condition among older adults. Prevalence rates of about 30% for any incontinence and about 5% for severe incontinence among older adults were suggested by several European studies and have recently been confirmed by American studies. The rates are typically higher among women than men.

Despite these findings, much about the true distribution of urinary incontinence remains to be firmly established. The proportion of different types and the differences between sexes, ages, and races need to be confirmed using representative population samples and valid measures of incontinence. These distributions cannot be accurately described using clinical populations.

Perhaps because urinary incontinence is viewed as highly embarrassing, it has not been a focus of media coverage or public discussion. More attention by the media and by health-care professionals would build public awareness of the condition. Older adults and their caregivers need to know that urinary incontinence is common and treatable, so that they will identify it promptly and bring it to their physicians' attention. Health-care providers and social workers must also be alert to the possibility of incontinence among their clients. They should be prepared to ask older patients directly, because many patients may disregard urine loss or be too embarrassed to mention it.

Currently, much of the management of urinary incontinence appears to be self-devised. Many incontinent persons have not talked to a physician about their problem. The largest proportion of those who attempt to control their urine loss use absorbent products or try to avoid loss by awareness of toilet locations and frequent toileting. Reliance on these methods is unfortunate because much progress has been made in developing diagnostic and treatment procedures for urinary incontinence. For example, surgical procedures to rectify an incompetent sphincter have been shown to be effective and are generally accepted. There are a number of medications effective for controlling detrusor instability. Further, various behavioral techniques appear to be promising as noninvasive initial interventions for many patients.

We are on weaker ground regarding the prevention of and early intervention in urinary incontinence. The existing epidemiological data on the development of incontinence are poor. We do not know the proportion of urinary incontinence that is transient and the proportion that is chronic or established. Nor do we know the risk factors for onset and progression of the condition. It is not clear whether one type of incontinence leads to another or whether the types are associated with independent sets of risk factors and sequelae. The data needed for investigation of these issues are expensive because longitudinal population samples are required. The methodological requirements are also prohibitive because valid measures and little (or at least nonbiasing) attrition are necessary. Yet these research issues should be high priorities because understanding the circumstances of the onset and progression of urinary incontinence will provide the basis for developing preventive programs.

To conclude, in recent years an impressive body of knowledge on urinary incontinence has accumulated, but much more remains to be learned about this little-acknowledged problem of many older adults.

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CHAPTER 4

Age, Physical Fitness, and Mental Processing Speed

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In the past 25 years, encouraged perhaps by the programs initiated during the Kennedy administration and by Kenneth Cooper's book *Aerobics* (1968), interest in the benefits, both physiological and psychological, that accrue to individuals who exercise on a regular basis has grown tremendously. Indeed, the importance of incorporating a program of systematic exercise into one's lifestyle is now advocated by organizations such as the American Medical Association (AMA) and the Department of Health and Human Services. Where in the early 1960s under the leadership of President Kennedy, the emphasis was on exercise in the early years of life, today's recommendations are that all age groups, including the elderly, participate in regular, systematic exercise programs. The current rather ambitious objective of the U.S. Public Health Service is to have 50% of older Americans exercising regularly by 1990. This would represent a substantial increase from the 28% of people over 65 who reported exercising regularly in the National Health Interview Survey of 1985 (National Center for Health Studies, 1986). At that time, although 41% reported having walked for exercise in the previous two weeks, only 12% reported having done calisthenics, 5% biked and 1% jogged.

This burgeoning interest in the broad benefits of exercise has spawned the growth of a multibillion-dollar fitness industry. Magazines and books are devoted to fitness; health clubs and spas are everywhere; exercise equipment of all varieties and prices is available to the health-minded consumer; and television and radio talk shows regularly feature segments devoted to fitness. Exaggerated claims are often made, implicitly or

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explicitly, about the benefits that derive from exercise. Typically included among them is the claim that the aging process can be slowed by exercise; that is, an important benefit of the fitness we achieve through exercise is that the rates at which different functions decline with age are slowed. In a youth-oriented society like ours, this claim has wide appeal. The belief that the ravages of age can be lessened through exercise is not new, however. Cicero, in his essay *On Old Age* (44 B.C.), wrote:

> One must fight against old age . . . as one fights a disease; you must take stock of your health; you must engage in moderate exercises. . . . And in truth you must not come to the aid of your body only, but much more to that of the mind and spirit. For these are snuffed out by old age unless you drop in oil as into a lamp; and bodies, of course, grow heavy with the fatigue of exercise, but spirits are lightened by exercising. (p. 18)

Cicero's advocacy of the benefits of exercise are based on reason, not empirical findings, whereas that of the fitness industry is motivated to a large extent (and well it should be) by the potential for profit in a health-conscious society. The recommendations of the AMA and the goals of the Public Health Service, however, come in large measure from an evolving body of scientific research on the physiological and psychological effects of exercise. What do these studies tell us about the influence of exercise on the aging process? A substantial literature has demonstrated that peripheral physiological functions, such as cardiovascular, pulmonary, and musculoskeletal, are maintained or improved in the elderly by regular exercise (Gorman, Posner Gitlin, & Windsor, 1988; Hollosczy, Ehsani, & Hagberg, 1983; Kannel & Sorlie, 1979; Paffenberger, Hyde, Wing, & Hsieh, 1986; Shephard, 1978), and the growing literature is revealing that exercise promotes the performance of daily activities and enhances certain aspects of mental functioning and psychological well-being in older adults (Bennett, Carmack, & Gardner, 1982; Berger, 1988; Elkowitz & Elkowitz, 1986). In a recent review, exercise is offered as one of several factors that can contribute to successful, as opposed to usual, aging (Rowe & Kahn, 1987).

Nevertheless, because the belief is relatively new that regular exercise may have broader psychological and physiological benefits for older adults than previously imagined, there are many important issues that have not been addressed or are only beginning to be examined through systematic research. Little attention has been given, for example, to evaluating (a) the influence of regular exercise on the psychological well-being of segments of the older population that may benefit from it (e.g., those with anxiety disorders or depression); (b) the beneficial effects of exercise on central, as opposed to peripheral, nervous system functions; and (c) the link between the physiological and psychological benefits of exercise.

The last few years have seen considerable publication activity in some of these areas, however. For example, comprehensive reviews have appeared on physical performance and aging (Stones & Kozma, 1985, 1986), motivation and other determinants of exercise (Dishman, 1988), and psychosocial effects of exercise (Berger, 1988; Hird & Williams, 1989). A common observation of these reviews is that the research methodologies in these areas need refinement before substantive conclusions can be made.

In this chapter I will not deal with these aspects of aging and exercise. Rather, I shall focus attention on the effects of exercise on central nervous system (CNS) functions in the elderly. My interest in this area derives from continuing challenges to the historical belief in neuroscience that CNS decline is inevitable with age; that it is steady, unremitting, and irreversible; that it occurs at a rate determined genetically, and consequently can be influenced only by identifying the basic neuromolecular mechanisms mediating the aging process and developing the appropriate neuropharmacological interventions. A growing number of neuroscientists are beginning to disavow the belief that CNS decline is unremitting and irreversible, to suggest that it may be slowed or reversed to varying degrees by factors such as nutrition (see reviews in Ordy, Harman, & Alfin-Slater, 1984; Wurtman, 1982), mental activity (Greenough, McDonald, Parnisari, & Camel, 1986), and exercise (Black, Polinsky, & Greenough, in press; Spirduso & Farrar, 1981).

My discussion will be restricted to the beneficial effects of exercise on cognitive processes, revealed in the analysis of speeded decision-making, as manifestations of the efficiency with which higher-order information can be integrated in the CNS. I will review studies that have assessed the effects of exercise in older individuals on behavioral (reaction time, movement time) and electrophysiological (electromyographic activation, timing of brain electrical activity) indexes of speeded decision-making. This review will suggest that although much more research is needed, exercise may indeed contribute to ameliorating declines in certain cognitive (i.e., central) functions.

BEHAVIORAL STUDIES

Age-related declines in a wide variety of cognitive processes are reported consistently in the psychological literature. Among the most reliably observed declines are those reported for mental processing speed, selective attention, and short-term memory (see reviews in Kausler, 1982; Plude & Hoyer, 1985; Poon et al., 1980; Salthouse, 1985). The prevalence of decrements in these mental functions across the lifespan has been demonstrated repeatedly by investigators in the field of cognitive aging. Accordingly, the goals of these investigators have been to delineate the decline as precisely as possible by (1) determining the extent to which disease processes contribute to declines in cognitive functions among elderly persons (see reviews in Johnson, 1982, and Katzman & Terry, 1983); (2) identifying differences in factors such as information-processing strategies and motivation that may produce results that suggest a cognitive deficit where none in fact exists (see Kausler, 1982; Strayer, Wickens, & Braune, 1987; White & Cunningham, 1982); and (3) distinguishing the elements of a cognitive task that produce age-related differences from those that do not (Hasher & Zacks, 1979; Plude, Hoyer, & Lazar, 1982; Wright & Elias, 1979).

A case in point is the slowing-with-age phenomenon. This slowing has been observed with such consistency in reaction-time (RT) studies of mental processing speed in the elderly that it represents one of the most robust findings in the psychological literature (Birren, Woods, & Williams, 1980; Kausler, 1982; Salthouse, 1985). Decrements in the rate of mental processing are considered to be typical concomitants of aging; however, the precise quantitative and qualitative nature of this slowing and the factors that influence it are yet to be delineated (Salthouse, 1985). The slowing-with-age phenomenon is thought to reflect changes that occur primarily in the rate of transmission and integration of information in central, rather than peripheral, nervous system pathways (Birren et al., 1980; Kausler, 1982; Salthouse, 1985). This conclusion is suggested by the fact that peripheral transmission composes only about 4% of the total reaction time in simple manual tasks like those studied typically in the laboratory (Birren et al., 1980; Kausler, 1982; Spirduso, 1980; Weiss, 1965) and by the observation that there is little age-related decline in peripheral nerve transmission (Desmedt & Cheron, 1981; Hugin, Norris, & Shock, 1960). Moreover, the magnitude of the RT difference between old and young subjects increases as processing complexity is increased and, presumably, central mechanisms are engaged more significantly (Cerella, 1985).

Within the past several years, data have begun to emerge that suggest that the slowing-with-age phenomenon may not be as inevitable as many believe. Studies of the information-processing rates of elderly persons who have maintained a lifetime involvement in aerobic exercise indicate that response speed is significantly faster in these older adults than it is in their sedentary age peers and that it may approximate the speed of young adults (see reviews in Spirduso, 1980, 1981). Indeed, in the first systematic study of this relationship, Spirduso (1975) found a close correspondence between processing speed, age, and physical activity level. She compared the performances of active (handball or racket sports), older (50–70 years), and younger (20–30 years) men with their sedentary counterparts on two types of speeded decision-making tasks, simple and disjunctive. Both RT and movement time (MT) were assessed. Simple reaction time was evaluated by presenting the subject with a series of light flashes that called for him to lift his hand from a microswitch as quickly as possible, and disjunctive reaction time was measured by presenting him with one of two stimuli, only one of which called for the hand to be lifted from the microswitch. Thus, the disjunctive reaction required the subject to distinguish between the two stimuli and to respond only to the appropriate one. Movement time was measured by further requiring the subject in both conditions to move his hand from the microswitch to a second microswitch located a short distance away.

Spirduso found that the older sedentary subjects were significantly slower than the other groups on all of the response-time measures and that the response times of the other three groups were generally comparable. She did find, however, that the order of these times roughly approximated physical activity level, even though the differences were not significant among the two young groups and the older exercisers on most of the measures. That is, young-active subjects had the fastest times, followed by the old-active, young-inactive, and old-inactive. Specifically, the old-active subjects were significantly faster than their sedentary age peers on all of the measures, whereas the young-active subjects were superior to their inactive counterparts only for movement time (in both RT tasks). Although the old-active subjects were superior to their age peers on the disjunctive reaction, they were slower than both young groups.

Spirduso and Clifford (1978) extended the work of Spirduso (1975) by adding groups of runners to the design. They tested speeded decision making in older (60–70) and younger (20–30) men who were runners, racket sports participants, or sedentary. Subjects performed a simple and a choice RT task. As in the previous study, movement time was also measured. The choice reaction required the subject to move his hand from the starting position (the time to lift off this first microswitch provided the measure of choice RT) to one of three finishing positions corresponding to one of three lights that could flash (the time from lift-off to touchdown on the second microswitch provided the measure of movement time). Spirduso and Clifford's results revealed that both older-active groups had simple and choice RTs that did not differ from the young nonexercisers and that the young-active were the fastest and the old-sedentary were the slowest among the groups. Among the older-active subjects, the racket sportsmen were faster than the runners. This difference was not apparent among the young, however. For movement time, the old-active subjects were faster than the young-inactive, the young runners were faster than the young racket sportsmen, but the older runners were faster than the older racket sportsmen only in the choice reaction-time condition. Measures of variance revealed that the active were more consistent than the sedentary for both RT and MT, and that the old-inactive were the most variable.

The differences in response times associated with exercise level and age first reported by Spirduso (1975) and replicated by Spirduso and Clifford (1978) have been corroborated in other laboratories (Clarkson, 1978; Kroll & Clarkson, 1978; Sherwood & Selder, 1979) and extended to include women (Baylor & Spirduso, 1988; Rikli & Busch, 1986). In addition, Sherwood and Selder (1979) reported a steady age-related decline in response speed for simple and choice reactions among untrained men and women ranging in age from the early twenties to the late fifties that was not evident among a comparable group of trained subjects. Thus, the results of these studies suggest that mental processing speed may be preserved in persons who have incorporated exercise into their lifestyles. This effect has been demonstrated very convincingly for aerobic exercise on many peripheral functions. A large body of literature indicates that the cardiovascular and general physiological fitness of active older adults is superior to that of their age peers (Ostrow, 1984; Seals, Allen et al., 1984; Seals, Hagberg et al., 1984; Shepherd, 1978) and among champion master athletes is comparable to young athletes (Cantwell & Watt, 1974; Pollock et al., 1974a,b; Seals, Hagbert et al., 1984; Shepherd & Kavanagh, 1978; Vaccaro, Morris, & Clarke, 1981). Hence, it is not unreasonable to hypothesize that certain CNS functions may be sustained as well by exercise.

ELECTROPHYSIOLOGICAL STUDIES

Fractionation of the Total RT: Electromyographic Measures

Although the behavioral results are suggestive, they must be replicated and extended to include techniques that permit the elements of processing that are engaged from the stimulus input to the response output to be delineated and the differential effects of exercise to be isolated. One method that has been used to achieve this goal is measuring the activation of the peripheral muscles that control the required movement.

Recording this electromyographic (EMG) activity has permitted investigators to infer two components of the overall reaction time: premotor time and contractile or motor time (Weiss, 1965). *Premotor* time is measured from the onset of the stimulus to the initial activation of the muscle, and *contractile* time is measured from the intitial activation of the muscle to the time of the overt response. The former is thought to represent the time involved in the transmission of information over central pathways, and the latter is thought to represent the time required for the engagement of the mechanisms mediating peripheral muscle contraction.

Clarkson (1978) utilized this procedure with young (18–28) and older (55–79) male subjects who were either *active* (defined by Clarkson as "men who participated in regular physical activity" [p. 18]; the type was unspecified) or *sedentary*. They performed simple and choice reaction-time tasks similar to those of Spirduso and Clifford (1978) that required a right-knee extension response. The groups were found to be ordered in the same way on all of the measures of processing speed. The young-active subjects were the fastest, followed by the young-inactive, old-active, and old-inactive. The two young groups did not differ, however, on any of the measures, whereas the old-active subjects were faster than the old-inactive on the measures of simple and choice RT, movement time, and premotor time for the simple reaction. The young-inactive were found to be faster than the old-active for simple and choice RTs, but not for any other measure.

It appears, then, that the total RT (simple and choice) is very sensitive to the effects of aging, and the movement-time component, although sensitive to age effects, seems to be more responsive to activity level in that the old-active group did not differ from the young on this measure. Contractile time appeared to be the least affected by age or activity level; it did not differ among the older groups, and the old-active did not differ from the young groups. The suggestion is that although peripheral slowing (as manifested in movement time) may account for some portion of the age-related slowing, the bulk of the decline is in premotor elements. Likewise, the bulk of the benefit that derives from exercise is seen in central processing.

Clarkson and Kroll (1978) found a similar pattern of differences on simple and choice reactions among older and young active and inactive subjects, and also found that both intra- and interindividual performance variability was related to age and activity level. The interindividual performance variability of old-active subjects was less than that of the old-inactive subjects in both the simple and choice reactions, and of the young-inactive on the simple reaction. Interindividual variability was higher among the old-actives than among the young-inactives in the choice reaction. The lowest interindividual variability was evident among the young-active subjects. In contrast, intraindividual variability was comparable among the old-active and inactive subjects and greater among these subjects than among the younger subjects. Thus, age may be a more important factor than activity level in determining the consistency of a subject's response times.

In a recent study, Baylor and Spirduso (1988) fractionated simple and disjunctive reactions by measuring EMG activity in middle-aged women (48-63) who were either active (joggers) or sedentary. In addition, movement time was measured in each task. As in the Clarkson studies, subjects responded with a movement of the right leg. These investigators found that all elements of both reactions were faster among the runners, suggesting that both peripheral and central transmission benefit from systematic exercise. It is of interest to note that unlike Clarkson (1978), Baylor and Spirduso found a consistent slowing of contractile time among the nonexercisers. This difference may reflect unknown variations in the subject sample, task demands, or movement requirements.

Fractionation of the Total RT: Brain Electrical Activity

The inference drawn from the EMG/RT studies is that the rate at which information-processing speed declines in the nervous system may be slowed by systematic exercise, particularly at central or premotor levels. Premotor time comprises a number of elements (e.g., stimulus registration, encoding, feature extraction and integration, response selection) that cannot be segregated utilizing only measures of EMG activation, however. Thus, more specific inferences cannot be drawn from the EMG/RT work. Central processing time can be partitioned into its hypothetical constituents with a fair level of precision using measures of brain electrical activity recorded at the scalp. These signals reveal activation of nervous-system pathways from the stimulus input to the motor output and thereby provide the investigator with a window through which inferred elements of cerebral activation can be viewed. Relatively specific inferences can therefore be drawn about the extent to which various elements of central processing benefit from physical fitness.

The studies described are also limited in that objective measures of physical fitness were not made of the subjects. Thus, reported activity was the only basis for establishing group membership. This could result in groups composed of individuals who exercise at widely varying levels of intensity and who, as a result, vary widely in physical fitness. Further, failure to obtain objective measures of physical fitness precludes doing more fine-grained analyses in which correlations between levels of physical fitness and variations in central processing speed can be established. One important objective measure of physical fitness that can be used to achieve these ends is the maximum oxygen uptake (VO_2 max). This measure is derived from an exercise stress test (given on a stationary bicycle or treadmill) and provides an index of an individual's aerobic fitness. Specifically, in a stress test the subject is worked to exhaustion by systematically increasing the effort that must be expended to pedal the bicycle or walk on the treadmill. The value yielded for VO_2 max indicates the individual's maximum aerobic capacity.

Two recent studies, one under way in our laboratory (Bashore, Martinerie, Weiser, Greenspon, & Heffley, 1988) and the other by Dustman, Emmerson, Ruhling, Shearer, Steinhaus, Johnson, Bonekat, and Shigeoka (in press), have attempted to identify central components that may benefit from exercise, using measures of brain electrical activity in subjects whose aerobic fitness was evaluated in an exercise stress test. The results of both studies indicate that CNS functions are maintained at a higher level in older aerobically fit individuals than in their healthy, but aerobically less fit, age peers and that this effect is not restricted to any particular constituent function (i.e., it is a generalized benefit). Indeed, these studies suggest a very close relationship between aerobic fitness and CNS processing efficiency.

We are currently conducting a study designed to assess the extent to which long-term systematic aerobic exercise has preserved mental processing speed in older men. To date, 140 subjects have been tested, 90 of whom are 60 or older (range 60–84) and 50 of whom are 20 to 35. Men were chosen because we thought it would be extremely difficult to identify the number of women we would need in the over-60 group who have exercised at the appropriate levels for the required time period. Six groups of subjects are being evaluated: young nonexercisers, young aerobic exercisers (cyclists, runners), young reaction-time exercisers (tennis, squash, racketball, handball), old nonexercisers, old aerobic exercisers, and old reaction-time exercisers. The older subjects must have exercised on a regular basis for at least 10 years and the younger for at least 2 years. As it turns out, most of the active older men have been avid exercisers their entire adult lives. This discussion will describe preliminary results on data we have collected from the nonexercisers and aerobic exercisers. Because the analyses are preliminary and include only a subset of the subjects we have tested and plan to test, the discussion should be read accordingly. We do think, however, that trends are revealed that will be evident when the final analyses are completed.

Volunteers for the study are given a complete medical examination that includes an exercise stress test. They are excluded from the study if they are taking any medication or have any disease that affects the CNS or if they have a history of drug abuse or psychiatric disorder. Each subject performs three speeded decision-making tasks that differ in processing demands: a simple reaction, a disjunctive reaction, and a choice reaction. Our discussion will be restricted to findings from the choice RT task.

In this task, the subject is shown a word, *left* or *right*, briefly on a computer monitor, that is embedded in a four-row-by-six-column matrix. On some presentations it is surrounded by number signs (#) and on others by letters chosen randomly from the set A–G or from the set A–Z (see Figure 4.1). The subject is required to make either a compatible or an incompatible response to the word (button press with the left or right thumb, indicated by the word *same* or *opposite* presented before the matrix on each trial). A large body of literature has demonstrated that RT is prolonged substantially in older persons when they have to identify a critical stimulus obscured by other elements and when an incompatible response must be made. As is evident, the task we are using is very challenging (see McCarthy & Donchin, 1981; Magliero, Bashore, Coles, & Donchin, 1984, for a detailed discussion of this task and the rationale for its use).

Two measures of mental processing speed are most important in our analyses—RT and the latency of the P300 component of the event-related brain potential (ERP). The ERP is recorded at the scalp (by surface electrodes) and comprises a series of positive and negative deflections in brain electrical activity that is produced in response to a stimulus. Each deflection is identified as an individual component of the ERP. These components are analyzed on the basis of their amplitude and latency (time to achieve maximum amplitude) characteristics. The P300 belongs to a class of components, referred to as *endogenous*, that are thought to reflect engagement of the brain mechanisms mediating higher-order cognitive processing. They stand in contrast to those components, referred to as *exogenous*, that are thought to reflect the activation of primary sensory pathways. The latter are very sensitive to changes in the physical properties of the stimulus (e.g., increases in the intensity of a light flash will shorten the latency and increase the amplitude of the component), where the former are relatively insensitive to these changes but vary with changes in the psychological demands of a task. Exogenous components are measured as the subject sits quietly and has no particular task to perform (i.e., under passive recording conditions), whereas endogenous components are most often recorded as, a cognitive task is being performed.

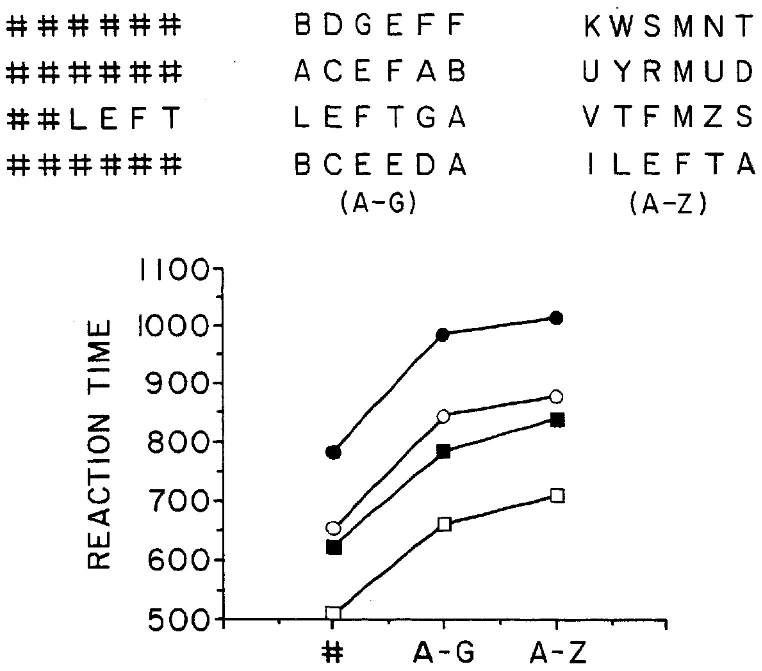

Figure 4.1 Examples of the three different matrices (# signs or no noise, A–G, A–Z) presented to the subjects are shown in the top half of the figure. Reaction times to these matrices for both compatible and incompatible responses by the young and the older subjects are shown in the bottom half of the figure. The response times of the young subjects are indicated by the unfilled squares and circles, and the response times of the older subjects are indicated by the filled squares and circles. Squares represent compatible responses and circles represent incompatible responses. Reaction time is given in milliseconds.

We chose to study the P300 because a large and growing literature indicates that its latency is more sensitive to age than are the other components that have been studied (for review, see Bashore, in press). P300 latency is observed to increase at a rate of about 1.5 to 2.0 ms per year from about age 15. Moreover, the timing of this component seems to reflect the engagement of stimulus, but not response, processing mechanisms (McCarthy & Donchin, 1981; Magliero et al., 1984). On the other hand, RT represents the final output from both stimulus and response processing and as such, varies with changes in either factor. Hence, variations in the timing of P300 can be used to infer the extent to which the rate of stimulus processing changes with age and in our case, may be preserved by aerobic exercise. The discussion now turns to our preliminary results.

Reaction Time

The pattern of effects observed in previous studies of young adults (McCarthy & Donchin, 1981; Magliero et al., 1984) was replicated by the young subjects in our sample. Grand averages for the young and the old, collapsed across exercise level, are plotted in Figure 4.1. For the young, we see that RT increases with the introduction of noise into the matrix and that the requirement to make an incompatible response adds a constant amount of slowing to the response time, irrespective of the type of noise surrounding the word. Of particular interest to us is that even though the older subjects are slower at all levels of the task, a similar pattern of effects is apparent among them; that is, the addition of noise prolongs the response latency, and the requirement to make an incompatible response adds a constant amount of time to the reaction for each noise matrix.

If we now differentiate the two age groups on the basis of fitness levels, we see a divergence among the old that is not apparent among the young. The older subjects were grouped on the basis of VO_2 max, and the young subjects were grouped according to whether or not they did aerobic exercise. We defined high-fit older subjects as those having a VO_2 max greater than 35 ml/min/kg and low-fit older subjects as having a VO_2 max less than 25 ml/min/kg. These data are shown in Figure 4.2. It is apparent that the two groups of young subjects do not differ, even though the exercisers were more fit than the nonexercisers (VO_2 max 40.39 vs. 50.13). In contrast, there is a reasonably dramatic difference between the two older groups. The high-fit have response latencies in the compatible conditions that are comparable to the response latencies for the young in the incompatible conditions. That is, their fastest times correspond to the slowest times for the young. In turn, the shortest latencies of the older less-fit subjects are comparable to the longest latencies of the fit older subjects, and their slowest times are the slowest of any group. It should be noted that the splits we used for VO_2 max to determine fitness level do not represent extremes. Rather, the criterion for low and high fitness includes those who are in the midaverage range and midgood range, respectively. There was no overlap between the

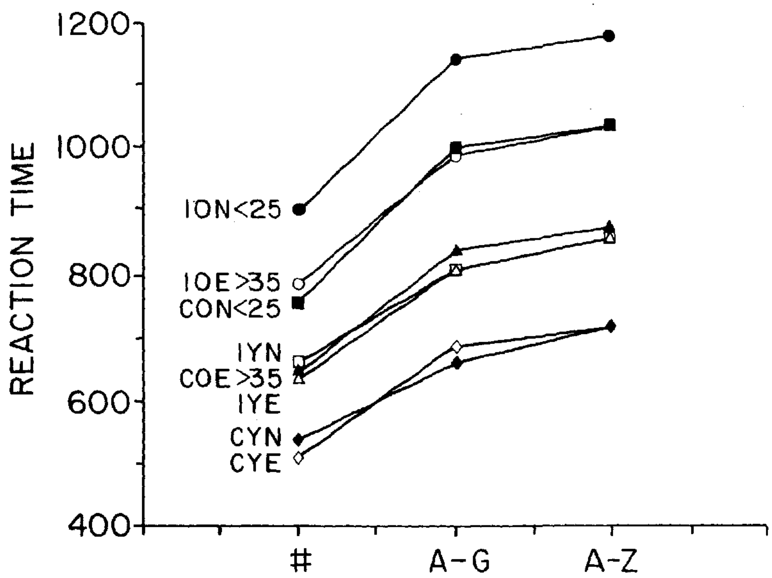

Figure 4.2 This figure shows the reaction times (in milliseconds) of young and older subjects divided into groups of exercisers and nonexercisers. The older subjects are grouped further on the basis of VO2 max, with a value < 25 indicating a low level of aerobic fitness and a value > 35 indicating a high level of fitness. $C =$ compatible response; $I =$ incompatible response; $Y =$ young; $O =$ older; $E =$ exerciser; $N =$ nonexerciser. For example, $ION < 25$ indicates the incompatible response condition for older nonexercisers with VO2 max levels less than 25 ml/min/kg.

groups, but there were members of each group whose fitness levels were reasonably close.

P300 Latency

Did the P300 latency data parallel the RT data? It appears as if the answer is yes. In Figure 4.3, we show the grand average ERPs recorded from each group of subjects. McCarthy and Donchin (1981) and Magliero et al. (1984) found that P300 latency increased as the noise in the matrix increased, but that it was unaltered by the requirement to make an incompatible response (unlike RT, which was prolonged in both cases). This pattern appears to be replicated in the young subjects and to be present as well in the old subjects. These results are shown in Figure 4.4 and Table 4.1. Note that not only do the older high-fit subjects have

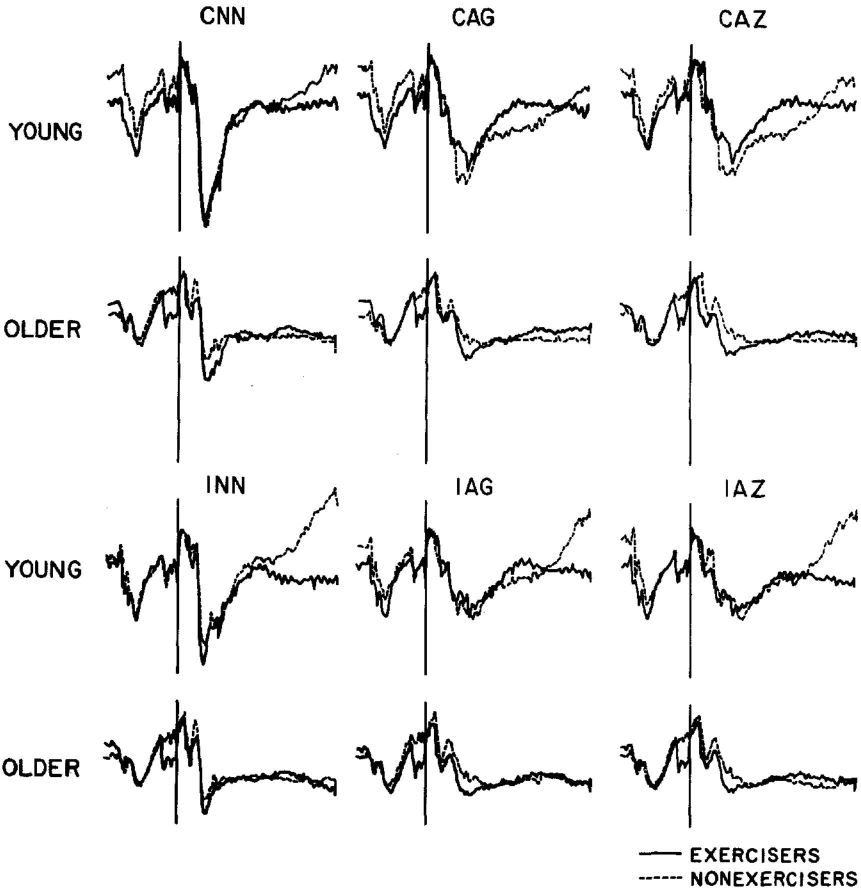

Figure 4.3 The grand average ERPs for each group of subjects in each of the experimental conditions. The vertical line indicates the time at which the matrix was presented to the subject, whereas the period before that represents the interval between the presentation of the cue word (SAME or OPPOSITE) and the onset of the matrix. The ERPs recorded from the exercisers are shown as solid line and those from the nonexercisers as dashed lines. A positive change in electrical activity is shown as a downward deflection. The large positive signal after the matrix presentation is the P300. In the case of the young nonexercisers, it is followed by a large negative-going waveform. This is unusual, and there is no ready explanation for it. It may represent, however, the contribution of a small proportion of the subjects in this group to the grand average.

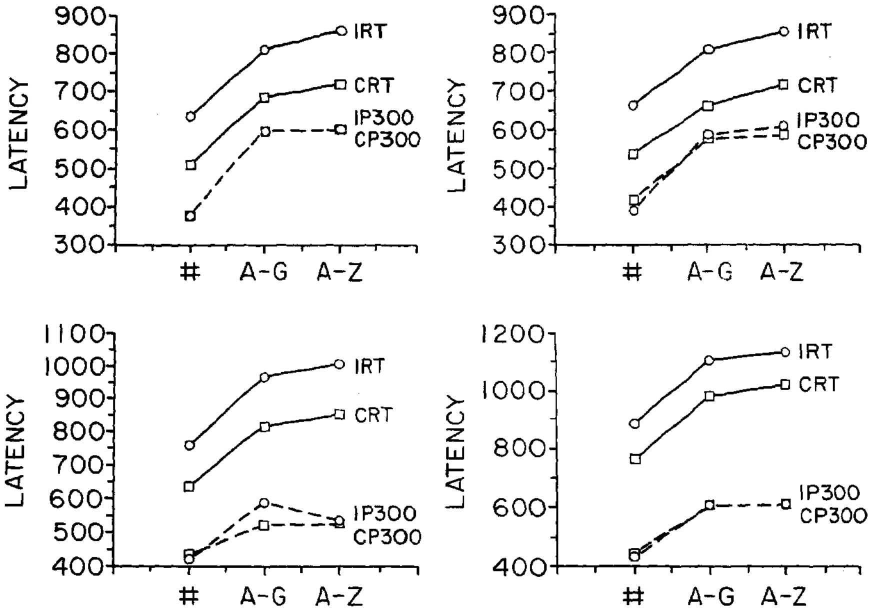

Figure 4.4 Plots of the RT and P300 latency values for each group of subjects. Latency is given in milliseconds. I = incompatible response; C = compatible response; P300 = P300 latency; RT = reaction time. The upper half of the figure shows the response and P300 latencies for young subjects; young exercisers are shown on the left side and young nonexercisers on the right side. In the bottom half of the figure are the latencies for the older subjects. Again, the exercisers are shown to the left, the nonexercisers to the right. Note the scale difference for the older nonexercisers whose latencies are generally longer.

shorter RTs than the older low-fit but they also have P300s whose latency is shorter at all levels of stimulus processing. Also note (in Figure 4.3) that the amplitude of the P300 is larger for the older high-fit than for the older low-fit.

Thus, these preliminary findings reveal a generally preservative effect of aerobic fitness on the type of mental processing speed we are studying and suggest that systematic aerobic exercise can serve to slow the decline of at least those CNS functions that subserve this task. This suggests, of course, that the historic view of an unremitting rate of decline in CNS functions, slowed only by genetic good fortune, may be in need of

Table 4.1 P300 Latency/Reaction Time*

		N	*CNN*	*CAG*	*CAZ*	*INN*	*IAG*	*IAZ*
YNE	P300	13	416	572	588	392	584	608
	RT		536	661	714	660	807	855
YE	P300	12	376	596	602	374	598	602
	RT		509	683	717	635	809	857
ONE	P300	13	446	600	614	436	610	610
	RT		763	979	1020	884	1106	1135
OE	P300	12	438	524	524	422	590	532
	RT		636	817	855	759	971	1008

*This table summarizes the mean values (in milliseconds) of RT and P300 latency for each experimental group. The following abbreviations are used: *N* = number of subjects in the group; *CNN* = compatible response to word surrounded by # signs; *CAG* = compatible response to word surrounded by letters chosen from the set A–G; *CAZ* = compatible response to word surrounded by letters chosen from the set A–Z; *INN* = incompatible response to word surrounded by # signs; *IAG* = incompatible response to word surrounded by letters chosen from the set A–G; *IAZ* = incompatible response to word surrounded by letters chosen from the set A–Z; *YNE* = young nonexercisers; *YE* = young exercisers; *ONE* = old nonexercisers; *OE* = old exercisers.

revision. It also suggests the importance of pursuing a series of systematic studies to assess the general benefits to CNS functions of a program of regular exercise practiced over the lifespan.

Exogenous and Endogenous Components of the ERP

Our work does not permit any inferences to be drawn about the general integrity of the CNS or about the specific integrity of primary sensory pathways in the CNS. The work of Dustman and his colleagues (Dustman et al., in press) does permit broader inferences to be drawn, however. They identified 30 young men aged 20–31 and 30 men 50–62, half of whom in each group were in excellent or superior aerobic condition for their age (as indexed by VO_2 max) and half of whom were in fair to very poor aerobic condition. These subjects completed a series of neuropsychological and electrophysiological tests to assess various aspects of CNS functioning. Sensory thresholds were measured in the auditory, visual, and somatosensory systems; critical flicker fusion (visual) thresholds were determined; and a battery of cognitive tasks was completed (Stroop Color Interference, Symbol Digit Modalities, Trails B, and Sternberg Memory Scanning). The cognitive tests were used to derive a single composite measure of cognitive performance.

A number of electrophysiological measurements were also taken to determine the extent to which they were influenced by age and fitness level. The frequencies of the waveforms in the resting EEG (e.g., the alpha wave of 8–12 cycles per second) and their distribution over the scalp were analyzed, as were the amplitudes and latencies of exogenous and endogenous components of the ERP. Exogenous components were recorded following stimulation in the somatosensory (electrical pulses to the median nerve in the wrist) and visual (flashes of light, sequences of pattern reversals of a checkerboard) modalities. Three levels of intensity were used for the electrical pulses and flashes, so that corresponding changes in the amplitudes of the exogenous components could be analyzed in both sensory systems.

Endogenous components were recorded from subjects as they performed an "oddball" task, the paradigmatic task for eliciting a P300 (Sutton et al., 1965). In this task, the subject is presented a series of stimuli, usually selected from two possibilities (e.g., a high- and a low-pitched tone), and is required to keep a running mental count of one of the stimuli. This counted or target stimulus usually appears randomly on about 15% of the trials in an experimental block; hence, the name oddball. The target elicits a large P300, where the nontarget produces little or no P300. These effects are apparent in the auditory, visual, and somatosensory modalities. This task has been used widely to study age-related declines in the efficiency of CNS processing (Bashore, in press). Dustman et al. used a visual variant in which an *X*, presented with a probability of .16, served as the target and an *O* served as the nontarget.

Their results were rather complicated but revealed that among the CNS functions they evaluated, several were influenced more by physical fitness than by age. That is, the older aerobically fit subjects resembled the young more on these measures than they did their less-fit age peers. Indeed, on some measures the older fit subjects did not differ from the young subjects. The principal findings can be summarized as follows. First, sensory thresholds were superior among the young for each modality (auditory, visual, somatosensory), but in the visual modality, the high-fit, young and old, were superior to their low-fit counterparts. Second, the frequency patterns in the EEG activity of the high-fit differed from those of the low-fit, irrespective of age, while the distribution of this activity over the scalp differed in the older low-fit from that of the young and the older high-fit subjects, who did not differ. Third, the latencies of a number of exogenous components in the visual system, particularly to the least intense stimulation, were shorter in the young and the highly fit than in the old and the poorly fit. This difference indicates that primary sensory information is transmitted at a faster rate among the high- than the low-fit. Similar effects of fitness were not apparent in the somatosensory system or in the visual responses to pattern reversals of the checkerboard. In both cases, exogenous components were prolonged in the older subjects, and this difference did not vary with fitness level. Fourth, increases in the intensity of the light flash produced a greater increase in amplitude of the early components among the low- than the high-fit, especially among the older subjects. Fifth, the pattern of results for the P300 was similar to that seen for the exogenous components. P300 latency was earliest in the high-fit subjects, irrespective of age, and the old low-fit had significantly longer latency P300s than any other group. This variation in P300 latency suggests that the time required to integrate the stimulus information is shorter among the high-fit subjects. Sixth, performance on the cognitive battery was best among the high-fit subjects and was correlated with VO_2 max, particularly among the older subjects.

EXERCISE AS AN INTERVENTION

The findings from both our study and that of Dustman et al. suggest that aerobic fitness may help sustain a broad range of CNS functions, both those mediating the transmission of primary information and those mediating higher-order cognitive processes. However, since these studies are cross-sectional, any conclusions about the preservative effects of exercise across the lifespan must be tempered by considering that they could reflect self-selection or other types of cohort effects. For example, self-selection may result in individuals who have inherently faster central reactions and better motor coordination choosing to engage in regular physical activity and to sustain that involvement for many years. Thus, differences in processing speed among older aerobically fit and unfit persons may reflect a basic difference in neurophysiological functions among these individuals and not a benefit of aerobic fitness achieved through exercise. If this was so, one might expect aerobically fit subjects to be faster on speeded decision-making tasks than aerobically unfit subjects at all age levels. Our data have revealed no differences among the young, irrespective of fitness level, whereas those of the Dustman group, although generally similar to ours, reveal that the relationships are quite complicated. Some processes seem to be age-sensitive, others to be fitness-sensitive, and with others fitness seems to have an influence on the older but not the younger subjects. These studies do not permit us, then, to eliminate self-selection as a central variable, even though they suggest that it may not be. Stronger inferences can be drawn about the benefits to CNS function of exercise in the elderly from studies in which exercise is an intervention. Next, we turn to prospective studies that are designed to assess the effect of aerobic fitness on older adults who are deconditioned.

If, as suggested by the cross-sectional studies, peripheral and central functions are relatively intact in persons who have maintained a lifestyle that includes regular aerobic exercise, it is important to consider the extent to which nervous-system functions can be restored by systematic aerobic exercise in those elderly persons who have led normally active lives and have presumably aged in the "normal" ways. A growing literature indicates that cardiovascular and other peripheral benefits are apparent in the elderly following participation in aerobic training, the so-called training effect (Gorman et al., 1988; Hurley et al., 1984; Niinimaa & Shepherd, 1978; Seals, Hagberg et al., 1984; Shepherd & Sidney, 1975). Indeed, on the basis of their research assessing these benefits, Blumenthal and Williams (1982) concluded that "regular exercise appears to reverse some of the physical changes that accompany advancing age in our society. . . . Some of the deleterious effects of aging in America may be attributable to the habitual physical inactivity that is customary for most middle-aged and elderly persons in our culture, rather than to inevitable biological consequences of aging" (p. 5).

In contrast to the extensive literature on the functional benefits of exercise begun later in life that accrue to peripheral physiological processes, little work has been done to evaluate changes in cognitive processes produced by exercise that may reflect improved central processing efficiency. This is a particularly egregious omission in the assessment of mental processing speed utilizing RT measures because of the widely held belief that RT is a very sensitive index of the functional integrity of the CNS (Birren et al., 1980). In four early studies, exercise was reported to produce no beneficial effect on speeded processing (see reviews in Spirduso, 1980, 1981). These studies have certain methodological flaws, however, that render their findings difficult to interpret. In general, extremely small numbers of RT trials were run, so that reactive capacity and performance stability were probably not achieved; the training programs were brief and of little vigor; and the subjects were in very poor condition at the outset, so that although training effects were achieved, the levels of fitness attained at completion were reasonably low.

A recent study by Blumenthal and Madden (1988) assessed the effects of aerobic exercise on the speed of short-term memory retrieval in middle-aged men (early 40s). They reported no beneficial effects. However, the exercise program was relatively brief in duration (12 weeks) and perhaps not sufficiently rigorous to produce meaningful change (see Holloszy, 1983). Although significant improvement in VO_2 max did occur among the aerobic exercisers, they began at moderate levels of fitness for their age, and their improvement was modest (mean VO_2 max of 34.54 to mean of 39.89). Moreover, given the age of the subjects, it would be surprising if sufficient decline in memory search time had occurred to be changed by aerobic fitness. Hence, this study is open to some of the criticisms raised against the earlier ones.

A notable exception to the other work has been published recently by Dustman, Ruhling, Russell, Shearer, Bonekat, Shigeoka, Wood, and Bradford (1984). They assessed the impact of aerobic training on CNS functions, using a battery quite similar to the one just described. The battery included a broad range of neuropsychological functions; two measures of depression (Beck Depression Index, Self-Rating Depression Scale); and measures of auditory, visual, and somesthetic thresholds, and of visual acuity. Comparisons were made among an aerobic exercise (AE) group, an exercise control group whose members participated in a strength-and-flexibility-training (SF) group, and a nonexercise (NE) control group. The neuropsychological battery included two subtests from the WAIS (Digit Span, Digit Symbol), a culture fair intelligence test, critical flicker fusion, dots estimation, simple and choice RT tasks, and a Stroop Color-Word test.

Subjects in the exercise groups trained thrice weekly (one hour sessions) for four months and were assessed pre- and postexercise. At posttest, VO_2 max improved by 27% in the AE group and by 9% in the SF group. Sensory thresholds and depression scores were unchanged in all three groups, while visual acuity improved in both exercise groups (these data were not given for the NE control group). Neuropsychological performance gains were achieved by both exercise groups; however, the gains achieved by the AE group were significantly greater than those achieved by the SF group. Indeed, although the overall performance of the SF group had improved at posttest, it differed significantly from that of the NE group only on dots estimation. In contrast, the AE group attained significant performance gains over both groups on dots estimation, critical flicker fusion, Digit Symbol, simple reaction time, and Stroop Color-Word naming. Improvement on Digit Span was evident for the AE group, but it failed to reach significance ($p = .08$).

CONCLUDING COMMENTS

The evidence reviewed in this chapter supports the inference that declines in certain elements of CNS function, both primary and higher order, normally associated with aging do not occur to the same extent in individuals who have maintained aerobic fitness. Furthermore, the findings from at least one study suggest that some functions that have declined in older persons may be restored to varying degrees if aerobic fitness is improved. Thus, the well-documented functions may have parallels in the central nervous system. Firm conclusions cannot be drawn, however, until a larger number of systematic studies have been completed. The extant studies suffer, by and large, from methodological flaws that compromise their findings. To remedy the current deficiencies, objective measures of fitness, such as VO_2 max, must be used to group subjects, experimental tasks must be used that make increasingly complex demands on CNS functions, and measurement procedures must be used that permit CNS activation to be partitioned into multiple primary- and higher-order levels. When exercise is an intervention, not only must objective measures of fitness be taken but the program must be of sufficient vigor and duration to produce meaningful gains in fitness level. Following these basic methodological principles, correlations can be established between levels of aerobic fitness and benefit to inferred constituents of CNS processing.

Despite the fact that considerable research must be done to achieve a precise delineation of the effects of aerobic fitness on central nervous system aging, it is probably not premature to suggest that the current literature holds forth the promise that, to paraphrase Cicero (44 B.C.), such fitness may provide one of the drops of oil needed to lighten older spirits. This will probably be demonstrated to be true whether aerobic exercise was begun and sustained early in life or initiated late in life.

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CHAPTER 5

Comprehensive Geriatric Assessment

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Comprehensive geriatric assessment is a multidimensional, often interdisciplinary diagnostic process designed to define an elderly individual's medical, psychosocial, and functional capabilities and problems to arrive at an overall plan for therapy and long-term follow-up. While comprehensive clinical assessment methodologies have benefited nonelderly groups of patients as well, multidimensional assessment has asssumed a key role in geriatric care because the delicate complexity of the typical frail elderly patient demands multidimensional diagnosis to attain both a reasonable understanding of the patient's problems and a prudent plan of treatment.

The present chapter provides a critical review of the literature on geriatric assessment and an evaluation of the evidence of its benefits. Further, we identify issues and problems regarding the knowledge base of geriatric assessment and the effectiveness of geriatric assessment programs, pointing the way to new research.

COMPREHENSIVE GERIATRIC ASSESSMENT: ORIGINS AND DEVELOPMENT

The philosophy of geriatric assessment—that careful, multidimensional review of the capacity and problems of frail elders can lead to long-term benefits to their functional health—originated during the 1930s in the work of pioneer British geriatricians (Brocklehurst, 1975; Matthews, 1984). Physicians Marjory Warren, Lionel Cosin, and Sir Ferguson Anderson observed high rates of long-term institutionalization among functionally impaired elderly patients, few of whom had received adequate evaluation from a medical, psychological, or social perspective or had been given a trial of rehabilitation services. These early geriatricians demonstrated an unexpectedly high prevalence of remediable, readily diagnosable conditions among elderly patients, both in and outside long-term institutions. They were further able to demonstrate substantial improvement in the functioning, health, and well-being of many patients given appropriate therapy and rehabilitation.

These early successes of geriatrics were in large part responsible for its emergence as a fully recognized specialty upon the founding of the British National Health Service in 1948. Comprehensive geriatric assessment rapidly became the linchpin in this British system of "progressive geriatric care" that comprised a continuum of geriatric services, including acute hospital care, day hospitals, rehabilitation units, and home-visitation services (Barker, 1987; Brocklehurst, 1975). In this system, most elderly patients needing acute hospital care (except those with intensive-care needs) are first admitted to an acute-care geriatric assessment unit. Here they receive a complete assessment of their medical, psychosocial, and functional problems during a two-to-three-week stay. An interdisciplinary team on the unit develops a multidimensional problem list and a comprehensive care plan that includes a determination of placement—whether discharge to home or to one of several levels of institutional care. Multidimensional assessment in a less intensive format is provided to other elderly patients through consultation clinics, day hospitals, and home-visitation teams.

Various aspects of progressive geriatric care and principles of geriatric assessment have been incorporated into the health-care systems of other Western countries (Brocklehurst, 1975; Brocklehurst & Williams, 1989; Kane & Kane, 1976; Schouten, 1979). Lack of a national health service or insurance system has hampered development of such a progressive geriatric-care system in the United States. Nonetheless, some of the elements of such a system are present, particularly within the Veterans Administration (VA) and on the local and regional level, where special geriatrics services such as case management, day and hospice care, meals-on-wheels, and visiting nurse care are available, together with traditional institutional and outpatient services. Moreover, many disciplines have been active in developing and using specific assessment tools for better quantifying aspects of older persons' physical and psychosocial functioning (e.g., clinical psychologists, social workers, nurses), but these disciplines were not able to integrate their concepts into larger-scale interdisciplinary clinical-care models. Despite numerous obstacles, perhaps the most important element of the developing geriatric-care system—the capacity for comprehensive interdisciplinary geriatric assessment—has been emerging and growing in the last two decades.

In 1985, Epstein and colleagues conducted a survey of VA-based and academically affiliated geriatric assessment programs in the United States. For their purposes, geriatric assessment programs were defined as those providing coordinated interdisciplinary care that addresses the medical, psychological, and social problems affecting older persons; included were units having an interdisciplinary team including at least one physician and one other health practitioner. At that time, 114 geriatric assessment programs were identified in the United States—almost half beginning operation after 1982. Of the programs responding to their survey, 80% were hospital-based, but 61% dealt exclusively with outpatients, 14% operated in outpatient and inpatient settings, and 25% were based on inpatient wards. Sixty-six programs were based in medical schools, and 38 were in VA facilities. VA programs tended to be based on inpatient units (23 of 38), while most of the school-affiliated units were outpatient programs (48 of 66) (Epstein et al., 1987). The survey confirmed the increasing interest in comprehensive geriatric assessment, the perception that more of these services are needed, and the recent rapid proliferation of different program models in the United States.

By 1987, sufficient experience with comprehensive geriatric assessment methods and programs had accumulated that the National Institute on Aging and collaborating agencies called a Consensus Development Conference on geriatric assessment in Washington, D.C. After review of this evidence, the Consensus Development Panel concluded "with moderate-to-high confidence," that geriatric assessment, coupled with implementation of the resulting care plan, is effective in attaining several favorable patient-care outcomes (Consensus Development Panel, 1988).

COMPONENTS AND PROCESS OF GERIATRIC ASSESSMENT

Geriatric assessment programs vary in their organization, operation, and objectives, based on differing national health-care systems as well as local needs and conditions. Published information describing particular geriatric assessment programs is collected in the Appendix. Several criteria were used in selecting programs for inclusion here: (1) the information is published; (2) the assessments are part of a clinical service package and not simply for research purposes; and (3) the assessments are multidimensional and focused upon elderly patients. The Appendix lists each program's geographic location, the program setting or type, the professionals involved in the assessment, the instruments employed or the information routinely assessed, the length and procedure of the assessment, and the program's objectives.

Settings

Assessment program settings vary widely and include both institutionally and community-based programs (see Appendix, legend). Settings tend to be intercorrelated with other variable programmatic characteristics. For example, inpatient assessment programs involve both more and the widest variety of personnel. This trend is confirmed in the Epstein survey, which showed that only 38% of outpatient programs had assessment teams with more than three members, compared to 95% of inpatient units (it must be noted that this survey generally excluded geriatric consultation services, nonteam assessment models, and programs not in medical schools or VA settings) (Epstein et al., 1987). Interdisciplinary participation is most often described in the literature for inpatient programs, although team assessment is also found among the community programs, and other-than-team approaches (e.g., the primary-nursing and physician-assessment models) are represented in institutional programs. Further, institutional settings also appear to allow more routine use of the nonportable diagnostic technologies in the comprehensive assessment process (e.g., laboratory tests, X rays).

Staffing

The staffing of assessment programs and the assessment content reflect some specialization, which in turn relates to the particular elderly populations served in different program settings. Many of the inpatient programs have distinctively medical or psychiatric staffing and patient populations. Geriatric-orthopedic units and other "combined" units have been reported with personnel and diagnostic technologies appropriate to altered case mixes. The most salient feature of program staffing is the emphasis on the team approach to comprehensive geriatric assessment, utilizing team meetings, rounds, and case conferences. As can be seen in the Appendix, a "core team" is sometimes described, consisting of a physician, nurse, social worker, and others. Core team members see and assess every patient, while an "extended" team may be specified, consisting of allied health professionals who do not see every patient but become part of the team for particular patients. Assessment descriptions often refer to consultative arrangements with specialists outside the team.

Many commentators emphasize the importance of "collegial" rather than physician-led teamwork in multidimensional diagnosis. This emphasis is consonant with the notion that frail elderly patients have complex clusters of problems and that—to the extent that implicit judgment plays a role in the different comprehensive assessment programs—different team members have distinct areas of knowledge and expertise to apply. Yet the geriatric assessment literature provides scanty description of modes of team functioning (Schmidt, Farrell, & Heinemann, 1988). In fact, the interdisciplinary-team model has often proven difficult to implement, and team-maintenance issues themselves demand considerable attention if objectives of "collegial" functioning and optimally effective and efficient comprehensive assessment are to be met (Campbell & Cole, 1987). Few studies have compared the diagnostic and treatment effectiveness of interdisciplinary-team assessment to other-than-team modes of assessing and treating elderly patients (Feiger & Schmitt, 1979; Katz, Vignos, Moskowitz, Thompson, & Svec, 1968; Kerski, Drinka, Carnes, Golob, & Craig, 1987; Zeiss & Okarma, 1984).

Domains and Techniques of Assessment

As with the staffing and team information-processing descriptions, the literature can be nonspecific as to the diagnostic techniques and instrumentation routinely employed in the geriatric assessment process. Some program descriptions simply note that they perform multidimensional geriatric assessments (Appendix). Most list at least some of the elements usually employed in assessment, often in connection with the disciplines using them or particular dimensions of health and well-being. Of programs responding to Epstein's questionnaire, 75% follow a standard assessment protocol. About 67% employed printed forms, published assessment instruments, or quantitative scoring methods in completing and recording assessment findings (Epstein et al., 1987).

The medical component of the assessment process varies in intensity and specialization with the program setting. Physicians (geriatricians, internists, geropsychiatrists) or physician extenders (nurse practitioners, physician assistants) are almost always involved in inpatient or clinic-based assessment programs, and they contribute by taking careful histories, performing physical examinations, reviewing medications, ordering diagnostic tests, and helping develop a list of medically treatable problems (Beers & Besdine, 1987). In geriatric consultation services, the medical assessment may consist largely of a review of medical data available from treating physicians (e.g., Bayne & Caygill, 1977) or involve a complete and independent workup (e.g., Allen et al., 1986; Hogan, Fox, Badley, & Mann, 1987). Some outpatient or community-based programs, particularly in the United Kingdom and Denmark, use physicians, nurses, health visitors, or even mailed questionnaires to screen patients in their homes for medical problems that once detected, can be subjected to more intensive diagnosis by the physician team member in clinic or hospital settings (e.g., Barber & Wallis, 1982; Hendriksen, Lund, & Stromgard, 1984).

Assessment in the psychological domain is usually performed most intensively on inpatient geropsychiatric wards, where psychiatrists, psychologists, and other mental health professionals form a large part of the assessment team (e.g., Dastoor et al., 1975). However, these professions are also represented on many geriatric assessment teams working on medical and rehabilitation wards and in outpatient settings (e.g., Cheah, Baldridge, & Beard, 1979; Cheah & Beard, 1980; Rubenstein, Josephson, et al., 1984; Rubenstein, Wieland, et al., 1984). While psychological assessment by teams in geropsychiatric settings may involve an array of intensive diagnostic techniques and measures (e.g., Ahmed, Wohlgemuth, Miller, & Noble, 1987; Reifler, Larson, & Teri, 1987), geriatric assessment in this domain is concerned primarily with evaluating the cognitive and affective status of the frail elderly patient as a screen for significant neuropsychiatric problems requiring more intensive assessment (Gallagher, 1987; Gurland, Cote, Cross, & Toner, 1987). This is often accomplished in nonpsychiatrically oriented programs by employing mental status instruments (e.g., the Kahn-Goldfarb Mental Status Questionnaire [Kahn, Goldfarb, Pollack, Pollack, & Peck, 1960], The Folstein Mini-Mental Status Exam [Folstein, Folstein, & McHugh, 1975], the Pfeiffer Short Portable MSQ [Pfeiffer, 1975], and brief measures of affect or morale; e.g., the Philadelphia Geriatric Center Morale Scale [Lawton, 1975], the CES-D Depression Inventory [Radloff, 1977], and the Geriatric Depression Scale [Yesavage et al., 1983]).

Evaluation of a patient's social competency, support systems, environment, and needs is the third major domain of geriatric assessment (Kane, R. A., 1987). A range of personnel is reported to collect and synthesize information in the social domain, including social workers, nurses, health visitors, mental health personnel, physicians, and occupational therapists. Information in this domain is used in multidimensional diagnosis and applied to placement decisions or continuity-of-care recommendations. Assessment programs that employ health visitors or home-visit teams can accomplish particularly intensive evaluation of patients' physical environment and social supports (Ramsdell, Swart, Jackson, & Renval, 1989).

Comprehensive geriatric assessment is often referred to as comprehensive functional assessment (American College of Physicians, 1988). This is because in the frail elderly person experiencing chronic diseases, functional disabilities are prevalent and symptomatic of complex multidimensional problems and because one of the goals of geriatric assessment is restoration of function rather than elimination of disease. Also, of the general assessment domains, the dimensions of functional status have become especially well developed through use of quantitative scales and instrument packages (Branch & Meyers, 1987). Correspondingly, published descriptions of geriatric assessment programs usually report use of functional scales, even if no other quantitative instruments are used. Almost all programs use basic and instrumental activities-of-daily-living scales. Eye, speech, and audiometric screening and examination are also common elements. Given more specialized case mix, several programs routinely incorporate range-of-motion and gait-mobility evaluation (e.g., Applegate, Akins, Van der Zwaag, Thoni, & Baker, 1983; Applegate, Akins, & Elam, 1987; Liem, Chernoff, & Carter, 1986). A variety of health-care personnel monitor functional status—from physicians, nurses, or health visitors in the solo-consultation, case-management, and home-visit models (e.g., Collard, Bachman, & Beatrice, 1985; Hendricksen, Lund, & Stromgard, 1984; Katz, Dube, & Calkins 1985)—to physiatrists and rehabilitation therapists in various team models.

Timing of Assessment

Program descriptions infrequently provide much information on the duration, volume, intensity, or other process aspects of geriatric assessment (Appendix). Many inpatient assessment and rehabilitation programs indicate that assessment is completed within a week of admission, allowing team members to see the patient, complete diagnostic tests, and attend a team meeting generally held once weekly. Several inpatient consultation services report seeing patients within one or two days of referral. Time needed by outpatient programs to complete an assessment appears more variable, ranging from one or more days for a single home or clinic visit to over a month for four clinic and home visits. Much time undoubtedly elapses between casefinding, screening and/or referral, and completion of home or clinic visits. Epstein's survey (1987) indicated that the actual consultation time for responding outpatient programs averaged 2.7 ± 2.1 hours (range, 0.5 to 10.5). Among programs reporting volume, inpatient units admit and assess at least two patients per week (Dastoor et al., 1975; Dastoor, Klingner, Muller, & Kachanoff, 1979; Rubenstein, 1984b, 1987), while one outpatient unit completes an average of eight new assessments weekly (Williams, 1987). Epstein's sample (1987) reported an overall average of 17 new patients assessed per month per program.

Staging of Assessment

Geriatric assessment programs vary greatly in how patients come to be assessed. It is useful to distinguish between screening, casefinding, and comprehensive assessment in describing how specific programs address their patient populations. Screening is a targeting technique whereby a program selects from referred patients those meeting certain admission criteria. Casefinding is another targeting method in which the program actively solicits referrals of a given profile (that is, it makes known its selection criteria) and/or searches within outside elderly populations (e.g., all elderly hospital inpatients, elderly in the community or catchment) for "cases" appropriate for comprehensive assessment. The comprehensive geriatric assessment per se (the process of performing detailed multidimensional diagnosis) is often arrived at only after patients have undergone some form of screening or casefinding (Muir-Gray, 1985; Rubenstein & Josephson, 1988; Williamson, 1981). Most programs performing comprehensive assessments screen patients using some criteria in addition to age in an effort to target their efforts, whether or not they engage in active casefinding. It appears that the more effective assessment programs (e.g., Hendriksen et al., 1984; Rubenstein et al., 1984b) employed active casefinding rather than starting with self-, family-, or physician-referred populations. Several community-based assessment programs (e.g., Barber & Wallis, 1976; Barber & Wallis, 1978; Hendriksen et al., 1984) perform primary casefinding using comprehensive but comparatively brief and inexpensive assessments at point of contact. More comprehensive assessments involve more time and personnel than primarily casefinding programs, inevitably expending more resources per patient seen. (Whether comprehensive programs also produce more per capita benefits depends not only on the validity of the assessment but largely on the ability of programs to target assessments as well as their ability to deliver or successfully to obtain treatments and services.)

Location of Assessment

Some medically oriented inpatient geriatric assessment units admit acutely ill patients directly from the community and/or from other inpatient services (e.g., Poliquin & Straker, 1977; Popplewell & Henschke, 1983). Other medical inpatient geriatric assessment units are based on subacute-care wards and admit many of their patients from the more acute-care wards after patients' acute illnesses have been stabilized (e.g., Liem et al., 1986; Rubenstein, Abrass, & Kane, 1981; Sloane, 1980). Geriatric assessment units in long-term chronic-care or rehabilitation facilities generally evaluate all elderly patients on admission to the institution in order to determine needs and monitor progress (e.g., Lefton, Bonstelle, & Frengley, 1983; Schuman et al., 1978).

Patients receiving geriatric assessment in outpatient settings, freestanding clinics, or home-visitation services are most often not acutely ill, nor do they as frequently require as much treatment and rehabilitation as those referred to inpatient assessment programs from other institutional inpatient settings. Nevertheless, many elderly persons "at risk" are in the community and may not come into contact with most assessment services until late into a downward course. Outpatient community-oriented services organized with outreach casefinding capabilities may benefit these individuals more and earlier than inpatient or office-based services with a more limited scope of medical surveillance. Some early descriptions of screened outpatient populations and geriatric outreach services in the United Kingdom showed such potential but suffered somewhat because of a lack of integrated clinical focus on functional health (Burns, 1969; Hodes, 1971). Most of the more recently described home-visit teams performing geriatric assessment are better oriented to patient functioning and thus better address objectives of early casefinding, referral, and surveillance (e.g., Cruse & Ebrahim, 1986; Hendriksen et al., 1984; Vetter, Jones & Victor, 1984). A few of the hospital-based or freestanding outpatient clinics also have home-visit services to perform this outreach function (e.g., Leonard & Kelly, 1975; Lowther, MacLeod, & Williamson, 1970; Ramsdell, Swart, Jackson, & Renval, 1989; Tulloch & Moore, 1979). The informal home assessments that involve a team or physician are usually triggered by referral, application to long-term-care facilities, or other indicators of increased risk (e.g., Arcand & Williamson, 1981; Currie, Moore, Friedman, & Warshaw, 1981; Levy, 1985). The outreach function of these services is sometimes extended by the use of nurses, health visitors, or mailed questionnaires to help identify elderly persons at risk for assessment (e.g., Barber, 1981; Barber, Wallis, & McKeating, 1980; Barber & Wallis, 1982; Milne, Maule, Cormack, & Williamson, 1972; Vetter, Jones, & Victor, 1984).

Objectives of Assessment

While the general goal of geriatric assessment is the improvement of care and outcomes for elderly patients, the variable organization of geriatric assessment programs determines which of several immediate objectives are attainable. In addition to multidimensional diagnosis, these immediate objectives include development of therapy, rehabilitation or placement plans or recommendations, provision of limited or more extensive treatment, implementation of longer-term primary care and case management, making optimal uses of health-care resources via a gate-keeping function, and geriatric education and research (Appendix). Given the limits affecting the development of American assessment programs, those in most fee-for-service and capitated settings may exercise only a few of these functions, given limited service obligations and relatively healthy populations (Fretwell, Cutler, & Epstein 1987; Gillick, 1987; Siu, Brook, & Rubenstein, 1986), while many of those in the VA system are able to address most or all of these objectives because of the VA's traditional emphasis on geriatrics and comprehensive care.

Several programs, particularly home-visit teams, have primary objectives of discovering elderly patients with treatable-manageable conditions and making optimal referrals or placements (e.g., Williams, Bennett, Nixon, Nicholson, & Gabert, 1972; Williamson et al., 1964). Inpatient consultation services and hospital-based outpatient programs usually have several objectives in addition to casefinding and referral, including development of a care plan or treatment recommendations (e.g., Campion, Jette, & Berkman, 1983; Winograd, 1987). Ensuring the appropriate use of services via payment authorization is the objective of geriatric referral or "channeling" programs that do not themselves provide therapeutic services (Williams, Hill, Fairbank, & Knox, 1973). Otherwise, many outpatient and inpatient assessment programs provide at least limited treatment. By and large, only the inpatient programs tie assessment directly to provision of extensive treatment and rehabilitation. Most outpatient and home-visit programs provide long-term primary care and/or case management, and some reassessment is performed periodically to monitor changes. Many assessment programs report important additional objectives of education and research.

In summary, geriatric assessment programs are quite variable in their structures and processes, largely reflecting the kinds of patients accepted.

In the following section we will focus on the questions of health outcomes and utilization and cost impacts that have been demonstrated for geriatric assessment programs.

IMPACT RESEARCH ON GERIATRIC ASSESSMENT

In recent years, published reports describing the patient-care effectiveness of specific geriatric assessment programs have been accumulating, and have been periodically reviewed (Kane, Kane, & Rubenstein, 1989; Rubenstein, Rhee, & Kane, 1982; Rubenstein 1987; Wieland, 1989). In this section we add consideration of the most recent published papers that include at least some outcome data. Our discussion will focus sequentially upon each of the various assessment program effects or outcomes that have been evaluated. We consider these findings in relation to the design and quality of the research and the varying organization and objectives of the assessment programs evaluated. We also provide data on negative conclusions for studies that have examined a particular outcome and failed to find an effect.

Tables 5.1 and 5.2 present brief overviews of the published research on geriatric assessment programs. (The citations given can be used to refer to program information in the Appendix.) Table 5.1 lists the descriptive-research publications supporting associations between specific assessment programs and a limited set of care improvements; most of these citations are to earlier evaluations of geriatric assessment programs employing preexperimental research designs; e.g., simple cross-sectional or one-time descriptions of diagnostic yield or improvement through comprehensive geriatric assessment. Table 5.2 concerns the controlled studies, listing the basic research designs employed, sample size, and specific research findings. Among the controlled studies are two that employed time-series analysis of system-level data (e.g., lengths of stay) (Barker et al., 1985; Schuman et al., 1978). Of the remaining controlled studies (all examining patient-level effects), 10 were truly randomized (Allen et al., 1986/Becker McVey, Saltz, Feussner, & Cohen, 1987/Saltz, McVey, Becker, Feussner, & Cohen, 1988; Collard et al., 1985; Hendriksen et al., 1984; Hogan et al., 1987; Rubenstein, Josephson, et al., 1984; Rubenstein et al., 1987; Rubenstein et al., 1988; Tullock & Moore, 1979; Vetter, Jones, & Victor, 1984; Williams, Williams, Zimmer, Hall, & Podgorski, 1987; Yeo, Ingram, Skurnick, & Crapo, 1987; Zimmer, Groth-Junker, & McCusker, 1984, 1985) and 7 evaluations utilized nonrandomized concurrent controls, matching, or stratification (Balaban, 1980; Berkman, Campion, Swagerty, & Goldman, 1983; Gayton, Wood-

Table 5.1 Descriptive Studies of Geriatric Assessment Program Impacts

Program Effect	*Program Type/ Setting*	*Reference*
Improved diagnostic accuracy	Hospital	Poliquin & Straker, 1977
		Cheah & Beard, 1980
		Applegate et al., 1983
		Gilchrist et al., 1985
		Katz et al., 1985
		Lichtenstein & Winograd, 1985
		Rubenstein et al., 1987
	Community	Williamson et al., 1964
		Lowther et al., 1970
		Bayne & Caygill, 1977
		Brocklehurst et al., 1978
		Reifler & Eisdorfer, 1980
Reduced medication	Hospital	Applegate et al., 1983
		Allen et al., 1986
		Rubenstein et al., 1987
Improved functional status	Hospital	Poliquin & Straker, 1977
		Applegate et al., 1983
		Caradoc-Davies, 1986
		Liem et al., 1986
	Community	Lowther et al., 1970
		Reifler & Eisdorfer, 1980
Improved affect or cognition	Hospital	Poliquin & Straker, 1977
		Applegate et al., 1983
		Liem et al., 1986
	Community	Reifler & Eisdorder, 1980
Improved placement location	Hospital	Poliquin & Straker, 1977
		Burley et al., 1979
		Sloane, 1980
		Lichtenstein & Winograd, 1985
	Community	Williams et al., 1973
		Bayne & Caygill, 1977
		Brocklehurst et al., 1978
Reduced use of nursing homes	Hospital	Poliquin & Straker, 1977
		Sloane, 1980
		Lichtenstein & Winograd, 1985
	Community	Williams et al., 1973
Reduced use of hospital services	Hospital	Burley et al., 1979
		Sainbury et al., 1986

Table 5.2 Controlled Studies of Geriatric Assessment Program Effects

				Outcomes/Effects									
Reference	*Program Setting*	*Study Design*	*Study Population*	*Improved Diagnosis*	*Reduced Medication*	*Improved Function*	*Improved Affect/MS*	*Improved Placement at DC*	*Less NH use*	*Reduced Hospital use*	*Increased Homecare use*	*Less Care Cost*	*Improved Survival*
Schuman, 1978	CHGAU	QE-TS/ NECG	case + control series = 2 yrs; cases = 98; 3 cntl grps = 333	0	0	0	0	+	0	+	0	0	0
Tulloch, 1979	HOD	RCT	N: cases = 145 controls = 150	+	0	0	0	0	0	+	+[1]	0	0
Balaban, 1980	HGARU	NECG	N: cases = 185 controls = 110	0	0	X	+	0	0	X	0	X	0
Berkman, 1983; Campion, 1983	IGCS	NECG-MC	N: cases = 35 controls = 17	X	0	0	0	0	0	+/−[2]	0	0	0
Lefton, 1983	HGARU	NECG-MC	N: cases = 50 controls = 50	0	0	+	0	+	+	0	0	0	0
Popplewell, 1983	HGAU	NECG-MC	N: cases = 50 controls = 50	0	+	0	0	+	0	X[3]	0	0	0
Teasdale, 1983	HGAU	NECG-MC	N: cases = 62 controls = 62	0	0	0	0	X	0	−[4]	0	0	X

[1] Hosp LOS significantly shorter for cases, rate of referral to community services significantly greater

[2] Assessed patients had significantly longer hospital LOS but significantly fewer readmissions

[3] Assessed patients had shorter LOS but used significantly more services

[4] Significantly longer LOS; subsequent utilization not described

Table 5.2 (continued)

				Outcomes/Effects									
Reference	*Program Setting*	*Study Design*	*Study Population*	*Improved Diagnosis*	*Reduced Medication*	*Improved Function*	*Improved Affect/MS*	*Improved Placement at DC*	*Less NH use*	*Reduced Hospital use*	*Increased Homecare use*	*Less Care Cost*	*Improved Survival*
Hendriksen, 1984	HVAS	RCT	N: cases = 285 controls = 287	0	0	0	0	0	0	+	+	+	+
Rubenstein, 1984b, 1987	HGARU	RCT	N: cases = 63 controls = 60	+	X	+	+	+	+	+/−[5]	X	+	+
Vetter, 1984	HVAT	RCT	N: cases = 279, 289 controls = 270, 291	0	0	X	+	0	0	0	+	0	+[6]
Barker, 1985	IGCS	QE-TS	366 consult pts: case series = 6 mo. control series = prior 2 yrs	0	0	0	0	0	0	+[7]	0	0	0
Collard, 1985	2 HGAUs	RCT	N: cases = 218 controls = 477	0	0	0	+	X	0	+	0	+	+[8]
Zimmer, 1984,1985	HVAS	RCT	N: cases = 85 controls = 82	0	0	X	X[9]	0	X	X[10]	+	X[10]	X
Allen, 1986 Becker, 1987	IGCS	RCT	N: cases = 92 controls = 93	X[11]	X[12]	X	0	X	X	X[13]	0	0	X

[5] Assessed patients had significantly longer initial LOS and service use, but significantly lower readmission rate

[6] Assessed patients in urban stratum had significantly improved affect, use more home services, and had improved surivial (rural sample differences n.s.)

[7] 21% decrease in bed-blockage census during intervention

[8] In one hospital unit, effects significant—in other unit, n.s.; complication rates n.s., n.s. trend to less restraint use

[9] Morale, n.d.; pt and caregiver satisfaction significantly improved

[10] Reduced use of hospitals and total health-care costs may be significant for terminal pts; n.s. in non-terminal group

[11] House officer compliance with recommendations significantly greater among cases

[12] Overall complication rate n.s.

[13] LOS tended to be positively correlated with recommendation compliance; n.s. trend for more readmissions among cases

Saltz, 1988 McVey, 1985													
Williams, 1987a,b	HOD	RCT	N: cases = 58 controls = 59	X	0	X	0	0	X	+	X	+	X
Yeo, 1987	HOD	RCT	N: cases = 106 controls = 99	0	0	+[14]	+[15]	0	0	+[16]	0	0	X
Hogan, 1987	IGCS	RCT	N: cases = 57 controls = 56	0	+	X[17]	+	0	0	X[18]	+[19]	X	+
Gayton, 1987	IGCS	NECG-MC	N: cases = 222 controls = 182	0	0	X	X	X	X	X	X	0	X[20]

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[14] Significantly improved physical and total SIP score (psychosocial score comparison n.s.)

[15] Improvement on Affect Balance Scale [p = .05]; self-rated health, depression, LSI-A, n.s.)

[16] Cases used significantly more primary care and ancillary services, inpt service use n.s.)

[17] Improvement in Barthel score n.s.

[18] Initial LOS n.s.; rehospitalization rate and total 1-yr hosp dys not examined

[19] Significant increase in referrals to community services

[20] Test of 6-mo. survival curves p = .06 favoring cases

N = total sample size
0 = not examined
X = no difference [p > .05]
+ = significant [p < .05]
− = sign. difference favoring controls
RCT = randomized controlled trial
NECG = non-equivalent control group design
-Hx = with historical controls
-MC = with matched or other concurrent control group
QE-TS = quasi-experimental time series
See Legend of Appendix for other abbreviations

dc = discharge
f/u = follow-up
GP = general practitioner
hosp = hospital
SIP = Sickness Impact Profile

NH = nursing home
pt(s) = patient(s)
n.s. = non-significant
LOS = length of stay

Dauphine, deLorimer, Tousignant, & Hanley, 1987; Lefton, Bonstelle, & Frengley, 1983; Teasdale, Schuman, Snow, & Luchi, 1983; Popplewell & Henschke, 1983; Schuman et al., 1978).

Diagnostic Efficacy

Overall improvement of diagnosis—an effect particularly stressed in the descriptive studies—is perhaps the most widely supported outcome of comprehensive geriatric assessment. Of course, this is the one common objective of geriatric assessment programs. The studies reviewed defined diagnostic improvement in a variety of ways. Some counted all new diagnostic labels as new problems uncovered by assessment, while others more conservatively tallied as new diagnoses only major treatable problems (e.g., Rubenstein, Wieland, et al., 1984; Rubenstein et al., 1987). Some outpatient programs documenting new diagnoses were concerned with elderly patients in the community who had little recent contact with health professionals (e.g., Harrison, Martin, Rous, & Wilson, 1985; Lowther et al., 1970; Williamson et al., 1964), while others found new problems among hospitalized patients who had been under the care of others (e.g., Applegate et al., 1983; Hogan & Cape, 1984). The frequency of new problems discovered ranges from almost one to over four per patient. Of the controlled studies, Tullock and Moore in an outpatient setting (1979) and Rubenstein et al. on an inpatient unit (1984; 1987) demonstrated significantly more new diagnoses via the assessment process. Two inpatient geriatric consultation programs (Becker et al., 1987; Campion et al., 1983) and another outpatient assessment program (Williams, 1987; Williams et al., 1987) failed to demonstrate a significantly greater number of new diagnoses among assessed patients. Of Epstein's (1987) respondents, over 92% judged their assessment programs to have improved diagnosis.

We must note that merely increasing the quantity of medical diagnoses by assessment may not be of great benefit uncoupled to treatment, nor is it the only means by which health professionals may reach a comprehensive understanding of an elderly patient's problems. Assessment may also improve the quality of diagnoses, and identify uncounted nonmedical problems important in planning or recommending treatment. The general effectiveness of assessment programs in identifying new problems appears to arise from the content and process of assessment itself, including the extra time spent with the patient and in many cases, a lack of diagnostic thoroughness on the part of referring or comparison services.

It is very likely that most other observed impacts of geriatric assessment programs are attributable to such multidimensional diagnostic improvements.

Polypharmacy

Taking large numbers of medications, *polypharmacy*, is a common and serious problem among elderly persons. Of the inpatient programs evaluating their impact on the number and appropriateness of medications, two controlled studies (Hogan et al., 1987; Popplewell & Henschke, 1983) and several descriptive studies have demonstrated medication reductions (e.g., Greene & Johnson, 1987; Poliquin & Straker, 1977; Rubenstein et al., 1981). Two randomized studies did not detect significantly greater reductions of medications among assessed than among control patients (Allen et al., 1986; Rubenstein, Josephson, et al., 1984; Rubenstein et al., 1987). On the other hand, 47% of assessed patients in Hogan's consult study (1987) received fewer medications at discharge versus 24% of controls. Similarly, 50% of Popplewell's (1983) assessed patients experienced medication reductions or substitutions versus 16% of control patients; assessed and control patients had received 3.6 drugs upon hospital admission—a number his Australian unit reduced to a mean of 3.4 at discharge, compared to 4.1 medications per discharged control. Over 90% of Epstein's sample programs claimed to be effective in improving drug regimens. About half of inpatient programs and nearly 40% of outpatient programs considered medication review the first or second most important element of their service (Epstein et al., 1987).

Physical Functioning

Numerous assessment programs have demonstrated improvements in patients' physical functioning, and these have by no means been restricted to inpatient programs (Applegate et al., 1983; Hogan & Cape, 1984; Lefton et al., 1983; Liem et al., 1986; Poliquin & Straker, 1977; Rubenstein et al., 1981; Rubenstein, Weiland, et al., 1984; Rubenstein, Josephson, et al., 1984). Descriptive studies of outpatient and home-visit assessment services have documented improved functional status (e.g., Barber & Wallis, 1978; Lowther et al., 1970; Reifler & Eisdorfer, 1980; Reifler, Larson, Cox, & Featherstone, 1981; Williams, 1974), as have two controlled studies of outpatient assessment programs (Tullock & Moore, 1979; Yeo et al., 1987). At the same time, programs failing to demonstrate functional improvement in experimental subjects versus controls are also located in diverse settings; e.g., home visitation services (Vetter et al., 1984; Zimmer, Groth-Junker, & McCusker, 1985), an outpatient program (Williams et al., 1987), inpatient consult teams (Gayton, Wood-Dauphine, deLorimer, Tousignant, & Hanley, 1987; McVey, Becker, Saltz, Cohen, & Feussner, 1985), and an inpatient unit (Balaban, 1980). In general, the ability of a program to improve patient function (as well as other health outcomes) depends upon the content and control of its rehabilitative intervention (quite weak for most home-visit and consult services) and upon the criteria employed in selecting patients likely to benefit in functional status from assessment, treatment, and rehabilitation. About three-quarters of Epstein's respondents (a larger proportion of inpatient than outpatient programs) reported being moderately or much more effective than "routine care" in improving or maintaining physical functioning in their patients. Correspondingly, arrangement for physical rehabilitation services was ranked as a function of primary importance by half of inpatient and less than one-fifth of outpatient assessment programs (Epstein et al., 1987).

Psychological and Social Consequences of Assessment

Various aspects of psychological and social functioning have been improved by geriatric assessment and treatment programs in diverse settings. In a descriptive study, Reifler and Eisdorfer's (1980) psychogeriatric outpatient service uncovered many reversible cognitive impairments leading to improvement of mental functioning in 24% of assessed patients. Descriptive studies of inpatient programs documented new treatable psychiatric disorders (Poliquin & Straker, 1977), reduction of depression and improvements in motivation and program compliance (Applegate et al., 1983), and improvements in cognitive or psychiatric status (Greene & Johnson, 1987; Liem et al., 1986; Poliquin & Straker, 1977; Spar, Ford, & Liston, 1980). Controlled studies of assessment and treatment programs have also demonstrated significant improvements in cognitive and psychiatric status. Of the inpatient assessment and rehabilitation units, Balaban (1980) found significant improvement in subjective well-being and emotional status among assessed patients, and a significantly larger proportion of Rubenstein's assessed patients (Rubenstein, Josephson, et al., 1984) had improved morale at follow-up. Hogan's (1987) consultation team achieved a significant improvement in mean cognitive status score for assessed patients versus controls; 79% of the former experienced a mental status improvement versus only 33% of the latter. Yeo's (1987) outpatients achieved significant improvement of affect balance (Bradburn, 1969) although they did not show such improvements in depression scores, self-rated health, or life satisfaction. Vetter's urban-based home-assessment service improved affect significantly among assessed patients. A small minority of assessment programs did not find significant positive impact upon mental and cognitive status (Gayton et al., 1987; Zimmer, Groth-Junker, & McCusker, 1985). Of Epstein's sample (1987) of assessment programs, over four-fifths judged themselves more effective than routine care in improvement or maintenance of "psychosocial functioning," but only half made the same judgment for cognitive functioning.

Assessment as a Guide to Successful Placement or Level of Care

The connection between comprehensive geriatric assessment and improvement of placement or level of care is a well-established one, going back to T. F. Williams's (1973) classic Monroe County study. This outpatient program assessed all patients referred to nursing homes, finding that only 38% required skilled care, while 23% could return to their homes and 39% to board-and-care or retirement facilities, given specific aids and therapies. Subsequent descriptive studies of various outpatient assessment programs have shown similar results (Bayne & Caygill, 1977; Brocklehurst et al., 1978; Hughes & Lindsay, 1980; Jonsson and Halldorsson, 1981), as have a number of descriptive inpatient-program studies (Hogan & Cape, 1984; Lichtenstein & Winograd, 1984; Poliquin & Straker, 1977; Robertson, Christ, & Stadler, 1982; Rubenstein et al., 1981; Sloane, 1980). With respect to the findings of controlled studies, inpatient assessment and treatment units have generally demonstrated significant placement improvements (Lefton et al., 1983; Popplewell & Henschke, 1983; Rubenstein, Josephson, et al., 1984; Schuman et al., 1978), the exceptions being two relatively untargeted acute assessment units (Collard et al., 1985; Teasdale, Schuman, Snow, & Luchi, 1983). Two inpatient consultation-model assessment programs, also untargeted, failed to demonstrate placement improvements (Gayton et al., 1987; Saltz, McVey, Becker, Feussner, & Cohen, 1988). Of Epstein's (1987) assessment programs, 84% rated themselves moderately or much more effective than routine care in preventing nursing-home placement.

Impact of Assessment on Utilization and Cost of Services

Several controlled studies followed patients for 6 to 12 months after the initial assessment took place and were thus able to examine longer-term utilization and cost impacts. Closely connected to improved placement is reduction of nursing-home days—an effect demonstrated by Schuman et al. (1978), Lefton et al. (1983), and Rubenstein, Josephson, et al. (1984) for inpatient assessment programs. A significant impact on nursing-home utilization was absent for two inpatient consultation programs (Gayton et al., 1987; Saltz et al., 1988), and two outpatient services (Williams et al., 1987; Zimmer et al., 1985). Several different effects have been reported for the use of hospital services. While some studies have shown prolongation of initial hospital stays in association with geriatric assessment services (Berkman et al., 1983; Rubenstein, Josephson, et al., 1984; Teasdale et al., 1983), others found their programs significantly shortened lengths of stay (Barker et al., 1985; Burley, Currie, Smith, & Williamson, 1979; Collard et al., 1985; Sainbury, Gillespie, Armour, & Newman, 1986; Schuman et al., 1978). Controlled evaluations, many following patients at least one year, reported reductions in the use of acute-care services over the time of follow-up (Hendriksen et al., 1984; Rubenstein, Josephson, et al., 1984; Tulloch & Moore, 1979; Williams et al., 1987). Most studies that did not demonstrate impact on subsequent hospitalization or total hospital days either did not examine patient hospital utilization beyond initial patient stay or did not follow patients beyond six months postassessment. Impact of inpatient programs on hospital stays is an exceedingly important issue in the development of geriatric services in the United States, where the mode of payment for acute services, the tendency toward fragmentation of health care and the lack of focus on long-term health and management of elderly patients leads to great pressure to abbreviate hospital stays. Over two-thirds of Epstein's (1987) assessment programs indicated they had a moderate or great effectiveness compared to traditional care in reduction of hospitalizations.

In association with declines in nursing-home placement and the use of institutional services, some of the longitudinal controlled studies have shown compensatory increases in referral to or the use of community-based and/or home-care services (Hendriksen et al., 1984; Hogan et al., 1987; Tulloch & Moore, 1979; Vetter et al., 1984; Zimmer et al., 1985), although this was not always the case (Gayton et al., 1987; Rubenstein, Josephson, et al., 1984; Williams et al., 1987). An increase in home services is an obvious consequence for those community-based and home-visit assessment programs whose patients would otherwise receive few formal noninstitutional services (Hendriksen et al., 1984; Vetter et al., 1984; Zimmer et al., 1985). Of hospital-based programs showing increases in home-services use, both examined only rates of referral to community services (not subsequent utilization), and neither were U.S. assessment programs (Hogan et al., 1987; Tullock & Moore, 1979). Three hospital-based assessment programs found no significant differences between home-services use by assessed and control patients (Gayton et al., 1987; Rubenstein, Josephson, et al., 1984; Williams et al., 1987). This effect is probably not stable, uniform, or necessarily appropriate in and across hospital-based assessment programs. The reason these programs do not have consistent impacts on use of community-based services may be the weakness of organizational connections between hospital-based health services and community-based social services. Thus, Epstein et al. (1987) found fewer than one-quarter of responding hospital-based assessment programs considered coordination of community social-support services as one of their more important impacts.

Several of the controlled studies of the programs that had effects on service utilization demonstrated corresponding effects on service costs or charges. Collard (1985) demonstrated significant cost reductions for patients treated on one of two acute-service assessment units, due to significant reductions in lengths of stay. Rubenstein, Josephson, et al. (1984) found total one-year direct patient-care costs reduced because of overall reductions in nursing-home and rehospitalization days and despite significantly longer initial lengths of stay on the geriatric assessment unit. Williams's outpatient program (1987) demonstrated reductions in medical-care costs due primarily to reduced hospital use. This occurred despite the fact that the measured health parameters of his assessed patients were not significantly different from controls at follow-up, suggesting either that care efficiency was enhanced by the outpatient programs or that there was improvement in some unmeasured aspect of health. Hendriksen's Danish home-visit assessment program (1984) reduced medical-care costs, evidently through successful early casefinding and referral for treatment, and providing community-living elderly with an "offset" for increased use of health services. Balaban's inpatient unit (1980) had no impact on length of stay, and health-care costs were not significantly different. Hogan (1987) found no difference in health-care costs, although postdischarge utilization and charges for assessed and control patients were not described. Improved survival of the assessed patient group could conceivably lead to increased service use and charges over time. However, the Sepulveda study demonstrated that given functional health and care improvements for assessed patients, survival can occur alongside reductions in service dependency and costs (Rubenstein, Josephson, et al., 1984).

Survival

Several randomized controlled studies of different types of assessment programs demonstrated significantly increased survival for assessed patients. Mortality was reduced for Rubenstein's assessment group by 50% at one year, and the survival curves of case and control groups were still significantly different at two years (Rubenstein, Wieland, et al., 1988). Collard found significantly lower mortality for assessed patients in one of the two acute-care assessment programs she studied (1985). The Danish trial demonstrated a 25% reduction in mortality after three years for its community-living assessed patients (Hendriksen et al., 1984), and the Welsh home-visit study had a similar effect among its urban group of assessed elderly patients (Vetter et al., 1984). The Rochester home-care assessment team did not significantly improve survival of its patients, many of whom were terminally ill (Zimmer et al., 1985). Of outpatient assessment programs, neither Williams et al. (1987) nor Yeo et al. (1987) detected significant survival differences between treatment groups. While trials of two inpatient assessment and consultation models did not detect significant improvements in survival (Gayton et al., 1987; Saltz et al., 1988), there was a trend toward improved six-month survival for Gayton's assessed group ($p = .06$), and Hogan's (1987) consultation and treatment services did significantly improve six-month survival.

Special consideration should be given to the relatively few controlled studies failing to show major outcome benefits. Two quasi-experiments (Balaban, 1980; Teasdale et al., 1983) and one experimental study (Zimmer, Groth-Junker, & McCusker, 1984; Zimmer et al., 1985) were not performed on frail subgroups and highlight the need to target assessment to patient populations in which the expectation of treatable geriatric problems is high. In the first two studies, many patients too well or too ill to show special benefit seem to have been included. On the other hand, the Rochester home-visit assessment and treatment study specifically selected homebound chronically ill elderly, including very disabled and terminal patients. While the capability of this program to improve patient and caregiver satisfaction was demonstrated, it is questionable whether this patient population could reasonably have been expected to improve meaningfully in functional health or survival (Zimmer et al., 1985). The population that an assessment program serves, in addition to program characteristics themselves, must be considered in selecting both reasonable program objectives and indicators of effectiveness (Fretwell, 1988).

Several inpatient geriatric consultation services did not show strong impacts on patient-care outcomes, although many previously undocumented problems were detected (Allen et al., 1986; Becker et al., 1987; Berkman et al., 1983; Gayton et al., 1987; Katz et al., 1985; Lichtenstein & Winograd, 1984). Where there was little targeting, some of the outcomes evaluated might have been inappropriate to segments of the population studied. A targeting procedure, such as that described by Winograd and colleagues (1987), could improve the cost-effectiveness of geriatric consultation services. Further, the interventions arising from assessment may have been relatively weak for some of these consultation-only programs when compared to those outpatient and inpatient programs that were able to control treatment. Katz et al. (1985) discuss the problem of convincing physicians in control to recognize the problems uncovered by assessment and undertake appropriate action. On the other hand, Allen et al. (1986) demonstrated higher rates of recommended treatments in consultation-group patients as compared to controls. The model tested recently by Hogan et al. (1987), which resulted in several improved outcomes, including survival, is unique among the inpatient consultation programs in that treatment and therapy as well as assessment recommendations were provided by the geriatric team.

As in all controlled studies, program impact must be viewed in relation to the nature of the intervention. We have earlier commented upon the unevenness of detail in descriptions of geriatric assessment methods, programs, and care processes. For none of the controlled studies reviewed would it be easy to conclude that controls were receiving particularly good or poor care where the evaluation and treatment of controls are not fully described. Thus, we do not know whether or how complex geriatrics programs (e.g., consultations teams, assessment units) produce (or fail to produce) various benefits when compared to unspecialized clinicians carefully reviewing and treating frail elderly patients. Only recently has a study (Pinholt et al., 1987) provided solid evidence that a particular standardized comprehensive functional assessment is considerably more sensitive in detecting multidimensional treatable problems in elderly inpatients than what clinicians detect with their usual diagnostic procedures. The most beneficial long-term effect of geriatric assessment programs could ultimately be improvement of the general standard of diagnosis and care of frail elderly patients through education and research. Although local conditions may determine the success of each assessment program, it may be that the best results in the near term will be obtained by well-targeted, high-profile geriatric assessment and treatment units that represent "the new technology of geriatrics" (Epstein et al., 1987).

IMPLICATIONS FOR POLICY AND RESEARCH ON GERIATRIC ASSESSMENT

Much research remains on the best ways for establishing comprehensive geriatric assessment and assessment-based intervention programs within effective, efficient, and equitable systems of geriatric health care. We have raised several questions in connection with our review of programmatic contexts and outcomes of assessment programs. In this section, we raise more general questions that may help inform further clinical, methodological, and policy-related research on comprehensive geriatric assessment.

Review of the geriatric assessment literature shows a great diversity of assessment styles, component measures, objectives, settings, populations, and evidence of effectiveness. In this growing literature, almost every program has had some important unique organizational components and benefits. However, although research has revealed benefit patterns, it is difficult definitively to attribute the pattern of findings to specific program elements. We lack controlled or meta-analytic studies comparing the relative value of assessment components and various follow-up treatment and rehabilitation programs. Documentation of the potential benefits of particular assessment programs against the background of "routine care" has been valuable in gaining the attention of policymakers. However, building progressive geriatric care on a national level, starting with the establishment of financially self-sustaining geriatric assessment units, will probably not go forward until we can specify the optimal assessment and treatment packages for given frail elderly patient populations. We need to know which components of the assessment programs are more important in producing benefits. What are the best selection (i.e., screening and casefinding) criteria for different forms of comprehensive assessment? Moreover, given a background of additional clinical-outcome research, what comprehensive assessment findings serve as indications for subsequent diagnostic and interventive efforts?

Until these questions are answered, further dissemination of assessment-based programs and related care-delivery improvements are likely to be hindered. Answers to these questions will allow health economists to gauge the cost-savings potentials of geriatric assessment programs.

Further, system reform may turn on a requirement that geriatric-care professionals (and society) link objective assessment findings and other explicit criteria to clinical decision making and management (and reimbursement).

What role do standardized assessment instruments currently play, as opposed to specialized clinical judgment, in the comprehensive diagnosis and decision making of assessment programs? The literature often mentions use of standardized assessment packages (particularly in functional and psychological evaluation) by physicians, nurses, and allied health professionals. In many programs, the impetus for the use of standardized instruments originally lay in the research and education objectives of clinical programs. Several geriatric assessment programs have adapted different instruments in screening referrals and active geriatric casefinding. Standardized measurement scales appear to play some additional role in comprehensive diagnosis and selection of treatments in some programs, as well as the monitoring of treatment courses and outcomes. Considerable work remains in establishing the validity and reliability of these comprehensive assessment tools, especially in connection with clinical decision making. Recently, cautionary voices have outlined criteria for adaptation of standardized instrument packages in geriatric assessment programs (Applegate, 1987; Kane, R. L., 1987).

Closely related to issues concerning the standardization of assessment instruments are questions concerning the personnel performing comprehensive geriatric assessment. Responsible for collecting specific data in their areas of expertise, geriatric team members record, report, and interpret standardized results to other team members, physicians, and relevant others. Much is left unclear, however, about the specific role team members play in the clinical decision-making process. The new imperatives of cost-effective and efficient health services will give increasingly high priority to research on the optimal structure and staffing of geriatric assessment and treatment teams. For given program types or settings, how does variation in the number and type of assessment personnel affect the quality and cost of comprehensive geriatric assessment and treatment?

CONCLUSION

Published evidence for the effectiveness of geriatric assessment is difficult to evaluate quantitatively because of the diversity of assessment components, targeted populations, and types of evidence offered. Most problematic is the fact that geriatric assessment has been seldom examined in pure form; i.e., independent of interventions arising from it and in contrast to the yield of well-described "standard" diagnostic procedures. The diversity of interventions raises further complications in evaluating the generalizability of geriatric assessment program impacts. There is no defined optimal blueprint for geriatric assessment or for interventions arising from it. Clinicians interested in developing services similar to those reviewed will do well to heed the experiences of others in adapting the principles of geriatric assessment to local resources. Clinical and policy researchers interested in establishing more securely comprehensive geriatric assessment as a basis of progressive geriatric care will have to attend to the comparative diagnostic value and costs of different geriatric assessment packages and the generalizability of their benefits.

Despite the current programmatic diversity, geriatric assessment programs share an underlying philosophy that multidimensional review of problems in functionally impaired elderly can uncover reversible problems and that assessment-directed treatment can improve elders' functioning and quality of life. The weight of the evidence from assessment program research strongly supports this philosophy. Many beneficial impacts have been observed with considerable consistency, more than justifying the spreading interest in comprehensive geriatric assessment and geriatric assessment programs.

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Appendix: Components and Process of Geriatric Assessment

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
Adelman, 1987; New York	NHGARU	Admission team: MG, PHYS, PT, SW, RN Rehab team: MG, PSY, MG-F, PHYS, PT, RN, PHAR, OT, AT, SW, NT, NA	Interdis team asmt includes functional eval using New York State DSM-1; few other specifics	Selects pts ≥ 60, with mental status sufficient to follow program, medically-stable; team f-u on dc'd pts	MDA, Tx, CM, TxR, RE
Ahmed, 1987; Massachusetts	HGPAU	PSY, NEUR, IM, NPSOL, RN, NT, SW, AT	Interdis asmt includes comprehensive psychiatric asmt (hx, mental status exam), lab tests (e.g., SMA-12, UA, CBC, x-ray, etc.), neuropsych eval (WAIS-R, Western Memory Scale, Weschler Aphasia Battery, etc.), ADL asmt, RN asmt; eval on request from audiology, ophthamology, nutrition, PT	Solicitation of referrals; unit admits pts ≥ 60 with recent-onset dementia or behavioral problems; exclusion criteria; asmt complete at wkly team mtg	MDA, Tx, TxR, RE
Allen, 1986; Becker, 1987; Saltz, 1988; North Carolina	IGCS	Consult team: MG, MG-F, CNS, SW	Multidim asmt includes GF's eval (hx, physical, Short Portable MSQ); geriatric clinical nurse specialist's asmt (Katz ADL, OARS IADL, and depression screen [CES-D]; social work asmt (social data, Veterans Alcoholism Screening Test)	Inpts ≥ 75 seen ≤ 2 ds of admission; team mtgs; pts followed by team; recs only	MDA, TxR, RE
Applegate, 1983, 1987; Tennessee	HGARU	Core team: MG, PA, PT, OT, PSOL, PSY, SW, NT, AUD, ST	Interdis asmt includes medical asmt (undetected disorders, cognitive state, medication asmt); nursing asmt (motivation, skin care, continence, self-care ability); rehab med asmt (ROM; gait, mobility asmt, ADL, IADL); psychiatric asmt (ori-	Asmt complete ≤ 7–10 ds; team mtg wkly; admission excl. terminal and demented pts, includes at risk for NH placement	MDA, TxR, Tx

Appendix (continued)

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
			entation, memory, motivation, depression); social services (need for/availability of family and support); nutrition; speech; audiology		
Arcand, 1981; Scotland	HVAS	MG, MG-S	Multidim asmt by MD and student including hx taken from pt and/or family; physical performed in home in most cases; asmt of physical environment, social support, and self-care abilities	MG home visit asmt of pts referred to inpt geriatric ward	MDA, GK, TxR, RE
Barber, 1976, 1978, 1981, 1982; Scotland	HVAS	HV, GP	Asmt record form of HV includes sections on demographics, "medico-social" problems including social supports and physical environment, sensory and functional impairments, social support needs, and symptoms	Casefinding by HV among retirees in GP panel	MDA, CF, Tx, TxR, CM
Barker, 1985; New York	IGCS	Consult team: IM, RN, SW	Interdis asmt includes review of diagnoses, treatments, nursing and social problems (chart review), living environment, use of services and devices, ADLs, mental and behavioral status	Team follows inpts ≥ 70 at risk of NH placement	MDA, TxR
Bayne, 1977; Ontario	CBAS	Primary care and/or hospital personnel complete precoded asmt form; CNS follows up as needed; Assessors do not see pts, are not described	Mutlidim asmt includes demographics; medical status (diagnoses, prognosis, treatments, level of cognitive function, emotional status); and functional capacity (ambulation, hearing, vision, speech, comprehension, and ADLs)	Not fully described; asmt on referral of inpt and outpt elderly with physical, mental disability; only recs to care personnel	MDA, TxR, RE

Berkman, 1983; Campion, 1983; Massachusetts	IGCS	Core team: MG, PSY, SW, PT, ST, OT, AT, NT, RN	Interdis team asmt includes physical functioning, depression screen (DSM-III), Kahn MSQ, review of active problems and medications	Team sees all referrals; RN is discharge nurse	MDA, TxR, RE
Boyd, 1982	HGAU (combined geriatric-orthopedic unit)	MG, SURG, ?	Multidim asmt; no specifics	Selects post-fx, post-surgical pts likely to benefit	MDA, Tx
Brocklehurst, 1978; England	HOPD	SW, MG	Social services asmt (social hx); standard medical asmt (includes hx, mental status exam, physical, lab tests)	Outpt MG asmt of pts referred to institutional care; SW asmt accompanies pt to clinic; pts admitted or followed as outpts	MDA, GK, TxR
Burley, 1979; Scotland	IGCS	Core team: MG, HO, RN Extended Team: SW, OT, PT	Interdis asmt; no specifics	Consultant finds inpts with "geriatric" problems; team asmt; wkly team mtg	MDA, CF, GK, TxR, RE
Caradoc-Davies; 1986; New Zealand	HGARU	Not described	Multidim asmt includes ADLs; few specifics	Open admissions from community, hospital transfers; ave. age 77 men, 80 women	MDA, Tx, CM
Cheah, 1979, 1980; Arkansas	HGARU	Interdis team includes: MD, RN, SW, NT, PSY	Interdis asmt; no specifics	Not described	MDA, Tx, CM, RE
Chekryn, 1979; Manitoba	CHGAU	MD, RN, PT, OT, SW	Interdis asmt completed initially by team. Medical asmt; functional asmt (includes Katz ADL); mental status asmt	Problem-oriented charting, biwkly team mtg	MDA, Tx, RE

Appendix (continued)

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
Collard, 1985; Massachusetts	HGAU	RN, MD, SW, PT, OT	"Detailed" multidimensional asmt undertaken by RN; no specifics	Primary nursing model; biwkly interdisciplinary team mtgs; RN performs case management	MDA, TxR, Tx
Cruse, 1986; England	HVAS	RN, GP	Multidim asmt included information on medical, psychological and social problems, use of services; caregivers and next-of-kin medications noted; dementia screen; urine sample taken; vital signs	Casefinding RN asmt in pts > 75 in practice panel; referral, pt/family education	MDA, CF, Tx, TxR
Currie, 1981; North Carolina	HVAS	MD, ?	Multidim asmt including affective, cognitive (MSQ), and functional aspects; few specifics	MD home visit asmt of pts referred from various sources	MDA, TxR
Dastoor, 1975; Dastoor, 1979; Quebec	HGPAU	PSY, PSOL, SW, RN, ?	Interdis asmt includes lab testing, measures of medical, cognitive, affective, and social functioning;	Not described; average of 2 new pts/wk	MDA, Tx, RE
Ford, 1980, Spar, 1980; California	HGPAU	IM-HO, PSY-HO, PSOL, SW, OT, PSY, RN	Asmt includes medical and psychiatric hx, p.e., mental status exam, standard lab tests, neuropsych testing, and Inventory of Psychic and Somatic Complaints	Primary nursing model; RN and core team asmt within 5 dys of admission; pts screened	MDA, Tx, TxR, RE
Fretwell, 1987; Rhode Island	HOPD	MG, RN, SW	Interdis asmt includes medical review of treatments, meds, hx, p.e.; RN asmt includes Folstein MMSE, Katz ADL, OARS IADL; SW asmt of social supports and activities, coping style, psychological function, economic resources and environment	Selects HMO pts ≥ 75; asmt complete in 1 2-hr visit; 30 min. each for RN, MG, SW eval plus 15 min. each for care planning conference, mtg w pt/family; consult letter to primary MDs	MDA, TxR only (no CM or primary care)

Gayton, 1987; Quebec	IGCS	Consult team: MG, CNS, SW, OT, PT	Interdis asmt; no specifics	Asmt of inpts ≥ 70 from ER; wkly team mtg; consultation with primary MD; recs to families, pts, plus limited tx, rehab	MDA, TxR
Gilchrist, 1985; Australia	HGPAU	Staffing not described	Multidim asmt includes DSM-III dxes; no specifics	39-bed unit w 1 open, 1 closed ward; admits from community pts ≥ 65; ave LOS 37 ds	MDA, Tx, TxR
Greene, 1986; Tennessee	HGPAU	Interdisciplinary team: PSY, RN, NA, MG-F, OT, CHP, SW, NT, HO	Medical and psychiatric hx, psych and physical exam, lab tests, Short Portable mental status exam (SPMSQ), Short Psychiatric Evaluation Schedule (SPES), asmt of social function, economic resources, self-care capacity, and psychosocial stress. DSM-III dxes.	"Intensive" rounds wkly; pts ≥ 60 with psych dx, hx, medically stable and ambulatory	MDA, TX, RE
Harrison, 1985; England	HVAS	HV, GP	Multidim questionnaire including sociodemographic data, current health, social and financial supports, dietary asmt, use of services, inspection of housing	Casefinding HV refers to practice, provider agencies	MDA, CF, ?
Hendriksen, 1984; Denmark	HVAS	RN	Multidim in-home questionnaire on social and health conditions; asmt did not include clinical exam; few specifics	Casefinding asmt of elderly ≥ 75 living in community; RN refers, performs follow-up visits	MDA, TxR, CF, CM

Appendix (continued)

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
Hogan, 1984; Ontario	CHGAU	Interdisciplinary team: RN, SW, PHYS, MG, MD	"Thorough medical evaluation" and occasional review by rehab services; no specifics	All admissions to hospital through GAU; pts screened; wkly team mtg	MDA, TxR, GK
Hogan, 1987; Nova Scotia	IGCS	Casefinder: RN Consult team: MG, RN, PT	Multidim casefinding asmt includes demographic and lab data, Hodkinson short mental status questionnaire, the Barthel Index, mobility, self-care skills, and sphincter control; no specifics on the full team asmt	Inpts ≥ 75 screened ≤ 2 ds of admission; selection criteria for team asmt; some recommendations to HO, other Tx by team; team rounds wkly	MDA, Tx, TxR
Jonsson, 1981; Iceland	HVAS	MG	Multidim asmt includes medical, cognitive (Kahn MSQ), and social asmt; few specifics	MD domiciliary asmt of pts on institutional wait lists; refers to appropriate LOC	MDA, TxR, GK
Katz, 1985; New York	IGCS	MD	Multidim physician asmt includes medical (hx and physical exam), mental health asmt (Folstein Mini-Mental State, Pfeiffer Short PES, Pfeiffer functional asmt inventory), asmt of socioeconomic resources, and Katz ADLs	Inpts ≥ 64 seen on referral; MD asmt averages 1.5 hrs	MDA, TxR, RE

Kirby, 1987; Texas	Nongeographic HGAU	Core team: MD, CNS, SW Extended team: PSOL, NT, RNs, PHARM, PHYS, ST, PT, others	Interdis asmt; no specifics	All pts admitted from community, over half self-, family-referred; core team conducts asmt at admission and daily rounds; extended team meeting weekly	MDA, Tx, CM
Kral, 1986; Ontario	HOPD	Staffing not described	Multidim asmt of psychiatric, neurological, medical, and psychosocial problems; few specifics	Outpt geropsych asmt	MDA, Tx, RE
Lefton 1983; Ohio	HGARU	Interdisciplinary team: RN, CNS, PT, OT, ST, SW AUD, NT, IM	Multidis asmt; no specifics	Wkly team mtg and rounds; admits pts ≥ 70 eligible for rehab hosp care	MDA, Tx, RE
Leonard, 1975; Hughes, 1980; Maryland	HVAS	MD, SW	Multidim asmt include initial SW eval (social environment, present behavior and problems, medical hx and use of services, caregivers; MD asmt]	Home asmt of pts referred by family/others for psychiatric hospitalization	MDA, GK, TxR
Levy, 1985	HVAS	PSY, MD?, SW?	Multidim asmt include geropsychiatric asmt (DSM-III dxes); no specifics	Accepts referrals from agencies, families; home asmt ≤ 7 ds	MDA, TxR, Rx, RE
Lichtenstein, 1984, Winograd, 1987; California	IGCS	Consult team: MG, MG-F	Multidim physician asmt (medical dxes, review of medical history, physical exam, mental status exam, ADLs, review with RNs of in-hospital functioning and family of pt functioning prior to admission, including IADLs)	Consult on referral; recs to HOs brief and limited to 4 to encourage compliance; asmt complete < 1 d	MDA, TxR, RE

Appendix (continued)

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
Liem, 1986; Arkansas	IGCS/ AGAU/ HGARU	Not described for consult team or acute unit; GARU team includes OT, PT, CNS, AUD, ST, PHAR, NT, PSOL, PSY, CONS-PHYS	Initial consult/unit asmt includes medical (diagnoses and therapies), functional asmt (ADLs and gait/mobility asmt), psychosocial asmt (motivation, mental function, social supports and financial resources), speech and audiometric eval	Pts screened and admitted from hospital wards; wkly team mtg; pts transferred to subacute GARU for further asmt, tx	MDA, Tx, TxR, RE, CM (clinic)
Lowther, 1970; Scotland	HOPD	MG, PSY?, HV, ?	Home asmt of household, house, family, family care provided, use of home help, district nursing and other supportive services; drugs identified in the home. Clinic eval included medical asmt (complete hx and physical, short psychiatric screen, chest x-ray, blood, UA)	Home asmt performed ≤ 1 wk of single clinic asmt; recs to pt, family, and primary care MD	MDA, CF, TxR
Martin, 1985; Pennsylvania	CBAS	RN, IM, SW, PSY Extended service from: MG, PSY, PHN social agencies	Multidim asmt includes medical hx and p.e., standard lab tests, "structured psychosocial questionnaire", Folstein Mini-Mental State, OARS Multidimensional Functional Asmt, family burden scale	Initial asmt takes 2-3 hrs, completed in 1-2 visits; team mtg held; family consulted; pts/families elect care at center or return to MD with asmt results and tx recs	MDA, TxR or Tx, CM

Millman, 1986; Pennsylvania	HOPD	Interdis team: MG, MG-F, NP, SW, GD, NT	Interdis asmt includes medical eval (hx, physical, hospital record review, chest X-ray and EKG, lab tests), screening eye exam, dental exam, and audiological eval; nursing asmt includes mobility, self-care and continence status, Folstein Mini-Mental State, need for special equipment, nutrition screen, and demographic data; social worker assesses support network, finances, transportation needs, recent loss, and bereavement	Selection criteria not specified; outpts followed and treated or referred; clinic performs primary care; wkly case conference; initial asmt = 2 hrs; f-u visits, 0.5 hrs	MDA, Tx, RE, CM
Mohr, 1985; Oklahoma	HGARU	Interdis team: IM, HO, PA, UROL, NEUR, SURG, PSOL, OT, PT, SW, NT, RN, case manager	Interdis asmt includes MD eval (hx, p.e., medication review), PSOL eval (memory, motivation, depression, psychosocial problems), RN eval (communication skills, skin, continence); PT/OT (ROM, mobility, strength, ADLs); SW eval (social supports, environment); NT (dietary needs, preferences)	Unit accepts older, younger chronically-ill pts (mean age 62; ave. 4.2 dxes); asmt complete 7-10 ds; case manager orients family; post-asmt decision to provide rehab or refer	MDA, Tx, TxR
Mold, 1987a,b; Oklahoma	HOPD	Core team: RN, MD, SW, PT, OT Extended team: PSOL, PSY, PHYS, ST, NT	Interdis asmt includes RN eval (demographics, social/dietary hx, medications, environmental questions, daily activities, mental status, depression, mood asmt instruments, family interview); hearing/vision eval; PT/OT eval includes mobility, strength, ADLs; SW eval of social supports; MD eval (hx, p.e.)	After referral, RN screens over telephone; asmt complete in 1 3-4 hr visit; team mtg following evals; pts returned to primary MDs w recs only	MDA, TxR only

Appendix (continued)

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
Moore, 1984; North Carolina	HOPD	Interdis team: MD, PSY, SW, MG-F, Allied Health?	Interdis asmt includes use of OARS Multidim Functional Assessment Questionnaire; medical and psychiatric eval	Primary clinician model; clinic accepts referrals from multiple sources	MDA, TxR, RE Tx (psych and social)
Poliquin, 1977; California	AGAU	RN, SW, SW-S, PSOL-INT, HSW, HSW-INT, PSY, MD-S, MD-F	History, physical exam, psychological testing, lab tests; multidis asmt	Asmt takes about 1 wk; wkly case conferences; f-u in clinic, home	MDA, Tx, RE CM (clnics)
Popplewell, 1982, 1983; Australia	AGAU	Not described; includes medicine, nursing, allied health	Interdis asmt; no specifics	Admits from ultiple sources pts ≥ 75 w functional impairment; asmt, tx complete in ave. 8 ds	MDA, Tx, GK, RE
Reifler, 1980, 1981, 1987; Washington	HOPD	Core team: PSY, IM, SW Extended team: OT, ARCH	Multidim asmt includes psychiatric, medical, social and environmental eval'n; psychiatric asmt of dementia, depression; medical (physical evaluation/lab testing); social work home visit (social supports, environment); OT (ADLs); architect (pt ability, desires, actual living situation)	Pts ≥ 60 with impairment and home supports selected for asmt; 4 visits to complete asmt	MDA, TxR, TX, RE
Robertson, 1982; Canada	HGARU	Core Team: MD, RN, SW, OT, PT, AT Extended Team: MD Specialists, GD, POD PSOL, NT, AUD, ST	Interdis asmt; no specifics	Team meets biwkly to plan asmt, includes medical tx, rehab, and dc	MDA, Tx

Rubenstein, 1981, 1984a, 1984b, 1987, 1988; California	HGARU	Core Team: MG, GF, PA, SW, RN Extended team: PSOL, NT, OT, PT, GD, AUD, PHN, ST	Interdis asmt and tx includes functional evaluation (Katz ADL, Lawton IADL), morale, mental status (Kahn), physical exam and complete hx, social asmt	Pts screened for admission; Asmt (core + extended team) = 1 wk; LOS to 3 mos.; team f-u in HOPD; team meets wkly on all inpts	MDA, Tx, RE
Sainbury, 1986; New Zealand	HGAU/ Combined geriatric-orthopedic unit	Initial screening: SW, OT, PHYS Post-admission team also includes: MG, Orthopedist	"Social and rehabilitation asmts"; includes OT assessment of home environment prior to pt discharge; few specifics	Wkly team mtg; home visits by PHN, SW post discharge; accepts weight-bearing pts ≥ 70	MDA, Tx
Schuman, 1978; Ontario	CHGAU	IM, HO, PHYS, RN, ?	Interdis team asmt; no specifics	Team audit; problem-oriented record; 1 mtg/mo.; admitted pts need subacute, terminal or rehab care	MDA, Tx, RE
Sloan, 1980; Florida	HGARU	Core Team: PCMD, NP, SW, CONS-PSY, RN	Multidim team asmt includes demographics, caregiver information, Pfeiffer Short Portable MSQ, Katz ADLs	Core team admits pts from ER referred to NH care; pts screened	MDA, Tx, TxR
Teasdale, 1983	AGAU	MG, PA, CON-PSY, SW, NT, CNS, PHAR	Interdis asmt; no specifics	Admits acutely-ill pts > 75; team	MDA, Tx, RE
Tulloch, 1979; England	HOPD	RN, MD	Socioeconomic and functional asmt by visiting RN, plus medical symptom questionnaire, followed by medical asmt at clinic or at home; routine lab testing, and "rating of patients vulnerability to medical and socio-economic problems"; surveillance during f-u includes additional asmt data	Casefinding in pts ≥ 70 on practice register; asmt used RN home visit, questionnaire, clinic visit; f-u care in clinic	MDA, CF, Tx, TxR, CM

Appendix (continued)

Reference; State or Country	*Program Setting/Type*	*Who Performs Assessment*	*Domains Assessed/Instruments Used*	*Assessment Process*	*Assessment Objectives*
Vetter, 1984; Wales	HVAS	HV	Multidim asmt; no specifics	"Usual HV practice"; no specifics	MDA, CF, CM
Williams, 1972, 1974; England	CBAS	GP, HV, TV, other staff?	Multidim asmt includes HV asmt (demographic data, social and financial information, height, weight, principal symptoms, medical hx, present tx); GP asmt includes a full physical exam, urinalysis, blood studies, and eval'n of "effective health" accounting for cognitive status, mobility, and basic daily activities	Casefinding by HV outpt ≥ 75 in practice panel; asmt aves. 1 hr —30 min for HV, GP 30 mins; ave. 8 asmts/wk; asmt leads to further eval, outpt tx, or referral with recs	
Williams, 1986, 1987a,b; New York	HOPD	Core team: MG, PSY, RN, SW Extended team: PHYS, NEUR, UROL, SURG, NT, OT, PT, POD, GD, etc. Full description of staffing, roles	Interdis asmt includes nursing asmt (reason for referral, prioritizing team asmts, determine special consultative needs), medical asmt (complete medical hx and physical, mental status exam, mood evaluation, lab tests, chest X-ray, EKGs as indicated); functional eval (ADL, IADL, mobility) amst of hearing, vision, comunication skills, nutritional status, psychosocial functioning (personal activities, hobbies etc.), psychobehavioral functioning (attention span, judgment, potential for disruptive behavior etc.)	Accepts outpts referred from various sources; screened ≤ 2 wks by RN on phone; medical and SW asmt 1.5 hrs during 1st visit; team mtg after visit; asmt usually complete after 4 visits (some at home) asmt leads to some direct tx, recs	MDA, TxR, RE

Winograd, 1987; California	IGCS	RN, SW, NT, PSO-F, MG, MG-F, HO, PHYS Resident	Interdis asmt includes complete clinical eval of medical, social, psychological, and function domains (standardized instruments are not used)	Consultation on referral plus care of pts admitted from geriatric clinic; teaching rounds, team mtgs 3× wkly	MDA, TxR, RE
Wooldridge, 1987; British Columbia	AGAU	Screening visit team: MG, RN, SW Expanded team: PHYS, OT, NT, PSY, AT, PHAR, NPSOL, other medical specialties	Interdis asmt includes medical eval (hx, p.e. and lab tests; x-ray as indicated); mental status exam; RN asmt includes functional and skin asmt, eval of pt's emotional and behavioral status; SW asmt includes family conference; OT asmt (ADLs); PT and NT eval	Admits acutely-ill pts ≥ 75, pts "failing" at home or ER, pts from long-term institutions with behavioral problems; all admissions MD referred; referral triggers initial home/ward team visit; biwkly team mtgs	MDA, Tx
Yeo, 1987; California	HOPD	MG, MG-F, NP/CNS, SW	Interdis asmt includes medical and functional asmt; SW asmt of financial and housing needs, family career strain, assistance and referral for social support; RN asmt and services include home visits and health education as ordered by physician	Accepts cognitively-intact pts ≥ 65 dc'd from acute care; wkly team mtg; outpts followed and treated, referred to specialty eval and care	MDA, Tx, CM, TxR, RE
Zimmer, 1984, 1985; New York	HVAS	IM, NP, SW	Multidim asmt; no specifics	Selects homebound terminal and impaired elderly pts from variety of sources; initial home asmt by full team; wkly team mtg; team performs primary & emergency care	MDA, Tx, CM, RE

Appendix (continued)

Program Setting:
CBAS = Community-Based or Office Assessment Service
CHGAU = Chronic or Long-Term Hospital Geriatric Assessment Unit
HGARU = Hospital Geriatric Assessment and Rehabilitation Unit
HGAU = Acute-ward Geriatric Assessment Unit
HGPAU = Hospital Geropsychiatric Assessment Unit
HOPD = Hospital Outpatient Department
HVAS = Home Visit Assessment Service
IGCS = Inpatient Geriatric Consultation Service
NHGAU = Nursing Home Geriatric Assessment Unit

Objectives:
Multidimensional diagnostic assessment = MDA
Casefinding = CF
Treatment/placement recommendations = TxR
Gatekeeping = GK
Long-term care management = CM
Implementing treating and rehabilitation = Tx
Research and Education = RE

Assessment: Personnel
-S = - Student
-INT = - Intern
-F = -Fellow
CONS- = Consulting
ARCH = Architect
AT = Activity Therapist
AUD = Audiologist
CHP = Chaplain
CNS = Clinical Nurse Specialist
GD = Gerodentist
GF = Geriatric Fellow
GP = General Practitioner
HO = House Officer (physician)
HV = Health Visitor
IM = Internist
MD = Physician
MG = Geriatrician
NA = Nursing Assistant
NEUR = Neurologist
NP = Nurse Practitioner
NPSOL = Neuropsychologist
NT = Nutritionist
OT = Occupational Therapist
PA = Physician Assistant
PHAR = Pharmacist
PHN = Public Health Nurse
PHYS = Physiatrist
POD = Podiatrist
PSOL = Psychologist
PSY = Psychiatrist
PT = Physical Therapist
RN = Nurse
SS = Social Scientist
ST = Speech Therapist
SURG = Surgeon
SW = Social Worker
UROL = Urologist
TV = Transportation Volunteer

Abbreviations:
ADL = activities of daily living
asmt = assessment
dc = discharge
dx = diagnosis
d(s) = day(s)
eval = evaluation
f-u = follow-up
fx = fracture
hx = history
interdis = interdisciplinary
LOS = length of stay
multidim = multidimensional
interdis = interdisciplinary
pts = patients
recs = recommendations
tx = therapy, treatment
wkly = weekly
? = unclear description

PART II

Geriatric Psychiatry

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Part II Introduction

This section considers not only mental health but also a specialized area characterized by tremendous growth in the past decade—the psychiatric study and treatment of disorders prevalent in old age. The two most prevalent psychopathologies of later life, depression and Alzheimer's disease, each have a chapter. The third chapter, linked to the first two, deals with problems that are actually a consequence of pharmacological treatment of depression and Alzheimer's disease, as well as other conditions of old age. In keeping with the multidisciplinary goal of the volume, this set of papers is designed to orient researchers and service providers to the latest knowledge in these important areas. All three reflect the concern of contemporary research with the interplay of biological and psychological processes. The significance of these interrelationships is made totally accessible to those without training in the biomedical area.

The epidemiological and pharmacological perspectives on depression are given major emphasis by Blazer. He also acknowledges the legitimate place of both psychological interventions and electroconvulsive therapy. Among the many interesting substantive issues discussed is the clear evidence for a cohort effect in the prevalence of depression. Where older data seemed to indicate an age-related increase in the prevalence of depression, high-quality epidemiological surveys of recent years have shown far lower prevalence among older people. Blazer's questions about changes in cohort reporting and the meaning and clustering of depressive symptoms in differing lifespan periods are likely to stimulate new research in this area.

Cohen to some extent continues the discussion of depression in noting the frequency of depressive symptoms in Alzheimer's disease. As Blazer did for depression, Cohen reviews the use of psychopharmacological agents in treating Alzheimer's. A variety of new topics are introduced: The plasticity of neural function and structure, the possible physical health mechanisms involved in the mortality of Alzheimer patients, and the biological aspects of caregiving stress in people caring for the aged. Most readers will find these topics new and relatable to some aspects of their work.

In their chapter, Morrison and Katz provide an encyclopedic look at the potential effects of a variety of drugs commonly used in the treatment of older people. The particular usefulness of this chapter comes from its discussion of both psychoactive drugs and those used for other purposes. The material is likely to be of use for teaching purposes in many clinical disciplines and for alerting multidisciplinary teams to surveillance practices that could identify unanticipated effects of medications on the cognitive functioning of the elderly. Because the age-specific literature tends to be scant in some areas, vigilance in citing effects known to occur in the general adult population is encouraged.

Morrison and Katz bridge Blazer's and Cohen's chapters in documenting effects that may be seen in both depressed and Alzheimer patients. Despite the usefulness of this material for a general clinical audience, again the literature has been combed to provide the most contemporary review available on unanticipated cognitive impairment consequent to medication use.

CHAPTER 6

Depression in Late Life: An Update

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No monograph, much less a review, can do justice to the advances in the clinical investigation of the affective disorders. Well-designed empirical community and clinical studies have changed the clinical perspective on late-life depression, not just complemented the extant studies of 10 years ago. In this review, I will concentrate upon those recent studies that have direct clinical relevance to the care of the depressed older adult.

THE EPIDEMIOLOGY OF DEPRESSION IN LATE LIFE

Through most of the twentieth century, community-based epidemiological studies of psychiatric symptomatology in late life have concluded that a variety of psychiatric symptoms increase in prevalence with age. For example, Dovenmuehle, Reckless, and Newman (1970) estimated the prevalence of disabling depression to be 21% in a cohort of older adults, and Gurland, Dean, and Cross (1980) found 13% of the over-65 to have pervasive depression. These data were substantiated by scattered reports that life satisfaction decreased as age increased (Bradburn & Caplovitz, 1965; Gurin, Veroff, & Feld, 1960).

The medical and psychiatric communities were therefore surprised when epidemiological investigators reported in the mid-1980s that major or clinical depression was less frequent in late life than at other stages of the life cycle. Weissman and Myers (1978) determined the prevalence of major depression in the community-based elderly to be less than 5% and to be no greater than at other stages of the life cycle. Blazer and Williams

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(1980) reported a prevalence of 1.8% for primary depression and 1.9% for secondary depression among the elderly in the community. The Epidemiologic Catchment Area (ECA) studies sponsored by the National Institute of Mental Health, however, documented most thoroughly the decreased prevalence of major or clinical depression with increased age. At all three ECA sites, major depression was lower among the elderly than for all other age groups (Myers et al., 1984).

In a more detailed study of depression in the elderly from ECA data, Blazer, Hughes, and George (1987) found that 27% of the subjects reported depressive symptoms: 19% were diagnosed as suffering from mild dysphoria; 4% from symptomatic depression; 2% from dysthymia; 1.2% from a mixed depression and anxiety syndrome; and 0.8% from major depression. Though the more severe clinical syndromes of depression appear adequately assessed using the methodology applied in the ECA studies (Blazer, Bachar, & Hughes, 1987), the majority of older adults suffering depressive symptoms are not captured by DSM-III or DSM-III-R diagnostic categories. Parmelee, Katz, and Lawton (1989) have found the prevalence of major depression in a long-term-care facility to be approximately 10%, much less than has been reported in previous surveys. In a recent study by Snaith (1987), it was suggested that "mild depression" (i.e., depression that does not meet current diagnostic criteria) may nevertheless be clinically relevant and of biological etiology. In summary, the current psychiatric nomenclature appears to work as well in distinguishing certain diagnostic categories in late life as at other stages of the life cycle (e.g., major depression with melancholia, psychotic depression, and so forth). Nevertheless, "atypical" depressions may not be so atypical among older adults. These depressive syndromes not otherwise specified include mild and transient episodes of dysphoria, mixed depression and anxiety syndromes, and prolonged depressive episodes associated with adjustments to physical and psychosocial stressors.

The explanation for the lower prevalence of major or clinical depression remains undetermined. This decline in prevalence cross-sectionally is also reflected in a decline in suicide in the current cohort of older adults (Blazer, Bachar, & Manton, 1986). A series of cohort analyses of depression suggest that the phenomenon may be a cohort phenomenon (Gershon, Hamovit, Guroff, & Nurnberger, 1987; Klerman et al., 1985). In a recent article (Blazer, in press), I reviewed the epidemiological data for methodological flaws and concluded that the apparent decline in depression and suicide reflected in these data could not be dismissed by methodology alone. Therefore, clinicians must seriously consider the possibility that older adults in the last two decades of the twentieth century may be—and may have been throughout their lives—protected from the development of major or clinical depression. The explanation is unknown, but one can speculate about the unique protective characteristics of this current cohort of elders. They suffer a current prevalence lower than that in younger age groups for most psychiatric disorders, including alcohol abuse and dependence, schizophrenic disorders, antisocial personality disorders, and so forth (Myers et al., 1984; Robins et al., 1984). They are among the healthiest older adults of the century, as the life expectancy of elders has increased throughout this century. The economic status of the elderly, though not adequate, has improved with better pension plans and better health care. Nutritional status of these older adults has improved as well.

The clinician and health-care planners must not be lulled into complacency, however. Succeeding cohorts of adults already exhibit a higher prevalence of depression, and there is no evidence that the prevalence of depression decreases in a cohort as age increases. The status of older adults in our society cannot be assumed to continue to improve (though it can be hoped for), and therefore the elderly may be at risk for increased prevalence of depressive episodes in the next 20 to 30 years.

THE PSYCHOBIOLOGY OF LATE-LIFE DEPRESSION

The intricate regulation of the brain by various feedback mechanisms is now recognized as key to the physical and psychological well-being of the human organism throughout life. Early studies of the affective disorders (Schildkraut, 1965) suggested that relative levels of neurotransmitters in certain areas of the central nervous system (CNS), such as levels of serotonin and norepinephrine, led to a so-called chemical imbalance which provided a neurochemical explanation for the affective disorders.

Disregulation of Receptor Sites

Chemical imbalance, however, has proven far too simplistic. Rather, a disregulation of these neurochemical messengers and their receptors is now postulated to be the most valid explanation of biological depression. Specifically, down-regulation of receptors has been suggested as a potential etiologic factor. A number of studies have emerged that explore receptor changes across the life cycle. Buckley, Curtin, Walsh, and O'Malley (1986) did not find that one well-known receptor, the $\alpha 2$-adrenoceptor, exhibited either a change in binding capacity or affinity with age. In contrast, Schneider, Severson, and Sloan (1985) found that the binding capacity of radioisotope-labeled imipramine was increased in the elderly when compared with younger age groups. The data suggest there is an increase in the density of platelet imipramine binding sites in the elderly; and in both the elderly and young, the density of these binding sites is lower in the depressed when compared with controls. Nemeroff et al. (in press) found that depressed patients in both middle age and late life exhibited significant reductions in the number of platelet ^{3}H-imipramine binding sites, but no change in affinity, when compared with their age-matched controls. This difference was more marked in the elderly than in the younger age groups.

Tritiated Imipramine Binding

The significance of tritiated imipramine binding is that such binding provides a marker for disorders of serotonergic neurotransmission in depressive disorders. Many antidepressants block serotonin (5HT) reuptake into the presynaptic terminals. The recently introduced compound fluoxetine specifically blocks serotonin uptake. As platelets are derivatives of the same embryological tissue as neurons in the CNS, changes in platelet binding in the depressed may provide a window into neurochemical changes within the brain.

MAO Activity

In addition to the investigation of α_2-adrenoceptors and serotonin receptors (as studied through tritiated imipramine), other investigators have addressed platelet monoamine oxidase (MAO) activity. Schneider, Sloan, Staples, and Bender (1986) found in a study of 42 unmedicated elderly depressed subjects, that among depressed women there was significantly higher MAO activity than in sex- and age-comparable controls. There was no significant relationship between MAO activity and duration of the current depressive episode, duration of the illness, or family history of affective disorder. MAO activity has been reported to be higher in secondary rather than primary depression and in nonendogenous and unipolar depressives.

The interest in platelet MAO activity reflects its accessibility and the possibility that it may reflect enzymatic activity in the central nervous system (Schukit, 1987). Specifically, the enzyme is involved in the destruction of monoamines. In general, low-platelet enzyme activity levels (and therefore higher monoamine oxidase) had been associated with more sensation-seeking behavior, greater likelihood of contact with mental health workers, and increased rates of psychiatric disturbances, including certain variants of depression (atypical depression). Low MAO levels may therefore be a state marker for some affective disorders. The enzyme is also under genetic control and is more likely to be lower in the relatives of subjects with affective disorder than controls.

Disregulation of the HPA Axis

Disregulation of the hypothalamic-pituitary-adrenal (HPA) axis has also been pursued as an etiologic factor in biological depression. Though the study of the HPA axis in relationship to depression spans decades, the recent attention directed to the dexamethasone suppression test (DST) as a possible biological marker for melancholic depression has stimulated study of the basic mechanisms. The DST is based upon the theory that feedback mechanisms in the depressed are interrupted, and therefore the normal suppression of plasma cortisol following a single dose of the synthetic steroid dexamethasone is disrupted. Subgroups of the depressed therefore "escape" suppression. In the original article by Carroll et al. (1981), the test proved to be specific but not especially sensitive.

A possible explanation is that hyperactivity of the HPA axis exists in this subgroup of melancholic depressives. The normal feedback mechanisms that direct the hypothalamus to shut down production of corticotropin-releasing factor (CRF) (which inhibits the pituitary excretion of ACTH and subsequently the production of cortisol) may be disrupted. In a recent study of this mechanism, Nemeroff et al. (1984) found that hypersecretion of CRF contributes to the hyperactivity of the HPA axis observed in patients with major depression. They measured concentrations of CRF in the cerebral spinal fluid (CSF) of normal healthy volunteers and drug-free patients with a DSM-III diagnosis of major depression and other disorders. Compared to controls and subjects with other psychiatric disorders, patients with major depression showed significantly increased CSF concentrations of CRF-like immunoreactivity. These findings are concordant with the hypothesis that CRF hypersecretion is, at least in part, responsible for the hyperactivity of the HPA axis characteristic of major depression.

What is the influence of age on the HPA axis? In a review article, Davis et al. (1984) concluded that the HPA axis is relatively resistant to the effects of age. Adanced age does not appear to influence significantly the circadian rhythm of plasma cortisol excretion nor mean plasma cortisol concentrations. Postdexamethasone cortisol levels, however, do appear to covary with age. In their study, Davis and colleagues examined the effect of age on plasma cortisol concentration of 81 depressed men after dexamethasone administration. They found that dexamethasone nonsuppression was significantly more frequent in depressed patients over 55 than in younger depressed patients. Older patients also had significantly higher postdexamethasone cortisol concentrations than younger patients at all times they sampled. The differences could not be attributed to severity or the prevalence of psychosis in the older versus the younger patients. This finding appears to contradict the hypothesis that the HPA axis is independent of age. Therefore, sensitivity of the DST may increase with age, but specificity may decrease. To emphasize further the possible decreased specificity, Jenike and Albert (1984) found that the DST in a group of nondepressed demented subjects was normal in mildly impaired demented subjects but abnormal in moderately impaired subjects.

Ferrier et al. (1988) have shed some light on this difficult problem. They measured cortisol and ACTH at two points in time before the administration of 1 mg of dexamethasone and at one time point on the following day. Thirteen severely depressed elderly patients, 15 patients with Alzheimer's disease, and 16 controls were studied. Cortisol samples were markedly elevated in depressed patients compared with the other subjects on the first-day sample. Following dexamethasone, both depressed and Alzheimer's patients showed a similar elevation of cortisol as compared with the controls. ACTH concentrations were not significantly different between groups before dexamethasone but were higher in both the depressed and Alzheimer's patients after dexamethasone. More depressed patients than Alzheimer's patients exhibited hypersecretion of ACTH after dexamethasone. This implies that ACTH is less responsive to glucocortisol and feedback in elderly depressed patients, which may be a factor in causing the hypercortisolemia.

Disregulation of Thyroid Function

Loosen and Prange (1982) have for a number of years reported disregulation of thyroid function in depressed subjects. They recently reviewed their work, with the thyroid-regulating hormone (TRH) test being the mechanism for discriminating depressed and nondepressed subjects. Blunting of the thyroid-stimulating hormone (TSH) response to TRH is indicative of a major depressive episode (i.e., depressed subjects exhibit hypersecretion of TRH). Initially the hypersecretion of TRH causes excessive secretion of TSH, perhaps in consequence of transient thyroid activation. After chronic hypersecretion of TRH, however, the pituitary becomes hyporesponsive to TRH administration, possibly because of down-regulation of pituitary receptors. Norepinephrine and dopamine appear to stimulate TRH cells; serotonin appears mainly to inhibit them. Therefore, reduced serotonin input or increased norepinephrine input may result in increased TRH activity. Reduced serotonin activity in depression is considered established for certain subgroups (Schukit, 1987). In contrast, norepinephrine activity in depression has been considered reduced, but recent formulations do suggest some increase may be possible. Increased dopamine activity, producing a blockade of TSH response to TRH, is an alternative explanation.

How is thyroid physiology affected by age? If there are changes, this will clearly change the sensitivity and the specificity of the TRH test. Gambert and Tsitouras (1985) recently reviewed the changes of thyroid functioning with age. Although studies of human TSH content do not document a significant change with age, recent studies have reported an increased percentage of elderly persons with clearly elevated serum levels of TSH, despite clinical euthyroidism. Increased age could therefore result in a blunted TSH response to TRH, and therefore the TRH should be used with caution in testing for both hypothyroidism and depression in the elderly. A number of empirical reports suggest that the use of 1-thyroxin as a replacement dose for subclinical hypothyroidism may lead to improvement in mood across the life cycle, especially in women. The usual dose is 25 μg daily. Despite the attention directed to the TRH test in recent years, the best method of screening for hypothyroidism is to use the TSH test alone. An elevated TSH, regardless of age, should alert the clinician to the possibility of subclinical hypothyroidism.

Disregulation of Circadian Rhythms

A third biological contribution to depressive disorders is the disruption of usual circadian rhythms. Those depressive disorders that are found either to cycle rapidly or to recur at predictable times have received considerable attention in recent years. Jacobsen, Wehr, Sack, James, & Rosenthal (1987) defined seasonal affective disorder (SAD) as a disturbance of mood and behavior which resembles some seasonal changes seen in lower animals. The disorder is thought to be related to decreased sunlight in winter months. In DSM-III-R, the criteria for seasonal affective disorder include the onset of an episode of bipolar disorder or recurrent major depression beginning between October and the end of November. These individuals undergo a full remission of the episode between mid-February and mid-April. At least three episodes in three separate years must be demonstrated; the episodes should meet criteria for endogenous depression; and the seasonal episodes should outnumber the nonseasonal episodes. Though the usual age of onset is in young adulthood, the disorder has been observed in late life. The symptom presentation is usually atypical, in that subjects report irritability, increased appetite (especially carbohydrate craving), and increased duration of sleep. Many of these patients would qualify for the diagnosis "rapid cycling depression" and depressive disorder not otherwise specified (NOS) in DSM-III-R or a bipolar II disorder according to the research diagnostic criteria (Spitzer, Endicott, & Robbins, 1978).

In a recent study, Wehr, Sack, Rosenthal, & Cowdry (1988) described 51 patients who suffered rapid cycling depression; i.e., four or more affective episodes per year. The continuation of rapid cycling was associated with antidepressant drug therapy in 51% of the patients. Thirty-seven percent of these patients obtained a complete remission, usually during treatment with lithium and/or monoamine oxidase inhibitors. Over half of these patients suffered from a bipolar II disorder. Rapid-cycling affective disorders can occur in the elderly as at other stages of the life cycle. Some investigators suspect (though it is not yet documented in the research literature) the prolonged use of tricyclic antidepressants (TCA) as an etiologic agent. Increased recognition by clinicians of SAD and rapid-cycling depression will, I suspect, increasingly have an impact upon the practice of geriatric psychiatry in the future. Many older adults have taken TCAs for years and are therefore possibly at risk for rapid cycling as they enter late life. In addition, the mild and fluctuating depressive disorders common among older adults, which are especially resistant to current biologic intervention (not to mention psychotherapeutic intervention), may prove variants of these rapid-cycling or seasonal disorders.

Of the circadian changes of interest associated with affective disorders, changes in sleep, however, are the best documented. According to Kupfer and Thase (1983), at least four EEG sleep abnormalities are commonly found in patients with primary or endogenous depression: (1) sleep continuity disturbances; (2) reduced delta (slow-wave) sleep time; (3) increased REM activity (or density); and (4) short REM latency. The pioneering work of Kupfer and his colleagues has led to the inclusion of sleep studies in the diagnostic workup of depressed persons of all ages. Unfortunately, the findings that are typical of depression and appear to discriminate depressed from nondepressed subjects are also more frequent as individuals age and even more common among the demented. Can age-adjusted studies of sleep be used to identify melancholic depression in the elderly and discriminate depression from dementia in the elderly?

In an early study, Kupfer, Reynolds, Ulrich, Shaw, and Coble (1982) found in 108 patients with major depressive disorders, that age was a powerful determinant of EEG sleep patterns. Sleep efficiency (sleep continuity), delta-sleep percent, and rapid-eye-movement (REM) latency all showed significant linear declines with age. Some variables were without age trends, including sleep latency, REM sleep percent, and REM activity. The authors therefore suggest that by using a cutoff score of 30 minutes or greater for REM latency, demented patients can be differentiated from depressed patients with reasonable sensitivity and specificity. To differentiate depressives from normals, they suggest using the "rule of 90." The rule of 90 stipulates that if the sum of a patient's age and REM latency is 90 or less, then a short REM latency usually is associated with depression. By using this rule, they reached a sensitivity of 65% and a specificity of 95%.

In a more recent study, Reynolds et al. (1988) were able to discriminate elderly depressed and demented patients reliably by sleep electroencephalographic data. In a sample of 235 elderly subjects, by using discriminant function analysis of sleep alterations in depression and dementia, 80% of patients were correctly classified. Four measures contributed to the separation of depressed from demented patients: (1) REM latency (lower in depressives); (2) REM sleep percent (higher in depressives); (3) indeterminant non-REM sleep percent (higher in demented patients, reflecting greater loss of spindles and K complexes); and (4) early-morning awakening (more marked in depressives).

RECENT ADVANCES IN THE TREATMENT OF DEPRESSION

Despite the appearance on the market of a number of new antidepressant medications, the advances during the last three years in the treatment of the affective disorders across the life cycle, and especially in late life, have been realized in a refinement of the use of traditional agents and combinations of these agents rather than in the substitution of new medications.

One example is refinement in the use of lithium carbonate. Shulman, McKenzie, and Hardy (1987) suggest in a review of the literature, that a blood level of approximately 0.5 mmol/L 12 hours after the last lithium dose is a reasonable maintenance level for lithium prophylaxis in the elderly. This level is well below the recommended levels in most text-books of 0.8 to 1.2. They suggest the use of a single bedtime regime (noting that the 12- and 24-hour blood levels vary little when a single dose is used) rather than multiple doses during the day. Such a dosage regimen would probably increase compliance. Based on pharmacokinetic data, the authors also recommend reducing oral lithium dosage by at least a third to a half, compared to the younger adult population, in order to achieve equivalent blood levels.

Kushnir (1986) reported on five elderly patients who were treated with a combination of low-dose lithium therapy (an average blood level of approximately 0.2) in conjunction with tricyclic antidepressants. This combination produced rapid, lasting remissions of depression in geriatric patients who had previously been resistant to treatment with antidepressant medications alone. This finding replicates earlier studies of younger patients, such as the study by Price, Charney, and Henninger (1985).

The tricyclic antidepressant that has been most studied in recent years in late life is nortriptyline (NT). Kumar, Smith, Reed, and Leelavath (1987) investigated the plasma levels and therapeutic benefit of nortriptyline treated with a standard daily dose of 150 mg per day. They found that plasma levels and elimination half-life of the drug were no different in geriatric patients than in younger patients. The antidepressant effects of nortriptyline appear to be similar in geriatric patients and in younger depressed patients. They also noted that orthostatic hypotension produced by nortriptyline was not greater in geriatric patients than in younger patients treated with the same dose, though orthostatic hypotension was a problem in the treatment across the life cycle.

Schneider et al. (1986) investigated the predictive value of pretreatment systolic orthostatic changes in unipolar depressed elderly patients (mean age 64) who received a 16-week course of nortriptyline. Patients with pretreatment systolic orthostatic pressure (PSOP) changes (i.e., patients who showed an orthostatic drop in systolic blood pressure of greater than or equal to 10 mm Hg) had greater improvement on nortriptyline than subjects who showed a PSOP of less than 10 mm Hg. There were no episodes of symptomatic orthostatic hypotension in the nortriptyline-treated subjects, despite the pretreatment orthostatic hypotension. These results suggest that orthostatic hypotension, a usual contraindication to TCA use, may potentially identify patients more likely to respond to TCAs.

This same group (Schneider, Cooper, Staples, & Sloane, 1987) found that individual daily doses of nortriptyline can be predicted from the administration of a 25-mg nortriptyline test dose with a plasma level drawn 24 hours later. This would be a corresponding test to that used in younger patients where 50- or 100-mg test doses have been used with the determination of plasma levels 24 hours later. By using a normogram presented by the data on 18 physically healthy, moderately depressed geriatric outpatients, there was a correlation of .83 between the 25-mg dose and steady-state plasma levels at a daily dose of 50 mg. At a daily NT dose of 50 and 100 mg, nearly half of the subjects exhibited steady-state plasma levls outside the 50- to 150-μg/ml window, emphasizing the importance of individualized dosing of nortriptyline in patients.

Despite these promising results, some caution must be used in interpreting these data. Though this reviewer cannot adequately document certain clinical opinions, these opinions are accepted by many practicing clinicians. First, despite the study of Kumar and colleagues, severely depressed older adults may be less likely to respond to tricyclic antidepressants than younger subjects. One reason is that elderly subjects suffering from major depression are more likely to suffer from psychotic or delusional depressions, and these episodes do not respond well to medication and are therefore more likely to be relegated to electroconvulsive therapy (Meyers & Greenberg, 1986). Most hospitals that operate an active ECT service find that a much-higher-than-expected percentage of patients who are treated with ECT are above the age of 60. In addition, the "therapeutic window" that has been discussed and tested with nortriptyline may not be as applicable in the elderly. More refined studies are necessary to establish the clinical validity of the window and its relationship to therapeutic response.

Another problem that plagues the clinician who treats depressed older adults pharmacologically is identifying clinical predictors of response to antidepressant medication. Georgotas et al. (1987) studied 42 patients aged 55 and above suffering from major depression in an attempt to isolate clinical variables that would predict response to antidepressants. Patients in a placebo-controlled, double-blind study were given either nortriptyline or phenelzine for five to seven weeks. There was no significant difference in response rates between patients subclassified as endogenous or nonendogenous by either RDC or Newcastle criteria. No difference in response rates was found between DSM-III melancholic and nonmelancholic subtypes as well. Neither drug was found to be differentially effective with a given subtype.

Other investigators have suggested the use of psychostimulants in the treatment of major depression. Kaufmann, Cassem, Murray, and Jenike (1984) studied the effect of using psychostimulants on five depressed patients with neurological disease. Four of these patients had been treated with tricyclic antidepressants, but the TCAs were discontinued because of concomitant deterioration of cognitive function and in one case were not used initially because of cardiovascular complications.

There was a rapid remission of depressive symptomatology and no adverse side effects with the use of methylphenidate at 10 mg per day or Dexedrine at 10 mg per day.

Reynolds et al. (1987) considered the problem of cognitive impairment using traditional antidepressant medications in more depth. They studied 16 inpatients with mixed symptoms of depression and cognitive impairment. Criteria for adequate treatment specified a steady-state plasma nortriptyline level of 50 to 150 μg/ml for four consecutive weeks or a minimum of six treatments with ECT. Ten of 16 mixed-symptom patients showed a drop in Hamilton Depression Rating scores of 50% during treatment. Similarly, Blessed dementia ratings declined significantly and were correlated with improvement in the Hamilton Depression scores. By contrast, Folstein Mini-Mental State scores did not change during treatment. These data suggest that elderly patients with mixed depression and cognitive impairment respond to treatment similar to that used in cognitively intact elderly depressives.

Burns, Moskowitz, and Jaffe (1986) compared two antidepressant medications for the potential to impair cognitive functioning. A battery of laboratory tests were used to measure drug effects on information processing, attention, and visual-motor skills. Amitriptyline 50 mg impaired vigilance in tracking performance and increased drowsiness. Trazodone 100 mg impaired only the most difficult tracking task. The study suggests that cognition and performance are less adversely affected in geriatric subjects treated with trazodone, which has virtually no anticholinergic effects, when compared with amitriptyline beginning 90 minutes after a single-dosage trial. That these results would be equally significant in depressed elderly subjects remains to be demonstrated.

Given the explosion of interest in the pharmacologic treatment of depression in the elderly, the paralleled increased attention directed toward the psychotherapy of the depressed elderly has been remarkably robust. We have witnessed, during the 1980s, more interest in and research of psychotherapy in late life than in any decade during the twentieth century. Interest in the area derives from diverse sources. Rodin (1986), in an article in *Science*, emphasized the importance of the relationship between health and a sense of control in late life. The increased relationship of health and a sense of control may grow stronger in old age, possibly because of three processes: (1) experience that is particularly relevant to control may increase markedly in old age; (2) the association between control and some aspects of health may be altered by age; and (3) age may influence the association between control and health-related behaviors or the seeking of medical care. Many studies, according to Rodin, demonstrate the detrimental effects upon the health of older adults whose control of their activities is restricted and interventions that enhance options for control (e.g., in nursing-home patients) may promote increased health. Nevertheless, she warns that variability in preferred degrees of control also increases with age, and sometimes greater control over activities, circumstances, or health has negative consequences, including stress, worry, and self-blame. Mechanisms mediating the control-health relation include feelings of stress, symptom labeling, changes in the neuroendocrine and immune systems, and behavior relevant to health maintenance.

Paralleling this applied research on control in the elderly has been the emergence of the study of cognitive-behavioral therapies for the treatment of depression in the elderly. Steuer et al. (1984) studied a group of depressed geriatric patients to determine whether these individuals would respond to group psychotherapy and if so, whether they would respond differentially to cognitive-behavioral versus psychodynamic group therapy. From pre- to posttreatment testing, patients in both therapy groups showed statistically and clinically significant reductions in an observer-rated measure of depression and anxiety as well as on self-reported measures of depression. There were no significant differences between the types of therapies. The only statistically significant difference between the two groups emerged on the Beck Depression Inventory that favored the cognitive-behavioral treatment. Unfortunately, there were no control conditions in this study.

In a similar study, but one that included a control group, Thompson, Gallagher, and Breckenridge (1987) studied the comparative effectiveness of psychotherapies for 91 depressed elderly subjects (diagnosed as suffering from major depression by RDC criteria). Prior to treatment, 20 of the subjects were assigned randomly to a six-week delayed treatment control condition. By the end of six weeks, patients in the treatment condition showed improvements, whereas controls did not. Overall, 52% of the treatment sample attained remission by termination, and another 18% exhibited significant improvement. The outcome measures did not demonstrate significant main-effect differences between the treatment groups and suggested that all three modalities of treatment (cognitive therapy, behavioral therapy, and psychodynamic therapy) were equally effective in obtaining positive results as compared to controls.

Though the study of psychotherapy for the depressed elderly has been spawned by interest in cognitive-behavioral therapies, in both of these reported studies, the advantages of such therapy over a more traditional psychodynamic approach have not been dramatic. It may therefore be significant that the first book, to my knowledge, on dynamic psychotherapy of older adults to appear in over a decade was published in 1984

(Myers). Writing in classic psychoanalytic style, he addresses dynamic issues such as therapy of narcissistic elders, the impact of losses on the sense of self, the impact of retirement, dealing with the loss of loved ones, coming to terms with death, and even issues of countertransference. Myers presents six case histories of patients, all of whom began psychoanalytic therapy after the age of 54, and two of whom began analytic therapy at 60 and 71. Myers notes that Freud never resolved conflicts toward his own parents, and this lack of resolution may be partly responsible for his conclusions that older persons could not be treated with psychoanalytic therapy.

Research in the use of electroconvulsive therapy for the treatment of the depressed elder is progressing as well. Nevertheless, the treatment remains controversial. As reported in *Science* (Holden, 1985), a panel assembled by the National Institutes of Health has given cautious endorsement to ECT as a treatment of last resort for some types of severe depression. ECT was determined by this panel to be an effective treatment for severe depression that has not responded to drug therapy. Patients, however, are to be informed as fully as possible of the potential risk. From the early 1960s until 1980, the number of patients treated with ECT dropped dramatically. Since 1980, the frequency of ECT treatment has risen, with a rough estimate suggesting that the number of cases has tripled in the last eight years. The use of outpatient ECT is also increasing.

In a study at Duke University Medical Center (Hinkle, Coffey, & Weiner, 1985), of all 228 ECT patients treated over a three-year period, 45% were over the age of 60, and 28% were over the age of 70. Individuals over the age of 60 were less likely to have a prolonged seizure requiring termination than younger individuals. However, they were more likely to have a missed seizure or brief seizure during the treatment. Immediate restimulation with higher electrical parameters was then needed to yield an adequate seizure. In another study by the same group (Coffey et al., 1988), the authors report the prevalence among depressed patients treated with ECT of leukoencephalopathy of the subcortical white matter to be 66%. Nevertheless, all but one of these 44 patients subsequently responded to a course of ECT which was generally well tolerated with minimal cognitive difficulties following therapy. Therefore, this neuropathological lesion remains to be explained clinically.

Nevertheless, the effect of ECT on memory in the elderly is still poorly studied. Frith et al. (1983) studied 70 severely depressed patients randomly assigned to receive eight real or sham ECT treatments. In comparison to a nondepressed control group, the depressed patients were impaired on a wide range of tests of memory and concentration prior to treatment, but afterwards performance on all tests improved. Real ECT induced impairments in concentration, short-term memory, and learning but significantly facilitated access to remote memories. At a six-month follow-up, all differences between real and sham ECT groups had disappeared.

In a recent review of the literature, Abrams (1986) reports that older patients have in the past exhibited a statistically significant advantage for bilateral ECT over unilateral ECT for the relief of depression but that bilateral ECT is known to lead to increased memory difficulties. In an older study, Fraser and Glass (1980) found no significant differences in improvement between the unilateral and bilateral groups in a randomly assigned study of depressed elderly patients. Memory function actually improved during treatment, for all these subjects showed significant memory impairments prior to treatment. There were no differences in this study between the unilateral and bilateral groups. Postictal recovery times, however, were significantly longer in the bilateral than the unilateral group after the first treatment and more than three times as long after the fifth treatment. In summary, ECT is a useful treatment for severe and antidepressant-resistant depressions in late life.

SUMMARY

Clinical and basic research units depressive disorders in late life have expanded our knowledge base appreciably in recent years. In the process, some clinical impressions have been confirmed (e.g., the association of depression and physical disorders); others have been refuted (e.g., depression increases with age); and now phenomena have been identified (e.g., the discovery of leukoencephalopathy in depressant elders who respond to ECT). The field of study now encompasses a range from neurobiology to sociocultural factors. The latter twentieth century is an exciting and optimistic era for clinicians working with depressed elders. As Sir Martin Roth has often said, "Where there is depression in late life, there is hope."

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CHAPTER 7

Biopsychiatry in Alzheimer's Disease

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In 1906, a neuropsychiatrist by the name of Alois Alzheimer presented a paper to the Association of Southwest German Specialists in Mental Diseases on what would become a classic case. His paper, published the following year, described a disorder that would later be called Alzheimer's disease. The following is an excerpt from the case description obtained during the patient's psychiatric hospitalization (Alzheimer, 1907):

> A woman 51 years of age exhibited ideas of jealousy against her husband as the first notable symptom. Soon a rapidly progressing loss of memory became apparent; she could no longer find her way around the home, dragged objects back and forth, hid them; at times she believed someone wanted to kill her and began to shout loudly. (p. 146)

From a biopsychiatric standpoint, Alzheimer's disease (AD) has generated enormous interest because while it is a devastating brain disorder with major neuroanatomical and neurochemical deviations, most of its major clinical manifestations are behavioral in nature, far into its clinical course (Cohen, 1988a; Group for the Advancement of Psychiatry, 1988). More apparent physical problems, such as incontinence, typically do not occur until the late stage of AD. Even incontinence, when it first occurs, is typically more a factor of poor concentration on the patient's part rather than somatic insufficiency. Hence, the National Institutes of Health Consensus Development Conference statement, "Differential Diagnosis of Dementing Disease," pointed out that "dementia is primarily a behavioral diagnosis" (U.S. Department of Health and Human Services, 1987). Behavioral phenomenology particularly characterizes the natural history of AD, explaining why its diagnosis can be difficult and misdiagnosis common; many other disorders, from depression to drug side effects, can present with similar behavioral manifestations.

The predominance of its behavioral manifestations sets AD apart from many other brain disorders. Strokes, for example, commonly produce observable signs—nerve, motor, and/or muscular changes. Not so with AD, where typical clinical signs and symptoms include cognitive changes (e.g., memory and intellectual impairment); problem behaviors (e.g., agitation and wandering); and psychological disturbances (e.g, depression and delusions)—in the absence of specific somatic findings on physical examinations or unique changes in laboratory tests. Thus, in Alzheimer's classic case description, the patient displayed cognitive changes ("rapidly progressing loss of memory"); problem behaviors ("she could no longer find her way around her home," and she "dragged objects back and forth, hid them"); and psychological disturbances (paranoid delusions that "someone wanted to kill her"). Again from a biopsychiatric perspective, one observes brain disease producing behavioral disorder.

Indeed Alzheimer's disease provides a paradigm for studying relationships between the brain and behavior (Cohen, 1988b). Disease can exaggerate certain phenomena that otherwise might not be apparent. By disrupting various underlying physiological pathways or neurobiological substrates, disease might uncover a range of new connections. New connections between various neurobiological substrates and certain emotional tendencies, for example, might be uncovered. Alzheimer's disease makes the point that brain changes can be unapparent yet have profound consequences on how one thinks, feels, behaves, and interacts with other persons. While we recognize that external or environmental factors can affect motivation, attitudes, emotions, task orientation, and social involvement in later life, we have looked less at the role of the aging brain's internal environment. Alzheimer's disease makes vivid the role of both environments, thus expanding our views on disorder and normal development alike. Indeed, research leading to new insights in this area is likely to increase significantly.

ASSOCIATIONS BETWEEN NEUROCHEMICAL AND NEUROPHYSIOLOGICAL CHANGES AND CLINICAL MANIFESTATIONS IN ALZHEIMER'S DISEASE

Neurochemical and neurophysiological changes in AD command considerable attention (Cain & Nemeroff, 1987; Whitehouse, 1987). While significant interest continues to be directed to the role of acetylcholine along with other neurotransmitters and neuropeptides in relation to memory impairment (Whitehouse, 1988), awareness of the influence of neurochemical changes on mood, personality, and behavior changes in AD is growing (Group for the Advancement of Psychiatry, 1988). This combined focus reflects a broader biopsychological orientation to AD, consistent with the clinical picture of Alzheimer's classic case.

Neurochemical Changes in Relation to Mood, Personality, and Behavior

Catecholamine neurotransmitter imbalances have long been recognized as being associated with mood disorders, and a growing literature has specifically focused on them in older adults (Ban, 1987; Nemeroff, 1988; Veith & Raskind, 1988). In particular, depletion of the neurotransmitter norepinephrine and decreased responsivity to serotonin have been cited in studies of depression in the elderly. Such findings have long been the basis of pharmacological treatments for depression; antidepressant drugs have been classically viewed as exerting their clinical effects either by elevating the norepinephrine level or by increasing the duration of time that the neurotransmitter is available to act on brain receptor sites.

Decreases in the levels of norepinephrine and serotonin are also reported in AD (Cain & Nemeroff, 1987). Just as a reduction in the brain level of acetylcholine in AD has been associated with memory impairment, reductions in norepinephrine and serotonin levels in AD have been associated with depression compounding the dementia. Curiously, AD patients with dementia and non-AD patients with depression in the absence of dementia have been reported to have lower cerebrospinal-fluid somatostatin concentrations than control subjects; these data raise interesting questions about possible biological links between AD and depression in older patients (Sunderland et al., 1987).

It is important to note that depression has been reported to be more common in the most severely demented, lending support to the view that depressive symptoms are an intrinsic part of the AD syndrome (Greenwald et al., 1986). Such reports have added to the debate about the origin of depression in AD. On the one hand, many view it as a reactive phenomenon of a psychosocial or environmental genesis. On the other hand, a large number view depression in AD as intrinsic to the disorder, of an internal biological origin. Reactive or psychosocial views of depression are based on the idea of the patient observing his own cognitive decline early in the clinical course of AD and responding with a profound sense of loss. By this reasoning, later in the clinical course of AD, the patient would not have enough intellectual awareness to register personal changes and thereby be less likely to become depressed. Hence, the greater severity of depression in more severely demented AD patients suggests either that the depression of AD is largely intrinsic to the dementing disorder or that the origin of depressed affect varies as AD progresses. Depression at the early stages of AD might be induced by extrinsic or intrinsic factors; at a later stage, it may more likely be brought on by intrinsic influences.

The frequency of depression in AD is significant, one study finding that 31% of the subjects met formal diagnostic criteria for a major mood disorder (Reifler, Larson, Terri, & Poulsen, 1986). Clear evidence of improvement in mood, vegetative signs (sleep and appetite disturbances), and ADLs (activities of daily living) was shown in 85% of these subjects upon treatment. Regardless of its origin, depression in AD is typically modifiable by treatment—at times through behavioral (including supportive psychotherapy) interventions, at other times through biological (pharmacological) treatments or the combination of the two (Cohen, 1988a; Group for the Advancement of Psychiatry, 1988; Jenike, 1988). While nonsomatic treatment approaches appear to have a role with AD depressions of intrinsic as well as extrinsic origin, further studies are needed to understand better the optimal indication and use of behavioral and somatic interventions for both types of depression in AD patients.

Excess Disability and the Response to Treatment

Though it is recognized that the symptoms of severe depression alone in the elderly can simulate the symptoms of AD (a condition referred to as pseudodementia), the impact of depression added to the dementia of AD has been less well appreciated. When depression becomes coupled with dementia in AD, cognitive impairment at that point in the course of the disorder is greater than would otherwise be the case—a state referred to as excess disability. When an excess-disability state is treated, a most interesting phenomenon may occur. One may witness a temporary but actual increase in overall functional capacity in the Alzheimer patient, with the lifting of compounding depression. What results is a paradoxical situation: objective clinical improvement in the face of an underlying disease process that continues to worsen. Only with the further passage of time do coping skills again show deterioration. The following case illustrates such a clinical scenario (Cohen, 1988a):

> CASE EXAMPLE: A 75-year-old brilliant chemist, Professor Janof, was evaluated because of significant trouble he was having with memory and concentration—to the extent that he no longer could balance his checkbook and had lost interest in reading. Professor Janof described difficulty noticeable only to him, a year earlier, when he was becoming less facile with complicated equations. To others, he still looked quite sharp, but not to himself. This problem was a terrible blow to his self-esteem, and he began to experience trouble sleeping, loss of appetite and weight, and increasing difficulty concentrating. A thorough differential diagnostic work-up resulted in Alzheimer's disease being diagnosed via the exclusion of other disorders. But the clinical impression was that depression was also present.
>
> Treatment was instituted for the depression, combining individual supportive psychotherapy and antidepressant (desipramine) medication. Professor Janof's appetite returned, the weight loss stopped, concentration improved, he started reading again, though trouble with the checkbook continued. Treatment helped Professor Janof come to terms with his underlying disorder (with AD) and residual skills were maximized during that stage in the course of his illness; quality of life during that interval was enhanced.
>
> Following treatment of the depression, Professor Janof continued to display subtle but increasing improvements for over a year. He then stayed at a plateau for another 6 months. It was not until three years from the point of initial evaluation that he had returned to the level of cognitive impairment with which he was first seen clinically. His clinical course from then was typical of the progression of AD.

The case of Professor Janof is decidedly not an isolated one. An analysis of cases of excess disability in demented outpatients found that one-half will have more than one illness in addition to the dementia; upon treatment, one-half of those can experience transient improvement of at least a month, and one-half can have persisting improvement (as in the case of Professor Janof) of over a year (Reifler & Larson, 1988). Depression, of course, is not the only compounding problem in AD that can cause excess disability. Excess disability can be brought on by a range of behavioral and physical problems.

Among the behavioral causes of excess disability, there are several in addition to depression (Merriam, Aronson, Gaston, Wey, & Katz, 1988; Teri, Larson, & Reifler, 1988). Moreover, these behavioral disturbances can occur in combination with one another—causing yet greater excess disability on the one hand, but presenting more than one treatment opening on the other. Hallucinations can occur in nearly 30% of AD patients; agitation, nearly 40%; wandering, 50%; by the late stage of AD, on the average, four behavioral symptoms coexist in contributing to excess disability (Teri, Larson, & Reifler, 1988).

Biological Markers, Behavioral Symptoms, and the Differential Diagnoses of AD

Neurochemical and neurophysiological changes in relation to behavioral manifestations in AD are also being investigated in search of specific biological markers to aid in diagnosis and differential diagnosis. For example, some preliminary work has pointed to the possibility of differentiating AD from major depression as a factor of differences in platelet membrane fluidity (Zubenko et al., 1987). Research on the protein A68, identified in greater quantities in the brain and cerebrospinal fluid of the Alzheimer patient as compared to normal control subjects, has similar differential diagnostic relevance (Barnes, 1987; Wolozin, Pruchnicki, Dickson, & Davies, 1986).

PHARMACOLOGICAL INTERVENTIONS AND BEHAVIORAL SYMPTOMS IN AD

Pharmacological studies in AD have essentially followed two broad directions—one toward alleviating cognitive impairment, the other toward reducing behavioral distress (Dysken, 1987; Group for the Advancement of Psychiatry, 1988). From a behavioral perspective in AD, pharmacological interventions have been examined both in terms of behavioral symptoms alleviated and behavioral symptoms induced.

Behavioral Consequences of Pharmacologic Intervention in AD

The complexity of pharmacological research in AD is highlighted by the fact that interventions for cognitive impairment can have adverse effects on behavioral symptomatology; the converse is also true. For example, the major thrust of drug treatment for memory and intellectual dysfunction in AD has been on correcting deficits in the cholinergic system where a deficiency in the level of the neurotransmitter acetylcholine has been consistently demonstrated in research studies on AD patients. But other research has found that cholinergic agents can cause depression in normal subjects, while use of a long-acting cholinergic agonist led to depressive symptoms in five of seven subjects with AD (Davis et al., 1987).

In another study, examining the role of endogenous opiates in modifying cognition, the opiate antagonist naloxone was found to produce restlessness, irritability, hostility, dysphoria, and mild drowsiness (Tariot et al., 1988). Naloxone has been one of the drugs studied in efforts to reduce cognitive dysfunction in AD.

Pharmacological Interventions to Alleviate Behavioral Symptoms in AD

Many of the behavioral problems of Alzheimer's disease respond to a range of nonsomatic interventions, involving environmental adjustments and psychological approaches (Group for the Advancement of Psychiatry, 1988). At times, though, the additional use of psychotropic medication can also assist in alleviating symptoms and improving residual coping skills. Symptoms of anxiety, depression, and psychosis all respond in varying degrees to drug treatment in AD (Group for the Advancement of Psychiatry, 1988). The number of studies are relatively few, however, comparing efficacy and side effects among the different drugs used to treat these target symptoms (see Chapter 8 by Morrison & Katz).

The rationales for choosing many of these medications have been based on the reported neurotransmitter disturbances in AD. Hence, the tricyclic antidepressants have been used to treat depression, given their enhancing influences on central nervous system responses to the monoamine neurotransmitters norepinephrine and serotonin—both of which have been found to be diminished in AD. However, a concern with the tricyclic antidepressants is that despite their efficacy, they can also cause cognitive dysfunction as a side effect, given their potential blocking action on acetylcholine—the neurotransmitter associated with memory and intellectual performance and already diminished in AD.

The Use of Monamine Oxidase Inhibitors in AD

Because of the potential anticholinergic side effects with the tricyclics, researchers have also been investigating the efficacy and adverse effects of another class of antidepressants known as monoamine oxidase inhibitors (MAOIs). Since the enzyme monoamine oxidase (MAO) is involved in the metabolic breakdown of the monoamine neurotransmitters norepinephrine and serotonin, a drug that blocks or inhibits MAO could function as an antidepressant by slowing the breakdown (thereby elevating the levels) of the mood-influencing monoamines (Martin, Owen, & Morihisa, 1987). Indeed, MAOI treatment of depression in AD has been found to be effective, including some patients who did not respond to the standard tricyclic antidepressants (Jenike, 1985; Jenike, 1988). But other findings suggest caution in the use of MAOIs in depressed patients with moderate or severe dementia as opposed to those with mild dementia; some patients moderately to severely demented have been reported to become more agitated, more confused, and even more paranoid when administered MAOIs (Salzman, 1986).

MAO-A vs. MAO-B

The MAO story is actually more complicated, as further research has revealed that there are not one but two forms of monoamine oxidase—MAO-A and MAO-B. The MAO inhibitors typically administered for treating depression act on MAO-A. In AD, though, MAO-B has been found to be particularly elevated in a number of patients, as compared to normal older controls (Bergener & Hesse, 1987; Tariot et al., 1987). In a clinical trial of L-deprenyl an MAO-B inhibitor, the drug was found to have positive clinical effects in approximately half ($N = 17$) the AD patients treated. Clinical improvement in symptoms of "anxiety/depression, tension, and excitement" resulted (Tariot et al., 1987). Improvement was also described in performance on a complex cognitive task requiring sustained effort. Moreover, minimal side effects were reported. Further studies on L-deprenyl are in progress.

Modifiability of Target Symptoms in AD

What these pharmacologic studies also show is that a diversity of target symptoms in AD are modifiable, responding to varying treatments. Considerably more research in this area is being contemplated, with an increasing number and diversity of studies underway. Data from a pilot study of carbamazepine, for example, were presented to show that the drug was clinically and statistically effective in suppressing and modifying assaultive behavior in a given group of patients with AD (Patterson, 1988). Neuroleptic medications are, of course, commonly considered in the treatment of assaultive AD patients, though understanding of their optimal indications, drugs of choice among them, and effective dosages have still received too little research attention (Group for the Advancement of Psychiatry, 1988). Again, the paucity of research in this area extends to the general role of pharmacology in the treatment of anxiety and agitation in AD, not to speak of interventions for sleep disorders and for the spectrum of behavioral problems from apathy to mania.

ASSOCIATIONS BETWEEN NEUROANATOMICAL CHANGES AND CLINICAL MANIFESTATIONS IN ALZHEIMER'S DISEASE

Though much obscurity surrounds the neural mechanisms underlying troublesome and disruptive behaviors in dementia, findings suggest that many behavioral symptoms in AD represent a direct rather than a secondary consequence of neural impairment (Swearer, Drachman, O'Donnell, & Mitchell, 1988). That specific neuroanatomical changes are linked to corresponding neurochemical changes, which in turn are linked to behavioral sequelae in AD, adds support to this view. Certainly, the identification in AD of a lesion in the nucleus basalis of Meynert, linked to decrements in the cholinergic system, which in turn has been linked to cognitive impairment, offers a paradigm for this perspective.

The Locus Ceruleus and the Nucleus Raphe Dorsalis

Two candidates for this triple linkage between neuroanatomical, neurochemical, and behavioral changes in AD are brain changes in the locus ceruleus and the nucleus raphe dorsalis. In AD, an exaggerated loss of neurons has been identified in the locus ceruleus, this in turn being found to correlate significantly with norepinephrine concentration, which is associated with mood levels (Bondareff et al., 1987). Moreover, other research findings have pointed to a correlation between the magnitude of pathology in the locus ceruleus and the degree of depression in AD (Zweig et al., 1988). In the nucleus raphe dorsalis, both neurofibrillary tangles and serotonergic cell loss have been described (Cain & Nemeroff, 1987); neurofibrillary tangles, of course, represent one of the classic neuropathological findings in AD, while serotonergic deficits have been linked to mood and behavioral disturbances.

Efforts to Foster Neuroplasticity in AD

With the progress of neuroscience research has come a new appreciation of the ability of the brain—including the aging brain—to undergo positive neurochemical and neuroanatomical changes (Cohen, 1988a). These changes represent aspects of brain resiliency and the capacity for repair, reflecting on the one hand, the brain's internal response to injury and on the other, the brain's responses to external influences (e.g., pharmacological agents). Hence, new understanding of the aging brain's capacity for modifiability (plasticity) has led to new research interest in further fostering this capacity. Potential therapeutic approaches under consideration range from the use of neural tissue grafts (to replace lesioned or degenerated brain tissue) to the use of new pharmacological agents known as nerve growth factors (to induce chemically regeneration of damaged nerve-cell processes). Though at a rudimentary level, investigations are moving very rapidly in these areas (Cohen, 1988a; Gage, Chen, Buzsaki, & Armstrong, 1988).

ASSOCIATIONS BETWEEN BEHAVIORAL AND COGNITIVE CHANGES AND PHYSICAL HEALTH PHENOMENA IN AD

It remains a research question whether AD patients, apart from their dementia, are physically healthier than the population of older adults as a whole. There is some evidence that they are (Wolf-Klein et al., 1988). Others, however, have focused on the reduction of life expectancy following the onset of AD, and with over 150,000 AD patients dying each year, describe the disorder as the fourth leading cause of death in American adults (Butler, 1978; Stone, 1987). Regardless, there are a significant number who have compounding physical problems causing excess disability (Reifler & Larson, 1988), and many whose behavioral problems increase the risk of physical health problems, ranging from falls to weight loss (Merriam et al., 1988). In general, though, relatively little information has been systematically gathered in relating behavioral phenomena to physical health status in AD. Such information could have considerable relevance to overall clinical management.

In the cases of falls and weight loss, the reasons for an increase in both are not clear. In one study on falls, the problem was identified in 36% of AD patients versus 11% of controls over a four-year period. A range of factors was examined to explain the increased frequency of falls, but no clear explanation emerged—neither an unequivocal physiological nor environmental basis (Morris, Rubin, Morris, & Mandel, 1987).

Similarly, unequivocal explanations are still being sought for weight loss in association with eating patterns and nutritional status in AD. Several questions, both behavioral and biological, are being pursued through research to explain weight loss among AD patients (Fairburn &

Hope, 1988). For example, is this weight loss a product of a general decline in ability or interest in self-care? Is the problem one of cognitive impairment, a failure to remember to have or complete a meal? Are there neurotransmitter changes influencing hunger and eating patterns? Are there mechanical problems in eating, due to apraxia associated with dementia?

BIOLOGICAL RAMIFICATIONS OF STRESS IN CLOSE CAREGIVERS OF ALZHEIMER PATIENTS

The significant degree of stress and reactive depression among close caregivers of AD patients continues to be documented as a major public-health problem (Cohen & Eisdorfer, 1988). In addition to the impact of stress on mood states of caregivers, their physical health status may also be affected. Caregivers have been reported to have poorer health, to be higher utilizers of health care, and to be greater users of prescription medication than controls (Haley, Levine, Brown, Berry, & Hughes, 1987).

Adverse Impact of Chronic Stress on Immune System in AD Caregivers

Data suggest that the greater physical health vulnerability of AD caregivers can in part be attributed to lower levels of immunological adaptation because of the impact of chronic stress on immune function. Lower percentages of total T-lymphocytes and helper T-lymphocytes were reported among AD caregivers as compared to controls. The caregivers also developed significantly higher antibody titers to Epstein-Barr virus, the etiologic agent for infectious mononucleosis (Kiecolt-Glaser et al., 1987).

Hence mental health interventions for AD caregivers have the potential of alleviating not only adverse behavioral consequences but also negative biological changes. Psychological and physical health status alike can benefit.

STUDYING BEHAVIORAL SYMPTOMS FOR THE PURPOSE OF GENERATING BIOLOGICAL HYPOTHESES IN AD

Apart from behavioral symptoms representing target problems for intervention in AD, symptoms themselves may provide new clues to predicting clinical course and identifying pathophysiology.

Predicting Clinical Course by Studying Behavioral Symptoms in AD

While efforts to delineate better the natural history or clinical course of AD continue (Group for the Advancement of Psychiatry, 1988; Reisberg, Ferris, deLeon, Crook, & Haynes, 1987), less attention has been focused on whether specific behavioral symptoms might predict the intensity or the duration of the disorder to follow.

Vocabulary Performance

Healthy active older adults are reported as experiencing a growth of vocabulary with aging. A reduction in vocabulary performance has been associated with a significantly shortened interval until death (White & Cunningham, 1988). Though this association is not specific to AD, it appears relevant to judging remaining longevity.

Personality Change in AD

In a study of mildly demented AD subjects, early personality changes did not appear to be associated with a more rapid progression of the disorder. Mildly demented AD patients with personality changes did not have a more severe course than the control group of mildly demented AD patients without personality changes (Rubin, Morris, & Berg 1988).

Psychotic Symptoms in AD

Contrary to the above findings with personality changes, preliminary research suggests that AD patients with psychosis deteriorate faster in terms of their cognitive status than nonpsychotic AD patients (Rubin, Drevets, & Burke, 1988).

Identifying Pathophysiology by Studying Behavioral Symptoms in AD

To an extent, studies of the behavioral symptoms of memory impairment and depression in AD helped identify neurochemical and neuropathological changes that occur in the disorder (Cohen, 1988a). Clinical observations that memory dysfunction could be caused by drug side effects associated with reduced acetylcholine levels in the brain eventually led to the search for altered levels of acetylcholine in the brains of cognitively impaired AD patients and later to the search for a neuroanatomical lesion site (the nucleus basalis of Meynert). Similarly, the discovery of diminished levels of monoamines in patients observed to be depressed eventually contributed to hypotheses about reduced levels of monoamines in the brains of depressed AD patients and later to the search for a neuroanatomical lesion site (the locus ceruleus). In short, studies of behavioral changes in AD offer an additional window on possible brain changes in this disorder.

CONCLUSION

The research highlights the growing potential of scientists to modify the symptoms and course of AD in a fundamental way. The recognition of how the behavioral symptoms of AD are linked to underlying brain pathology has already led to some progress in modifying these symptoms. As a result, a number of patients with AD can now be helped through the course of their disorder with less suffering and improved coping, and a number of their families have had burdens eased and the risk of adverse biomedical effects from chronic stress reduced. Relating brain-behavior relationships in AD to treatment opportunities and to new views about diagnosis, natural history, pathophysiology, and etiology, is at the core of a biopsychiatric approach to Alzheimer's disease.

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CHAPTER 8

Drug-Related Cognitive Impairment: Current Progress and Recurrent Problems

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This chapter reviews recent research on drug-induced cognitive impairment, focusing primarily on global cognitive disorders, delirium and dementia, occurring as adverse effects of pharmacological agents used in clinical practice. Our primary interest is cognitive toxicity occurring in the elderly, but because there are major gaps in the literature on adverse drug effects in the aged, the discussion is supplemented with findings from other adult populations. We are concerned with cognitive toxicity as a clinical problem rather than with the use of drugs as probes for elucidating the neuropharmacological mechanisms underlying learning and memory. The primary focus will be on agents that affect the central nervous system directly rather than those that give rise to cognitive symptoms via demonstrable effects in the periphery. The emphasis is on recent studies on agents used in therapeutics; we have excluded articles on both occupational or environmental toxins and substances of abuse. The literature includes articles on both prescription and over-the-counter drugs. The strategy for retrieving the relevant papers was based primarily upon a search of the Medline data base for studies on humans published in the period from 1983 to early 1988 under the subject headings "dementia," "delirium," or "cognition disorders," and the subheading "chemically-induced."

This chapter is written with two goals in mind: First, periodic reviews of the literature on adverse drug effects are necessary to help clinicians keep up to date in evaluating the risks versus the benefits of the medications they prescribe. Second, a review of current publications in this field allows us to describe the process by which adverse drug effects are discovered and characterized and that by which such knowledge is translated into systematic efforts at preventing morbidity and disability. The latter goal is perhaps the more crucial. Review of the literature leads inescapably to the conclusion that existing mechanisms do not ensure that there is appropriate evaluation of the potential for specific drugs to cause cognitive deterioration. This chapter is therefore written from an activist as well as a scholarly perspective, with the conviction that clinicians, academic investigators, those in the pharmaceutical industry, and those responsible for regulation of the industry all share a responsibility for closing the gaps in the current system.

The magnitude of the problem can be evaluated by considering the diversity of drugs capable of causing cognitive impairment, the multiplicity of mechanisms implicated, and the prevalence of the problem in clinical populations.

Numerous tabulations of drugs implicated as causes of cognitive deterioration have appeared (e.g., Caird & Scott, 1986; Medical Letter, 1986); however, lack of specification of the criteria for including or excluding specific agents makes these difficult to evaluate. Though a detailed discussion of mechanisms is beyond the scope of this review, it is important to note that drug-induced cognitive impairment can result from diverse pathogenic mechanisms. It can occur through direct effects on the brain or through indirect effects in the periphery—e.g., drug-induced hypoglycemia, dehydration, or electrolyte disturbances. Both anticholinergic (muscarinic-blocking) agents and benzodiazepines can cause cognitive impairment through specific receptor-mediated mechanisms. Ricou, Forster, Bruckner, Chastonay, and Gemperle (1986) have demonstrated that a specific benzodiazepine antagonist (RO 15-1788) can improve alertness and reverse anterograde amnesia due to the benzodiazepine midazolam. Physostigmine can reverse cognitive impairment due to anticholinergic agents. In addition, several studies with animals (Boast, Bernard, Barbaz, & Bergen, 1983; Vatashsky, Beilin, Razin, & Weinstock, 1986) and humans (Nilsson, 1982) have demonstrated reversal of the effects of benzodiazepines by physostigmine. Though physostigmine reversal has not been confirmed in all studies (Pandit, Kothary, Samra, Domino, & Pandit, 1983), these findings do suggest that indirect actions on cholinergic systems may be involved in the pathogenesis of benzodiazepine-induced cognitive impairment. Reports that physostigmine can also reverse cognitive effects due to H-2-receptor antagonists (Bostrom, Holmgren, & Lundberg, 1982; Goff, Garber, & Jenike, 1985; Jenike & Levy, 1983; Mogelnecki, Waller, & Finlayson, 1979) suggest that indirect effects on cholinergic systems can mediate drug-induced impairment from these agents. Further research is necessary to evaluate the extent to which disruption of cholinergic systems is a final common path in the pathogenesis of the toxic and metabolic encephalopathies. Other classes of mechanisms have also been described. The adverse effects of myelography with metrizamide, for example, may be secondary to inhibition of hexokinase and effects on cerebral carbohydrate and energy metabolism (Bertoni & Steinman, 1982; Ekholm, Reece, Coleman, Kido, & Fischer, 1983). Other adverse drug effects can be secondary to toxic (subconvulsive) "ictal" states (Van Sweden, 1985). Cognitive impairment can also occur as a result of drug-induced (reversible or irreversible) structural lesions in the brain (e.g., leukoencephalopthy from carmofur [Kuzuhara et al., 1987] or, possibly, more focal structural lesions from clioquinol [Ferrier, Schwieger, & Eadie, 1987]).

It is now widely recognized that the elderly are, in general, at increased risk for adverse drug reactions as a result of increased use of medications (including the increased potential for drug interactions), changes in pharmacokinetics, and changes in the responses of target organs. Changes in both pharmacokinetics and pharmacodynamics may be due to the effects of aging itself or to those of associated diseases. Adverse drug reactions in the elderly can occur either as acute events or as more insidious and persistent causes of distress and disability. Adverse drug effects have reproducibly been identified as one of the most common causes of delirium and related acute toxic encephalopathies. Chronic cognitive toxicity, in general, is manifest as a state of dementia. A review of diagnoses in nine published series of clinical cases demonstrates that drug toxicity is the most common of the reversible dementias, accounting for approximately 2.7% of all cases of dementia (Katzman, Lasker, & Bernstein, 1988). The clinical experience summarized was derived from patient flow at tertiary referral centers. The prevalence of reversible disorders may be higher in patients seen in primary care. Larson and coworkers (Larson, Reifler, Featherstone, & English 1984; Larson, Reifler, Sumi, Canfield, & Chinn, 1985, 1986; Larson, Kukall, Buchner, & Reifler, 1987) have demonstrated that medications can be both primary and contributing causes of cognitive impairment and that this occurs in approximately 10% of patients evaluated for dementia in their clinic. In an extension of these observations, the authors report on the effects of drug withdrawal in 35 patients with drug-induced impairment (Larson et al., 1987). Their findings confirm that drug reactions were not only primary causes of cognitive impairment but also secondary causes of worsened performance in patients with an underlying irreversible dementia. Impairment was attributed to a single agent in 27 cases; a second drug was identified as a possible secondary cause in 8 cases. The drugs most commonly implicated were sedative hypnotics and antihypertensives. Others included neuroleptics, analgesics, cimetidine, insulin, amoxapine, and amantadine. The relative odds for drug-related impairment increased from 2.7 for those taking two–three prescription drugs, to 9.3 for those taking four–five, and 13.7 for those taking six or more.

Given the scope of the problem in terms of the number of agents, the diversity of mechanisms, and the number of patients affected, it is reasonable to propose that all agents used in clinical practice should be evaluated to establish their potential for causing cognitive impairment. To put current activity in this area in perspective, it is necessary first to review, in general, the processes by which adverse drug effects are identified and to discuss the application of this process to the problem of cognitive toxicity in the elderly.

THE PROCESS OF DISCOVERY OF ADVERSE DRUG EFFECTS

The initial human studies on the efficacy and safety of investigational new drugs are carried out under sponsorship from the pharmaceutical industry under the regulation of the Food and Drug Administration (FDA) (FDA, 1977). By the time research on the safety and efficacy of a new pharmacological agent is completed and a New Drug Application is submitted to the FDA, data will be available on approximately 1,000–3,000 subjects exposed to the new drug. Few of these, however, will be elderly subjects or patients with concomitant illnesses or medications. Such patients are generally exposed to new medications only after their approval and marketing.

According to the most current FDA draft guidelines for the format and content of a New Drug Application (FDA, 1986), data on safety must include studies of pharmacodynamic properties of the drug other than the specific property thought to relate to clinical effectiveness. These include effects on CNS function. The draft guidelines state, "For almost any drug in any pharmacological class, it is important to have a reasonably complete pharmacological profile. . . . We know, for example that CNS drugs can have profound cardiac effects and cardiac drugs, profound CNS effects" (p. 60). However, it is stated that evaluation of these properties does not necessarily require formal pharmacological study and that "at times, a clinical observation can be an earlier and more dependable index of an effect than a laboratory test with which that effect correlates" (FDA, 1977, 6). In fact, drug research appears to rely primarily on clinical observation of "confusion" to evaluate the potential for cognitive toxicity. By the time a new drug application is submitted, data on the drug's safety may be limited to that necessary to determine whether or not it commonly causes gross, clinically observable states of confusion in young or middle-aged adults. Less severe effects and those occurring specifically in the elderly may not be apparent at this time. The draft guidelines for New Drug Applications state that "documented or potential age related effects should be highlighted" (FDA, 1986, 18); they do not, however, specifically address the increased vulnerability of the elderly patient to drug-induced cognitive impairment. For an otherwise safe drug, it is likely that the potential for cognitive toxicity in the elderly would most often become apparent only after approval and marketing, when the most vulnerable patient populations are exposed to the agent with the least systematic monitoring. These concerns are not unique to cognitive toxicity; many of the adverse effects of greatest concern to clinicians were discovered only after drugs were marketed.

In reviewing the process of discovery for the most important adverse drug reactions since thalidomide, Venning (1983a–e) noted that informal observation leading to anecdotal reports, often of a single case, represented the first sources of alarm for the majority of effects. The problem in evaluating case reports is determining whether an undesirable clinical manifestation or adverse clinical event is in fact an adverse drug reaction. One approach to evaluating such events has been the development (Kramer, Leventhal, Hutchinson, & Feinstein, 1979) and validation (Hutchinson et al., 1979) of an algorithm for the operational assessment of possible adverse drug events. This approach has been applied (in modified form) to evaluating suspected cases of drug-induced cognitive impairment by Larson et al. (1987).

Though case reports and clinical observations on individual patients are central to the process of discovery, they cannot provide the data necessary for an adequate characterization of adverse drug effects. They cannot, for example, indicate whether the agent causes drug-related impairment as a rare event or whether it more commonly causes impairment of a subclinical degree that may be apparent only with formal psychological testing.

Jick (1977) discusses the discovery of drug-induced illness in terms of the magnitude of two "risks": the baseline rate of an adverse clinical event in the absence of drug and the added risk experienced by users of the drug. Based upon this discussion, the high baseline rate of cognitive impairment makes it difficult to rely on clinical observation for the identification of drugs that cause cognitive impairment in the elderly. It is thus possible that the first alarms of toxicity with respect to a drug that commonly causes cognitive impairment in the elderly will be sporadic observations of confusion in younger patients.

ADVERSE EFFECTS OF SPECIFIC AGENTS

With these considerations in mind, we review the literature on drug-related cognitive impairment for those classes of medications for which there has been recent progress. There are differences between the classes in the extent of investigation and the nature of the studies. This is reflected in the literature. With the anticholinergic (muscarinic-blocking) medications and with several of the agents used in the treatment of psychiatric disorders, there is a body of research dealing specifically with cognitive impairment as an adverse drug effect in the elderly. For these agents, this review focuses selectively on the literature directly relevant to geriatric patients. In contrast, for those drugs used for the treatment of somatic disorders, there is less dealing specifically with this problem. For these drugs, we discuss the literature derived from other populations, to draw attention to the information that is available and that which is not.

Anticholinergic Medications

Anticholinergic agents are central to consideration of cognitive impairment in the elderly. First, anticholinergics have provided a model for memory disturbances of aging, as well as Alzheimer's disease. Second, toxicity from anticholinergic medications represent a pragmatic clinical problem. Diverse pharmacologic agents have marked anticholinergic effects and are prescribed in elderly and nonelderly populations alike for a variety of clinical symptoms. However, the elderly may be particularly sensitive to the central effects of anticholinergic agents. Cognitive impairment resulting from treatment with antidepressant and antipsychotic medications is discussed in this section. Though it is clear that their central anticholinergic activity contributes strongly to their effects on cognitive performance, it is possible that other mechanisms may also be involved.

Cholinergic Functions and Memory: Scopolamine in Normal Young and Elderly Subjects

Memory impairment resulting from scopolamine, a potent and specific muscarinic antagonist, has been repeatedly documented in normal volunteers (e.g., Caine, Weingartner, Ludlow, Cudahy, & Wehry, 1981) and animals (e.g., Bartus, 1978) after acute administration of scopolamine. Recently, Sunderland et al. (1987) evaluated sensitivity to scopolamine in patients with Alzheimer's disease and normal, age-matched controls in a double-blind cross-over study in which placebo or several doses of scopolamine were administered in pseudorandomized fashion. Patients with Alzheimer's disease evidenced significant impairments in most cognitive tasks at lower doses of scopolamine than controls and were relatively more impaired at higher doses. These differences were unrelated to peripheral physiologic effects. Also, behavioral ratings based on a structured interview revealed that mild euphoria, motor incoordination, and hostility occurred at the .25 mg dose in patients with Alzheimer's disease but not controls.

Other studies have suggested that sensitivity to cholinergic blockade is increased in the normal aged. Sunderland et al. (1986) gave scopolamine to normal elderly and found that it produced memory impairment which approximated the cognitive impairments of Alzheimer's disease. These impairments were induced by a lower dose of scopolamine than was used in previous studies with young normals, suggesting increased sensitivity with aging. However, controlled studies involving direct comparisons of the sensitivity of normal elderly, elderly patients with illnesses affecting cognitive performance, and younger controls are yet to be conducted.

Anticholinergic Agents Used in Medical Practice

A number of recent studies have considered the sensitivity of both normal elderly and impaired elderly subjects to the cognitive (i.e., amnestic) effects of specific anticholinergic medications used in the treatment of somatic disorders. In one of the best-controlled studies to date, Miller et al. (1988) evaluated the effects of low-dose scopolamine on cognitive functioning in psychiatrically healthy elderly medical inpatients scheduled for surgery. Patients were randomly selected to receive either an intramuscular injection of placebo or .005 mg/kg of scopolamine two hours before surgery. Scopolamine resulted in low serum anticholinergic levels and produced mild cognitive impairment observable only on a Delirium Symptom Checklist and the Rey Auditory-Verbal Learning. Degree of impairment was related to serum anticholinergic levels (and in a small number of patients who received spinal anesthesia, to CSF anticholinergic activity).

In a randomized double-blind study, McEvoy et al. (1987) compared the effects of trihexyphenidyl and amantadine on memory in 30 normal elderly volunteers. Subjects participated in a four-day trial of each medication (amantadine 100 mg bid; trihexyphenidyl 4 mg bid). During the trihexyphenidyl phase, subjects complained of confusion and memory impairment, and demonstrated memory impairments on both a free-recall word list and a recognition memory test. No memory impairment was noted during the amantadine condition. In a related study, Potamianos and Kellett (1982) observed significant memory impairment in elderly subjects after a single dose of only 2 mg of trihexphenidyl. In a subsequent report, McEvoy (1987) compared findings in the elderly with those from a sample of healthy young-adult normal volunteers who participated in a similar study comparing benzotropine (2 mg bid) with amantadine. Memory impairment resulted from the benzotropine but was not as pronounced as that seen in elderly subjects as the result of trihexyphenidyl.

Some indication of the potential negative impact of anticholinergic medications on patients with Parkinson's disease is provided by Meco et al. (1984), who evaluated cognitive status in elderly patients and age-matched controls. Patients receiving anticholinergic medications (either alone or in combination with other medication) performed more poorly on all tests. Similarly, De Smet et al. (1982) noted that among a sample of 75 hospitalized Parkinsonian patients, confusional states were observed in 46% of patients not receiving anticholinergic drugs and 93% of those receiving anticholinergic therapy.

Several recent case reports also attest to adverse cognitive effects of anticholinergic medications. Agents implicated include meclizine (Molloy, 1984) and homatropine eyedrops (Delberghe & Zehers de Beyl, 1987). Recently, Katz, Stoff, Muhly, and Bari (1988) evaluated cognitive status, findings from the clinical electroencephalogram (EEG), and medication use in a population of patients seen in a geriatric evaluation program and suggested that the degree of EEG background slowing, or the combined use of EEG and cognitive measures, may serve to identify patients with cognitive impairment resulting from anticholinergic medications.

Tricyclic antidepressants. Data relevant to the cognitive toxicity of tricyclic antidepressants in the elderly are available from studies addressing delirium and/or confusional states as clinically observed drug reactions and from psychometric investigations on drug effects. Delirium as an adverse effect of tricyclics has been considered primarily a central anticholinergic syndrome resulting from the antimuscarinic properties of these agents. Cole, Branconnier, Saloman, and Dessain (1983) concluded that approximately 5% of elderly depressed patients receiving amitriptyline or imipramine developed clinically significant confusion or agitation.

In a prospective study, Meyers and Mei-Tal (1983) reported that toxic delirium developed in 3 of 43 geriatric inpatients with DSM-III diagnoses of major depressive disorder who were treated with tricyclics. These data contrast with earlier findings reported by Davies, Tucker, Harrow, and Detre (1971) that 35% of 55 patients over age 40 treated with tricyclics developed confusional episodes, in contrast to only 1% of 95 patients under age 40. Davies et al. observed even higher percentages of confusion with increasing age (e.g., 33% of patients age 60–69; 50% of patients age 70–79). In considering these differences, Meyers and Mei-Tal note that 40% of the patients who experienced toxic reactions to TCAs in the Davies et al. (1971) study were psychotically depressed and speculate that some number of these persons actually suffered a TCA-induced exacerbation of psychosis. Furthermore, several of the patients of Davies et al. (1971) were taking other medications likely to cause cognitive impairment.

Livingston, Zucker, Isenberg, and Wetzel (1983) conducted a chart review of 125 inpatients taking tricyclic antidepressants; they report that delirium was documented in 10 cases and was statistically related to age, race, and plasma tricyclic antidepressant levels. Nelson, Jatlow, Bock, Quinlan, and Bowers (1982) investigated adverse reactions to desipramine and found that age and concurrent treatment with antipsychotic drugs were significantly associated with an increased frequency of side effects. Anticholinergic reactions including delirium occurred almost exclusively in patients who were also receiving antipsychotic medications but were unrelated to desipramine plasma levels.

Several informative case reports have recently appeared. Kutcher and Shulman (1985) described a 68-year-old female who developed a delirium while being treated for depression with low-dose desipramine. Her plasma level was in the subtherapeutic range. Symptoms included inattention, drowsiness, word-finding difficulties, and "confusing spells." The authors emphasize the potential difficulty in differentiating adverse medication effects from worsening affective symptoms. Frances and Teusink (1984) described a case of imipramine-induced dementia. Burns and Tune (1987) recently reported two cases of subtle cognitive impairment resulting from the antidepressant amoxapine.

Other reports have provided psychometric data regarding anticholinergic cognitive effects of tricyclic antidepressants in elderly individuals. A series of investigations was conducted by Branconnier, Cole, and their colleagues. Branconnier Devitt, and Cole (1982) reported that a single 50 mg dose of amitriptyline in normal elderly subjects reduced retrieval from secondary memory (but not storage) in comparison to placebo. Branconnier, Cole, Ghazvinian, and Rosenthal (1982) compared amitriptyline (150 mg/day), placebo, and mianserin (60 mg/day) in the treatment of elderly depressed outpatients with pretreatment evidence of mild cognitive impairment. Amitriptyline significantly impaired performance on a composite measure of cognitive functioning based on nine psychological tests. There was no indication that either baseline levels of cognitive impairment or degree of cognitive change during drug therapy was significantly related to the degree of antidepressant response. Finally, Branconnier et al. (1983) compared the clinical efficacy and adverse effects of bupropion, an atypical antidepressant, and imipramine in 63 elderly depressives and reported that cognitive performance improved under all three treatments.

The effects of amitriptyline and trazodone on information-processing, attention, and visual-motor skills in healthy adults aged 60 and older were evaluated by Burns, Moskowitz, and Jaffe (1986) in a double-blind, placebo-controlled, crossover investigation. Results indicated that amitriptyline 50 mg impaired vigilance and tracking performance, and increased drowsiness. Trazodone 100 mg adversely affected only the tracking task, the most difficult task in the battery. The authors concluded that the performance of these healthy subjects was less impaired by trazodone than by amitriptyline.

Neuroleptics and the treatment of psychoses. Findings from investigations on younger-adult schizophrenic patients treated with antipsychotic medications used together, when necessary, with anticholinergic anti-Parkinsonian medications have raised concerns about the possibility that treatment of psychosis in the elderly may be associated with cognitive deficits. In a pioneering investigation, Tune, Strauss, Lew, Breitlinger, and Coyle (1982) evaluated cognitive performance and plasma levels of anticholinergic equivalents (by radioreceptor assay) in a group of schizophrenic outpatients and found a significant relationship between drug levels and memory deficits. This finding implied that drugs used to treat psychosis can cause cognitive deficits of which neither doctors nor patients are aware. Functional deficits, if observed, were apparently misattributed to the schizophrenia. Similar considerations are likely applicable in the elderly.

Steele, Lucas, and Tune (1986) evaluated cognitive status in patients with Alzheimer's disease treated with either haloperidol (1, 2, and 5 mg/day) or thioridazine (25, 50, and 75 mg/day), for two-week periods in an open crossover study. Neither medication produced significant impairments on the Minimental State Examination. However, in two patients who subsequently had thioridazine doses increased to 100–125 mg/day, Minimental State scores decreased by 4–5 points. Evidence that low doses of thioridazine can cause significant adverse effects comes from the report of Lanska and Harsch (1984) who described a 71-year-old woman who developed symptoms of hypotension, hypothermia, and lethargy after receiving an initial dose of 25 mg thioridazine for treatment of visual and auditory hallucinations.

The evaluation of cognitive effects of neuroleptics is complex, as target symptoms for which these medications are typically prescribed can affect cognitive functioning. This issue was considered in greater detail by Perlick, Stastny, Katz, Mayer, and Mattis (1986) in a study utilizing neuropsychological measures to evaluate memory deficits in relationship to anticholinergic levels in chronic (nonelderly) schizophrenics. The authors differentiate between memory deficits associated with anticholinergic effects (i.e., correlated with anticholinergic levels) and memory deficits which were apparently secondary to symptomatic states such as impaired motivational or attentional levels. These results may be particularly relevant to the use of psychotropic medication in the elderly, who for a myriad reasons, may experience states of impaired motivation and attention that may confound and/or compound adverse medication effects.

Benzodiazepines

The most common adverse effect of benzodiazepines is excessive CNS depression subjectively experienced as sedation, drowsiness, fatigue, memory difficulties, dizziness, light-headedness, and incoordination (Greenblatt, Shader, Divoll, & Harmatz, 1984). The results of a number of investigations have shown that the effects of benzodiazepine-induced CNS depression are associated with psychometric measures of impaired cognitive and behavioral performance. Specific performance impairments observed in both anxious patients and normal volunteers as the result of benzodiazepines include impaired learning of verbal and visual information (e.g., Ghoneim, Hinrichs, & Mewaldt, 1984; Scharf, Khosla, Brocker, & Goff, 1984; Scharf, Khosla, Lysaght, Brocker, & Moran, 1983); slowed psychomotor performance (e.g., Johnson & Chernik, 1982; Spinweber & Johnson, 1982); impaired vigilance (e.g., Wolkowitz & Tinklenberg, 1985); and impaired driving performance (e.g., O'Hanlon, Haak, Blaauw, & Riemersma, 1982).

Wolkowitz et al. (1987) administered intravenous diazepam in several doses or placebo (saline) in randomized order at one-week intervals to normal adult volunteers and found that it selectively impaired anterograde episodic memory and attention but did not affect access to information in long-term memory (e.g., semantic or knowledge memory).

Diazepam also produced a significant impairment in self-ratings of attention at the doses that resulted in impairments in episodic memory (140.1 μg/kg). Therefore, it is possible that an attentional deficit underlies the memory impairment. The authors note that the memory impairments produced by diazepam are different from those produced by scopolamine, which impairs semantic as well as episodic memory (e.g., Caine et al., 1981). They suggest that diazepam and scopolamine may provide pharmacologic models of two very different clinical syndromes. Diazepam effects may serve as a model for organic amnestic syndromes (e.g., Korsakoff's syndrome), while scopolamine serves as a model for Alzheimer's disease. These findings and the proposed model will require replication and further amplification.

It is useful to distinguish between short- and long-acting benzodiazepines. In addition to the desired pharmacodynamic effects of the drugs, the cognitive deficits associated with certain of the long-acting benzodiazepines have been shown to persist for some time (Bond & Lader, 1981). Given altered pharmacokinetics of certain benzodiazepines in the elderly (e.g., Greenblatt, Allen, Harmatz, & Shader, 1980; Greenblatt et al., 1983; Macklon, Barton, James, & Rawlins, 1980), it is likely that increased accumulation and the persistence of side effects in older patients may be a particular problem.

A number of recent investigations have suggested that elderly patients may be more sensitive to the deleterious side effects of the benzodiazepines (Greenblatt, Sellers, & Shader, 1982; Thompson, Moran, & Nies, 1983). Pomara et al. (1984) evaluated the acute effects of relatively low doses of diazepam in normal elderly volunteers on memory and psychomotor performance. Under double-blind conditions, subjects were administered placebo or diazepam (2.5, 5, 10 mg) in four consecutive sessions separated by at least one week. Maximum impairment occurred at the highest doses and at times corresponding to peak plasma levels. However, even the lowest dose produced performance deficits on all four measures. Most studies of diazepam effects with young subjects, in contrast, have used doses above 5 mg.

In order to evaluate further the possibility that the elderly may be more sensitive to low doses of diazepam, Pomara et al. (1985) compared the performance of their elderly volunteers with younger height- and weight-matched controls and found that the 2.5 mg dose of diazepam did not affect performance in the young. Plasma levels of diazepam were significantly higher in the older subjects at one hour after drug administration, leading the authors to speculate that the increased sensitivity of the elderly could be due to age-related pharmacokinetic differences. However, there was no correlation between plasma diazepam levels and memory deficits, suggesting that pharmacokinetic differences may have contributed to the differential sensitivity.

In contrast to these reports, the results of a placebo-controlled study by Scharf, Hirschowitz, Woods, and Scharf (1985) found that clorazepate (3.75 and 7.5 mg) did not impair immediate or delayed verbal recall among normal elderly volunteers. These findings are consistent with the results of several studies with young-adult subjects, which have indicated that anterograde amnesic effects occur more frequently following use of higher-potency and shorter-acting benzodiazepines (Scharf et al., 1983; Scharf, Khosla, Brocker, & Goff, 1984; Shader & Greenblatt, 1983). For example, Scharf et al. (1983, 1984) reported significant anterograde amnesia in patients treated with lorazepam and none in young adults treated with clorazepate. On the basis of the available data, it is difficult to draw general conclusions about the balance between pharmacokinetic and pharmacodynamic parameters in determining the older patients' sensitivity to benzodiazepine-induced cognitive deficits. The findings emphasize the importance of empirical study on individual agents with monitoring of both plasma levels and CNS effects.

There are few data from controlled evaluations addressing the effects of chronic administration of benzodiazepines on cognitive functioning in geriatric patient populations. Viukari, Jaatinen, and Kylmamaa (1983) conducted a randomized double-blind crossover study of the effects of 1 mg flunitrazepam and 5 mg nitrazepam (both intermediate-acting benzodiazepines) on performance on cognitive and behavioral tests among 37 geropsychiatric inpatients, 15 with senile dementia, Alzheimer's type. Subjects received one of the medications followed by a placebo period, and then the second medication, each for a period of two weeks. Neither benzodiazepine resulted in consistent impairments of performance. Approximately half of the subjects performed better on the drugs than on placebo. The authors conclude that "claims that accumulation, oversedation and hangover might occur" with the use of these intermediate-length benzodiazepines as hypnotics are "unjustified" (pp. 833–834). However, these data are difficult to interpret because acute effects of single-dose administration were not evaluated. It is not known whether medications initially produce acute performance impairments that diminished with time, and therefore one cannot adequately conclude whether the results represent "tolerance" or simply "no initial impairment." Furthermore, clearance studies with flunitrazepam and nitrazepam in the elderly have shown only small or negligible age-related changes (e.g., Castleden, George, Marcer, & Hallett, 1977; Kanto, Kangas, Aaltonen, & Hilke, 1981). Different findings regarding cognitive performance might result from benzodiazepines with age-dependent pharmacokinetics.

While there is a lack of epidemiological data on drug-related cognitive impairment, several recent reports on falls related to benzodiazepine use indicate that CNS effects are epidemiologically significant. Kramer and Schoen (1984) found that medical inpatients 70 or older who experienced a fall during their hospital stay were more likely to be taking flurazepam than elderly patients who did not fall. Although these findings cannot establish a causal relationship between flurazepam use and performance impairment, they are provocative. Ray, Griffin, Schaffner, Baugh, and Melton (1987) conducted a case-control study of 1,021 patients with hip fractures and 5,606 controls from among elderly Medicare enrollees and reported that patients treated with hypnotics or anxiolytics having short (< 24 hours) elimination half-lives had no increased risk of hip fracture. However, current users of hypnotics or anxiolytics having long (> 24 hours) elimination half-lives had a significantly increased risk.

Foy, Drinkwater, March, and Mearrick (1986) highlight a further issue relevant to cognitive impairment resulting from the use of benzodiazepines in the elderly—the development of withdrawal symptoms following discontinuation of benzodiazepines. Fifty-two out of 103 consecutive elderly hospital admissions were found to have a positive urine test for benzodiazepines. These patients had an increased risk for developing a confusional state in hospital. Seven of 8 benzodiazepine users who developed confusion had had their benzodiazepines stopped on admission. Six of these patients were treated for the confusion with diazepam which was subsequently withdrawn gradually without adverse effects. There have been recent case reports of benzodiazepine-withdrawal syndromes, especially with alprazolam (e.g., Fernando & Sagi, 1986; Levy, 1984; Zipursky, Baker, & Zimmer, 1985).

Lithium

Cognitive effects of lithium are of two types: memory impairment and slowing of psychomotor performance. Findings, especially with regard to memory, have been inconsistent. Reus, Targum, Weingartner, and Post (1979) reported that long-term lithium treatment adversely affected verbal recall in a group of bipolar patients, in comparison to a group of untreated patients. However, Squire, Judd, Janowski, and Huey (1980) examined the effects of a two-week trial of lithium on memory and cognitive functions in psychiatric inpatients, using a placebo-controlled double-blind crossover design, and did not observe any effects on memory. Lithium did result in slowed performance on certain perceptual motor tasks. Similar findings regarding performance deficits involving psychomotor slowing as the result of two weeks of lithium treatment have been reported in a series of investigation by Judd and his colleagues (Judd, 1979; Judd, Hubbard, Janowski, Huey, & Takahashi, 1977). Finally, Weingartner, Rudorfer, and Linnoila (1985) observed only subtle memory impairments resulting from chronic lithium treatment in normal volunteers.

There have been no controlled studies that have specifically evaluated treatment effects in the elderly. However, a number of case reports of cognitive impairment resulting from lithium treatment in elderly patients have been presented. Smith and Kocer (1988), for example, describe two cases of rapidly progressive dementia related to lithium.

Beginning with an initial report of a neurotoxicity in four patients receiving lithium and haloperidol (Cohen & Cohen, 1974), a number of reports have implicated neurotoxicity from the combined use of lithium and neuroleptics. In a retrospective study, Miller, Menninger, and Whitcup (1986) examined inpatient records of patients 65 or older who had received lithium or lithium plus a neuroleptic for the treatment of bipolar illness. Of five patients administered lithium and neuroleptic, three developed neurotoxicity and delirium. No patient treated with lithium alone developed neurotoxicity. Neuroleptic dosages were moderate (400 to 600 mg CPZ equivalents). It should be noted that appropriate doses of lithium and haloperidol have been safely administered in combination to numerous patients (Ayd, 1974), although data for the elderly are lacking.

With respect to other potential drug interactions, Price and Zimmer (1985) reported a possible acute reaction resulting from coadministration of lithium carbonate and carbamazepine. Both Yassa (1986) and Osanloo and Deglin (1980) described confusion and tremor resulting from administration of lithium together with methyldopa.

Antihypertensive Drugs

Hypertension is a risk factor for cerebrovascular disease and multi-infarct dementia and, possibly, more subtle cognitive deficits. Evaluating the effects of antihypertensive medications on cognitive performance requires consideration of the interactions of performance with both disease and treatment (Miller, Shapiro, King, Ginchereau, & Hosutt, 1984; Shapiro, Miller, King, Ginchereau, & Fitzgibbon, 1982). Nevertheless, there is reason for concern regarding the cognitive toxicity of antihypertensive medications.

Most of the literature on the cognitive effects of antihypertensive agents deals with those agents that act on catecholaminergic systems, alpha-methyldopa, clonidine, and the beta blockers. Concern that clinical use of these drugs can lead to cognitive impairment dates to Adler's (1974) description of five patients who reported symptoms such as decreased memory and difficulty in calculations and reading while taking standard doses of alpha-methyldopa. Since then there have been additional case reports of cognitive impairment due to alpha methyldopa (Fernandez, 1976; Ghosh 1976); propranolol (e.g., Belin & Larmande, 1985); and clonidine (e.g., Fein, Merrin, Davenport, & Buffum, 1987).

In studies on normal volunteers, clonidine was noted to cause greater decrements in reaction time and measures of information processing than the antihypertensive drug (guanfacine) (Kugler, Seus, Krauskopf, Brecht, & Raschig, 1980). However, preliminary studies have found that clonidine may enhance memory in patients with Korsakoff's psychosis (McEntee & Mair, 1980). Clonidine's effects on cognitive performance during treatment of hypertension have not been systematically investigated. In contrast, the effects of alpha-methyldopa and the beta blockers have been investigated in controlled studies. Harvey, Clayton, and Betts (1977) evaluated the effects of atenolol, propranolol, alpha-methyldopa, and reserpine in normal volunteers in a double-blind, placebo-controlled study and found no differences between drugs on the Stroop color-word test. The first controlled study demonstrating cognitive toxicity from these agents was that of Solomon et al. (1983), who compared hypertensives treated with propranolol and diuretics, alpha methyldopa and diuretics, and diuretics alone and reported deficits in verbal but not visual memory in those patients treated with alpha-methyldopa and propranolol. It should be noted that the design of the study, in which subjects were recruited after their physicians had stabilized them on an individualized medication regimen, leaves open the possibility for confounding the effects of medication with either differences in the severity of hypertension or physician bias in prescribing practice. However, to support the suggestion that performance decrements were in fact related to the drug, they cite comparable levels of performance in normotensive patients receiving propranolol.

The finding that use of alpha-methyldopa can be associated with cognitive impairment was confirmed by Croog et al. (1986), who reported on a study in which 626 men with mild to moderate hypertension were randomized to treatment with captopril, alpha-methyldopa, or propranolol (with hydrochlorothiazide added as needed). Patients taking alpha-methyldopa, but not those taking propranolol, had poorer visual-motor performance (Trails B) than those taking captopril. Though this study suggests that captopril causes fewer cognitive, affective, and behavioral symptoms than the other agents, it provides no information about whether captopril can be associated with cognitive impairment. The possibility that captopril can cause cognitive impairment was raised in two publications (Gillman & Sandyk, 1985; Jorgensen, Badskjaer, & Nordin, 1983). In the former, the authors report that the captopril-induced cognitive deficit was reversed by naloxone.

The results of other investigations have failed to confirm that the use of propranolol (or other beta blockers) impairs cognitive performance in either hypertensive (Blumenthal et al., 1988; Gengo, Fagan, de Padova, Miller, & Kinko, 1988; Gengo, Huntoon, & McHugh, 1987; Madden et al., 1986) or normotensive individuals (Gengo, Ermer, Carey, Kalonaros, & McHugh, 1985; Kostis & Rosen, 1987; Van Gelder, Alpert, & Tsui, 1985). In fact, in several investigations, the effects of at least certain beta blockers included improvements on some cognitive measures (e.g., Blumenthal et al., 1988; Gengo, Fagan, de Padova, Miller, & Kinko, 1988). However, many of the studies cited used only single tests to monitor cognitive performance, and further, the tests used have differed widely across investigations. Though it is clear that beta blockers do not commonly cause global cognitive impairment, the lack of comparability across studies makes it impossible to exclude more specific deficits. Given the possibility that beta blockers can improve performance by decreasing anxiety (Hartley, Ungapen, Davie, & Spencer, 1983), data on subjects' anxiety in the test situation would have been necessary to allow the comparison of findings across studies.

Digoxin

Digoxin toxicity can present with delirium, dementia, hallucinations, delusions, or other psychiatric symptoms (Closson, 1983; Grubb, 1987). Eisendrath and Sweeney (1987) demonstrated that digoxin can cause cognitive impairment, even when plasma levels are within the conventional therapeutic range; they report two cases with digoxin levels of 1.5 and 0.6 who exhibited cognitive, affective, and behavioral symptoms of acute onset. Their report raises questions about whether digoxin at therapeutic plasma levels can cause cognitive impairment of less dramatic degree and more insidious onset. Tucker and Ng (1983) investigated the relationship between cognitive status and plasma levels of digoxin in outpatients (average age 65) recruited from a cardiac clinic. Digoxin levels varied from 0.7 to 1.8 nmole/1, all within the therapeutic range. There was a significant correlation between plasma level and performance on the Buschke selective reminding test. Scores on delayed measures of facial recognition also contributed significantly to the prediction of plasma level in a regressing model. The authors state that the cardiac disease was excluded as an explanation of the association between digoxin and cognitive state.

Calcium Channel Blockers

There have been two recent case reports of verapamil-induced cognitive impairment, one a report of delirium occurring in a 24-year-old woman treated experimentally with verapramil for bipolar disorder (Jacobsen, Sack, & James, 1987), and one of confusion, depression, and impotence in a 45-year-old man treated for hypertension (Fogelman, 1983). There have been no systematic investigations of cognitive status in patients taking verapamil. Myrhed and Wilholm (1986) reviewed physician reports regarding nifedipine reactions to the Swedish Adverse Drug Reactions Advisory Committee. Confusion was reported in 8 cases out of 80 reports mentioning 116 adverse reactions, representing 0.5 reports of confusion per million daily doses.

Antiarrhythmic Agents

Quinidine and disopyrimide have muscarinic-blocking properties and can cause cognitive impairment as a result of their central anticholinergic actions (Mirro, Manalan, Bailey, & Watanabe, 1980). Summers, Allen, and Pitts (1981) reported a case in which quinidine-induced delirium in a 69-year-old was reversed by physostigmine. Saravay, Marke, Steinberg, and Rabiner (1987) reviewed the literature on mental changes and CNS effects of lidocaine and noted that 11 case reports of delirium, agitation, confusion, disorientation, and hallucinations had been reported prior to 1987. They reported on 15 additional cases in which psychiatric symptoms could reasonably be attributed to lidocaine. Eight of 15 had overt confusion or disorientation; 6 had hallucinations or delusions; 12 had significant anxiety or depression; and 11 had “doom anxiety.” There have been case reports of dysarthria and visual hallucinations resulting from intravenous flecainide (Ramhamadany, Mackenzie, & Ramsdale, 1986) and of confusion, paranoid symptoms, and hallucinations in patients taking oral tocainide (Clarke & El-Mahdi, 1985; Currie & Ramsdale, 1984). Clinically manifest confusion was observed in 15% of 369 patients in open treatment with tocainide in a humanitarian protocol (Horn et al., 1980).

Corticosteroids

Lewis and Smith (1983) reviewed the literature on psychiatric symptoms resulting from use of steroids and estimated that severe psychiatric disorders occurred as adverse reactions in approximately 5% of patients treated with corticosteroids. They noted that affective disturbances are most common, occurring in approximately 73% of drug-induced psychiatric disturbances, with psychosis in 14% of cases, and delirium in approximately 13%. Varney, Alexander, and MacIndoe (1984) reported six cases of steroid-induced dementia identified by record review out of over 1500 patients for whom steroids were prescribed over the study period. In two of the patients, the dementia appeared to be a residual syndrome occurring after the resolution of a steroid-induced psychosis. In each case, the patient recovered normal mental status after steroids were withdrawn.

Nonsteroidal Anti-Inflammatory Drugs

Cuthbert (1974) reviewed adverse reactions to nonsteroidal anti-inflammatory drugs as reported to the U.K. Committee on Safety of Medicines. Among the three "standard" drugs available at that time, the side-effect profile for indomethacin (but not phenylbutazone or oxyphenbutazone) included symptoms involving the central nervous system, including headache, dizziness, confusion, and visual disturbances. Among the newer agents for which experience had accumulated, ibuprofen was associated with similar CNS symptoms. More recently, case reports (but no systematic investigations) of cognitive dysfunction resulting from nonsteroidal anti-inflammatory drugs have been accumulating. Agents implicated include naproxen (Ames, 1983; Goodwin & Regan, 1982); sulindac (Neufeld & Korczyn, 1986; Thornton, 1980); and ibuprofen (Goodwin & Regan, 1982). Confusion can result in both acute and chronic intoxication with aspirin. The latter occurs in both children and adults, usually as a result of excessive use of aspirin for therapeutic purposes (Proudfoot, 1983; Vivian & Goldberg, 1982). Skiendzielewski, Parish, and Harrington (1986) and Cohen (1988) have recently reported cases of aspirin-induced delirium in elderly chronically ill women.

Meperidine

Data from the Boston Collaborative Drug Surveillance Program (Miller & Jick, 1978) demonstrated that approximately 0.5% of patients receiving either oral or parenteral meperidine exhibit "disorientation, bizarre feelings, hallucinations, or psychosis." Eisendrath, Goldman, Douglas, Dimatteo, and Van Dyke (1987) reported on delirium due to meperidine in six surgical patients; two of the cases also experienced seizures. The authors state that the delirium was reversed by physostigmine in one patient and that discontinuation of meperidine or substitution with morphine were usually successful in reversing symptoms. Another case was reported by Fogarty and Murray (1987). The only prospective study reported was that of Kaiko et al. (1983), who reported on the "CNS excitatory effects" of meperidine in 67 cancer patients receiving meperidine for management of postoperative or chronic pain. "Excitatory" effects ranging from nervousness to tremors, twitches, multifocal myoclonus, and seizures occurred in 48 patients, possibly related to accumulation of the active metabolite normeperidine. The myoclonus was multifocal and associated with an agitated delirium; it occurred in 8 of 68 patients.

Antibiotics

There have been rare and sporadic reports of cognitive impairment and other psychiatric symptoms related to use of antibiotics and other anti-infectives. Reports of confusion occurring during treatment of acute illness are, of course, difficult to interpret with certainty. Agents implicated include metronidazole (Schentag, Ziemniak, Greco, Rainstein, & Buckley, 1982); amphoteracin B (Weddington, 1982); acyclovir (Saral, Burns, Laskin, Santos, & Leitman, 1981; Vartian & Schlaes, 1983; Wade & Meyers, 1983); cefuroxime (Vincken, 1984); cephalothin (Tollefson, 1984); and cloxacillin (McAreavey & Redding, 1983). The difficulty in interpreting such case reports is illustrated by a report of tobramycin-induced delirium (McCartney, Hatley, & Kessler, 1982) that has subsequently been questioned (Hamilton, 1982). Twelve cases of amnestic symptoms (described as resembling transient global amnesia), some of which were slowly resolving or persistent, have been reported in relationship to cliquinol use (Kaeser, 1984). Two of the patients presented again after asymptomatic intervals of over 10 years with clinical and EEG evidence of partial seizures originating in the temporal lobe (Ferrier, Schwieger, & Eadie, 1987).

Radiocontrast Agents

There have been case reports of delirium, confusion, transient aphasia, memory impairment, anxiety, agitation, affective symptoms, hallucinations, delusions, and other psychiatric symptoms, as well as seizures (including nonconvulsive status epilepticus) and myoclonus resulting from intrathecal administration of the nonionic contrast agent metrizamide, primarily for myelography. In general, the adverse effects are brief, lasting less than 48 hours, and benign in outcome; prolonged symptoms, however, can occur (Elliot et al., 1984; Vollmer et al., 1985). Risk factors for these symptoms include the amount of the agent administered, dehydration, and age. Though several studies suggest that the risk of psychiatric or neurological symptoms is related to the amount of agent that diffuses into the intracranial space, this has not been confirmed in all studies (Yu, duBoulay, & Paul, 1986). The neurotoxicity of metrizamide may be related to inhibition of hexokinase and disturbances of cerebral energy metabolism (Bertoni & Steinman, 1982; Ekholm, Reece, Coleman, Kido, & Fischer, 1983).

The incidence of clinically apparent cognitive, affective, and behavioral symptoms in several series of cases was approximately 10% or less (Amundsen, 1977; Cronqvist & Brismar, 1977; Hauge & Falkenberg, 1982; Schmidt, 1980). The higher incidence in one series (Gelmers, 1981) has been attributed to use of excessive amounts of contrast agent. Richert, Sartor, and Holl (1979) systematically administered a psychological test battery to a series of patients receiving metrizamide for lumbar myelography and found significant cognitive deterioration in 6 of 18 patients; the higher rate clearly resulted from an operationalized approach to case identification and the ability to detect "sub-clinical" impairment. The validity of this higher estimate is supported by the data on the incidence of electroencephalographic abnormalities found in prospective EEG studies of metrizamide myelography (Ropper, Chiappa, & Young, 1979). The finding of subclinical toxicity has been confirmed in subsequent series using cognitive testing, standardized methods for assessment, and EEG. The relatively low rate of pathology observed in earlier series thus reflects the rather high threshold for clinical observation of cognitive impairment and other psychiatric disturbances.

Following the confirmation of the side effects of metrizamide, several studies compared the adverse effects of metrizamide with those of other agents. One multicenter study compared metrizamide to iohexol and found confusion in 4 or 5 of 175 patients given metrizamide and none of 175 given iohexol (Kieffer et al., 1985). Statistically significant differences between metrizamide and iohexol (Cronqvist, Holtas, Laike, & Ozolins, 1984; Ratcliff, Sandler, & Latchaw, 1986) and between metrizamide and iopamidol (Galle, Huk, & Arnold, 1984) were found in smaller studies using psychometrically defined measures of cognitive performance and affect (Cronqvist et al., 1984; Ratcliff et al., 1986). The differences between metrizamide and other agents was apparent in a wide variety of tests. Using standardized measures, Ratcliff et al. (1986) demonstrated that with metrizamide, affective and cognitive changes were intercorrelated, suggesting a common underlying cause, but with iohexol, there was no interrelationship between the lower levels of cognitive and affective symptoms. Galle et al. (1984) demonstrated that changes in cognitive performance after metrizamide were correlated with the amount of agent diffusing into the intracranial space, but after iopamidol, the lesser decrement in cognitive performance was not related to the brain's exposure to contrast agent and thus was likely a nonspecific effect.

H-2 Receptor Antagonists

The effects of H-2 receptor antagonists on the central nervous system have been known since 1977, primarily as a result of a large number of case reports of adverse reactions during treatment with cimetidine. The earlier cases were reviewed by both Russell and Lopez (1980) and Sonnenblick, Rosin, and Weissberg (1982); several additional cases have been reported subsequently (Crowder & Pate, 1980; Gordon, 1981; Handler, Besse, & Wilson, 1982; Niv, Zlatkis, & Kosakov, 1986; Rosse, 1986; Sutton & Dean, 1979). Delirium is the most frequently described manifestation of neurotoxicity, but dementia, depression, visual and auditory hallucinations, agitation, lethargy, stupor, coma, "brain stem dysfunction," extrapyramidal symptoms, and respiratory depression have all been reported. Many of the reports describe complex cases occurring in seriously ill patients and those taking multiple concomitant medications. In such cases, cognitive impairment could have resulted from the underlying illness or through indirect effects of cimetidine on the metabolism of other drugs. Nevertheless, the cumulative strength of the evidence for cognitive toxicity is overwhelming. Many of the reported cases are characterized by hepatic or renal impairment, old age, or high doses. A dose-dependent nature of the symptoms was also suggested on the basis of data on individual cases (Kimelblatt et al., 1980). The observation that physostigmine can reverse cimetidine-induced confusion (Mogelnicki, Waller, & Finlayson, 1979); respiratory depression (Bostrom, Holmgren, & Lundberg, 1982); and delirium (Jenike & Levy, 1983) suggests that cholinergic systems are affected in cimetidine toxicity, probably via indirect mechanisms.

In spite of the widespread use of cimetidine and the repeated observations of adverse effects on cognitive performance, few controlled studies have been conducted. Gifford, Aeugle, Myerson, and Tannenbaum (1980) and Humphries et al. (1984) report data from a manufacturer-initiated, postmarketing surveillance program that found cognitive toxicity in 5/9907 cases on the basis of initial reports and 6/7243 at one-year follow-up. Davis, Pickett, and Schlossen (1980) report that mental confusion was spontaneously reported to the manufacturer in 1.1 per 100,000 patients treated with cimetidine.

In sharp contrast to the low incidence of cognitive toxicity reported in these surveillance studies, Schentag and co-workers (Schentag, 1980; Schentag et al., 1979) used a mental-status assessment scale based on behavioral observations and found "moderate to severe" changes in mental state in 6 of 36 inpatients receiving cimetidine. Sixty-four percent of the patients were treated in critical-care units, and 70% received the drug intravenously. Patients with impaired renal and with hepatic function were at risk for cognitive toxicity. Changes in mental state were associated with trough cimetidine concentrations above 1.25 μg/ml. Cimetidine was found in CSF with a CSF/plasma ratio of 0.24.

It is against this background that ranatidine was introduced as an alternative drug. It differs significantly from cimetidine; though both drugs decrease hepatic blood flow, ranatidine does not directly inhibit drug metabolism. A review of experience with the drug in 1984 stated that no cognitive effects had been reported (Thomas & Misiewicz, 1984). Furthermore, Forsell (1983) reported that no drug-placebo differences in confusion were noted during premarketing testing. Reports appeared soon after release of the drug, stating that it had been used with safety in patients with renal failure and in those who had experienced cognitive impairment while taking cimetidine (Bories, Michel, Duclos, Beraud, & Mirouze, 1980; Pedrazzoli et al., 1983; Rosse, 1986). In spite of this early optimism, case reports have begun to appear claiming that ranatidine too can cause cognitive impairment (Davies, 1983; Epstein, 1984; Hughes, Reed, & Serjeant, 1983; Mandal, 1986; Mani, Spellun, Frank, & Laurence, 1984; Silverstone, 1984; Sonnenblick & Yinnon, 1986). Curiously, one of the reported cases of ranatidine-induced delirium occurred in a patient who had been able to tolerate prior treatment with cimetidine (Hughes et al., 1983). In one patient, reversal of delirium after discontinuation of ranatidine was followed by recurrence with inadvertent rechallenge (Epstein, 1984). Though the initial case reports of ranatidine-induced impairment have been questioned as complex and ambiguous (Bridge, 1983; Hegarty, 1984; Piper, 1983), the cumulative evidence does suggest the need for further research. Ranatidine has been measured in the CSF of patients taking the drug, documenting that it can penetrate into the CNS (Kagevi & Wahlby, 1985; Walt et al., 1981). There is one case report claiming that symptoms of ranatidine-induced delirium were partially resolved with physostigmine treatment (Goff, Garber, & Jenike, 1985); given the complexity of the case, replication is necessary.

Interferon

Most of the relevant research on interferon has been conducted during trials of alpha interferon in cancer chemotherapy. Toxic encephalopathies, identified through clinical-manifest symptoms such as disorientation, lethargy, confusion, and seizures have been noted in several studies (Honigsberger, Fielding, & Priestman, 1983; Mattson et al., 1983; Muss et al., 1984; Quesada, Swanson, & Trindade, 1982; Rohatiner et al., 1983; Scott, Secher, & Glowers, 1981; Smedley et al., 1983; Suter et al., 1984; Talpaz et al., 1986). In a prospective study of CNS effects occurring during IV infusion of interferon in patients with leukemia or lymphoma, Rohatiner et al. (1983) observed that clinical toxicity ranging from apathy to delirium occurred in 8 of 11 patients, independent of the source of the interferon. Three patients became disoriented, and 1 experienced hallucinations. Diffuse disturbances of the EEG were apparent in each of 8 patients evaluated prospectively. EEG effects have been confirmed in subsequent investigations (Honigsberger et al., 1983; Smedley et al., 1983; Suter et al., 1984). Adams, Quesada, and Gutterman (1984) evaluated cognitive status in cancer patients receiving alpha interferon and demonstrated a high prevalence of subtle degrees of impairment that would have gone undetected by clinical observation. In addition to the studies on alpha interferon, reversible neurotoxicity—at times dose limiting, manifested by lethargy and confusion—occurred in a trial of recombinant DNA gamma interferon for otherwise untreatable malignancies (Brown et al., 1987). Neurotoxicity from alpha interferon has also been reported during trials for therapy of other diseases including chronic viral hepatitis (Renault et al., 1987) and amyotrophic lateral sclerosis (Farkkila et al., 1984).

Other Antineoplastic Agents

Cognitive deterioration is common in patients with advanced cancer (Bruera, Chadwick, Weinlick, & MacDonald, 1987; Massie, Holland, & Glass, 1983). The problem of cognitive impairment resulting from medications used in cancer chemotherapy was reviewed by Silberfarb (1983). Since then, cognitive toxicity has been reported for a number of agents, some used in clinical practice, others investigational new drugs. Agents implicated in case descriptions or reports of toxicity observed in therapeutic trials include chlorambucil (Walsh, Shelley, & Daly, 1984); ketoconazole (Pillans, Cowan, & Whitelaw, 1985); D-Trp^6-LHRH (Kahan, Delrieu, Amor, Chiche, & Steg, 1984); acivicin (Maroun et al., 1986); high-dose cytoxine arabinoside (Herzig et al., 1983); carmofur (a masked derivative of 5-fluorouracil) (Kuzuhara et al., 1987); spirohydantoin mustard (Brown, Ettinger, & Donehower, 1986); and lymphokine and interleukin-2 activated killer cells (Denicoff et al., 1987). Long-term follow-up of patients with small-cell lung cancer treated with combination chemotherapy with or without irradiation suggested that 5.6% may have been cured. Cognitive impairment, however, may have been a manifestation of late toxicity in 11 of 13 of the long-term survivors (Johnson et al., 1985).

Few studies have specifically evaluated the possibility that the toxicity of chemotherapeutic agents may be increased in the aged. One exception is the investigation of Gottlieb et al. (1987) in which 17 patients with acute myeloid leukemia were treated with high doses of cytosine arabinside. Neurotoxicity, characterized primarily by cerebellar dysfunction but including confusion and changes in the level of consciousness, occurred in 7 patients. In 4, toxicity was severe and irreversible; in 3, milder and reversible. Neurotoxicity of some degree was observed in 3 of 10 patients under age 55, but in 4 of 5 over 55. Severe toxicity was observed in none of 10 younger patients, but in 4 of 5 older than 55. The authors suggested that older patients should not be treated with high-dose cytosine arabinoside.

Anticonvulsants

Though adverse effects of anticonvulsants on cognitive performance have been well established in studies on children, adolescents, and young adults, little attention has been given to the problem of the cognitive toxicity of anticonvulsants in the elderly. Trimble (1987), Vining (1987), and Dodrill (1988) have recently reviewed the literature on the adverse cognitive and behavioral effects of anticonvulsants. Toxicity in children has been discussed in a report by the Committee on Drugs of the American Academy of Pediatrics (1985). As with other medications, the elderly are likely to differ from other patients in pharmacokinetics and the sensitivity of the nervous system to adverse effects. The need for research on these agents in the elderly follows more specifically from the interaction of aging and the etiology of seizure disorders. Epilepsy in children and young adults is primarily idiopathic; epilepsy in the elderly, in contrast, is primarily secondary to focal lesions in the brain, most frequently from cerebrovascular disease. We review recent studies on the effects of anticonvulsant medications in adults. These are presented more to document the need for analogous studies in the elderly than from any conviction that the conclusions drawn from this work are directly applicable to the aged.

Cognitive impairment in patients with epilepsy can result from both the effects of anticonvulsant medications and the underlying seizure disorders (Trimble, 1984). The most rigorous demonstration of the effects of untreated seizure disorders comes from a VA Cooperative study (Smith et al., 1986) in which 622 adult patients with well-defined seizure types were given a battery of neuropsychological tests under standardized conditions before treatment with anticonvulsant medications was initiated. Compared to a group of control subjects, the patients demonstrated significant deficits on tests of motor function, cognitive performance, and self-reports of tension, depression, vigor, and confusion. After randomization to treatment, patients receiving certain medications exhibited further deterioration (Smith et al., 1987). With respect to total scores on the test battery, patients taking phenobarbital and phenytoin exhibited significant deterioration relative to the baseline at both one and three months after the start of treatment. Patients taking primidone exhibited significant deterioration at three months. Those on carbamazepine exhibited stable performance.

One approach to isolate the effects of anticonvulsant medications from those of epilepsy has been to study the effects of the drugs on cognitive performance in normal volunteers. Following their demonstration in a placebo-controlled, double-blind crossover study of cognitive deficits related to phenytoin, Trimble and Thompson (1983) performed a double-blind crossover study in normal volunteers to evaluate the cognitive effects of phenytoin, carbamazepine, sodium valproate, and clobazam. Although cognitive performance was negatively affected by all drugs at serum levels within the "therapeutic" range, the pattern of impairment differed between the drugs. Phenytoin had the most widespread effects. Carbamazepine, sodium valproate, and clobazam did not interfere with specific tests of memory. The effects of sodium valproate and clobazam suggested a slowing of mental processing. With carbamazepine, in contrast, the deficits were primarily in motor speed.

Studies on patient populations have demonstrated that polypharmacy with multiple anticonvulsants (Ludgate, Keating, O'Dwyer, & Callaghan, 1985; Thompson & Trimble, 1982) and use of higher doses (and higher plasma levels) (Thompson & Trimble, 1983) are associated with greater cognitive deficits. Significant differences between agents used in monotherapy have also been demonstrated. Several investigators have compared the cognitive effects of carbamazepine and phenytoin. To minimize the confounding effects of prior treatment and the duration of disease, Andrewes and co-workers (Andrewes, Bullen, Tomlinson, Elwes, & Reynolds, 1986; Andrewes, Tomlinson, Elwes, & Reynolds, 1984) evaluated cognitive performance in newly referred patients, and reported that phenytoin-treated patients exhibited performance deficits relative to untreated patients and those given carbamazepine. Gallassi et al. (1988) studied the effects of these agents in patients who were stable and seizure-free for a period of at least two years by evaluating neuropsychological performance while patients were on medication, during dose reduction, and after drug withdrawal. They reported effects of phenytoin on attention, visuomotor performance, and intellectual functioning. Patients taking carbamazepine were impaired only in tests of attention. Neither group differed from controls when examined one year after complete withdrawal from drugs. Gallassi et al. (1986) reported similar findings in favor of the safety of carbamazepine in a study of neuropsychological performance in 16 patients treated with phenobarbital or carbamazepine during treatment and after withdrawal of medication. Troupin et al. (1977) evaluated neuropsychological performance for 20 patients, each on carbamazepine or phenytoin under double-blind conditions and reported "lower error rates with carbamazepine on tasks having a high cognitive component."

Butlin, Danta, and Cook (1984) investigated cognitive performance in three groups of epileptic patients (average age 30) and a group of normal controls. Phenytoin-treated patients, but not patients treated with carbamazepine or sodium valproate or the controls, deteriorated on a test of facial recognition. They also reported that patients chronically treated with phenytoin showed improvements in facial recognition when switched to carbamazepine, but that patients on carbamazepine were not affected by a switch to sodium valproate. The same group (Butlin, Danta, & Cook, 1984a) investigated the intercorrelations between cognitive measures, serum anticonvulsant levels, and red-cell folate levels in patients taking either phenytoin, carbamazepine, or sodium valproate and suggested that the cognitive effects of the anticonvulsants may be mediated through effects on folate metabolism.

Though sodium valproate and carbamazepine are associated with less cognitive toxicity than other agents, there are reports demonstrating that these agents can cause adverse effects affecting the CNS (O'Dougherty, Wright, Cox, & Wilson, 1987; Tartara & Manni, 1985; Zaccara et al., 1984; Zarit & Cohen, 1986). McLachlan (1984) reports a case in which sodium-valproate-induced cognitive impairment was associated with reversible cerebral atrophy as demonstrated in repeat CT scans.

Anti-Parkinsonian Agents

The evaluation of cognitive impairment related to anti-Parkinsonian medications presents a difficult problem: Parkinsonian patients are at increased risk for dementia of the Alzheimer type as well as other less-well-characterized forms of cognitive impairment. The anticholinergic anti-Parkinsonian medications can clearly cause cognitive impairment (Meco et al., 1984). The effects of other agents are less well established. Much of the research in recent years has focused on the use of dopamine agonists that can serve as alternatives to the use of L-dopa. Lieberman and co-workers (Lieberman et al., 1982; Lieberman et al., 1985) report that of 56 patients given pergolide, the drug had to be discontinued in 6 as a result of an "organic confusional syndrome" consisting of hallucinations or delusions with a clouded sensorium; in another 4, the symptoms could be managed by dose adjustment. Of 63 patients given lisuride, the drug was discontinued in 15 due to an "organic confusional syndrome"; in another 5, symptoms could be managed by dose adjustment. In another series, Goetz, Tanner, Glantz, and Klawans (1985) did not report cognitive impairment in 10 patients treated first with bromcriptine and then with pergolide.

Cyclosporine

Atkinson et al. (1984) reported that 5 of 64 patients receiving cyclosporine for immunosuppression after bone-marrow transplantation experienced CNS toxicity with manifestations including cerebellar signs and motor spinal-cord impairment. Two of the 5 exhibited significant confusion. Wilczek, Ringden, and Tyden (1985) reported no CNS toxicity in 31 patients given cyclosporine after bone-marrow transplantation and 1 out of 125 treated patients after renal transplantation. CNS toxicity was observed in 13 of 48 patients after liver transplantation and use of cyclosporine (De Groen, Aksamit, Rakela, Forbes, & Krom, 1987); these patients had elevated cholesterol levels compared to those without symptoms. In 3 patients symptoms were severe and were accompanied by reversible white-matter changes apparent on CT or MRI imaging. Visual hallucinations have also been reported both in the presence and absence of more general mental-status changes in transplantation patients (Noll & Kulkarni, 1984; Katirji, 1987). In contrast, in patients without severe systemic disease, no significant changes in mental status were clinically apparent in 26 patients with ocular inflammatory disease who were treated with cyclosporine (Palestine, Nussenblatt, & Chan, 1984).

Other Agents

There have been case reports of delirium from metoclopramide (Fishbain & Rogers, 1987) and memory loss with nominal aphasia from phenylpropanolamine and caffeine (Dexatrim) (Puar, 1984). There have been reports that baclofen can cause cognitive impairment both during treatment (Roy & Wakefield, 1986; Sandyk & Gillman, 1987; White, 1985) and withdrawal (Garabedian-Ruffalo & Ruffalo, 1985; Lees, Clarke, & Harrison, 1977; White, 1985).

CONCLUSIONS

The most general and important conclusions to be drawn from this review reflect concerns about the adequacy of current knowledge on drug-related cognitive impairment. Although cognitive deterioration resulting from adverse drug effects is well documented for many of the agents in common use, information needed to evaluate the risks of drug treatment adequately is frequently lacking. This problem is relevant for all patient populations but becomes critical in the elderly because of factors such as the increased use of medications, the increased sensitivity of the older patient to cognitive impairment, and the high base rate of cognitive deterioration. In principle, treatment of the older patient with medications having the potential for CNS effects can be conducted most safely only if the physician can estimate the magnitude of the risk of cognitive impairment, if he or she is aware of the nature of the deficits most likely to occur, and if he or she has access to validated instruments for detecting these deficits. At present, drug treatment must generally be conducted in the absence of such information.

Research on cognitive impairment induced by scopolamine and the benzodiazepines has been conducted both to elucidate basic mechanisms and to derive more practical information about a significant clinical problem. The experimental designs and the protocols used in this research could serve to guide further investigations on other agents suspected as causes of cognitive impairment. Such research will require standardization of brief cognitive-test batteries in multiple equivalent forms. Both studies on the anticonvulsants (Thompson & Trimble, 1983) and those comparing the cognitive deficits induced by scopolamine and the benzodiazepines (Wolkowitz et al., 1987) suggest that different medications can cause qualitatively distinct types of cognitive deficits. Thus, no single psychological test or global screening instrument is adequate either for evaluating the cognitive effects of drugs or for monitoring patients in the clinical setting. However, few research programs have evaluated diverse drugs, either within or across classes, with a similar test battery.

This review allows us to make observations and draw several conclusions about the state of knowledge in this field. With medications (of all classes) having anticholinergic activity and with many of the benzodiazepines, the potential for cognitive toxicity in elderly patients is established. With these agents, it is clear that much of the drug-induced cognitive impairment, demonstrable with psychological testing, occurs without gross evidence for confusion and can go unrecognized in informal clinical observation. Though this cognitive impairment may be "subclinical" from the perspective of the physician, it can nevertheless be disabling. The remaining problem with these agents is to develop and validate methods of monitoring cognitive status in the individual patient requiring treatment. With anticonvulsants, the potential for toxicity has been established in younger patients, but no controlled studies have been conducted in the elderly; there is an obvious need for research comparing the safety of effective agents specifically in the elderly. The literature on other medications gives examples of promising leads: studies on anticholinergic medications, interferon, and metrizamide, for example, suggest that EEG monitoring, as well as cognitive testing, may be of value in screening for CNS toxicity.

The investigations on the radiocontrast agent metrizamide provide an example of an orderly process: Clinical observations of CNS toxicity were followed by studies that used psychological tests to detect "subclinical toxicity," and then by studies designed to evaluate risk factors for cognitive impairment and controlled studies comparing alternative agents using quantitative measures of cognitive performance. The result has been that use of metrizamide has largely been supplanted by other less toxic agents. Such smooth progress, however, is rare; the literature is full of gaps and loose ends. In some cases (e.g., cyclosporine and agents used in cancer chemotherapy), where agents with significant systemic toxicity are used for treatment of severely ill patients, progress is intrinsically difficult. In other cases, the reasons for the lack of progress are not so readily understandable. With digoxin, case reports have demonstrated that cognitive toxicity can occur at "therapeutic" plasma levels, and one small-scale study has suggested that this can occur frequently, but there has been no follow-up. With other drugs (e.g., calcium channel blockers, antiarrhythmic agents, steroids, nonsteroidal anti-inflammatory drugs, meperidine, certain antibiotics, and the newer anti-Parkinsonian agents), the literature suggests that cognitive toxicity occurs, but there have been no controlled studies using formal neuropsychological testing. With the beta blockers, a significant body of research has been conducted, but lack of comparability of test instruments across studies limits the conclusions that can be drawn from the available data.

Review of the literature on the H-2 receptor antagonist cimetidine demonstrates another type of gap in the current process. Though there have been at least 50 reported cases of drug-related cognitive impairment as well as a prospective study using behavioral change as a measure of toxicity, there have been no reports of controlled studies evaluating the effects of cimetidine on standardized tests of neuropsychological functioning. On the basis of the observed cases of gross confusion, the FDA-approved labeling for the drug (Physician's Desk Reference, 1988) notes that "reversible confusional states" have been reported and that they occur in between 0.3% and 4% of cases, depending upon the indication for the drug and the dose; this is further emphasized by the precaution stating that "reversible confusional states have been observed on occasion." Though this labeling recognizes the validity of the adverse effect and alerts the clinician, it does not indicate whether the drug commonly causes less severe neuropsychological deficits, nor does it characterize the deficits or provide guidelines for monitoring the individual patient. A more useful response to the recognition of toxicity would have been studies designed to provide the practitioner with the information necessary to evaluate the drug's risks in vulnerable patients and to use it with optimal safety.

The current process for identifying adverse drug effects consists of both formal and informal elements. It relies heavily on clinical observation and spontaneous case reports for raising alarms about potential adverse drug effects but provides no mechanism for ensuring that these alarms generate the systematic research necessary to guide clinical practice. As discussed above, this approach may fail specifically when applied to the problem of cognitive toxicity in the elderly because the clinical criteria for case identification are insensitive to mild impairment and because base rates of impairment are high in the aged. There is need for reform in this process. There is a need for systematic critical evaluation of spontaneous case reports to determine when more systematic research is necessary and then a mechanism for ensuring that such research is conducted.

The question is, Whose responsibility is it to ensure that this process is initiated? Studies to date have, in general, been initiated by academic investigators or by pharmaceutical companies interested in documenting the increased safety of new drugs over established agents with similar indications. For new drugs, the responsibility for ensuring that the appropriate research is conducted should probably be with the pharmaceutical industry and the federal agency responsible for its regulation. For established agents in current clinical use, ensuring that these studies are conducted may require targeting of research support at the federal level. A formal system that triggers systematic investigations on drugs with suspected cognitive toxicity would lead to improvements in clinical practice and allow the prevention of disability. An alternative even more comprehensive system would incorporate a formal evaluation of drug effects on cognitive performance into the earliest studies of each drug's pharmacodynamic profile in man and would repeat these studies in elderly subjects for those drugs for which early investigations on safety and efficacy indicate potential for clinical development. Studies such as those proposed are necessary to gain further knowledge about the risks of drug treatment in the elderly; they are necessary to define the magnitude of the risk and the nature of the impairment that can result. We recognize, however, that use of agents with the potential for cognitive toxicity is often unavoidable. There is no substitute for systematic monitoring of the individual patient, using repeated measures of cognitive performance to identify causes of early or subclinical toxicity. Development of methods for such monitoring is another critical area requiring further research.

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PART III

Psychosocial Interventions

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Part III Introduction

This section moves away from topics where the place of geriatric medicine is obvious to topics just as obviously anchored and manifested in a social context. The social context has been evident in all the medical and psychiatric treatments in previous chapters. Medical participation is much less likely, however, in self-help groups, retirement preparation, or community-based care systems. Whether there should be more participation by physicians is another matter, however. Some self-help groups (for example, Alcoholics Anonymous) actively reject this kind of professionalism, while many support groups for caregivers of Alzheimer patients welcome such participation. Many formal retirement-preparation programs have an obligatory section on health after retirement. Community case-management programs certainly call on physicians. It is worth noting, of course, that one of the first of these was conceived and directed by T. Franklin Williams out of a community hospital (Berg, Browning, Hill, & Wenkert, 1970). However, these and many other social interventions are likely to use any medical component as an add-on, which may well be appropriate in light of the nature of the problems addressed.

Aside from the medical component, however, the multidisciplinary relevance of the programs is evident. One such component may be identified in the referral process. Specifically, the more professionals who are aware of the service, the better the referrals made to older people. Some of the self-help groups discussed by Lieberman are least well connected through professional channels. Again, the Alzheimer caregiver groups are an exception, but many other less age-specific groups are not considered part of a professional treatment network by other professionals and will sometimes be ignored. Retirement-preparation programs are often linked to large employers and therefore considered out of the general referral network. Case-management and community long-term-care programs have in recent years gained enough local visibility to benefit from referrals from many different sources.

A word is in order about the state of research in self-help and retirement-planning groups, as compared with that in some of the problems discussed in earlier chapters of this volume. Both Lieberman and Ekerdt make explicit the paucity of methodologically acceptable research in their areas. Because so much of the program design and planning is now based on assertion rather than knowledge, it seemed especially desirable to indicate the major conceptual issues and gaps in knowledge. Thus, these two chapters are seen as contentual reviews, one of whose major functions is to spur new research.

Lieberman's chapter on self-help groups helps put in perspective the magnitude of the self-help movement. Alzheimer support groups, groups of the widowed, and many others are rarely visible in the professional help-giving community. His conceptual analysis provides a framework of dimensions by which groups may be evaluated. Still open is the question whether the similarities among age groups are more striking than the differences. Some of Lieberman's research begins to tell us something about older people's responses to such groups, and his identification of other important research should advance the state of this art.

In another inadequately researched area, retirement-planning programs, Ekerdt provides some data relevant to basic issues such as prevalence, types, and characteristics of programs. He makes it clear that such data are fragmentary, a situation even more evident in the case of evaluations of programs. The author's comments regarding efficacy are not very positive, but the appropriate conclusion seems to be that evaluation with better methods and more diverse and representative samples will be necessary before any verdict can be reached.

By contrast, Capitman's chapter on community-based long-term care deals with a heavily researched area. The type of service under discussion may well have been the major service policy issue of the decade. By the decade's end, one must admit that enthusiasm has dwindled for the possibility that targeted supportive services administered to impaired people who continue to live in their own homes can lower care costs or institutionalization rates. The next phase clearly involves the careful study of many approaches to the evaluation of such programs—to reshape goals and particularly to understand which aspects of programs should be retained and which need to be revised. Capitman provides the most comprehensive and comprehensible overview that has yet appeared of a confusing array of demonstration programs. He leaves us with a particularly clear picture of the need to integrate acute-hospital and community-based programs, as well as some hope for better programs if lessons from the evaluations are heeded in the programs of the next decade.

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CHAPTER 9

Mutual-Aid Groups: An Underutilized Resource Among the Elderly

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Despite the fifty-year tradition of self-help or mutual-aid groups, their recognition by professionals has been slow in developing. Self-help services today involve an estimated 12 to 14 million adults in the United States (Lieberman, 1986). They address nearly every known disease and problem, and include many areas that deal with issues common among the elderly: chronic illness, life crises associated with aging as well as transition events, and social dilemmas that increase with chronological age.

This chapter examines self-help groups' conceptual and empirical knowledge base. Addressed are definitions of self-help groups; utilization rates; effectiveness or outcome studies; motivations and social context factors impelling (or repelling) people from joining such groups; characteristics of organizational structure, with particular emphasis on mechanisms of recruitment; group factors that facilitate or interfere with benefits; and strategies for professionals. The chapter examines each of these issues for SHG studies in general and, when available, studies appropriate to the elderly. The amount and quality of research about self-help groups is highly limited; information about the elderly is often totally absent.

The chapter is in six sections: scope and utilization of SHGs; factors affecting utilization—recruitment methods, perceptions of help; SHG outcomes—methodological issues, overview of empirical studies; processes in self-help groups—fit or misfit for the elderly, common characteristics of helping groups, general differences among helping systems, differences among SHGs; expectations and experiences of the elderly in SHGs; role and contributions of professionals in SHGs.

The term *self-help group* is applied to a vast range of activities. It is commonly applied to support systems; social movements; spiritual movements and secular religious systems of consumer participation; supplementary communities; expressive-social influence groups; and organizations of those facing discrimination (Killilea, 1976). Homogeneous therapeutic groups are sometimes called self-help groups. Theoretical as well as empirical distinctions exist between professionally led groups and SHGs (Weiner, 1986). The present chapter defines SHGs in terms of several attributes. First, they are composed of members who share a common condition, situation, heritage, symptom, or experience. Second, they are largely self-governing and emphasize self-reliance. Third, SHGs generally offer a face-to-face fellowships network, available and accessible without charge. Finally, they tend to be self-supporting rather than dependent on external funding.

SCOPE AND UTILIZATION

A relatively new type of organization, the self-help clearinghouse, provides information on the populations served by SHGs. The Self-Help Center of Evanston, Illinois, for example, publishes a listing of SHGs active within the Chicago metropolitan area, with 320 organizations in its directory. These SHGs range from well-established national groups, such as Alcoholics Anonymous, to single-chapter groups, such as the All-but-Dissertation SHG. The breadth and diversity of problems these groups address are indeed astonishing. Almost all chronic diseases are represented, as are psychiatric conditions such as agoraphobia, depression, and anxiety disorders. Also included are a variety of neurological diseases, eating disorders, and a multitude of serious emotional crises brought on by expected as well as unexpected life events—retirement, widowhood, loss of a child, birth of twins, illnesses or handicaps of children, unemployment, suicide by a family member, and divorce.

Reliable information on growth, magnitude, and prevalence is at best approximate. Gussow and Tracy's (1976) study of Laryngectomies, Recovery Inc., International Parents Organization, United Ostomy Clubs, Gamblers Anonymous, Parents Anonymous, and Alcoholics Anonymous indicates a yearly 3% growth rate in numbers of chapters for nationally organized groups. Their data did not, however, address the diversity of loosely affiliated or nonaffiliated local groups.

Results from a recent survey provide prevalence information. Mellinger and Balter (1983) estimated a one-year utilization rate from the groups reported by a national probability sample of over 3,000 households. In one year, 5.6% of the sample consulted mental health professionals, 5.0% turned to clergy or pastoral sources, and 5.8% utilized SHGs. These findings support the estimates that from 12 to 14 million adults utilize SHGs and suggest that mutual-aid groups are a major source of help for a variety of physical and emotional difficulties.

Utilization by the Elderly

The elderly appear to be underrepresented in self-help groups as they are in other psychological services. Lieberman and Borman (1979) found that widows over age 60 represent 20% of membership in national widowhood SHGs, a proportion less than that expected, based upon the age prevalence of widowhood. In contrast, Borkman's (1982) review of the published literature suggests that for problems such as alcoholism, elderly participation accurately reflects the age prevalence of the disorder.

Secondary analysis of the Mellinger and Balter (1983) data provides estimates of utilization by age groups (Lieberman, 1987). In 1979, approximately 20% of the population under age 65 was involved in all forms of psychosocial treatment, while of those aged 65 to 79, about 9% were so involved—a 55% difference. The overall drop-off rate between mid-life (ages 50–64) and the older ages for all forms of professional psychosocial treatment other than SHGs was 30%; the same age drop-off rate for treatment by the clergy was 25%, but the drop-off rate for SHGs was 72%. This indicates that although the use of psychosocial treatments generally declines with age, the drop-off is much larger for SHGs.

FACTORS AFFECTING UTILIZATION AND NONUTILIZATION

What factors explain the sharp decrease by the aged in the utilization of SHGs? Previous research (Lieberman & Borman, 1979) shows that analyses of specific samples of participants and nonparticipants in SHGs (equating for availability) did not yield robust findings on the characteristics of members of such groups. Those who utilize SHGs were found on the average to be more likely to use other helping resources and to be somewhat more socially active than their matched nonparticipants.

The Mellinger-Balter survey data were used to examine the relationship between participation in SHGs and utilization of professional psychosocial treatment (Lieberman, 1987). Asked were: Is there a linkage between social support availability and participation? What effect do health problems have on the utilization of SHGs? What effect does life stress have? To what degree are psychic distress and role impairment due to emotional causes linked to utilization of SHGs? The analysis contrasts self-help versus professional psychosocial treatment by age.

The results of this analysis indicate that informal instrumental and emotional support decrease with age. As anticipated, there is no support for the argument that the elderly have resources other than professional help and SHGs. Serious role impairment was related to the use of professional mental-health services but not to SHGs. Similarly, use of professional help was found to be linked to the existence of health problems. Persons with more severe health problems were more likely to use professional help than SHGs. These factors, however, do not explain the decreasing use with age of both psychosocial therapy and SHGs.

Life stress (measured by the number of negative events during the past year) was related to the use of SHGs but even more strongly to the use of professional help. As anticipated, life stress decreased with age. This suggests that one reason for lower utilization of SHGs by the aged is a lower incidence of the types of events that precipitate the use of such groups by younger populations. However, the moderate decline with age in the report of life-stressing events cannot explain the sharp drop-off in the use of SHGs. Overall, the analysis of this survey does not reveal a convincing explanation for the lower use of SHGs by the aged. Other factors must play a role in such utilization patterns.

Recruitment

Some SHGs may erect barriers to participation, particularly through their procedures for attracting members. The type of help people use is partially accounted for by their social network. In a study of two SHG organizations for the spousally bereaved (Lieberman & Borman, 1979; Lieberman & Videka-Sherman, 1985), differences in recruitment practices were observed. THEOS recruited members through word of mouth, often relying on members' social networks; NAIM, formally associated with the Catholic church, recruited members through the church's formal and informal networks. The portion of those aged 60 or more was 20% in THEOS compared to 46% in NAIM. Seventy-seven percent of widows and widowers joining THEOS had friends in the group, and 44% were recruited by these friends. In NAIM, 35% had friends who were members of NAIM, and 37% were recruited by these friends. At this level of analysis, the findings would suggest that self-help organizations that rely primarily on recruiting their membership through social networks yield a membership that is unlikely to extend beyond the demographics of the organization. Thus, a self-help group like THEOS, whose members tend to be concentrated in mid-life, is obviously more likely to recruit new members of similar age. On the other hand, organizations that utilize formal structures, in this example the Catholic church, are slightly more likely to recruit a more diverse population. (See Lieberman & Borman, 1979, Chapter 9, for a description of NAIM recruitment strategies.) Accessibility to a self-help organization is in part controlled by the method of recruitment.

Data could not be developed to test whether accessibility, ease of transportation, convenience of meetings, or fear of crime interfered with participation in the widows' self-help groups. It must be stressed, however, that in both the THEOS and the NAIM samples, the number of very aged people (70 and above) is small, and there is no information on widows and widowers over 70, since they are not recruited into and do not join self-help groups. Therefore, the question of the effect of accessibility is not answerable from the information available in our own studies. The next section explores some empirical findings on perceptions of SHGs through comparisons of the spousally bereaved in SHGs with those who were invited to join but declined.

PERCEPTIONS OF SELF-HELP GROUPS: WIDOWS' VIEWS OF SHGs

A list of positive and negative perceptions of the self-help group was presented to participants and those who were invited but chose not to participate beyond one or two meetings. Those who chose not to join, irrespective of age, saw THEOS as too depressing; the members as "too old." "I did not want to associate with widowed people." Meetings were "boring." "Not the kind of help I need." "Too serious" and "too religious." Analysis of the same items for NAIM nonparticipants stated: "not having enough men in the group"; "didn't give me the kind of help I needed"; and "didn't want to associate with widowed people." Analysis of this questionnaire indicated such information, reflecting attitudes of individuals who have already decided to participate or not to participate in a help-providing setting, may obviously reflect reasons based on reducing cognitive dissonance. What this information does tell us, however, is that those invited to join who declined saw the groups differently from those who joined. Of particular importance is the decliners' perception that they did not wish to be associated with groups whose central focus emphasized their widow status.

Did those deciding not to join have different social networks? Did they perceive themselves as needing different kinds of help? Did they perceive the status of widow as representing a different set of issues? Did they cope with widowhood by more denial and avoidance, and therefore not wish to participate and be labeled by joining a group of other widows as a major role status?

We used the sample of participants in NAIM to answer these questions. No differences, based on a series of one-way analyses of variance, were found between those who joined and those who did not on role distress, financial stress, mental health, self-esteem, life satisfaction, and coping mastery. Nonparticipants had less anger and guilt toward the deceased spouse, fewer negative life events, and less stigma associated with widowhood than did the participants in the group. Social-network characteristics also distinguished between joiners and those who did not join. Members saw old friends and relatives less frequently but made more new friends. Nonmembers perceived their social network as more likely to have someone with whom they could share personal problems. Of particular import was that they saw people in their social network as much more helpful in handling the grief than those who joined a SHG. Older widows, as might be expected, had intimate social networks that contained a higher proportion of other widows, and their networks were more often composed of "new friends." Older widows more frequently than mid-life widows called on family for certain types of social support.

Overall, it does not appear that the major difference between the joiners and nonjoiners is in their level of functioning or current psychological status but in their views of widowhood and, most important perhaps, in their perceptions of the social-network resources available to them. Participants show significantly more disappointment in the resources provided by their social networks and perhaps show less resolution of the transition to widowhood, in that they express more anger and guilt toward the dead spouse and see themselves as more stigmatized.

Explanations for the underutilization of self-help group services by the elderly based upon available empirical data provides, at best, only guided hunches. Three classes of explanations, admittedly based upon flawed and limited empirical data, were examined. The number of elderly in these studies is unfortunately limited. Underutilization could be affected by (1) recruitment practices; (2) attitudes, beliefs, and needs for help getting among the elderly; and (3) alternative help-providing resources.

Most compelling is the evidence suggesting that in part the underutilization by the elderly may reflect differential recruitment, a simple yet powerful effect. In comparing the two spousal-bereavement self-help groups, we were able to show differences in the number of elderly based upon the type of recruitment procedures each of the organizations used (peer versus institutional recruitment).

Unfortunately, the available data sets did not contain powerful measures for looking at differential attitudes, beliefs, and needs. It is nonetheless reasonable to speculate that one factor affecting utilization is the less favorable image by the elderly of self-help groups in contrast to other alternative helping sources, particularly those offered by professionals. However, there are no empirical data that address this issue, even indirectly.

In examining alternative sources of help and the effects of social-network resources in particular, we did isolate several suggestive empirical findings. Major differences were found between participants and nonparticipants in their perceived available social networks.

Although participants irrespective of age have less accessible social supports (smaller networks to whom they can turn for emotional support) and less certainty that they can count on family and friends predating widowhood, the elderly (both participants and nonparticipants) are lower than the young on accessible supports. However, the elderly differ in one important characteristic that mitigates their overall less accessible social-support network: Within their close network of friends, they tend to have more widows (people like themselves) available.

In a recent study (Lieberman, Heller, & Mullen, 1989), we found that among widows, availability of other widows in their network predicted long-term positive adaptation. Analysis of the social supports of widows (both participants and nonparticipants) in self-help groups revealed the following: There is no relationship between the density of the social network and age; the number of widows in a person's close social network was linked to age; and older widows tended to have more networks based on either all-old-friends or all-new-friends than did their younger counterparts. Older widows were less likely to turn to friends or family for support and comfort; in general, older widows were more likely to utilize one of, rather than both, family and friends social-support resources, and were more likely to report no one available to serve as a confidante. With regard to type of social support, older widows generally turned for information and guidance to their family rather than their friends.

Thus, there are factors in the social networks of the elderly that are on one hand, associated with joining self-help groups and on the other, factors that may indicate alternative resources in their own social networks. The data at hand do not permit us to access the relative contribution of each with regard to participation in self-help groups.

ASSESSMENT OF EFFECTIVENESS

Methodological Issues

Empirical research on outcomes is limited and, for the most part, covers a narrow band of activities. Studies of behavioral (and therefore more easily countable) deviations—alcoholism, overeating, and drug abuse—predominate. Studies of groups that deal with various life transitions, crises, or major mental disorders of central concern to psychiatry are less frequent. Compared to the relative sophistication and frequency of empirical studies on psychotherapy, the number and quality of studies available for assessing the effects of self-help groups resemble the status of psychotherapy research in the 1950s.

Clinical-descriptive studies are far more numerous than are more rigorous quasi-experimental or experimental designs. There are a variety of problems facing investigators in designing self-help-outcome research that contribute to the scarcity of well-controlled studies. Self-help organizations, in contrast to settings for psychotherapy, are not under the control of the investigator. The values inherent in self-help and their base in the community frequently make it difficult to design research using current standards of psychotherapy evaluation. The problem of randomization is relatively unsolvable; the methods that self-help groups use to recruit their members would make the usual design requirements for random assignment, alternative treatments, or delayed-treatment controls logistically difficult. The few experimental studies that do exist on self-help groups (for example, see Farash, 1979; Gates, 1980; Gordon, Edmunson, & Bedell, 1979) represent self-help in name only, since they are frequently controlled by professionals, are time limited, and do not represent some of the essential characteristics of self-help groups. The best-quality research in this area uses quasi-experimental design, contrast-groups designs, and occasionally alternative treatments. More frequently, the research contrasts treated with untreated cohorts of the similarly afflicted who have had access to self-help. Large-sample methods, using statistical controls, represent the state of the art.

Beyond such research-design issues are questions of how to address the classic issues that are found in psychotherapy-outcome research—what to measure, when to measure, and whom to measure.

What to Measure

Traditional criteria of mental-health status have been used as outcome measures by some self-help researchers. For many self-help groups, however, the designations of illness and the absence of illness are different from the traditional categories of mental health. For example, in one study of women's consciousness-raising groups (Lieberman & Bond, 1976), evidence was gathered that the majority of the women entering such groups could be characterized as having clinically relevant depression and that participation in these groups was linked to a lessening of symptoms. At the same time, participants in consciousness-raising groups systematically increased in their view of themselves as stigmatized by society. Such an attitude would not ordinarily be seen as reflecting positive mental health. These groups viewed this attitude as positive in keeping with their ideological perspective. That many groups' definitions of health are often at variance with predominant criteria for mental health is illustrated by the oft-quoted critique of Recovery, Inc., as encouraging denial of illness. From the perspective of the group, such behavior is fundamental to their ideology and to the processes by which they attempt to affect their members. The criteria used to evaluate the impact of self-help groups can dovetail with criteria commonly used to evaluate most studies of intervention; but frequently they may be irrelevant to the purpose or function of the group. Alternative perspectives, as well as a recognition of the relativity of the professional view of good functioning, are required for understanding self-help groups.

When to Measure

Traditional psychotherapeutic treatment is usually time-limited. Evaluation procedures are thus based on the expectation that people who enter treatment will go through a set of therapeutic experiences and will leave when they show improvement. In contrast, self-help groups encourage long-term involvement. There are no "graduations" or clear-cut exit points. For example, one never loses one's status as an alcoholic, a compulsive gambler, or a drug addict. Although there are points of graduated status in many groups, from beginner to "senior member," it is the nature of self-help groups that membership is indeterminate and may persist far beyond professionally defined recovery. Spousal-bereavement groups often produce positive results in members within six months to one year; however, membership ordinarily lasts far longer. It is too simplistic to see the extended membership as a pathological indicator. In part, the extension of membership is a reciprocation of help to others of similar status. More importantly, long tenure expresses the primacy of affiliation needs of such individuals. Finally, open-ended membership serves legitimate needs for the continued existence of such organizations. Were duration of membership not indeterminate, self-help groups could not endure, since there would be no one to carry on the work of the organization. The absence of clearly defined exit points makes the study of self-help outcomes less precise than comparable outcome research in psychotherapy.

Whom to Measure

Psychotherapy researchers have adopted a shared perspective on whom to measure, since therapy is clearly defined and certain rules have been prescribed regarding participation in therapy. An investigator studying brief psychotherapy of 20 sessions, for example, has set standards based on the number of sessions for which a patient is in therapy. For many self-help participants, patterns of participation are systematic but differ radically from the weekly or twice-weekly pattern of psychotherapy. The patterns range from the not-untypical behavior in AA, in which members go to a variety of different chapters, sometimes three to four times a week, to the pattern in bereavement groups such as Compassionate Friends in which members use the group sporadically at points of particular stress. Members may be active for years, but their participation is not regular. Further complicating the assessment of outcomes are the findings by Lieberman and Borman (1979) of the use of multiple helping resources by most participants in self-help groups. Such multiple use is, of course, not absent in psychotherapy research, but the magnitude of such utilization by self-help participants precludes the simple isolation of a particular impact.

These methodological and design problems do not negate the possibility of evaluating the impact of self-help groups. Rather, these issues should alert us to the current state of knowledge and to the fact that good empirical research will (by the very nature of the phenomena being studied) have to be somewhat different from traditional psychotherapy outcome research. In all likelihood, evaluation models rather than outcome models will be the direction of the future.

Empirical Examples

The most widely studied SHG is Alcoholics Anonymous (AA). Some studies have evaluated AA alone (Bohince & Orensteen, 1950; Henry &

Robinson, 1978). Others examined the contribution of AA as one of several interventions (Kish & Hermann, 1971; McCance & McCance, 1969; Pattison, Headley, Glesser, & Gottschalk, 1968; Robson, Paulus, & Clarke, 1965; Rohan, 1970; Rossi, 1970; Tomsovic, 1970). Large-scale studies based upon cross-sectional surveys are represented by Bailey and Leech (1965), who obtained questionnaire responses from over 1,000 persons, and by Edwards, Hensman, Hawker, and Williamson (1967), who reported on 306 respondents. Such cross-sectional findings suggest that at any time, from one-third to one-half of AA participants have been sober less than one year. Studies evaluating AA as one element in the treatment program suggest that those alcoholics do better who attend AA in addition to other treatment modalities.

SHGs for eating disorders are rapidly expanding, with estimates of upwards of half a million members in the United States for one such group, Take Off Pounds Sensibly (TOPS). Stunkard, Levine, and Fox (1970) suggest that the effectiveness of TOPS is limited. In contrast, a study by Grimsmo, Helgesen, and Borchgrevink (1981), reporting on a Norwegian prospective study of over 10,000 SHG participants, found significant and meaningful weight-reduction outcomes.

Outcome studies of SHGs other than behavioral-disorder groups are less plentiful. Much of this research has been conducted by the author and his colleagues, who over the past ten years have examined eight SHGs: women's consciousness-raising groups; Mended Hearts, a medical SHG concerned with individuals who have had open-heart surgery; NAIM and THEOS, both directed toward widows and widowers; Compassionate Friends, an SHG for parents who have suffered the death of a child; mothers and mothers-of-twins groups, both addressing the emotional problems of motherhood; and SAGE, a group for those over age 65. The outcome question was addressed by surveys of both participants and nonparticipants ($N = 5{,}000$). For follow-up, members and nonmembers were assessed at least twice at yearly intervals; in the bereavement groups, four-year follow-ups were also used.

Overall, the results of these studies are encouraging (Lieberman & Bond, 1976; Lieberman & Borman, 1981; Lieberman, Solow, Bond, & Reibstein, 1979; Lieberman & Videka-Sherman, 1986; Videka-Sherman & Lieberman, 1985). Measurable improvement was found in levels of depression and self-esteem among women who joined consciousness-raising groups. The spousally bereaved who participated in SHGs showed a marked improvement in levels of depression, well-being, self-esteem, and life satisfaction in comparison to controls. A recent study (Marmar, 1988) comparing widower SHGs to individual therapy reported improvements in both, with no differences between the treatment conditions. Among the members of Mended Hearts, the large subgroup that had retired as a consequence of surgery showed significantly improved scores on mental-health indicators. Among parents who had lost children, there was improvement (relative to a control group) in coping strategies and in measures of existential concerns but no significant improvement, after one year of participation, in mental health or social functioning. The results for first-time mothers were more ambiguous; no evidence was found that participation in such groups substantially improved women's psychological or social functioning. Mothers of twins, however, showed some improvement in their social functioning.

In recent years, there has been a rapid increase in the number and diversity of programs developed to provide help to caregivers of Alzheimer's patients. Some of these programs represent SHGs as defined in this chapter; others are homogeneous therapy groups (Weiner, 1986). Other caregiver programs resemble a particular kind of SHG that has a primary focus on advocacy expressed through the development of funding sources to attack a disease (for example, Huntington's chorea). Other programs have developed innovative technologies for linking people to one another through telephone contact. It is beyond the scope of this chapter to evaluate the variety of programs directed toward Alzheimer's caregivers. Briefly, some Alzheimer's support programs function like SHGs in terms of means of control, ownership, and helping strategies.

The recent review by Ory et al. (1985) provides ample evidence that despite the proliferation of mutual-aid groups for family caregivers, little is known about their effectiveness. Most of the published evaluative research is on homogeneous therapy groups, professionally directed groups in which all the members share a common problem. Research findings suggest that membership in such "support" groups strengthens the emotional well-being and morale of Alzheimer's caregivers (Barnes, Raskind, Scott, & Murphy, 1981). Lazarus, Stafford, Cooper, Cohler, and Dysken (1981) concluded that discussion groups provide both educational and supportive functions to relatives of Alzheimer's patients. Glasser and Wexler (1985) found in their evaluation of caregiver educational support groups that members benefit most from acquiring knowledge of the problems they might expect in the future. Medical information on dementia syndromes and the sharing of management skills were also highly rated.

The most extensive information on self-help groups for caregivers comes from the report on SHGs established through the efforts of the Duke University Center for the Study of Aging. George and Gwyther (1985) report on the Duke University Family Support Program, presenting cross-sectional findings comparing members and nonmembers of support groups as well as analyses of pretest and posttest measures with a smaller sample. The results suggest that SHG participation significantly increased the knowledge of the variety of community services available but had little impact on increasing the use of such community services. Findings also support the view that loneliness and feelings of isolation were lessened by participation in SHGs.

Such data presently represent an early stage of research. Member satisfaction and attitude change are characteristic findings. Data are not yet available regarding such issues as how SHG participation affects the levels of stress and well-being of caregivers, alters the behavior of patients, or delays institutionalization. Beyond outcome findings on Alzheimer's caregiver groups, very little information exists on specific age-related outcomes.

A reanalysis of the widows data (Lieberman & Videka-Sherman, 1985) provides some information on age-related outcomes. Overall, the study found that compared to a control group, participants showed significantly more positive change in psychiatric symptoms, self-esteem, and social functions over the year's time. Group participants who improved compared to group members who did not differed in the degree of reciprocal social exchange among members. There were no age differences in degree of reciprocal social exchange; elderly widows participated in the groups in a manner similar to that of their younger counterparts. Age was not a factor in effecting amount or kind of outcomes measured after one year of participation in the widows' self-help group.

PROCESSES IN SELF-HELP GROUPS: FIT OR MISFIT FOR THE ELDERLY?

This section examines the particular ways self-help groups function as specific helping settings. How do self-help processes affect psychological functioning for the elderly? Is there any misfit between typical psychological patterns found in the elderly and the procedures characteristic of self-help settings?

How the elderly perform and react in small, face-to-face group settings has rarely been examined in the scientific literature. There is some consensus in our discipline that systematic differences may exist between people in various stages of the life cycle, but there is no consensus about the nature of age-related features of group interaction. Among clinicians there is disagreement about the elderly's capacity to benefit from group settings. Some of the pioneers in the use of professionally led groups with the elderly such as Goldfarb (1964) suggest that "younger persons in group psychotherapy break, remake, test and consolidate relationships with others and acquire insight. . . . Older people do not seem to go through this process in their groups, no matter what the interest or the skill of the therapist."

Lakin and his colleagues (Lakin, Brenner, & Oppenheimer, 1981, 1982, 1985), using a quasi-experimental design, studied elderly peer-support groups compared to similarly chosen groups of young adults. Group-interaction ratings included boundary behaviors, subgrouping, normative behaviors, organizational behaviors, establishing personal significance, self-disclosure, conflict behaviors, support behaviors, relationships of group to leader, relationship of leader to group, and the group's emotional atmosphere. The groups were structured minimally, by informing the participants that "we are interested in seeing how you relate to one another and we also want to hear about your concerns as well as your satisfactions at your time of life." The groups composed of the elderly showed significantly more boundary behavior, self-disclosure, and less boredom; the young-adult groups showed more support and more conflict. Leader behavior was more frequent in the groups composed of the elderly than it was in the younger groups. Groups structured as peer-support groups were shown to be functional for the elderly. The high scores on self-disclosure suggest that the elderly were quite willing to talk about significant personal problems.

There is no a priori reason to believe that peer groups or mutual-support groups are not suitable settings for the elderly. Clinical lore over a number of years has raised issues regarding the suitability of elderly patients for individual psychotherapy. However, an examination of the published studies indicates that much of this view is based upon limited case studies and highly restricted samples. There is obviously a marked drop-off in the numbers of elderly people who present themselves to psychotherapy, a fact that can be explained by a number of issues. This question is not the same as the question of whether elderly patients in therapy work in ways similar to those of nonelderly patients.

Lakin's studies of peer-support groups provide a useful starting point. Such groups are quite different, however, from most established SHGs. Given the absence of studies directly addressing the SHG, one useful direction is to examine how self-help or mutual-support groups are similar to and differ from other psychosocial treatments. This endeavor may help set the boundaries of exploration for the question of whether the self-help-group format is psychologically comfortable to most elderly. Of course, a major caution should be stated at the outset: In our studies of self-help groups, we have found that on the one hand, there are some factors common to all; however, SHGs do differ in important process characteristics (Lieberman, 1983).

Common Ground

All helping groups are small, face-to-face interactive units. The fact that individuals enter such structures in a high state of personal need and are required to share with others topics and feelings often considered personal and private leads to important consequences for the kinds of experiences participants will encounter. They find themselves faced with a number of strangers frequently dissimilar to themselves, except for one critical characteristic—the shared problem. Such groups share three basic elements: the intensity of need expressed by the individuals joining them; the requirement to share something personal, no matter how banal; and the real or perceived similarity in their suffering. These conditions and the structure of a small, face-to-face interactive system have profound consequences for what will occur.

Foremost is the capacity of such groups to generate a sense of belonging, a shared sense of similar sufferers that creates high levels of cohesiveness. It provides the motivation to remain in and work with the group. Cohesive groups offer almost unconditional acceptance and provide a supportive atmosphere for taking risks, which in most such groups involves the sharing of personal material and the expression of emotions which may, from the participants' perspective, be difficult among strangers.

Another factor creating a high sense of belonging is the perception by the participants of their deviant status in society. The feeling of being stigmatized leads frequently, in small groups, to the creation of a feeling of "we-ness" and a sharp boundary between "them" and "us."

The high level of cohesiveness, perceived similarity, and the perception that they are "different" from others outside of the "refuge" influences the salience of being a participant. In some ways, the group takes on the characteristics of a primary group; it becomes familylike and does in fact serve as a new reference group. These interrelated properties of small groups are not a product of the particular group theory or ideology, type of problem, or style of leadership. Rather, they are intrinsic conditions of small groups, made all the more pronounced in groups of similarly affected individuals by the state of need in which they enter such groups and requirements for certain kinds of personal sharing and banding together against an external world perceived as hostile. These group conditions provide a sense of support, acceptance, and normalization of their perceived affliction (Lieberman, 1979).

The group's capacity to control behavior and to provide a system of reward and punishments is closely associated with and dependent on the level of cohesiveness. As a microcosm of a larger society, small, face-to-face groups develop their own cultures and depend on special rules or standards that they establish as they extend their lives. How much one talks, what one does or does not talk about, even the way one talks about certain things, are aspects of behavior that the group influences. The group member is almost inevitably confronted with pressure from others to change behaviors and views. The need to be in step, to abide by the rules, is a powerful factor inducing conformity in the group. Disregard for the rules means possible psychological punishment. The ultimate punishment available to the group is the power of psychological or physical exclusion. An additional strong force pulling members toward conformity is the group's most prized reward, the authenticating affirmation of one's peers. The experience of consensual validation (approval by other members who have become important) appears to be one of the most important and gratifying experiences available to members in the group.

Illustrations of these group characteristics in self-help groups are abundant—for example, the emphasis in consciousness-raising (CR) groups on issues centered around womanhood. A focus on women's issues as important change processes is in part understandable, not necessarily because of the intrinsic needs of the participants but because of the influence of the group toward a certain kind of conformity. We found that most women joined CR groups to address emotionally distressing problems (Lieberman et al., 1976). However, it is probably impossible to remain a participant in a CR group without being influenced by its particular emphasis on women's issues. These explorations do prove useful to the members of such groups. It is nonetheless important to place such perceptions in context and see them not only as a product of ideological issues or the nature of the status but also as a product of the special characteristics of all face-to-face groups.

Another important aspect of face-to-face groups is their capacity to induce powerful affective states in the participants. The group's potential to stimulate emotionality bears directly on the experiences members have in small groups. This characteristic is particularly important in helping groups, where members arrive with high needs, frequently in states of vulnerability, and are required to share personal matters. This group property is likely to lead to certain expressions of affect. Most notable in the self-help groups that I have studied are the emotional expressions of pain, anger, and profound sadness. For example, Compassionate Friends' opening ritual, where members recite the loss of a child, usually induces in new members strong affects that soon become shared by all in attendance.

Another common characteristic of groups is social comparison. Because the group members are placed in a social context that expects and often demands that they talk about personal matters and needs relevant to the problem that brought them to the group, this social comparative process becomes all the more compelling. Individuals contrast their attitudes and feelings about things that matter, and such comparisons facilitate revision of identity by suggesting new possibilities for feeling, perceiving, and behaving. The cognitive mechanism of modeling, in which individuals are able to compare their own approach to problems with that of others and to gain new perspectives on possible solutions, is a prime example of this process. For example, Compassionate Friends emphasized the inculcation of hope through seeing others endure a similar loss. Because such groups focus on specific relevant issues in an emotionally charged setting, they provide their members with a wide variety of information about how others perceived as similar feel, think, believe, and behave.

Taken together, these characteristics provide the commonality among helping groups. They are intrinsic properties of groups, conditions that prevail no matter what the particular ideology, affliction, or belief system of a leader. These properties influence what members perceive as important and in fact influence the actual experiences people are likely to have in such groups. They occur because individuals in high need have sought out such groups.

Comparing Helping Systems

Differences exist among the many dyadic and groups settings that offer psychological help: SHGs, individual dynamic psychotherapy, group therapy, peer counseling, homogeneous group therapy, and social supports can be usefully described by five dimensions: the group as a social microcosm, level of technology, distance versus closeness of the leaders, specificity of helping methods, and differentiation among members.

The Helping Group as a Social Microcosm. The group is a small, complete social world, reflecting in miniature all of the dimensions of real social environments. It is this aspect of the group—its reflection of the interpersonal issues that confront individuals in a larger society—that is most highly prized by professionals as a group property linked to an individual's change. Various schools of psychotherapeutic thought differ over what transactions are most important—those between patient and therapist or those among patients. They also differ regarding which emotional states are most conducive to positive change. But underneath all activities lies the assumption that cure or change is based on the exploration and reworking of relationships in the group. SHGs develop a rather different stance on the issue of the group as a social microcosm. The interaction among members as a vehicle for change is deemphasized. The group is a supportive environment for developing new behavior, not primarily within the group but outside. The group may become a vehicle for cognitive restructuring, but analysis of the transaction among members is not the basic tool of change.

Technological Complexity Versus Simplicity. This concept portrays one attempt to capture the central characteristic that distinguishes professional psychotherapy from help provided by peers or nonprofessionals. Differences among helping systems include the theoretical model delineating the nature of the problem, methods for translating information provided by the client into a diagnosis, and principles guiding interventions used to bring about change in the client. Most professional treatment models depend on complex technologies that may require many years of therapist training for accurate and effective implementation. In contrast, help provided within the client's informal network relies upon the simplest of technologies: no formal definitions of problems, no diagnoses, and interventions that are rooted in everyday social interactions. Other nonprofessional help systems, such as Goodman's (1972) companionship therapy, where college students "counsel" high school students, grew out of the assumption that most psychologically healthy people have the capacity and know-how to be helpful. Such interventions resemble normal social exchange and are similar to help given within the informal network. However, because peer counselors encounter more defined problems and have access to training and supervision, their interventions are somewhat more complex than those offered in ordinary relationships.

Self-help groups offer more systematic modes of treatment than those provided by friends and relatives or peer counselors. While SHG interventions appear simple, drawing upon everyday skills, their helping methods follow a specific ideology that defines the problem and directs specific interventions. Through participation, members learn the cognitive framework or ideology of a specific SHG and incorporate these principles into their thinking and interactions with others. It should be noted that professional help is not always equated with high technological complexity and nonprofessional help with low complexity. Rioch, Elkes, and Flint's (1963) classic project for training housewives to be psychotherapists relied on the development of complex technological skills in relatively untrained people.

Psychological Distance versus Closeness Between Helper and Helpee. Many professionals, located at one extreme, deliberately increase the psychological distance between themselves and the patient. By contrast, nonprofessional help systems assume that reducing psychological distance promotes identification and trust, which in turn facilitates productive therapy. In peer counseling, when the helper shares a cultural background or social position with the client, he or she would presumably convey understanding of certain problems and therefore be less threatening to the person seeking help. Of all help systems, self-help groups achieve the greatest psychological parity between the helper and those being helped. Not only are helpers frequently similar to the help-seeker in social background, but more importantly, helper and help-seeker share the same affliction. Client control of the organization also erases psychological distance between helper and helpee; often, all members work together to solve problems, with no formal distinctions between helper and client.

Specificity versus Generality of Help Methods. This concept refers to variations in how the methods of helping systems relate to the particular dilemma, distress, or affliction they address. High generality, in which methods do not vary with the particular dilemma, characterizes the help offered by friends and family. Such informal helpers offer support, warmth, understanding, and instrumental help in much the same manner, whether the dilemma arises from widowhood, illness, or other problems and predicaments that plague the human condition. Help provided by nonprofessional therapists and peer counselors tends toward the general. Interventions rooted in normal social exchange resemble each other, regardless of the nature of the particular problem.

The methods employed by professional therapists are more specific than the generalized support offered by peer counselors but (with a few important exceptions—e.g., behavior-modification regimes) less specific than the help offered in mutual-aid or self-help groups. Exercises and methods used in encounter groups, although sometimes directed toward particular group members, do not necessarily respond to individual differences. Helping systems such as client-centered therapy that do not emphasize diagnosis tend to be quite general, despite codified intervention techniques. Dynamic psychotherapies assign a diagnosis and more specifically address personal problems, while still relying on nonspecific therapeutic factors.

High specificity characterizes self-help groups. Antze's (1979) study of self-help organizations demonstrates how they develop specific ideologies about the nature of the problem and tailor appropriate methods to the specific afflictions they address. Drug-abuse groups conducted by ex-addicts employed confrontive, often explosive, emotionally exhausting techniques in order to counteract the mounting anxieties and social withdrawal characteristic of certain types of drug abusers. In Mended Hearts, a self-help group for individuals who have had open-heart surgery, methods focus on altruism in order to deal with the "survival" guilt found among such patients (Bond et al., 1979).

Differentiation versus Nondifferentiation Among Participants. Being "neurotic," having a psychological difficulty, or being a patient are vague and relatively unbound identifications, compared to being a widow, a parent whose child has died, an alcoholic, or someone who has undergone open-heart surgery. It is easier for SHGs than for psychotherapy groups to stress identity with a common core problem. Although it is typical for a psychotherapeutic group to go through a period when similarities among members are stressed, this is usually an early developmental phase, representing an attempt of the group to achieve some form of cohesiveness. It is not the *raison d'etre* of the group, as it may be for a self-help group. In fact, there is some evidence that psychotherapeutic group participants who remain committed to a sense of similarity are less likely to experience positive change. The potency of SHGs, on the other hand, appears to stem from their continued insistence on the possession of a common problem; the members derive support from their identification with a common core issue.

There is a class, however, of group psychotherapy, labeled by Weiner (1986) *homogeneous group* therapy, whose members are united by their struggle with a common problem. Weiner reviews the literature of such group psychotherapy for a variety of psychiatric and physical problems. This parallel development in group psychotherapy thus represents characteristics shared between traditional group psychotherapy and self-help groups. Weiner states that such homogeneous groups appear more useful than other therapeutic approaches in dealing with persons whose complaints center around a single problem or who see themselves as reacting to environmental pressures. They are also useful in treating patients for whom education, identification, and mutual support are the most important elements of therapy and for patients who are better able to make peer identifications than to identify with the therapist.

The points at which these dimensions intersect show emerging patterns. Most self-help groups are low on complexity, use of the group as a social microcosm, and differentiation. They are high on specificity and low on psychological distance. Traditional dynamic group psychotherapy is high on complexity, and emphasis is on social microcosm, moderate on specificity, and high on psychological distance and differentiation. Social support from family and friends and peer counseling are low on complexity, low on specificity, and low on psychological distance. Nonprofessional individual therapies incorporating the training methods such as those Rioch et al. (1963) used with the housewives in their study are high on complexity, low on specificity, and moderate on psychological distance.

Differences Among SHGs

Self-help groups are complex entities. They create experiences thought to be therapeutic such as inculcation of hope, development of understanding, and the experience of being loved. Self-help groups are also cognitive restructuring systems possessing elaborate ideologies about the core cause and source of difficulty and about the way individuals need to think about their dilemmas in order to get help. Additionally, they are social linkage systems where people form relationships, and in that sense, they provide social support. We found that all types of SHG are unified by the simple facts that they are collections of fellow sufferers in high states of personal need and that they require some aspect of the personal and often painful affliction to be shared in public. Regardless of the type of group, participants uniformly indicated that the abilities of such groups to provide for normalization (universalization) and support were central (Lieberman, 1983). Despite these common elements, examination of various self-help groups suggests major differences in emphasis on a variety of other mechanisms. Self-help groups differ considerably, for example, with regard to their emphasis on cognitive mechanisms. Such processes—increasing understanding, putting roles into perspective, and providing insight into personal problems—are critical in women's consciousness-raising groups. In contrast, Compassionate Friends' participants emphasize the inculcation of hope and existential concerns; they view cognitive mechanisms as relatively unimportant. Mended Hearts emphasizes altruism. Overall, our findings suggest that despite a common core, there are major differences in the mechanisms that different groups find useful.

A recent study provides empirical support for the observation of group-specific processes (Lieberman, 1983). Three organizations were chosen to test whether specific "curative factors" were associated with benefit. All three types of SHG in this study involved significant personal losses: spousal bereavement (THEOS and NAIM) and child loss (Compassionate Friends). A 31-item instrument of change mechanisms was administered after one year's participation. Members were asked how helpful, on a three-point scale, each of the 31 mechanisms had been in their learning. The categories used to generate the items were universality, support, self-disclosure, catharsis, insight, social analysis, advice-information, perspective, feedback, comparative-vicarious learning, altruism, and existential experimentation (Lieberman & Borman, 1979).

Outcome was measured using a common central concern of bereavement—feelings of guilt and anger. The participants studied included 491 THEOS members, 187 NAIM members, and 197 members of Compassionate Friends. Separate factor analysis of the responses to a self-rating change questionnaire yielded a factor concerned with guilt and anger for each of the self-help organizations. Low but significant correlations (.20 range) were found between this factor and standard depression and self-esteem scales. Decreased guilt was defined by change score ≥ 1 SD, below the group mean, while ≥ 1 SD above the mean was defined as increased guilt. Analyses of the 31-item checklist of change mechanisms revealed that those related to decrease in guilt were unique for each type of SHG studied.

For the widows in NAIM, the core experiences associated with guilt reduction were the sharing of troublesome feelings; normalization, not feeling out of place; redirection of anger by externalizing it; seeing problems as products of an insensitive world; and the more socially acceptable mechanisms of reaching out to others in need. Avoidance of hostile impulses by not venting anger, as well as avoiding the aggressive implications of social comparison, was characteristic of those who did not show guilt reduction.

In the other type of spousal-bereavement SHG, THEOS, contrasting results were observed. The normalization aspects were present, but rather than emphasis on expressivity, revelation and externalization emphasis on cognitive mastery and the use of the group context for experimentation were characteristic for guilt reduction.

Among parents who have lost a child, change mechanisms different from those in either of the two widowhood groups occurred. Although normalization was common to all three, critical for guilt reduction in Compassionate Friends were existential considerations: the inculcation of hope and confrontation with the situation. Loss of a child, especially where the loss was unexpected, was uniformly accompanied by bitterness and fury at society. Many parents experienced isolation from everyone; this appeared to represent a psychological state different from what was seen among widows and widowers. Perhaps the dilemma facing those who have lost a child, and the consequent experience of acute guilt and responsibility, can best be resolved through confrontation with the ultimate meaning of their lives.

Another empirical test of SHG specificity was demonstrated by two recently completed studies examining bereaved parents and widows and widowers (Lieberman & Videka-Sherman, 1986; Videka-Sherman & Lieberman, 1985). The methods for study were identical. Cohorts of bereaved who were members of self-help groups (those who participated in at least three meetings) were compared to matched bereaved parents or spousally bereaved people who had access to, but chose not to join, such groups. All were followed for one year, and outcome was measured by assessments of mental health, social functioning, and physical health. Analysis of the spousally bereaved indicated that the development of new linkages with other widows or widowers in which mutual exchange occurred was the necessary condition for significant change. Those participants who experienced a diversity of therapeutic mechanisms, including abreaction, advice, and inculcation of hope but did not form such new social-exchange relationships, did not significantly improve. However, using identical measures among the bereaved parents, those who established such relationships were no more likely to improve than those who did not establish significant exchange relationships.

Such findings suggest that detailed studies of processes are required before making the all-too-easy generalization that SHGs benefit people because they provide excellent sources of social support. In these two outwardly similar problem areas, we found that the psychology of each was different and that the processes by which such structures as self-help groups work were distinct. Such findings are particularly important because of the all-too-common perception that equates SHGs and socially supportive relationships. Certainly, relationships are formed in all groups we have studied. People talk to one another, often about emotionally important and sensitive issues, and share important information about the affliction. Members are frequently exposed to information about coping strategies, and often they are provided acceptance and the enhancement of self-esteem by other group members. It is thus not an issue whether certain socially supportive transactions occur both during formal meetings and in times between meetings. Their occurrence, however, does not mean that these are the necessary and sufficient conditions for SHG helpfulness.

Another perspective on specificity is offered by the work of Antze (1976), who suggests that each group he studied (AA, Recovery Inc., and Synanon) has a specific ideology closely linked to the underlying psychological problem associated with the affliction. He suggests that the common pathology found among alcoholics reflects an exaggerated sense of personal power and that this attitude plays a central role in the psychology of compulsive drinking. His analysis of AA ideology suggests that AA provides a specific and thorough antidote to the alcoholic's way of being; its prime therapeutic function is to induce contradiction of the member's sense of exaggerated power. To absorb the AA message is to see oneself as less the creator of events in life, the active fighter and doer, and more a person with the wisdom to accept limitations and wait for things to come. Antze's careful analysis of AA and comparison to Recovery Inc., which on superficial grounds may appear to function similarly, demonstrate specific and unique characteristics for each group.

This overview of similarities and differences in processes between SHGs and professional help on the one hand, and among different SHGs on the other, does not, of course, inform us about the specific experience elderly participants have in self-help groups. We have tried to illustrate that self-help groups are psychological matrices distinctive from other helping sources. Underutilization by the elderly may be in part accounted for by the particular psychological messages provided by self-help groups. We need direct evidence about psychological modes preferred by the elderly and how they are related to the psychological characteristics of the setting—in this case, the self-help group. The next section will explore the psychological stances the elderly take in relation to self-help groups and the kinds of experiences they are likely to report from participation.

THE EXPECTATIONS AND EXPERIENCES OF THE ELDERLY IN SHGs

Members entering SHGs were asked to indicate on a "reasons-for-joining" questionnaire how appropriate or inappropriate was each of the reasons. Factor analyses of these 29 items produced two general factors representing outcome and processed goals. The outcome dimensions were for mental health, awareness, existential, interpersonal relationship, political-social, and change-in-lifestyle goals (Lieberman & Borman, 1979). The process dimensions were similarity-communion, cognitive-information, modeling, emotional support, abreactive-cathartic, linkage with others, altruistic, and social hedonistic goals. Such dimensions tended to distinguish professional from self-help systems. The expectations and needs of those entering professional helping systems were highly instrumental and help oriented. Although we found similar end-state desires in participants in various types of self-help groups, what stood out was that self-help emphasizes the *process*—*how* they will change rather than *what* they will become. These findings suggest that the expectations participants have in coming into professionally conducted "treatment," as compared to coming into a self-help group (often for the same type of problem), are psychologically distinct in the participant's mind. Now let us turn to a specific analysis of one such organization in which a number of older persons participated and examine their expectations.

Age Differences and the Experience of the Self-Help Group

In a recently completed but unpublished study, 190 recently widowed women who joined spousal-bereavement SHGs were given the reasons-for-joining questionnaire. A linear discriminant analysis, using a four-age classification (30–39, 40–49, 50–59, and 60–69) was performed using item scores. The three discriminant functions representing the 29-item questionnaire failed to significantly discriminate members on the basis of age. Thus no evidence emerged to support the hypothesis that the motivations of elderly widows in joining SHGs differ from younger women.

Participants in the same spousal-bereavement SHGs were asked to rate on a five-point scale how helpful a list of events or experiences that may have occurred in the group had been to them personally. The 31 items included the standard dimensions developed by Yalom (1975) and Lieberman et al. (1973) to assess "change mechanisms." Included in the overall list of mechanisms were items indexing altruism, group cohesiveness, universality, interpersonal learning, guidance, catharsis, identification, family reenactment, self-understanding, inculcation of hope, existential factors, feedback, and a variety of cognitive restructuring items. We know from previous research that professional systems differ from self-help groups and that self-help groups differ among themselves in the emphasis each places on these mechanisms (Lieberman, 1983). Did the elderly widows who participated differ from their younger counterparts?

A linear discriminant analysis, using the same age classification (ages 30–39, 40–49, 50–59, and 60–69) was performed. The first discriminant function (48% of the variance) significantly distinguished among subjects classified according to age at $p \leq .05$. Younger widows reported that normalization of their status and cognitive mechanisms that provided information and a framework for understanding their loss were the change mechanisms most important to them. In contrast, elderly widows emphasized the social-supportive aspects of the SHGs, seeing the availability of others to whom they could turn when depressed and fearful as most salient. They also emphasized altruism, being able to reciprocate by helping others.

These differences in what were considered useful experiences in the group may be due in part to the psychological and social tasks facing widows at different points in the life span. Widowhood for women in their thirties is ordinarily unexpected, "off time," and confronts the widow with a need to normalize and find some way of providing meaning to understand the loss. Young widows rarely have other widows in their close social networks. In contrast, for older widows, the status is not wholly unexpected, and although they are likely to have others like themselves in their immediate social network, those who enter SHGs appear to require a mechanism for finding others like themselves who can provide emotional support when they are depressed and fearful. These results suggest that although the motivations for seeking out SHGs may be similar for elderly and younger women, they may experience the groups as somewhat different, in the sense of what aspects of the helping system they found important.

Available data cannot test whether there is a misfit between the typical processes characteristic of self-help groups and preferred psychological and attitudinal states of the elderly. Some of the characteristics of professional group therapy might suggest that self-help groups are more appropriate for the elderly. Professionally conducted groups explore the current interactive setting (the group as a social microcosm), a method that does not appear to be comfortable for many in the current generation of elderly. The emphasis in some therapies on internal psychological exploration or high emotional expressivity has also been noted by some authors as not being comfortable. In contrast, self-help groups that provide a specific and bounded focus on a particular problem and offer the participant high levels of control over their circumstances as well as high levels of structure defining what people have to do might be comfortable for this group. On balance, there seem to be no conceptually based hypotheses about why many types of self-help groups could not afford an appropriate psychological climate for the elderly.

ROLES AND CONTRIBUTIONS OF PROFESSIONALS

What can professionals with specialized knowledge contribute to self-help groups? This section examines four strategies for contribution: legitimization, transfer of technology, consultation, and the development of new groups. Also examined are concerns that professionals may have about the continued development and expansion of self-help groups covering an ever larger range of problem areas. Does the spread of self-help groups that resemble, but are certainly not identical with, diverse forms of professional help pose a problem for professional practice? Are self-help groups competitors with professionals in the marketplace? This concern is particularly salient, given that the number of professionals trained to provide service is growing but resources to pay for the service are low among this population. In a national sample of participants in a spousal-bereavement SHG (THEOS), 28% of the members had used professional mental-health services for problems associated with widowhood (Lieberman & Videka-Sherman, 1986). Although the sample was by no means representative of all widows, it does provide some clue regarding the utilization of services. Veroff, Kulka, and Douvan (1981) reported that only 4% of widows/widowers in a nationally representative sample utilized professional mental-health services. The finding that somewhat over a quarter of those in our SHG sample utilized psychotherapy underscores a more generalizable characteristic of self-help participants, namely that they are users of multiple services. When compared to nonparticipants in SHGs, they availed themselves of professional services significantly more often and generally had better social-support networks in addition to their utilizing self-help groups. The majority of such multiple-service users also perceived the services in the various settings as productive.

Some mental-health professionals are concerned about the damage that may be caused to the psychiatrically vulnerable by participation in SHGs. Henry (1978) pointed to the possibility that some people are in need of services that can best be provided by professionals but are diverted into SHGs. Harm in this sense is produced by not obtaining help at the particular juncture in the person's life cycle when it is most needed. Our own studies have not permitted us to clarify this issue. One can always point to specific individuals at particular times whose problems were of such a magnitude that most SHGs could not reasonably address them. Major depressive illness precipitated by the loss of a spouse has, in my experience, not been amenable to the otherwise positive benefits of widow and widower SHGs. Beyond case examples, however, our own data suggest that most individuals who participate in SHGs ordinarily avail themselves of a variety of services. The simple fact that SHG processes are different from those utilized by mental-health professionals is not a prima facie case for SHG inadequacy or harmfulness.

Others have speculated on the potential of the self-help movement for diverting society from developing and funding critical services. This social criticism is a serious one and certainly should be noted; unfortunately, at this juncture no meaningful empirical evidence exists that would shed light on this issue.

Strategies Used by Professionals in Aiding SHG Legitimization

SHGs, like other help-providing structures, require societal legitimization. Professionals can play a critical role here. Health-care providers frequently can transfer legitimacy to SHGs. Other traditional systems sanctioned by society for serving the bereaved, such as religious institutions, are frequently the prime legitimizers of bereavement SHGs. Simple strategies such as referral to SHGs when indicated, backup support through providing space and facilitating minor services, and positive public labeling are common examples. Without such legitimacy, self-help groups we have studied (Lieberman & Borman, 1979) tend to look inward, lack vitality, and often disappear within a few years.

The Transfer of Technology

Perhaps the most common role, the one that flows most logically from the mental-health professional's specialized knowledge, is the provision of technical skill for the nonprofessionals who form the core of SHGs. The transfer of technology through education, training, and supervision has a long and variable history (for general reviews, see Collin, Gardner, & Zacks, 1967; Williams & Ozarin, 1968; Grosser, Henry, & Kelley, 1969). The need to transfer helping technologies reflects broad societal changes in conceptions of who should deliver psychotherapeutic services. Since the 1960s, help for psychological problems has come from many sources: high school students, middle-aged housewives, neighborhood workers, nurses, retired people, ex-addicts, ex-alcoholics, and parents trained to treat their own children. Conceptual ambiguity marks these efforts since the activities labeled peer therapy may have little in common with one another. Peer treatment implies that those conducting the therapy share a significant characteristic with their clients, such as the presenting problem or social class.

Despite this long tradition and considerable clinical and evaluative experience, it does not seem that the transfer of technology by the development of *self-help group leaders* educated in the helping strategies developed by professionals is a useful direction. This conclusion is based on both conceptual analysis and some empirical findings. Earlier in this chapter, I outlined differences between professional help and self-help groups. Five dimensions were described: social microcosm, technical complexity-simplicity, specificity-generality of helping methods, degree of psychological distance between the group leader/therapist and participants, and the differentiation-nondifferentiation among participants.

Neither the view of the group as a social microcosm nor the intervention style rooted in a highly developed complex technology are characteristic of SHGs. Nor are they strategies that nonprofessionals can easily use. In addition, training peers in professional styles increases the psychological distance between the provider of service and those who are helped.

This is not to say that professionally trained peer-helpers are not effective in certain settings and circumstances. However, if we accept the view that SHGs are highly specific structures with their own characteristics that make them successful and if we believe that such groups have evolved an elaborate and intricate ideology out of the experiences of the afflicted themselves, we then need to recognize that SHGs are a fundamentally different activity for alleviating human suffering from the processes of alleviation provided by professionals.

One study (Lieberman & Bliwise, 1979) provides some empirical support on the limits of technological transfer. It compared SAGE participants (a group program developed for the community elderly), randomly assigned to groups led by professionals and to groups led by the elderly, who were trained and supervised by the SAGE professional staff. Both conditions were compared to a wait-list control group. A series of pre- and posttreatment measures in goal attainment, physical health, and mental health were used to evaluate impact. After nine months of intervention, analysis revealed statistically significant evidence that the groups conducted by professionals had a more positive impact than those led by the peers. Differences in the group processes between professional and peer leaders provided additional confirmatory evidence.

We know that SHGs can be effective; we also have evidence (Durlak, 1979) that paraprofessionals or nonprofessionals can be effective therapists. The implications of the SAGE study need to be viewed in context. The efficacy of SHGs cited earlier was demonstrated in groups that evolved their own helping procedures. There is no reason to assume that nonprofessionals trained in professional helping procedures could do as well as professionals. If we accept the unique processes of SHGs, there apears to be no rationale for a strategy based on professionalism, despite its obvious appeal. At best, such inadequately transferred technology can only create an underclass of helpers who probably cannot operate with the skill of professionals.

Another model for the transfer of technology has recently evolved, based on new institutions developed to facilitate SHGs. These are professionally directed settings—self-help clearinghouses—that provide a variety of facilitative services to established SHGs by linking people in need of such services to appropriate settings, providing legitimization, and helping to establish new SHGs. The information exchanged in these settings is, however, based on the methods of established self-help organizations, a technology distinct from professional therapeutics.

Caution, however, needs to be exercised when using this approach. For example, new SHGs are often "spun off" from older ones. Well-established groups such as AA are copied by people with a variety of other afflictions. This approach may have limited success. Since the ideology, strategy, and structure of AA address the unique and specific social-psychological issues of alcoholism, they may have little to do with other problems. Those groups that appear to have been successful in borrowing current ideologies and structures have modified them. Professionals can help in this transfer by helping differentiate appropriate from inappropriate "borrowing."

Self-help clearinghouses have facilitated the spread and maintenance of SHGs by providing consultation from one SHG to another. It is important, however, for professionals to remind themselves constantly that what enables most SHGs to flourish is a set of shared ideas. Professionals must be sensitive to these ideas, which address the nature, cause, and cure of problems. They may often be diametrically opposed to a professional view of the nature of the problem and, most particularly, professionally designed procedures for helping.

A study of the history of many SHGs (Lieberman & Borman, 1979) clearly suggests the central role of professionals in many such organizations. The models are many, and those that have been successful recognize the distinction between professional involvement and professional direct service. It is the attempt of professionals to provide direct services rather than their involvement in other ways that inhibits the development of SHGs. Above all, we need to be clear about what kind of institutions we are trying to aid and not make the all-too-frequent mistake of coopting terminology that may have current value (as self-help does) by simply relabeling our traditional methods. SHGs are useful on pragmatic grounds. They offer an alternative to professional service. The issue is not which is better but the value of encouraging diversity in service.

The Consultative Approach

Our experiences and those of other professionals are that most SHGs and organizations welcome the participation of professionals. Two straightforward problem areas encountered by many SHGs would benefit substantially by the involvement of professionals with special skills in aging, mental health and small groups. First is the SHG participant with serious psychopathology. Some SHGs such as Recovery, Inc. specifically address the needs of individuals with major psychopathology. However, in settings not geared to such a problem area (such as bereavement groups whose group procedures are geared toward distress but not illness) people experience considerable difficulty responding to those who have serious psychopathology. Consultation with mental-health professionals and providing alternative service settings is a welcome and meaningful contribution we can make to SHGs.

A second area for professional consultative experience is the skills that therapists have developed for the therapeutic aspects of groups. The trained therapist often possesses skills for bringing together a group of needy and distressed individuals and creating a functioning social system within which they can practice their therapeutic skills. Many SHGs will from time to time experience problems in how to manage the system—troublesome members, high turnover, nonparticipating people, and the like. These are common occurrences both in SHGs and in psychotherapy, and consultation on the social-system aspects of groups, not the treatment model, is a meaningful contribution that professionals can make to self-help.

The Development of New SHGs

The most challenging and perhaps most satisfying contribution professionals can make is the development of new SHGs that provide ongoing service for a wide variety of conditions and problems. I have already touched upon some of the ways professionals have attempted this complex task. This section describes two other strategies that have recently been used to facilitate the development of new SHGs. Perhaps the most exciting is the one developed by the California Self-Help Center at University of California at Los Angeles. The group at UCLA has developed a series of tapes (*Common Concern*) that provide a generic structure for leading groups of lay people without benefit of a professional leader through a series of experiences and teachings about helping behavior and how to conduct a group. The tape program is capable of creating a fully functioning, independent self-help group. Although it is too early for a formal test, pilot data gathered by the group at UCLA is highly encouraging that fully functioning self-help groups can be developed by this method.

There are many examples of collaborative efforts between concerned professionals and lay individuals who desired to develop SHGs for a particular problem area. Such collaborative arrangements, in which professionals aid in organizational issues and provide legitimization and support, appear to be a successful strategy for aiding those desiring to develop self-help groups. The Duke program for self-help groups for caregivers of Alzheimer patients and another for the development of cancer SHGs in South Carolina are but two examples of such strategies. Unfortunately, each seems to be a special and perhaps unique set of circumstances; it is still too early to provide any meaningful generalizations on the long-term success of such strategies. It is useful to remind ourselves that since the inception of self-help, professionals have been involved in the initiation and development of such groups. What is important is to recognize the distinction between such groups and professional service, and to be sensitive to the complex and often subtle ways SHGs view the cause and cure of problems—ways that are often distinct from what we as professionals practice. By maintaining this distinction and by providing a variety of facilitative professional activities, we are likely to maximize success. Facilitation will be enhanced if we maintain the boundary between what we do as professionals and what self-help groups offer.

The Relevance of Age to the Self-Help Group

Most self-help groups are age-heterogeneous. Would age-homogeneous groups be more attractive in recruiting, retaining, and beneficially influencing the elderly? Certainly there is some evidence that age-homogeneous setting facilitate social networks. Similarly, the homogeneity of the affliction, problem, or issue facing the participants is of paramount importance for SHGs. An SHG for those who have had open-heart surgery illustrated this principle when the issue of bypass surgery versus valve replacement as a membership requirement became emotionally charged. Although such a distinction might seem odd to an outsider, it reflects an important and basic requirement of SHG formation: instant and early identification among members.

However, age alone does not appear to be a valid criterion for homogeneous group composition. Except among groups organized to advocate changes in the larger society, it is unlikely that SHGs for mutual aid and self-improvement could be organized and function successfully on the basis of age alone. The requirement is a perceived similarity based on disease or affliction, status, crises or life transitions. Groups focused on retirement, unemployment, grandparents who have suffered the death of a child, grandparents of the divorced, and other life situations with some degree of age prevalence may be acceptable. Whether the elderly would do better in age-heterogeneous groups if the age basis of identification were promoted cannot presently be ascertained.

The important point is that mutual, immediate, and psychologically salient identification must be present as in caregivers of family members with Alzheimer's disease and related disorders. Despite the common core of caregiving issues, however, it is unlikely that caregivers for those with a diversity of afflictions would generate groups based on general issues of caregiving.

The discrepancy between the potentials of service offered by SHGs and the underutilization by the elderly provides a clear challenge to clinical gerontologists. Needed are a series of "clinical" trials and careful evaluations that can lead to solid generalizations and meaningful policy.

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CHAPTER 10

Retirement Preparation

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The point of departure for this discussion is Kasschau's (1974) review of existing retirement preparation programs, in which she made the following points: There is (a) confusion about the appropriate goals of retirement preparation programs, which (b) hinders meaningful evaluation of these efforts, (c) leaving employers and other potential sponsors noncommittal toward such programs. Even with clear goals, Kasschau found too few programs that were well designed or comprehensive enough and too few evaluation studies that fairly tested program effectiveness. Employers were seen to offer programs out of a sense of public-spiritedness rather than serious conviction about their value. Nonetheless, surveys showed that employees were gratified to have assistance with retirement preparation. On balance, Kasschau was optimistic about the potential for programs to stimulate personal planning for retirement.

This sort of commentary echoes through the subsequent literature on retirement preparation. On the one hand, there is sufficient demand for planning assistance, a corps of professionals willing to design and administer programs, and an awareness among employers of the functions of such programs. On the other hand, there are recurring refrains about superficial programs, offered at too late an age to be helpful, which fail to reach the people who need help the most, evaluated by inappropriate measures on inappropriate samples. Retirement preparation is continually said to be at a crossroads.

This chapter surveys research and comment that has appeared since the mid-1970s on the subject of retirement preparation. For this purpose, *retirement preparation* will be the general term that subsumes formal and informal activities related to planning and counseling for the transition to retirement. In addition, this is a review of *pre*retirement preparation; the literature says very little about planning or counseling activities that may occur after withdrawal from work (see ASPA-BNA, 1980). While attention is directed mainly to organized interventions—programs—it should be recognized that these occur in a context of individual adult development and anticipation of the later years (Rekar & Wong, 1988).

On overview, retirement preparation is a most diversified activity. Consider that retirement preparation can serve a number of different functions, is initiated individually or in group settings, and encompasses a set of topics that are more or less relevant to the needs of workers of different ages or different backgrounds. There is a spectrum of potential providers or program sponsors, along with a variety of possible program models, formats, and settings. The absence of consensus about goals and formats also extends to terminology (Lynch, 1978; Olson, 1981), where such terms as *(pre)retirement education, counseling, assistance*, and *planning* are used loosely and not consistently defined. Imprecise terms, as will be seen, complicate the interpretation of survey results on the prevalence of retirement preparation.

Retirement preparation also has a wide and varied literature which stretches back over 40 years. Indeed, the second issue of the fledgling *Journal of Gerontology* carried an article on the subject (Moore, 1946). Much of the current literature consists of hortatory articles on the usefulness of planning and counseling; reports on the prevalence of programs and the characteristics of program participants; and descriptions of curricula, content, and conduct of programs. Smaller segments of the literature contain research-evaluation reports, training material, bibliographies (e.g., Hunter, 1978; Migliaccio & Cairo, 1981; Montana, 1985), and reviews. In the last category, three reviews, by Atchley (1981), Olson (1981), and Slover (1982) can be cited as the finer summaries of the last 10 years. The present review is concerned primarily with the available research literature and less with hortatory or feature articles. The issue of "available" literature is important because there is a large practical literature on the subject that is not readily available, to even the most determined reader. This consists of private reports, newsletters, proprietary publications, house organs, and nonserial circulars. Such sources can nevertheless contain a good deal of wisdom and useful vernacular advice about program content and organization, as well as research results and legislative updates. One example of this practical literature is *Retirement Planning*, the quarterly publication for the membership of the International Society of Preretirement Planners.

THE MULTIPLE OBJECTIVES OF RETIREMENT PREPARATION

Retirement preparation can serve certain purposes for individuals—either on their own or assisted by others—and for sponsors, particularly employers.

Kasschau (1974) made the useful distinction between preparation with a *planning* emphasis and that with a *counseling* emphasis. Programs with a planning emphasis are an "information-disseminating and stimulant-to-planning device." They should provide individuals with enough information so that they will form realistic and reasonable expectations about retired life that will lead them to make provisions for future income, housing, health care, and so forth. Planning, at its most practical, is a matter of financial planning, because retirement requires some sort of replacement of income from salary and wages. Schulz (1988, Chapter 4) develops the rationale for income planning by detailing the impressive financial uncertainty and risk faced by prospective retirees. The second major rationale for planning that is stressed in hortatory articles is the sheer length of normal life expectancy that now extends after retiring—some 15 to 20 years (U.S. Senate, 1987–1988).

Counseling programs, in Kasschau's typification, are designed to develop favorable attitudes toward retirement and thereby promote good adjustment. In addition to attitude change, this category could include preparation that is oriented to the affective or emotional management of the retirement transition. The rationale for a counseling emphasis was more easily made in the past when it was presumed that retirement often posed a crisis for individuals, a notion dispelled by later research (Friedmann & Orbach 1974; Streib & Schneider, 1971). Another often-cited rationale for attempts to change attitudes was the early finding (e.g., Thompson, 1958) that a positive preretirement attitude predicted better postretirement adjustment. The relationship between positive pre- and postretirement attitudes may have been less a case of cause and effect and more a matter of both attitudes being drawn from an enduring general outlook on life.

Kasschau (1974) endorsed the planning function as more feasible to organize, administer, and evaluate. The subsequent literature has not, however, maintained a crisp distinction between planning and counseling functions. (In one respect, it is advantageous not to do so, because programs can be promoted as more comprehensive to the extent that they encompass multiple goals.) Dennis (1984b), for example, writes that "to many retirement specialists, adequate preparation is achieved when preretirees increase their awareness and understanding of retirement issues, when they develop a retirement plan, and/or have a positive attitude toward retirement" (p. 191).

Preparation programs can also serve the interests of their sponsors. Educational institutions can use them as a laboratory for adult education methods or as a way to discharge their responsibility to the community. There is a current in the literature that emphasizes the benefits to employers of conducting retirement preparation (Dennis, 1988; Hall, 1980; Hodges, 1982; Kasschau, 1974; Morrow, 1980). One objective is to create a climate that encourages the acceptance of retirement or even the willingness to retire. The manipulation of retirement decisions is an increasingly relevant goal for programs, given the legislated removal of mandatory retirement rules for most occupations as well as the recent corporate stress on reducing and restructuring work forces in the name of competitiveness. Programs may also have payoffs in terms of improved morale and productivity, and a burnished corporate image. Siegel and Rives (1978, 1980; also Morrison & Jedrziewski, 1988; Research & Forecasts, 1980), in surveys of large firms, found companies citing such organizational benefits as "improved company image and higher loyalty, hence less employee turnover and higher morale" (1980, p. 189). A more recent survey highlighted employee goodwill as the major benefit (Siegel, 1986). Hall (1980) summarized the case for employer sponsorship of retirement preparation by noting

> its preventive significance in forestalling court cases, new labor demands and general employee dissatisfaction. In recognizing and addressing new employee needs, employers will also improve their corporate images and meet social responsibilities. The dollars spent on preretirement planning may, in the long run, be a profitable management technique. (p. 208)

A unique argument has been made by Underwood (1984) that planning programs can be used to cut pension costs in the long run. There is, according to Underwood, a distressingly common view that it is employers and government, not the individual, who are responsible for retirement income security. Such employee expectation of entitlements needs to be reduced. In addition, there is a burden of large, unfunded pension liability that can be solved only by retrenchment or restraint on benefits. Companies should therefore institute early and aggressive planning programs and provide actual investment opportunities that specifically encourage private saving for retirement. Underwood promotes retirement planning as a device to wean workers away from corporate paternalism, encourage self-reliance in retirement preparation, and thereby reduce corporate pension liability.

There is thus the potential for conflicting interests and objectives between program participants and sponsors. To the extent that retirement preparation activities can reduce uncertainty about retired life, they can be a service to employees as well as a useful management device. It is appropriate, nevertheless, to recognize that in a particular setting, the interests of the preretiree and the sponsor may not be equally well served by the same program. In this vein, Hodges (1982) has proposed a program participant's "bill of rights" to protect employees from manipulation.

THE PROCESS AND LIFE-COURSE CONTEXT OF RETIREMENT

The backdrop for assisted, organized retirement preparation activities is a hypothesized "process" of retirement. More than a string of events surrounding the decision to retire, the concept implies a long-term dynamic experience of anticipation and adaptation (Atchley, 1982a; George, 1980). Retirement practices have become institutionalized in pervasive economic, political, and social arrangements, and a "retirement stage" is now also built into everyday conceptions about the normal course of life (Atchley, 1982b). Retirement today is a highly visible, normative life event that has been regularized in the career rhythms of work organizations. As current workers look ahead, they can draw on the familiar experience of several generations of postwar retirees, along with a good deal of cultural lore about the opportunities and hazards of retirement (Ekerdt, 1986, 1987). Features on retirement planning and retired life are staples of the print and broadcast media. Come-ons for tax-deductible Individual Retirement Accounts have been advertised heavily in the 1980s. And, as Schulz (1988) points out, almost all adults by their mandatory participation in Social Security and other pension systems are required to make substantial provision for retirement.

While the retirement process is an ubiquitous concept in social gerontology, research has not really specified the modal, time-ordered features of preretirement anticipation. Despite Atchley's (1976) attempt to conceptualize the retirement process, few studies have specifically organized their findings by respondents' proximity to retirement. Earlier research conclusions that aging workers generally grew less favorable toward retirement probably reflected cohort and survivor effects. Certainly, advancing age does not appear to pace a decline in work involvement or job satisfaction (Kalleberg & Loscocco, 1983; Lorence & Mortimer, 1985). While it is not clear whether temporal proximity affects attitudes toward work or retirement (Atchley & Robinson, 1982), some research on informal anticipatory behaviors has shown that preretirement involvement increases steadily as men draw closer to retiring (Evans, Ekerdt, & Bossé, 1985). It is good that anticipatory socialization appears to begin long before the expected event, because many workers retire unexpectedly. Planned ages for retirement can fluctuate greatly over time (Ekerdt, Bossé, & Glynn, 1985; Goudy, 1981) and less than two-thirds of workers eventually retire within a year of their planned age (Anderson, Burkhauser, & Quinn, 1986; Beck, 1983; Ekerdt, Vinick, & Bossé, 1989; Nestel, 1985).

Research thus suggests that preparation activities can capitalize on workers' normative increasing involvement in the upcoming retirement event, but providers should also recognize that that event may not occur in a rational and orderly fashion. (As for the postretirement process, research conclusions about its possible shape or sequence are few [Ekerdt, Bossé, & Levkoff, 1985]. Preretirement program content would be greatly informed by knowledge about retirees' possible coping strategies and whether retirees can expect an "experimental" first year or risk transient letdowns along the way.)

While Atchley (1976) has offered the appealing idea that there are near and remote phases of retirement anticipation, research gives no substantial guidance about the optimum time to engage adults' interest in retirement preparation. One national sample of retirees felt on average that retirement planning should begin in one's mid-thirties (Johnson & Higgins, 1979). Yet it has not been common to see preretirement programs offered by employers until workers are in their mid-fifties (Morrison & Jedrziewski, 1988; Reich, 1977; Siegel & Rives, 1978, 1980). Almost all professional opinion favors an early (mid-life) start to planning, at least as far as health and financial readiness are concerned. If these are the key features of a later satisfactory retirement experience—and retirement adjustment studies show that they are—then delayed planning is unlikely to be fruitful (Slover, 1982). The later planning begins, the greater the risk of making costly and irreversible decisions. However, against this enthusiasm for early planning, Phillipson (1981) points out that 40- or 50-year-old individuals may be unresponsive to discussions about retirement. They may be too involved in the progression of their organizational career to consider its terminus, or they may perceive early programs as an attempt to impose early retirement.

Ideally, however, effective formal or informal retirement planning would have the following progression, introducing a sequence of topics in their logical order of salience (Kiechel, 1985). Prudent workers, beginning in their thirties or forties, will begin a program of saving for retirement that favors growth investments. Younger workers should realize that job stability will enhance their prospects for a larger private pension if one is available. Mid-life should also see the development of a health-maintenance regimen if one is not already established. Workers in their fifties are advised to step up their savings, review their mix of investment vehicles, and acquaint themselves with the requirements and provisions of Social Security and other pensions. This is also the time to develop projections of postretirement income, look closely at the possible effects of inflation, and consider at what age it might be most financially advantageous to retire. Workers in their final years of employment can switch some savings to more conservative investments, rehearse their budget, scout postretirement employment opportunities, arrange for the continuation into retirement of available life and health insurance coverages, and anticipate how the latter will be integrated into Medicare. Wills and other legal matters can be reviewed. Preretirees should also attend seriously to issues of daily retirement living such as residential options, use of leisure time, social and familial obligations, and health habits.

THE PREVALENCE OF RETIREMENT PREPARATION

Self-Preparation

All retirement preparation comes down to self-preparation. Slover (1982) makes the point that in the rush to offer programs, "we have learned too little about the extent, nature, and quality of personal preretirement preparation" (p. 344). If programs are to be a stimulus to personal planning, then a more thorough understanding of the latter seems an essential basis for further program development.

Workers do not admit to extensive self-preparation for retirement. In 1979, Louis Harris conducted a national survey of attitudes toward pensions and retirement that included a series of questions on financial planning (Johnson & Higgins, 1979). Responses, it should be noted, may have been colored by the prevailing worrisome rates of inflation. Among current retirees, only 29% felt that they had done enough planning to have a comfortable retirement; 34% claimed to have done no planning. These reflections had a lot to do with pension position—satisfaction with prior planning being twice as high among pension recipients. Among current workers aged 50–64, 38% claimed to have done "enough planning," considering their age, 42% had done some but not enough, and 20% had done no planning. Hourly wage workers planned least, and the self-employed planned most. (It is well to remember that the self-employed are often self-pensioning and therefore must plan.) Of what did this planning consist? Forty-five percent of this age group had given "some thought" to how much money they would need in retirement, but when asked to project a monthly figure, nearly one-third were not sure of their retirement income needs. The majority of pension-eligible workers did not know what their monthly benefit would be from Social Security (78% not sure), private (58%), or other government plans (61%). Other questions about pension eligibility led the survey report to doubt respondents' depth of knowledge on these matters as well (see also General Accounting Office, 1987).

A national Gallup survey of workers aged 40 and older for the American Association of Retired Persons (1986) found that 40% had made specific retirement plans, but another 40% admitted to not having "any specifics worked out." The report did not specify what these plans were. Morse and Gray (1980), in studies of nearly 1,900 retired supervisory and nonsupervisory personnel (Morse, Dutka, & Gray, 1983), reported that most respondents had done at least some planning but few could be characterized as model planners. The same conclusion could be drawn from a national survey of retired union members, where about 75% reported at least "a little" preparation regarding savings and pension benefits, but only 20% recalled that they had discussed retirement "a lot" (Charner, Fox, & Trachtman, 1988). Other surveys have shown that no more than 40% of older workers admit to having made definite plans for or often thinking about retirement (Fitzpatrick, 1978; McPherson & Guppy, 1979; Prentis, 1980). All such studies have found involvement in upcoming retirement to be greater among persons with higher social status and leisure orientation. Studies of retired workers from various industries have also shown that women have been generally less inclined to take a personal initiative in retirement planning (Kroeger, 1982; Morse & Gray, 1980; Morse et al., 1983).

A pair of national surveys by Louis Harris, while not focused on retirement preparation per se, did ask about steps taken to prepare for the later years (National Council on the Aging, 1981). The extent of planning among the public aged 55–64 was largely stable between 1975 and 1981. The likelihood of having engaged in five or more preparatory activities was greater among respondents who were white, higher paid, and better educated.

Individual Participation in and Access to Programs

There are two ways to count the prevalence of retirement preparation programs: by surveys of individuals or by surveys of sponsors. The former surveys are less numerous and also convey the conclusion that programs are less numerous.

The 1981 NCOA/Harris survey, previously noted, reported that 10% of 55-to-64-year-olds and 8% of persons over 65 claimed to have taken a course in retirement preparation. Beck (1984) analyzed responses on this issue among a national sample of older male workers in the National Longitudinal Surveys (ages 60 to 74) in 1981. Men were asked if they had "ever taken a course, either at work or anywhere else that attempted to help you prepare for retirement," or whether they had ever had the opportunity to take a course. These questions, Beck allowed, were general, ambiguous, and prone to recall error. Findings showed that less than 4% of this cohort reported ever participating in a course, and only 12% overall felt that they had had the opportunity to participate. Participation and the opportunity to participate varied with socioeconomic factors. Program opportunity and use were more likely among men who were white, had higher levels of education and occupational prestige, and were eligible for private pensions. Government employees also had greater access. Beck concluded that it is the socially and economically advantaged worker who is more likely to have access to retirement preparation programs, thus confirming the long-standing observation that those who may need retirement planning the most are least likely to get it.

Another national survey (American Association of Retired Persons, 1986) asked older workers about the broader subject of "retirement planning information from employers," which 23% overall reported receiving. Again, information went more often to upper-income, better-educated employees or to employees who worked for larger organizations or in the public sector. The national survey of retired union members (Charner et al., 1988) reported that 19% recalled attending union-sponsored preretirement programs, 19% attended employer programs, and a small number attended programs of other organizations. Because of overlapping attendance, a total of one-quarter of the retirees went to some type of program. However, of the retirees who did attend, more than half chose the response "a little" (versus "a lot") to characterize their participation. This response pattern may in part have been a comment on the comprehensiveness of programs.

The socioeconomic differentials in access to and use of programs can be seen in the structural context of access to other fringe benefits. Retirement preparation, insofar as it is sponsored by employers, tends to be part of a progressive benefits package that will include a private pension. And who gets pensions? Roughly 55% of the American work force is currently in pension-covered employment (Schulz, 1988). These pensions are deferred earnings and part of a compensation structure that is unequally distributed across occupational contexts (O'Rand, 1986). Coverage is more common in occupations that benefit from large firm size, unionization, and location in the public sector, and coverage is less common in occupations characterized by part-time, seasonal, and self-employment. It is also well known that people are unequally distributed into such occupations by age, race, and gender.

To the extent that pensions and their sometimes concomitant fringe benefit—the preretirement preparation program—are concentrated among certain kinds of workers and occupations, program design seems likely to orient itself to a narrow constituency. Torres-Gil (1984) observes that the field of retirement preparation and planning "has yet to serve a heterogeneous population that differs by sex, language, race, and socioeconomic status" (p. 109).

Prevalence of Employer-Sponsored Programs

The alternative to counting participants is counting programs. Because programs vary widely in their features, it would seem useful to define program types prior to enumerating them. However, surveys seldom begin with a tidy idea of what qualifies as a *program.*

At the most rudimentary level, all employers with pensions must periodically provide some preretirement information. The federal Employee Retirement Income Security Act (ERISA) requires that employers furnish pension-plan participants with a Summary Plan Description (SPD) written in lay language. The SPD booklet, which must be updated and distributed at least once every five years, should describe benefit levels, eligibility requirements, claim procedures, rights of participants, and the identity of the plan sponsor. It should also explain that participants are entitled to an annual statement of their accrual status.

Do plan descriptions succeed in conveying an adequate understanding of pension provisions and serve as an effective aid to retirement planning? Not according to a recent study by the General Accounting Office (1987) for the House Select Committee on Aging. The study attempted to verify workers' knowledge of their pension eligibility. When the GAO matched SPD information with the survey responses of a national sample, it found extensive misunderstanding of retirement provisions. Of persons eligible for early retirement, over 40% either held inaccurate information or did not know about their eligibility for benefits. Of those who *did* know they were eligible, 75% were incorrect or ignorant about the eligibility age. Regarding normal retirement, over 70% of workers either did not know the age of eligibility for benefits or reported an eligibility age that differed from plan requirements by more than one year. Understanding of plan provisions was better among persons more proximate to retirement but tended to be worse among women and those with less education. It was not within the scope of the GAO report to evaluate the two likely explanations for this state of affairs—namely, that disclosure information from SPDs is uninformative or that workers pay little attention to it.

Under ERISA, the SPD booklet is all that an employer is required to do in the way of preretirement assistance, and then only if a pension plan is in effect. (This may change for large employers in New York State, where legislation has been proposed that would require companies employing 600 or more people to offer annual preretirement seminars to employees over the age of 50.) Another necessary circumstance for preretirement assistance occurs with the offer of an early-retirement incentive program, where employers need to inform targeted workers in short order about the incentive options that are being promoted (Morrison & Jedrziewski, 1988; Mutschler, 1986).

The prevalence of programs offered by nonemployer sponsors (e.g., unions, universities) is not well reported in the literature. Employer-sponsored programs have been described by a number of surveys (Avery & Jablin, 1988; ASPA-BNA, 1980; Drake-Beam, 1979; Morrison & Jedrziewski, 1988; O'Meara, 1977; Research & Forecasts, 1980; Siegel, 1986; Siegel & Rives, 1978, 1980; Underwood, 1984; see Olson, 1981, for earlier surveys). Characteristically, these are surveys of personnel executives of large firms drawn from the *Fortune* 500 or other such readily available lists. In interpreting results from such surveys, it is well to keep in mind that, as discussed above, large firms are far more likely to have the kind of benefits package that would include a pension and perhaps a formal retirement program. In addition, return rates for these surveys (when published) are low—less than 40%—and characteristics of nonresponding firms are not reported. Because responding firms are not representative of all employers and probably not representative even of large employers (Beck, 1984), findings should not be extrapolated to represent the prevalence of retirement preparation programs in the American workplace.

To the extent that survey results can be collated, approximately 30% to 40% of large firms surveyed since the mid-1970s may offer some sort of formal retirement program. The pair of surveys by Siegel and Rives (1978; 1980) specifically avoided any definition of *program* and reported a wide range in the percentage of different types of firms administering them. A later survey by Siegel (1986) found 51% of *Fortune* 500 companies with "counseling programs," up from an earlier 29% overall. This increase may have reflected greater ERISA compliance; other questionnaire data revealed no particular expansion of corporate commitment toward retirement preparation since the late 1970s. O'Meara (1977) described a range of offerings, from 12% of companies with no assistance to 15% with extensive programs. Drake-Beam (1979) reported 42% offering programs, with another 51% giving limited information. The Research & Forecasts (1980) study reported, curiously, that 37% of companies had programs when personnel directors were responding, but 69% had programs when chief executive officers were responding. Using the personnel directors' responses, Research & Forecasts characterized programs according to content as "narrow," "intermediate," and "broad." Of 136 programs, 32 covered a broad content, and these tended to be found in larger firms (see also ASPA-BNA, 1980).

Morrison and Jedrziewski (1988) found that two-thirds of companies provided some sort of retirement preparation information to employees, but only 23% used formal programs that involved seminars, individual counseling, and financial counseling. This report was a survey of the membership of the American Society of Personnel Administrators (ASPA), who nonetheless tended to respond on behalf of large firms. The ASPA results also showed that almost all organizations had heard about preretirement programs, but 32% had not seriously considered offering them. Among important reasons why firms had not adopted programs were the opinions that they were too costly and time-consuming to administer, that qualified program leaders were not available, and that employees were uninterested in programs (see also Research & Forecasts, 1980).

Surveys of companies may also touch on other topics, including the age at which programs are offered, whether programs are limited to salaried workers, the length of time programs have been in place, where programs are conducted and by what personnel, whether spouses are invited, and corporate plans for future programs. One other survey of note was conducted among colleges and universities by the Teachers Insurance and Annuity Association (Mulanaphy, 1978). Among 2,210 responding institutions, just 4% reported a formal program to help employees prepare for retirement.

One interesting feature of the literature is the interpretive spin put on the results of surveys of firms, where the same findings may be interpreted in an upbeat or downbeat manner, depending on the observer's point of view. For example, results from the Conference Board survey (O'Meara, 1977) have been cited as showing that as many as 88% or as few as 15% of companies help their employees plan for retirement (i.e., 88% at least do something, but only 15% have extensive programs). There is also a recurring theme in the literature that emphasizes how interest is "growing" and programs are "proliferating," helped along by corporate statements of good intentions for the future (Research & Forecasts, 1980; Siegel, 1986; Siegel & Rives, 1978; 1980). Beck (1984) sounded a less sanguine note about the proliferation of company-sponsored programs when he observed that less than 2% of older men reported taking a retirement preparation course at work. Regarding the state of corporate retirement planning, Morrison and Jedrziewski (1988) concluded that progress is being made, but "despite the vast expansion of retirement information in recent years, most employers still do not have formal retirement preparation programs in place and many firms continue to seek very basic information about the design, content and administration of these programs" (p. 76).

Surveys could be more informative about employee rates of participation when group programs *are* offered. (For this purpose, group programs should be distinguished from individual counseling or reading programs.) Just because companies offer a group program does not mean employees will attend. The personnel directors responding to the Siegel and Rives surveys (1978, 1980) claimed a participation rate of about 80% among eligible employees, though rates ranged from 25–90%. O'Meara (1977), however, reported participation rates at the lower end of that range. Siegel's later survey (1986) found an average 50% participation rate. In the Research & Forecasts (1980) study, one-third of companies reported a rate of 75% or better, and another third had participation rates below 50%. Though not specifically limited to employer-sponsored pensions, Beck's (1984) figures showed that among older men who had access to programs, somewhat less than one-third participated. Campione's (1988) characterization of participants versus nonparticipants in this same population indicated that the sort of socioeconomic advantages associated with access are also associated with actual participation.

Actual figures aside, the literature conveys the impression that participation rates need improving. Why don't more come? In the 1980 Research & Forecasts survey, personnel directors reported problems in persuading workers to attend. Three-fifths attributed nonparticipation to employees' lack of desire to learn about retirement, and half cited the problem as a "fear of facing retirement" (see also Raffel, 1980). Palmore (1982), reflecting on experience with a program conducted at Duke University, was less ready to lay the onus for nonparticipation (two-thirds in this case) entirely on workers. Employees can be uninterested, either unconvinced of the usefulness of a course or well enough prepared not to need one, or they can find course offerings inconvenient to attend. Palmore also pointed out that in the Duke multisession program, initial attendees were often absent from later sessions of the course, perhaps again due to inconvenience, disappointment with content, or interest in some topics but not others. On both counts, nonparticipation and intermittent attendance, Palmore urged more research as valuable for expanding program outreach. Kasschau (1974) wondered whether employee acceptance of programs (and the quality of programs themselves) might be enhanced if programs were operated out of the training rather than the personnel departments of corporations. Less stigma may result from enrolling in a training program than from getting counseling or advice from the personnel department.

Among calls for more research on program offerings, Olson (1981) made the point, still pertinent, that the field has enough surveys of large firms. What is needed is information about the extent and scope of services from other providers such as smaller businesses, government agencies, educational institutions, and community centers. Preparatory activities should also be measured precisely. Future prevalence surveys must draft better questions to specify what is meant by *preretirement courses, programs, seminars, assistance, counseling, and education*—this so that minimal efforts such as the distribution of an SPD booklet are not counted as equivalent to comprehensive programs.

It is also worth repeating Olson's (1981) call to document the exact need for retirement preparation programs. Need is usually presumed. But Olson points out that just because workers have not planned or are uninformed, it does not follow that they will attend a formal program. Not only should we know whether the general desire for planning assistance is strong (e.g., Fitzpatrick, 1978) but what is the inclination of the public to attend programs under specific sets of circumstances? Will they come out at night, travel a moderate distance, read supplementary materials, accept group discussion formats, entertain a broad range of topics, or even pay for such services?

SPONSORS AND SPECIALISTS

The parties responsible for delivering retirement preparation services can be discussed under two headings. *Sponsors* are the organizations that make services available to preretirees. *Specialists* are the personnel who develop or conduct the actual retirement preparation activities. Specialists may or may not be affiliated with the sponsoring organization.

Sponsors

Whether counting participants or programs, employers are the most prominent sponsors of retirement preparation, usually through their personnel or training departments. As discussed earlier, several organizational goals can be served by the sponsorship of retirement preparation. Alongside the reasons for starting or having programs, it is also noted that these programs exist at the margin of the fringe benefit fabric and are vulnerable to changing economic conditions, new management priorities, personnel cutbacks, or shifts in corporate culture (Dennis, 1989). Finally retirement preparation programs are not the only things a company can do to ease employees' transition to retired life (ASPA-BNA, 1980; Levine, 1985; Morrison & Jedrziewski, 1988). A few companies allow near-retirees to taper off their hours, and some offer tuition assistance to help workers prepare for later careers. More common is the provision for reemployment of retirees on a part-time or consulting basis. This topic—the extent and quality of employment opportunities for retired workers—is a significant subject in its own right (Iams, 1987; Parnes & Less, 1985).

Although the prevalence of offerings by other sponsors has not been estimated, the literature does mention such potential providers as unions, professional and trade organizations, governmental units, educational institutions (universities, community colleges), libraries, churches, senior centers, fraternal organizations, adult-education outlets, social-service agencies, chambers of commerce, and membership organizations for seniors. Universities deserve particular mention as sources of innovative program development and demonstration (Blank, 1982; Dennis, 1988). Sponsors are also specialists when program services are offered by personnel who represent their consulting firms, financial service companies, or educational organizations.

Programs will reflect and may be constrained by sponsor interests. The planning advice of a financial services company may showcase the investments it is in business to sell. Employers or unions responsible for negotiating a nonindexed pension plan may want to modulate their warnings about inflation and fixed incomes. Companies using programs to encourage retirement would want to emphasize the advantages of retired life.

Finally, the Social Security Administration must be counted among the important sponsors of retirement preparation services. As a useful tool for financial planning, the agency will provide a worker with detailed earnings information and retirement-benefit estimates. In addition, Social Security personnel frequently appear as guest speakers at group programs.

Specialists

The *specialist* label subsumes personnel who are the individual planners, counselors, and educators, as well as the developers and representatives, of the major vendors of packaged programs. The International Society of Preretirement Planners, an organization of several hundred members, publishes an inclusive *Annual Directory of Consultants in the Field of Retirement Planning* (1988). TIAA/CREF (1986) publishes a more selected and annotated list of the major profit and nonprofit providers and sources of planning services. The American Association of Retired Persons (1988) has compiled a directory of national suppliers of retirement planning services which helpfully includes some information about costs. Specialist listings can also be found in the telephone Yellow Pages. Individual advisors such as attorneys, accountants, tax advisors, counselors, stockbrokers, and life insurance agents can be fashioned as consultants for retirement planning. There are some circumstances that almost require the use of skilled consultants, one example being the impact of the retirement of a partner on a professional partnership (Israel & Reinstein, 1986). Considering the variety of potential providers, retirement preparation services are available, for a price, to any worker who wants them.

Whether freestanding or affiliated with an organization, the retirement specialist may have to wear many hats (Dennis, 1984b; Humple, 1984):

> The diverse roles require the retirement specialist to have specific knowledge and skills to develop, conduct, and evaluate retirement preparation programs. The specialist should have knowledge in . . . the demographics of the elderly, the normal aging process, adult development, principles of adult education, program planning and evaluation, topics in preretirement education, and resources. Skill areas should include group process, communication, public speaking, administration, organization, program planning, and instruction for adults. (Dennis, 1984b, p. 191)

Add to this the role of marketer, with the specialist having to sell his or her services to management and preretirees.

Employer-sponsored programs and planning information tend largely to be assembled and provided by company personnel (ASPA-BNA, 1980; Morrison & Jedrziewski, 1988; Siegel, 1986; Siegel & Rives, 1978; 1980). In only a minority of cases are programs purchased from national or local vendors, and then usually by larger corporations (Research & Forecasts, 1980). Though "developed" in-house, program design is likely to imitate features of vendors' packaged programs. And though conducted in-house, programs often feature invited experts such as a physician, an attorney, or that standard fixture of the group program, the local representative from Social Security.

There are program formats that involve minimal administrative burdens (e.g., distributions of reading materials) as well as formats that demand greater specialist competence. One consulting firm, Retirement Advisors, Inc., tells clients that they may need to familiarize themselves with program strategies, overcome organizational resistance, assess needs, develop the program, implement it (sometimes at multiple sites), learn about available services, and estimate costs. Given these possible administrative tasks, it is not surprising that corporate programs assembled in-house tend to have narrower content (Research & Forecasts, 1980).

Training for Specialists

Training is a continuing issue as individuals achieve a specialty in retirement planning or have it thrust upon them. Necessary knowledge and skills, sketched earlier, are described more fully elsewhere (Brahce & Hunter, 1985; Dennis, 1984a; Montana, 1985; Roth, 1983). Training for the retirement specialist can be had from courses at scattered universities, but more usually from workshops and seminars conducted by consultants and other vendors of packaged programs. As the "business" of training specialists expands, Atchley (1981) has warned against slipshod workshops that give too little attention to retirement in the broad sense and to the human issues. Careful training and retraining can also forestall the danger of legal liability as a result of incorrect or negligent advice regarding benefits or taxes (Pellicano, 1977). Professional certification has been suggested as a means to establish and maintain a minimum standard for those practicing or providing preretirement services (Dennis, 1982).

PROGRAM CURRICULA: WHAT AND HOW

Lynch (1978) has offered perhaps the most helpful guide to the large assortment of terms and concepts that describe preretirement programs. Programs are here distinguished from benefits counseling, magazine subscriptions, distributions of informational materials, the ongoing counseling and other resources of the personnel department, referral, and "the entirely obscure issue of follow-up services after retirement"

(p. 316). Lynch provides four concepts—content, process, model, program—for organizing discussions of program methodology. Each concept is successively nested within the next. *Content*, the narrowest concept, is the body of information and topics relevant to preparing for retirement. *Process* refers to the techniques and pattern of techniques for getting content across—case studies, group dynamics, games, simulation exercises, workbooks. The broader idea of *model* refers to delivery design for promulgating a specific content (e.g., a lecture model, a group-discussion model). A *program*, finally, encompasses everything from "the publicity to the refreshments," including matters of recruitment, delivery design, and evaluation. Programs are "events" in which presentations and materials become an educational experience.

To illuminate some of these matters, this section first considers program content, then issues of delivery methods, then the targeting of programs.

Content

Retirement preparation is preparation for what? There are likely to be a reduction in income, a change in the source of income (Social Security, pensions), changes in roles, increased availability of leisure time, and the possibility of changed relationships with family and friends. These are the things to think about, and while one is at it, there is the opportunity to review other aspects of daily life, like health habits.

The core content for retirement preparation is a remarkably noncontroversial subject in the literature, with extensive overlap among authors. Table 10.1 shows, in no particular order, an inventory of suggested topics for retirement preparation that were gleaned from the literature and examples of packaged programs. This long list can nevertheless be bundled under several general headings that correspond to the likely session material for a multipart program: income and finances, health maintenance, living arrangements, relationships, leisure-time use, and aging and development. Lately there has also been an increased emphasis on employment options. Some of these topics address aspects of preretirement as well as postretirement experience. Indeed, looking over the list in Table 10.1, most of these subjects would contain good life-planning advice for adults of any age, not just people in their fifties and sixties.

Not all topics have equal weight on the preretirement agenda. There is a dual tier of subject matters, with income, health, and leisure in the first, and all else in the second. Morrison and Jedrziewski (1988; also Siegel,

Table 10.1 A Partial List of Topics for Retirement Preparation

- Social Security and Medicare
- Pension provisions
- Savings and investments
- Daily budgeting
- Estimating net worth
- Postretirement employment
- Second careers
- Educational opportunities
- Housing
- Relocation
- Legal considerations
- Estate planning
- Health insurance
- Life insurance
- Careful consumerism
- Avoiding fraud
- Availability of community services
- Marital relationships
- Family relationships
- Eldercare
- Psychological aspects of changing roles
- Use of time
- Volunteering
- Recreation and hobbies
- Travel
- Emotional well-being
- Preventive health, health promotion
- Medications
- Long-term care
- Human development and personal potential
- Widowhood

1986) reported that organizations concentrate their efforts most highly on pensions and Social Security, with less attention to issues of education, housing, and widowhood. There was a parallel ranking for the issues about which firms would like more information. The two tiers of retirement topics correspond to the distinction that is commonly made between *limited* and *comprehensive* content (Kasschau, 1974; Olson, 1981; Research & Forecasts, 1980). Limited programs cover only income matters and perhaps health maintenance, while comprehenisve programs take more time to handle a wider range of material.

One reason that pension and insurance subjects are most prevalent is that programs tend to be developed and conducted by firms' benefits and compensation personnel. And financial subjects deserve first rank in the curriculum, money being older workers' most worrisome concern about retirement (American Association of Retired Persons, 1986). After all, replacement of lost wages by pension and other income is the fundamental factor that enables retirement. Workers facing retirement want income information (Fitzpatrick, 1978), and it is a necessary drawing card for programs.

Writers do caution that to the extent feasible, content should vary with the needs of the particular program group (Kasschau, 1974). Standardized or packaged programs run the risk of boring people with information that some participants may already know (Phillipson, 1981). Pellicano (1977) notes that the polished programs of imported "road shows" still need local staff for interpretation and follow-up. Formal needs assessment as preparatory to program development is rare (e.g., Fitzpatrick, 1978) and presumes a continuity of sponsor resources and commitment to retirement preparation. A broader issue, discussed later in this section, concerns the design and targeting of programs for particular segments of a work force.

Delivery Methods

How should content and learner be brought together? It is over questions such as these, says Lynch (1978), that substantial philosophical and methodological arguments are joined. Writers have noted how models and processes (following Lynch's terminology) can differ in their underlying assumptions about human nature and the human response to retirement (Giordano & Giordano, 1983; Monk, 1979). For example, people can be seen as primarily achievement-oriented, or social, or seekers after meaning; retirement is assumed by turns to be a hazardous event, a void to be filled and managed, or a liberating opportunity. Models and processes can differ in the goals they serve, and the major idea here remains Kasschau's (1974) distinction between a planning (information providing) and a counseling (affect management) emphasis (see also J. Peterson, 1984). Models and processes can also differ in the "postures" they establish for the learner within the educational experience. A lecture type of program, for example, puts participants in an audience posture. Lynch (1978) illustrates how a particular content can be arranged differently, given assumptions about the content-learner relationship. If the topic is leisure time, a program might tell people about their options, or it might set out to explore attitudes toward leisure and lifestyle changes. Ramsey (1984) describes a menu of instructional alternatives for handling financial-planning content, each reflecting a different learner posture.

The different approaches to content delivery can be arranged along a "pedagogy/androgogy" continuum (Lynch, 1978). The distinction here is between children and adults as learners, between learner postures as passive and active, and between leader postures of directing and facilitating. There is no doubt that the sympathies of educational methodologists in retirement preparation favor the androgogical, engaged-learner approaches (e.g., Giordano & Giordano, 1984; Lynch, 1978; Manion, 1976; Phillipson, 1981). This is done on the grounds that something so personal and subjective as the task of preparing the balance of one's life is simply less suited to lecture programs. D. Peterson (1984) has embodied this outlook into a set of seven points for facilitating the learning of older adults.

Lynch (1978) identifies and cites representative examples for several pure types of "process-modes" for conveying preretirement content. Two refer to styles of self-preparation rather than programs. Among programs that assemble participants, two modes are dominant: presentation/audience and stimulus/discussion. The *presentation/audience* mode relies on the lecture or expert speaker for informational input. Except for a question-answer feature, communication flows from presenter to audience, with little interaction among audience members. In its favor, this traditional program model is easy to conceive and convenient to conduct. It is a profoundly familiar way of learning things, though it may also evoke unfortunate memories of childhood (Phillipson, 1981). In the second dominant mode, *stimulus/discussion*, there is informational input to a small group. Along with a stimulus input—by speakers, written materials, tapes—there is reactive discussion among group members. Stimulus/discussion—with more or less structure in either component—lends itself to packaged programs. Some models require highly trained leaders, and some need just conveners.

Lynch also identifies two further process-modes that are closer to the androgogical ideal, but less likely to see extensive use. The *workshop* mode has as its distinguishing quality a shared, task-oriented participation in information-generating activities. Small group activities call upon the diversity of members' information, experience, and understanding; group deliberations are reinforced by regular reporting to the full workshop. In the *facilitated interaction group*, "the emphasis is upon shared concerns and experience as a foundation for a mutually supportive, helping group process" (p. 327). Trained facilitators lead small groups to address attitudes, lifestyle issues, problem-solving skills, and decision-making behavior relative to a particular content.

Discussion of the foregoing techniques emphasizes the human arrangement of leader and learner, but printed and taped materials are also integral to many strategies (Allyn, 1984; Nevins, 1985; TIAA/CREF, 1986). For example, almost all programs in the Research & Forecasts (1980) survey reported the use of printed materials such as worksheets, booklets, and brochures.

A final point regards goals and delivery methods. Just as with content and methods, there is no one-to-one correspondence between particular goals and methods. Programs with a planning function can be served by the lecture, discussion, or workshop modes of Lynch's framework. Counseling functions can be met by appropriately conducted discussion, workshop, or facilitated groups. Programs intended to manage emotional aspects do seem best suited to facilitated interaction groups, but these curricula too will have their informational component (e.g., Bolton, 1976; Manion, 1976; J. Peterson, 1984).

Group-Specific Programs

The literature suggests that programs and the marketing of programs might be more effective if content and methods were tailored to certain segments of the work force, segments that not coincidentally have less access to preparation programs. The social-class composition of participants is one such consideration. Reich (1977) notes that some sponsors conduct separate programs for supervisory and nonsupervisory personnel, this in order to promote optimal discussion of issues. The free and comfortable discussion of finances and personal relationships can be inhibited among persons of different organizational authority and rank (Phillipson, 1981). Moreover, the different income implications of retirement for white- and blue-collar personnel require selectivity in the range of financial advice that may be provided. Olah (1982) has described a union-sponsored program specifically oriented to blue-collar workers.

Different methods may also be in order when targeting preretirement assistance to minorities. Torres-Gil (1984) argues:

> The retirement literature concentrates exclusively on a population that is white, educated, and relatively affluent, implying that techniques and educational methods used by retirement planning specialists for that population can

> be just as useful for individuals who are of a different race, ethnicity, and/or language. (p. 109)

This author offers suggestions for making retirement preparation responsive to minorities' greater planning needs regarding finances and health maintenance. Torres-Gil urges that more minority members be recruited as retirement specialists and that planning materials be sensitive to cultural situations.

The great and special need of women workers for retirement planning has been discussed (Beram & Chauncey, 1987; Block, 1984; Olson, 1981). Women tend to be less knowledgeable than men about their pensions and impending retirement circumstances (Fitzpatrick, 1978; General Accounting Office, 1987; Prentis, 1980), perhaps because they consider themselves to be the secondary wage earner of the marital unit. Careful preparation is particularly important for women because of their greater longevity, risk of widowhood, and vulnerabilty to a sudden retirement in the event of family or marital changes. Block (1984) has outlined content for a model program geared to the needs of preretired women.

Constraints

The hortatory and methodological literature on retirement planning brims with suggestions for desirable program features. Monk (1981) has summarized the ideal demand for retirement preparation: "Programs must be comprehenisve in scope, individualized, and possibly reinforced through multiple program activities." Programs should focus on "the retirement needs of special populations, defined in terms of socioeconomic levels, educational attainment, ethnic background, environmental conditions, and occupational identification" (p. 90).

As important as educational criteria and participant needs are, programs are more likely to be structured according to available resources and the sponsor's existing training procedures (Phillipson, 1981). For example, the attendance of the preretiree's spouse—something universally urged—is not helped if companies schedule their program during the day when working spouses cannot attend (Reich, 1977). Glamser (1981) concluded that so long as brief programs are the norm, the effectiveness of comprehensive programs will be largely an academic question. Retirement planning is not a high-priority matter in most large corporations (Research & Forecasts, 1980; Siegel, 1986). In such a climate, group programs with a counseling emphasis, which entail greater administrative complexity, are not likely to be competitive with planning types of programs that can more conveniently handle people in large batches. Besides, companies in general "avoid intruding into the private affairs of employees and dealing with their intense feelings" (Reich, 1977, p. 40; Hodges, 1982).

One interesting example of how program development is channeled by practical considerations can be read from a series of articles (Fitzpatrick, 1978, 1979, 1980) in the National Council on Aging (NCOA) journal, *Aging and Work*. These articles summarized an NCOA effort to design a widely useful retirement planning program. A consortium of nine major corporations and four large unions cooperated with NCOA in the design of a multiple-module program that would include certain characteristics important for its versatility and, one can infer, its marketability. For instance, it would have far more of a planning than a counseling emphasis. It was designed to accommodate any mix of blue- and white-collar workers and to be appropriate for employees aged 40–70. The program would not require experts or highly trained leaders. Each "materials-based" module came with detailed instructions for leaders, including scripts of what to say and do. Each module also came with "measurable human performance objectives," so that programs could easily be evaluated. The program's design also built in the capacity for revision. (And it has been revised considerably. Readers can consult NCOA about current features.) In all, the project illustrated compromises with ideal educational principles in favor of enhancing the applicability of the package and perhaps the availability of these services.

EVALUATION OF PROGRAM OUTCOMES

The subject of evaluation for retirement preparation programs is confined in the literature almost exclusively to the evaluation of program outcomes at the level of the individual. This focus is not the only kind possible. Programs may be evaluated as *events*, where participants are asked at the conclusion to rate the quality of the presentations, content, location, handouts, and so forth. This is a necessary and useful adjunct to ongoing program development. Another kind of evaluation judges the utility of the program as it meets sponsor or specialist objectives per se. However, Kasschau (1974) commented—and it is still true—that there has been little confirmation of such assertions that programs boost morale and productivity, encourage workers to retire, or benefit the corporate image. It is entirely possible for programs to be marginally useful to participants but quite successful by sponsor criteria.

Evaluations of program outcomes for participants are of two kinds: research that follows up the participants of particular programs and population surveys about program participation. An example of the latter post hoc approach was the survey by Greene, Pyron, Manion, and Winklevoss (1969). In either case, readers who consult this literature will ultimately want to generalize across programs that will, at bottom, have many incommensurable features, such as goals, methods, content, intensity, and participant mix.

Considering studies of individual programs, Kasschau (1974) again provides a point of departure: "The definitive evaluation of retirement preparation programs must wait until such time as these programs are systematically conceived, designed and implemented, and until rigorous experimental research procedures are employed that include participant randomization and long-run follow-up techniques" (p. 44). This was a strong assessment, but subsequent commentary on the state of evaluation studies has been no less harsh (Atchley, 1981; Palmore, 1982; Slover, 1982).

Evaluation Design

The ideal design for evaluating program outcomes would have these features: Most importantly, the program(s) under scrutiny should from the outset, have explicit, appropriate goals that are further specified into expectations about the participants' knowledge acquisition, behavioral change, and/or attitude change (Jackson, 1984). Even better are a set of performance objectives (e.g., Fitzpatrick, 1980) against which the success of the program can be defined. For example, a sufficient proportion of participants should have made a financial plan or increased in their knowledge about Medicare or grown more favorable toward retirement. Without clear goals and objectives, and research appropriately designed to assess them, programs may be evaluated unfairly for things they do not try to accomplish (Kasschau, 1974). Of course, the more modest the objectives, the easier it will be to claim program success.

Samples should be large enough to afford power for statistical tests, especially because data may contain considerable measurement error. Next to clear objectives, the key design feature of the ideal study would be to randomize individuals between program participation and assignment to a control group. The self-selection of participants into programs confounds evaluation (Campione, 1988). A program overstocked with eager participants predisposed to retirement planning can exaggerate how successful a program might be with the general run of workers. The same situation, however, might bias evaluation toward the conclusion that there were only marginal gains in knowledge or attitudes—this because participants will have come already somewhat prepared and wanting their thoughts and ideas only confirmed by the program's expertise (Phillipson, 1981). Use of comparison groups with similar social characteristics does not really mitigate the issue of self-selection. Evaluation of programs with no control or comparison group is very difficult indeed.

Instrumentation must be appropriate, and dependent or outcome variables should be a fair test of program objectives. Ideally, there should be preprogram assessment of the outcome measures that is uncontaminated by recruitment-related information or promises. Follow-up assessments should be scheduled to allow participants enough time to accomplish program objectives for behavioral or attitudinal change. If a program aspires to effect better adjustment to retirement, then the evaluation design must incorporate the considerable task of long-term follow-up. A final design feature for the ideal demonstration of program effectiveness would be to conduct evaluation studies across classes of workers, industries, or regions, while keeping constant aspects of program methods or content.

The foregoing set of standards for rigorous program evaluation, which are encountered with some frequency in the literature, are, when taken together, extraordinarily difficult to fulfill—more so when considering such research problems as sponsor constraints on design and use, suspicions of research participants, and program dropout and intermittent attendance (Palmore, 1982).

Specific Studies

Perhaps because of these obstacles, there have been remarkably few evaluation studies reported since the mid-1970s (though undoubtedly every program that consumes a sponsor's resources is "evaluated" in some fashion, if only informally). A pair of studies by Glamser (Glamser, 1981; Glamser & DeJong 1975) are often cited for their two conclusions: that a comprehensive preretirement program can bring about short-run changes in retirement-related knowledge and behavior, but the long-term impact on the retirement experience is in doubt (see also Abel & Hayslip, 1987). In the first study by Glamser, the older male work force of a glass manufacturer was assigned to a control group or to one of two experimental groups, depending on plant location. One group participated in a comprehensive eight-session group-discussion program with a planning emphasis. The other group received a half-hour individual briefing about benefits. Rates of participation in the two interventions were 62% and 71%, respectively. The four-week posttest compared knowledge, attitudes, and behavior between 19 discussion-group participants, 40 men who received the briefing only, and 20 controls. (A curious feature of the study was that program nonparticipants were nevertheless included in the posttest report.) Compared to the others, the group-discussion members proved to be more knowledgeable at the posttest and had undertaken more preparation activities. Effects of the individual briefing were minimal. Neither intervention had a strong effect on attitudes, but uncertainty about the future may have been reduced somewhat. Finally, participants were very pleased with the assistance they had received.

Glamser (1981) later followed these same persons into retirement, resurveying them six years after the program had ended. This time, groups did not differ on measures of life satisfaction, retirement attitudes, work attitudes, or reported preparedness for retirement. Allowing for limitations of the study, Glamser concluded that "the true value of retirement preparation programs may lie in the help that can be provided when it is needed—during the preretirement stage" (p. 249). These were sobering results, but Palmore (1982) has pointed that this may have been too negative an interpretation of the findings.

Another study cited with some frequency was Tiberi, Boyack, and Kerschners's (1978) comparison of four program models. The models, labeled according to Lynch's (1978) framework of delivery formats, were facilitated interaction, semi-structured stimulus/discussion, presentation/audience, and individual/resource. In order, they represented a rough continuum of decreasing intensity and opportunity for group discussion. Several hundred persons volunteered to participate in the four programs; a comparison group of persons willing but unable to participate was included in the design. Complete pretest and three-month follow-up data were available for 295 (56%) of the original volunteers. The authors carefully acknowledged issues of self-selection and selective attrition among program participants. Groups were compared on nine factor scores said to measure behavioral, informational, and attitudinal change. In general, participants in the more intensive programs had more favorable pre- to postprogram changes in behavior and information. Tiberi et al. (1978) did misinterpret their findings in one respect. In regression models that covaried pretest scores, the presentation/audience and individual/resource groups had a number of negative coefficients on change. While the authors interpreted this absolutely as showing "negative change," the proper interpretation would be that these groups showed less change relative to other groups. The author's unwarranted conclusion about the "inappropriateness" of these models has been cited in the literature as an argument against lecture models.

Though not an evaluation of specific program goals, Palmore (1982) compared 33 participants in a comprehensive planning course with 33 age- and education-matched retirees from a panel study of aging who had not had a preretirement course. Program participants were university employees who had attended a 10-session course, had later retired, and had contributed data from preprogram and postretirement surveys. Data for the comparison group came from pre- and postretirement waves of their panel study. The outcome, "adjustment to retirement," was indexed by several measures of general well-being (self-reported health, life satisfaction, affect balance, social integration). For half of these measures, findings showed that relative to the comparison group, program participants had more favorable changes in levels of well-being. Again, because of self-selection, the marginally greater well-being of the university retirees cannot be conclusively attributed to their having taken a preretirement course.

There are also reports of evaluation studies with weak designs and unwarranted conclusions (Turnquist, Newsom, & Cochran, 1988) or studies designed in such a way that they could not fail to be complimentary to the program under review (Fitzpatrick, 1979; Morrow, 1981). In addition to participant self-selection, these designs entail testing for outcomes (e.g., reading about retirement) that were program exercises in the first place.

In all, this handful of evaluation studies holds no ringing endorsement of the effectiveness of preparation programs, but the studies nevertheless have been encouraging about the ability of more intensive models to increase knowledge and planning behaviors, at least in the short run. The available evidence justifies only modest expectations that programs can bring about favorable outcomes for individuals.

CONCLUSION

This survey of the retirement preparation literature has outlined conceptual issues regarding the objectives, providers, and formats for these activities, and it has reviewed research on the prevalence of preparation and the evaluation of program outcomes.

In their proper perspective, organized preparation activities are a service or resource offered to people who are—with varying degrees of thoroughness—already preparing themselves for later life. For older workers who have passed their middle years expecting or expected to retire, readiness for retirement is a motif of advancing age. As a service, the objectives of retirement planning are usually described in terms of benefit to individuals, either providing people with information that helps them plan their future or perhaps assisting them with the emotional management of the retirement transition. Yet retirement preparation activities also serve their sponsor's institutional interests, of which the benefit to individuals may be only one among other objectives.

Estimates of the prevalence of retirement preparation are clouded by imprecise measurement. Most people facing retirement give it some thought, but only a minority admit to careful, serious planning, and these tend to be among the more economically and socially advantaged workers—white men with higher incomes and happier pension prospects. Not coincidentally, these workers are also likely to have employers who, as part of a progressive benefits package, sponsor a formal retirement preparation program. Program offerings are more numerous in large companies or organizations, yet even here, surveys show that most large employers do not have formal preparation programs in place. While proud of the progress that has been made, the retirement planning field is far from satisfied with the range of people it is reaching.

Programs are provided by different kinds of institutional sponsors, not just employers, and programs are developed and delivered by specialists who have varying skills and knowledge. While some programs are more comprehensive than others, the core content of information and topics covered by preparation programs is fairly settled and predictable. What has been debated in the literature are the methods of program delivery, the models and formats that bring content and learner together (e.g., group-discussion versus lecture formats). Potential providers can now consult a large body of available curriculum materials. Several factors ultimately shape the design and conduct of programs: educational criteria, participant needs, specialist abilities, and (not the least) sponsor interests and resources.

Solid demonstrations of program effectiveness would greatly help the field to achieve its goal of reaching a wider audience. The few existing evaluation studies, which are encouraging about the short-run usefulness of planning programs, have been criticized for their limitations. Evaluation research, however, is easier said than done when the principles of rigorous evaluation design confront the circumstantial constraints under which programs are conducted. The field stands in great need of institutional support or sponsorship of proper evaluation studies.

It is usually said that there should be more people getting more and better preparation for retirement. Will there be? The literature carries impressive arguments about the importance of, and need for, comprehensive planning. These arguments, however, need to be reconciled with the widespread evidence that most retirees claim to have satisfactory retirements without the benefit of organized preretirement preparation. The literature also establishes quite clearly that there is a solid market for retirement preparation services among some segments of the work force and some corporate cultures. However, there is no strong evidence of movement or development in this market over the last dozen years. Surveys of large firms continue to roll out the same findings. The field can nevertheless feel confident that there is no shortage of suggestions for program design and no shortage of willing providers. Indeed, it has been observed that there may be more persons who want to be retirement planners than want to plan their retirement.

One point that has not been emphasized in the literature is a possible limit to the market for retirement preparation services. Some individuals are not fitted by their personalities to be conscientious about or plan for the future. Studies illuminating the relationship between personality and planning would be welcome. Other individuals have been socialized by experience to appreciate that much of life, due to social or economic disadvantage, is beyond their control. The notion that it is unreasonable or futile to plan for retirement was revealed in a recent national survey of workers aged 40 and older (American Association of Retired Persons, 1986). Telling numbers of respondents agreed "very much" that It's no use planning for something like retirement because we can't control the future—we just have to take things as they come (18%); I have plans for retirement, but changes in my life over the years keep forcing me to change those plans, so I'm not sure I can carry them out (15%); I have so much trouble managing things now that there is no way I can think about retirement (12%). Can retirement preparation services reach such individuals?

Hardheadedness about the limits of retirement planning would also befit the research literature on work and retirement, where articles routinely carry airy conclusions that "the findings have implications" for retirement planning. They may, but this shopworn idea can also perpetuate condescension toward practice. A better relationship between research and practice could be forged if one did not presume upon the other.

As for the future, entrepreneurial providers are likely to take an increasing share of the planning action, moving to package their services more attractively for employers and aggressively to market their expertise directly to workers who are receptive to the idea of planning, which is, most profitably, financial planning. There is the possibility that such promotions might actually expand the demand for planning services, much in the same way that the developers of retirement communities in the 1950s not only built houses but also, by their shrewd salesmanship, built markets for their houses (Calhoun, 1978). Yet the field will thrive on more than salesmanship. There must continue to be expanding knowledge about the meaning and experience of retirement, more creative ways of knitting educational ideals with sponsor constraints, and continued respect for the human potential of people who are facing their later years.

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CHAPTER 11

Policy and Program Options in Community-Oriented Long-Term Care

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Proposals for major reforms in the organization, delivery, and financing of long-term care for the aged and disabled increasingly dominate federal and state health-policy debates. Innovative programs and large-scale demonstration and research efforts have focused attention on expanding community-oriented long-term care (CLTC). This review examines findings from national surveys, evaluations of CLTC demonstrations, and early returns from emergent comprehensive models with a focus on the lessons and challenges presented by CLTC for health-care practitioners and clinical research. The first section summarizes the major criticisms of the current delivery system for long-term care and defines two sets of conclusions derived from studies of programs intended to improve this system.

CRITICISMS OF THE CURRENT LONG-TERM CARE SYSTEM

The long-term-care debate is in part a response to changing demographic trends and resulting increases in demand for care. The aged, and in particular the oldest-old, will continue to be a growing share of the population (Soldo & Manton, 1985). Elders will dominate the consumer market for medical care well into the next century (Rice & Feldman,

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1983). Even greater growth in demand for long-term-care services is anticipated, however, because of changes in family structure and medical-care outcomes (Verbrugge, 1984). These future long-term-care users are also expected to have both greater economic and fewer informal care resources than current users (Rivlin & Weiner, 1988).

This demographic challenge is made more difficult by the absence of a federal policy for long-term care. Medicare provides limited coverage for nursing homes following an acute-care stay and skilled home-health services within narrowly defined situations (Davis & Pritchard-Pullins, 1987). Individuals requiring ongoing provision of related though less intensive services must in general pay for them out-of-pocket until they exhaust their resources and qualify for Medicaid (Branch, Freidman, Cohen, Smith, & Socholitzky, 1988). As a result, Medicaid has been the major public payor for extended nursing-home care and nursing homes absorb the largest share of Medicaid expenditures on behalf of the aged.

Rivlin and Weiner (1988) combine demographic trends, utilization experiences, and assumptions about economic conditions to project annual spending on long-term care for various periods. Assuming current policies, they project annual spending of $33 billion on nursing-home care during the 1986–1990 period in constant 1987 dollars, with 42% of these costs absorbed by Medicaid, 2% by Medicare, and the remainder primarily by individuals. With these assumptions, total annual Medicaid expenditures in the 2016–2020 period are projected to exceed $46 billion in constant 1987 dollars, or 47% of total expenditures (Rivlin & Weiner, 1988).

Such projected increases in public and private costs for nursing-home care have been alarming, not only because of their magnitude but also because of lingering dissatisfaction with the quality of institutional providers (Institute of Medicine, 1986). Nursing homes have been criticized for failing to address adequately the medical, rehabilitation, and psychosocial needs of elders. At the same time, there was a perceived imbalance in public funding between institutional and community long-term care. As a result, federal, state and local government spending on CLTC has increased more rapidly than on nursing homes since 1980 (Lipson, Donohoe, & Thomas, 1988). Contributing to this growth are the Medicaid 2176 Home- and Community-based Care Waiver programs that provided access to case-managed personal care and related services in 34 states by 1985 (Laudicina & Burwell, 1988). Nonetheless, for most elders, Medicaid and other state-administered programs provide a still-fragmented, overly expensive, and often inadequate supply of community alternatives to nursing-home care (Justice, 1988). More affluent elders have been encouraged to purchase private long-term-care insurance, but the available plans have been criticized because of high costs, low loss ratios, and restrictive or underdeveloped enrollment and underwriting criteria (Firman, 1988).

The impetus to fill the federal policy void has come in part from medical-care providers as they adjust to a new environment. Hospital and nursing-home ownership has become increasingly centralized and proprietary (Sirrocco, 1988; Starr, 1982). New financing and reimbursement approaches have required new economic perspectives on clinical practice. Medicare's Prospective Payment System (PPS) has encouraged nationwide reductions in hospital lengths of stay (Sloan, Morrisey, & Valvona, 1988) although the implications of this change for the quality of care are debatable. Managed-care systems, such as health maintenance organizations (HMOs), have grown within the Medicare and Medicaid programs. These plans tend to enroll elders with slightly better health status (Luft & Miller, 1988) and lower current or prior medical and nursing-home use (Rossiter & Langwell, 1988) than users of the fee-for-service system. Nonetheless, for competitive health plans, financial survival has often been dependent on the ability to substitute long-term-care use (both covered and not) for more expensive hospital and outpatient medical care.

The long-term-care delivery system in the United States faces new challenges because of demographic changes and the social transformation of medical care. Yet many believe that an absence of federal policy has created a "nonsystem" that is unprepared to meet these new demands. Long-term care will become increasingly costly because of overreliance on institutional service, the poor quality of institutional care, and inequitable access to often inadequate CLTC alternatives.

LONG-TERM-CARE REFORM AND RESEARCH FINDINGS

In response to these concerns with the current long-term-care system, a number of approaches to reforming the long-term-care system have been suggested. These proposals have had the opportunity to be informed by a growing body of findings drawn from CLTC demonstrations. Proposals have tended to reflect contrasting interpretations of these findings as presented in several major reviews. Capitman (1986) summarized the evaluations of the Medicaid 1115 waiver and Medicare 222 waiver experiments that explored changes in restrictions on eligibility for publicly financed care and the type, duration, and scope of covered services in order to offer coordinated community-oriented systems of long-term care. Kemper, Applebaum, and Harrigan (1987) and Weissert, Cready, and Pawelak (1988) reviewed a broader series of studies including the National Long-Term Care Demonstration (Channeling) and the Medicaid and Medicare projects that were its predecessors. Kane and Kane (1987) conducted an ambitious review of the effectiveness of institutional and community long-term care.

These reviews have focused on largely the same series of studies, and there has been little controversy regarding the quality of the evidence available or the basic cost-effectiveness and clinical efficacy findings. Reviewers differ, however, regarding the conclusions to be drawn. Proposals for reform of the long-term-care system reflect these differing perspectives. Two broad categories of proposals may be identified: *enhanced financing* for existing delivery approaches and expanded financing of *integrated delivery systems.*

ENHANCED FINANCING PROPOSALS

Some proposals are based on the perception that increased financing for CLTC may be desirable but will not significantly influence the overreliance on Medicaid by the nonpoor or spiraling nursing-home expenditures. These conclusions are consistent with the dominant interpretation of the demonstration findings as presented in the prior reviews:

- CLTC does not offer cost-effective alternatives to nursing-home care, except perhaps when offered to Medicaid-enrolled nursing-home applicants under strict cost controls;
- Nursing home use is difficult to predict and even harder to influence; and
- CLTC services may improve the quality of life for users and their informal caregivers without influencing medical or functional outcomes.

As Kemper, Applebaum, and Harrigan (1987) suggest, the major lesson from the demonstrations was that we must seek to justify CLTC on grounds other than cost-effectiveness or clinical efficacy: the debate should focus on how much community care we are willing to purchase as a society rather than how much money we can save by purchasing these services.

Consistent with this interpretation, some long-term-care reformers recommend new mechanisms for public and/or private financing of the current delivery system. Proposals of this type include further extensions of Medicare to cover long nursing-home stays (two years or more), extension of Medicare coverage to particular services (e.g., adult day health care), and changes in tax- and pension-policy treatment of private long-term-care insurance to increase incentives for individual and corporate participation (Leutz, 1986; Leutz, Capitman, Abrahams, Pendleton, & Omata, 1989; Rivlin & Weiner, 1988). All of these approaches have focused on one criticism of current long-term-care policy: the absence of affordable mechanisms for private payment for long-term care results in the impoverishment of users and their resulting overreliance on Medicaid.

INTEGRATED DELIVERY SYSTEM PROPOSALS

A second set of proposals arises from a different interpretation of the results of CLTC experimentation, though the basic pattern of findings is not disputed. These proposals begin from the observation that chronic-care needs are intertwined with underlying medical and psychosocial conditions. Expanding CLTC through social-service interventions may alter utilization for some stable chronically disabled and socially isolated subgroups, but for much of the diverse long-term-care population, effective treatment will require multidisciplinary clinical practice and integrated medical- and supportive-service delivery systems. According to this perspective, a critical review of the demonstrations suggests that such delivery systems remain largely untested. Specific survey and demonstration findings thus receive increased attention, including

- CLTC participants used more medical care than the general aged population; while Medicare hospital and physician costs were substantially greater than long-term-care costs;
- CLTC demonstrations devoted the vast majority of service expenditures to provision of paraprofessional home-care services and did not increase the intensity or duration of skilled home-care services;
- While CLTC demonstration case managers were able to allocate services within cost cap limits when required, neither the intensity or service components of care plans were predicted by client demographic, functional, diagnostic, or informal support features; and
- CLTC services offered to Medicaid nursing-home applicants did reduce nursing-home use, particularly when other sources of paraprofessional home care had limited availability.

This view of CLTC results suggests that it is premature to conclude that expansion of coordinated community-oriented services cannot influence utilization or outcome patterns for long-term-care patients, since available studies have focused almost exclusively on a supportive-service model. Further, there are major issues in clinical practice, resource allocation, and coordination with medical-care providers that remain to be elucidated.

Proposals reflecting this perspective focus on development of *integrated delivery systems* by recommending increased availability of comprehensive programs that combine both financing and delivery for acute- and long-term-care services. In the Medicare and Medicaid fee-for-service context, integrated systems would go beyond enhanced financing to develop multidisciplinary care-management services accessed at major points of transition between medical and long-term-care use, such as hospital or nursing-home discharge. But prepaid plans, financed through pooling of Medicare, Medicaid, and private funds, that offer a broad spectrum of medical and supportive services better exemplify this approach.

While a broad consensus has emerged regarding the basic findings on sample characteristics and treatment effects on utilization and other outcomes from the completed CLTC demonstrations, the interpretation of these findings and conclusions regarding their implications for practice and policy formation are still being disputed. Most analysts have focused on the absence of cost-effectiveness in the findings and thus suggest that policy be directed to enhancing financing for both nursing-home and home-care services. Others, by contrast, note the limited range of new interventions that have been tested and the evidence for cost-effectiveness of services for narrowly defined subgroups. From this perspective, CLTC research findings challenge practice and policy development more appropriately to address the heterogeneous and changing medical and social needs of long-term-care users through integrated delivery systems.

LONG-TERM-CARE USE IN THE CURRENT SYSTEM

Research findings both from studies of long-term-care use in the current system and evaluations of the CLTC demonstrations that are most relevant to the delivery-system-integration perspective, have received inadequate attention. Considered in this first of three sections are data on the factors that appear to determine formal service use by the long-term-care population. Evidence for the diversity of long-term-care users and the varied features of their utilization careers are also highlighted. The second section reviews organizational characteristics and practice approaches in the CLTC programs featured in earlier reviews as well as the findings from newer programs exploring system integration. The third and final section discusses potential areas for future CLTC research and program development.

Determinants for Long-Term-Care Use

The long-term-care population has generally been characterized by the need for supportive services over an extended period (Callahan & Wallack, 1981). Attention is most often focused on the use of human assistance in performance of daily living or personal-care activities (Katz, Ford, Moskowitz, Jackson, & Jaffee, 1963), cognitive, affective, and instrumental or home-management activities impairments (Pfeiffer, 1975), and extended requirements for particular skilled treatment or educational services have also been used to characterize this population.

Pollak (1973) suggested the primary conceptual framework for relating the level of disability in these factors to setting (home or facility) and intensity of long-term-care use. In this framework, individual needs for long-term-care services are assumed to be relatively static, but the intensity of formal care requirements and likelihood of nursing-home use increase with disability. Data from nationwide surveys and smaller-scale studies provide partial support for this framework. These data also highlight the need for a more complex model of the determinants of formal long-term-care use.

Multiple Causes for Formal Long-Term-Care Use

Nursing-home residents are more likely to be disabled in personal-care activities than community residents. The 1984 Supplement on Aging to the National Health Interview Survey indicates that about 10% of the over 26 million persons then living in the community and aged 65 and above received help in personal care, while about 22% received help in household management (Stone, 1986). In addition, about 1.3 million or about 4.6% of the population aged 65 and above were residents of nursing homes on any given day, according to the 1985 National Nursing Home Survey (NNHS) (Hing, 1987). Among these nursing-home residents, 92.4% required human assistance in personal care. About 934,218 of the nursing home residents in 1985 and 1,429,000 of the 1984 community residents aged 65 and above needed assistance with three or more personal-care activities, while 368,424 and 3,308,000 of the 1985 nursing-home and 1984 community residents, respectively, required assistance with one or two personal-care activities. These data suggest that factors other than personal-care or instrumental-activities deficits determine long-term-care use, since even among the most disabled, there are higher proportions in the community than facilities.

At least three other determinants of formal long-term-care use are suggested by cross-sectional national data: age, receipt of informal care, and medical conditions and associated acute-care use. These three factors have consistently emerged in longitudinal studies of nursing-home use, though other factors such as community characteristics, bed supply, Medicaid nursing-home admissions criteria, availability of specific services, and poverty have been noted as well (Branch & Jette, 1982; Shapiro & Tate, 1988).

Age and Service Use. The proportions of the aged population who experience functional problems and institutionalization increase dramatically with age. In 1984, for example, 78% of the 65–74-year-old female community residents experienced no disabilities. By contrast, only 18% of the females aged 85 and above residing in the community experienced no disability (Manton, 1988). Further, while about 1.3% of the 65–74-year-olds were nursing-home residents at some time in 1985, 21.9% of those aged 86 and over were in nursing homes that year. The effect of age on institutionalization remains after correcting for differences in rates of mortality and functional disability within age cohorts (Hing, 1987; Manton, 1988).

Informal Care and Service Use. Informal caregiving appears to moderate the effects of disability on nursing-home use. Most aged disabled persons in the community receive most of their care from informal sources such as spouses, other family members, and friends (Brody, 1985). Data from the 1984 Health Interview Survey Supplement on Aging indicate that among those who were moderately to severely limited in daily activities, those who lived alone were more than twice as likely as those living with others to use formal services (Stone, 1986). Comparisons of nursing-home and community residents also highlight the effects of informal caregiving: community residents were three times as likely to have a living spouse as nursing-home residents in 1985 (Hing, 1987).

Illness and Service Use. Complex patterns of acute and chronic illness may represent the underlying cause for both disability and medical-care use (Soldo & Manton, 1985). As a result of changes in medical practice, receipt of medical care may also have a direct influence on long-term-care use. It has been noted that the relationships between illness, disability, acute-care use, and long-term-care use have received inadequate attention (Eggert & Friedman, 1988). Nonetheless, the incidence of disability in personal-care activities has been related to morbidity. Data from the National Medical Utilization and Expenditures Survey, for example, showed that restricted activity days and limitations in activities were far higher among those with particular medical conditions, including stroke, arthritis, hypertension, ischemic heart disease, and respiratory problems (Pope, 1988; Soldo & Manton, 1985). While these are among the most common diagnoses for elders, several analyses indicate that they are also associated with acute hospital recidivism and resulting catastrophic medical-care expenditures (Gooding & Jette, 1987; Gruenberg & Tompkins, 1986). Further, disability has appeared as a major predictor of physician and hospital use, and the disabled are far more likely to use these services than other elders (Mutran & Ferraro, 1988; Wan, 1987).

Nursing-home use is intimately linked to acute-care use. The majority of 1985 nursing-home residents were admitted from another health facility, with 45% entering from a hospital or mental-health facility and 12% from another nursing home. By comparison, 40% of patients were admitted from the community (Hing, 1987). Most individuals discharged alive from a nursing home in 1985 went to another health facility, with 54% going to hospitals and 11% going to another nursing home. At the same time, the effects of changes in medical-care practice in response to PPS are evident in admissions patterns for nursing homes and home-health-agency services. The proportion of residents entering these settings from hospitals increased significantly over the rate observed before the introduction of PPS (Meiners & Coffey, 1985; Morrisey, Sloan, & Valvona, 1988). Seksceski (1987) also showed that for 1985, as compared to 1977, a greater proportion of those discharged from nursing homes were deceased, and a larger share of those discharged alive went to hospitals or other facilities. Together, these data are suggestive of an emerging medical-care system role for all long-term-care providers.

Less information is currently available about the roles of medical conditions and medical-care use in use of community services. Neither national nor state data have been adequate for tracking movement between acute and CLTC systems (Justice, 1988; Lipson, Donohoe, & Thomas, 1988). Manton and Hausner (1987), however, merged Medicare-utilization and expenditure histories with assessment data for a sample of Medicare enrollees. Medicare-reimbursed home-health services were used by 11% of the chronically disabled populations, while 53% of Medicare home-health users were chronically impaired. Manton and Hausner's (1987) analysis suggested that home-health use is related to both disability and acute exacerbation of chronic illness.

Diverse Population with Changing Service Use

The relationships between morbidity and functional impairment have not been explored fully. Yet it appears that the long-term-care population is more diverse and its service-use patterns characterized by more transitions in setting, level, and sources of care than Pollak's conceptual framework or CLTC demonstration planners had anticipated (Weissert, Cready, & Pawelak, 1988). Specifically, diversity in the duration and outcomes of both nursing-home and community care have been documented, and broad variation in the intensity of service needs have been shown in both settings.

Duration and Outcomes of Nursing-Home Use

Diversity among nursing-home users with regard to the duration of stay and the outcomes of care has been well documented. Keeler, Kane, and Solomon (1981), Liu and Manton (1984), and Manton, Liu, and Cornelius (1985), using data drawn from the 1977 National Nursing Home Survey, concluded that the nursing-home population was at least bimodal with respect to length of stay. Liu and Manton's life-table analysis showed that 52% of nursing-home patients remain in the facilities for three months or less and that about 16% have been in the facilities for a year or more prior to discharge. Medicare as the primary payor at discharge was associated with shorter stays, while Medicaid payment was associated with particularly long stays. These analyses have not been updated using the more recent 1985 National Nursing Home Survey, where the inclusion of data on both admission and discharge primary source of payment should help to clarify the relationships between payor, length of stay, and outcomes.

Several studies by Kane and his colleagues examined length of stay and other outcomes for residents in California nursing homes. Lewis, Cretin, and Kane (1985) followed discharges from 24 facilities for up to two years. The majority of study participants experienced multiple admissions: less than 10% of the sample had only one admission and survived the two-year study period. Kane, Bell, Reigler, Wilson, and Keeler (1983) examined a sample of 217 persons admitted to four California nursing homes. Stability was more common than change after three months in the facility: 43% were still residents after three months, 8% had died, and the remainder had been discharged alive. Large differences were noted among the facilities in the proportions experiencing various outcomes. Paralleling the findings from national samples, these results underscore the variation in nursing-home length of stay and outcomes.

CLTC Duration and Outcomes

Less information is available on variations in CLTC duration of stay and other outcomes. Longitudinal data from national surveys such as the two-year follow-up of participants in the NLTCS and the Longitudinal Study of Aging show that significant proportions of those receiving community services in the initial surveys were still in the community but not receiving formal services or living with caregivers at follow-up (Bishop, 1987; Kovar, 1988). Transitions in functional levels, and thus the implied need for formal or informal support, have been examined in some detail by Manton (1988) using the NLTCS. Manton disaggregated the 1982 sample by functional levels and traced transitions in disability levels, institutionalization, and mortality over the two-year period. Parelleling Bishop's (1987) findings on caregiving transitions, results suggested extreme heterogeneity in functional change among community residents. Overall, death and functional improvement, rather than institutionalization, are the major forces of decrement to the population. Manton also noted differences by sex and age in patterns of functional change and mortality. These analyses do not take shorter-term fluctuations in functional level or setting for care into account. Further, the absence of detailed Medicaid and social-service utilization data makes it impossible to trace the relationships between service use and the heterogeneous patterns of functional change.

Because of the NLTCS sampling approach, it is possible that individuals with short-term disabilities associated with acute episodes have been overrepresented and the dynamic nature of long-term-care needs exaggerated. But Capitman and Arling (1986) traced transitions in level and setting for care experienced by control-group participants in the South Carolina Community Long-term Care demonstration. Participants were observed for 12–48 months, depending on their admission year. Since participants were eligible for Medicaid and qualified for nursing-home coverage, they might be expected to represent the more stable, long-term nursing-home users. Analyses of the first episode of use after initial assessment and placement in a nursing-home or home-care setting found that change rather than stability was the norm. For example, 76% of the intermediate-care group initially placed in the community survived at least one transition (hospitalization, nursing-home placement, improvement in level of care, or deterioration in level of care). Most of these transitions occurred within six months of initial placement.

Intensity of Service Needs

Heterogeneity of service needs on a daily basis also characterizes the nursing-home and home-care populations. A number of studies have proposed case-mix measures that relate patient characteristics to the intensity of nursing and aide resources used daily as a basis for quality assurance and reimbursement system reforms. Nursing-home case-mix measures have emerged from studies using diverse methods. As a result, there are notable differences in the number of resource-intensity groups derived and their features. Even with these differences, two findings emerge consistently (Arling, Nordquist, Brandt, & Capitman, 1987; Cameron, 1985; Fries & Cooney, 1985). First, all studies find that both personal-care disabilities and requirements for medical/nursing treatments or procedures account for the explained variance in daily resource use. Second, all studies have found five to six times more nursing and aide service delivered to the most disabled groups than to the least disabled groups in nursing homes.

While there have been fewer case-mix studies in CLTC, the variations in resource use among groups appear comparable. Manton and Hausner's (1987) analysis of the Medicare home-health service use by NLTCS participants showed intensity of home-health services varying sixfold between the least and most needy groups. Fries, Foley, Cooney, and Schneider (1986) studied the case mix of publicly financed community long-term-care-program participants in New York, finding more subgroups than observed in nursing homes but a similar range in the intensity of service use. Capitman, Arling, and Bowling (1987) attempted to explain variance in home-care use among those diverted to the community in Virginia, using a case-mix measure developed for nursing homes. They observed broad variability in service intensity within each nursing-home case-mix group. Administrative factors such as Medicaid enrollment status and location at assessment were more predictive of service intensity than were client demographic, functioning, and informal-support characteristics.

Viewed in the context of new data on the complex determinants of formal long-term-care use, the nursing-home and home-care case-mix studies provide evidence for the variable and changing needs that typify the long-term-care population. This picture requires further elaboration, since research that jointly considers variations in daily service intensity, duration of care, and outcomes of care is still unavailable. Nonetheless, the findings reviewed above suggest that formal long-term-care use is determined by a broad array of individual and delivery-system features. Functioning and demographic factors alone appear inadequate in determining the likelihood or intensity of service use. Further, for much of the user population, the progress of underlying medical and social conditions results in relatively frequent changes in both functioning and care requirements.

MANAGING SERVICE USE IN ALTERNATIVE SYSTEMS

This emerging description of long-term-care populations differs from that available to planners of early CLTC efforts and directs attention to the management of changing needs through successful coordination with acute-care providers. Most analysts have focused on reviewing demonstration findings related to the costs and outcomes of CLTC, and several of the newer programs consistent with the delivery-system-integration perspective have not been reviewed. This section first examines whether the structural and operational characteristics of the CLTC demonstrations supported a capacity to manage service use for diverse and changing long-term-care patients and, second, focuses on early returns from hospital-based CLTC and comprehensive medical and long-term-care systems.

Operational Features of CLTC Demonstrations

The crucial challenge for developers of CLTC systems has been to show the potential for cost-effective alternatives to existing approaches. Other outcomes, such as improved functioning or greater life-satisfaction for participants as compared to users of existing systems, were viewed as desirable by-products but of far less consequence to policy development. This characterization is particularly relevant to the National Long Term Care Demonstration (Channeling) and its precursors, the 12 Medicare 222 or Medicaid 1115 waiver demonstrations. These are the projects that have received most attention in prior reviews (Capitman, 1986; Kane & Kane, 1987; Kemper, Applebaum, & Harrigan, 1987; Weissert, Cready, & Pawelak, 1988) since they combine both provision of case management and at least some expansion of public financing for community-oriented services. Yet examination of the organizational features, client-identification and selection (targeting) procedures, and service-allocation patterns of the demonstrations suggests that with notable exceptions, they had few of the design features needed to achieve sufficient reductions in the use of currently covered services to offset costs associated with the new services and case management.

Medicare Demonstrations

Seven demonstrations were primarily supported through Section 222 waivers to Medicare restrictions on the type, scope, and duration of coverage: Triage (O'Rourke, Raisz, & Segal, 1982; Quinn & Hicks, 1979); On Lok (Zawadski & Eng, 1988); Project OPEN (Sklar & Weiss, 1983); New York City Home Care (Horowitz, Brill, & Dono, 1984); San Diego Long-Term Care Project (Hill & Pinkerton, 1984); and Channeling (Applebaum, 1988). In order to be shown cost-effective, these programs had to achieve reductions in the use of Medicare-reimbursed, short-term, post-acute, skilled-nursing-facility care, skilled-home-health care, or medical-care services offered through hospitals, physicians, and allied providers. As noted in prior reviews, the Medicare demonstrations did not achieve sufficient reductions to offset the additional public costs of new services. Three factors in the operation of the programs appear to account for these findings: linkage to other providers, social-service targeting, and care-planning practices.

Linkage to Other Providers. Initial reductions in postacute SNF and skilled-home-health-care use would have required intervening in the process by which patients are transferred to these settings by acute-care hospitals, yet none of these demonstrations received more than one-quarter of their referrals from hospitals. Hospital referrals to these programs ranged from 6% in the San Diego project (Hill & Pinkerton, 1984) to 24% at Project OPEN (Sklar & Weiss, 1983) and Channeling (Applebaum, 1988). Subsequent reductions in home-health use were difficult since Channeling and the prior Section 222 demonstrations received no more than 3% of their referrals from SNFs.

Once clients were admitted to the demonstration, strong linkages with hospital-discharge planners or other medical providers would have been needed to divert prospective nursing-home or home-health applicants to demonstration services. But the demonstrations rarely had arrangements for continuous tracking of participant admissions to hospitals, did not station intake workers within hospital discharge-planning offices, SNFs, or home-health agencies, and often reported troubled relationships with these providers (Capitman, 1986; Phillips, Kemper, & Applebaum, 1988).

In general, the organizational structures of the Medicare demonstrations were not geared to intervening in transitions among levels and settings for care. As a result, few of the demonstrations attempted to mirror the episodic patterns that typify Medicare use. Yet in order for any reductions in SNF or home-health-care utilization to result in cost savings, the duration of use for the new services needed to be limited, or their costs would overwhelm any savings over time. Consistent with a focus on long-term maintenance, the primary forces of decrement in demonstration populations were death and institutionalization. For example, 32% of the Channeling clients left the demonstration before one year of participation, but less than 1% were discharged based on project protocols for limiting length of stay (Phillips, Kemper, & Applebaum, 1988). Organizational isolation from other Medicare providers was compounded by a failure to manage the duration of project participation.

Social-Service Targeting. Alternatively, reductions in use of traditional Medicare-financed services could have been achieved by reducing the incidence of acute exacerbations of chronic illness and associated use of hospital, physician, and allied professional services. But the Medicare demonstrations sought client groups characterized by functional impairments or inadequate informal supports, rather than focusing their efforts on disabled elders with unstable medical conditions and resulting high risk for acute exacerbations. None of the Medicare demonstrations used medical instability, recent multiple hospitalizations, or high levels of physician use as eligibility criteria.

Nonetheless, the Medicare demonstrations served samples with rates of hospitalization higher than the general aged population, both before and during the demonstrations (Capitman, 1986; Weissert, Cready, & Pawelak, 1988; Wooldridge & Schore, 1988). But these use patterns were not atypical for disabled elders in the community: early programs were not targeted to the subgroup of disabled elders prone to frequent acute episodes or catastrophic medical-care costs (Capitman, 1986). Insufficient data are available, however, from Channeling or its predecessors on the relationships between medical conditions at intake and medical-care-utilization patterns. This absence of data is indicative of a conceptual framework that failed to view long-term care in the larger context of illness and health-care-system utilization.

Care-Planning Practices. Channeling and its Medicare demonstration predecessors had no consistent impacts on hospitalizations, rates, or total utilization. It is possible that hospitalizations were simply unavoidable, the necessary consequences of underlying illness, in this population. Examination of demonstration service-allocation practices, however, suggests a different conclusion. Service allocation in these systems was based on a fixed-technology approach that regardless of client medical, functional, and informal-support features, increased dramatically the proportion of recipients and total use of paraprofessional home care (e.g., personal-care and homemaker services) with only minimal increases in receipt of skilled home care, allied health professional, or physician-extender (nurse practitioner or physician assistant) services. For example, Channeling's basic model significantly increased the proportions receiving formal assistance with personal-care and household-maintenance activities only. Channeling's financial control model also increased the proportions receiving therapy or medical treatments, but these effects were far smaller than the dramatic increases in the proportions using paraprofessional services. Further, significant increases in the care received, compared to the control groups, were restricted to the paraprofessional services (Corson, Granneman, & Holden, 1988). In the earlier Medicare demonstrations, the vast majority of demonstration expenditures on new services were for paraprofessional care, ranging from 64% at Project Open to 94% at the New York City Home Care Project. No project reported significant increases in the proportion receiving skilled-home-care or outpatient therapies and medical treatments.

Related to this almost exclusive focus on paraprofessional services, demonstration care-planning practices often failed to vary service prescriptions in response to apparent variations in patients' needs. Intake measures of demographic characteristics, functioning, and informal supports were not predictive of the overall intensity or the types of waivered services provided (Capitman, 1986; Corson, Granneman, Holden, & Thorton, 1986). Hospitalization rates were not affected by the Medicare demonstrations because they generally did not systematically increase access to medical or ancillary services for those participants who might have experienced decreased frequency of acute exacerbations of chronic disease.

Medicaid Demonstrations

The cost-effectiveness challenges faced by the early Medicaid Section 1115 waiver demonstrations of community long-term care, and ongoing Medicaid 2176 Home- and Community-based Care programs were somewhat different. These efforts needed to show that use of nursing homes by Medicaid enrollees, or those who spend down to Medicaid shortly after admission, could be reduced without increases in community-service expenditures by Medicaid and other state-administered programs. Since the Medicaid program is the payor of last resort for medical care and more typically finances extended nursing-home stays, these demonstrations were less concerned with avoidance of medical-service use and curtailing the duration of project participation.

Medicaid community-care projects that have received research attention can be divided into two groups. First, five projects used a freestanding case-management provider and community-service expansion model: Georgia Alternative Health Services (AHS) (Skellie, Mobley, & Cohen, 1983), Wisconsin Community Care Organization (WCCO) (Seidl, Applebaum, Austin, & Mahoney, 1980) the California Multipurpose Service Project (MSSP) (Miller, Clark, William, & Clark, 1984), Florida Pentastar (Ross, Bigor, Papgiannis, & Springfield, 1984), and most of the small-scale Medicaid 2176 programs that were operational by 1985 (Laudicina & Burwell, 1988). Several of these programs used randomized treatment and control groups, but none were clearly shown to be cost-effective. Second, six programs used various organizational structures but limited project participation to individuals identified through nursing-home application: South Carolina Community Long Term Care Project (Blackman, Brown, & Lerner, 1986), ACCESS (Eggert, Bowlyow, & Nichols, 1980; Eggert & Freedman, 1988), New York's Nursing Home Without Walls (Birnbaum, Gaumer, Pratten, & Burke, 1984), and Medicaid 2176 programs in Virginia (Capitman, Arling, & Bowling, 1987; Harkins & Bowling, 1982), Connecticut (Yeatts, Capitman, & Steinhardt, 1987) and Minnesota (Moscovice, Davidson, & McCaffrey, 1988). For this group, unfortunately, only the South Carolina project was studied, using a randomized treatment and control-group design, while aggregate-level comparisons with nonparticipating areas, nonequivalent client-level comparison groups, or treatment population subgroup analyses were used for the others. Prior reviews concur that cost-effectiveness was demonstrated clearly only by the South Carolina project and by the New York project sites outside the New York City metropolitan area. Encouraging findings were indicated in the other less methodologically convincing comparative studies of preadmission screening programs.

Freestanding Case-Management Programs. Projects in the first group failed to demonstrate cost-effectiveness because they shared many of the design problems that plagued the Medicare demonstrations. In particular, freestanding case-management and community-service expansion models lacked links to the medical-care system. Without such links, it was difficult for these programs to identify potential clients at the time of nursing-home application or to intervene in the institutionalization of continuing participants.

Since organizational features were inadequate to intervene in the nursing-home admissions process, these projects were forced to rely on assessment-based eligibility criteria and staff prognostication regarding the risk of nursing-home use. These criteria were often inadequate: most programs did not consider factors such as advanced age, the availability and commitment of informal caregivers to maintaining the potential program participant in the community, medical stability, or prior service use. This approach identified relatively few individuals likely to use nursing homes in the absence of the expanded services since, as noted above, there are more community than institutional residents at every level of impairment. In the 1115 demonstrations, for example, control-group institutionalization rates were 14% or lower (Capitman, 1986; Weissert, Pawelak, & Cready, 1988).

As an alternative to intervention in nursing-home admission or selection of client groups with short-term risk of nursing-home application, the freestanding case-management programs might have sought to prevent or postpone institutionalization. Yet these programs primarily expanded access to paraprofessional home care. They were able to address personal-care and household-maintenance needs of low-income chronically disabled community residents, but rarely were able to alter the progress of underlying medical and psychosocial conditions. At the same time, the relatively small size of most Medicaid freestanding case-management and service-expansion efforts precluded aggregate-level reductions in nursing-home use or costs. For example, only one state served more than 0.1% of elders through 2176 waivers (Leutz et al., 1986).

Nursing-Home Preadmission Screening Programs. Programs such as South Carolina's and others in the second group used nursing-home application as the primary method for identifying potential participants and restricted project admissions to individuals who qualified for nursing-home care under state guidelines. These programs also offered case management and expanded access to home- or community-based services. Organizationally, these programs were linked to acute hospitals and nursing homes, so that assessment for project admission became a necessary step in nursing-home application. Community services and case management were offered as specific alternatives to nursing home admission. In South Carolina and Connecticut, waivers of financial eligibility rules allowed the projects to serve individuals who would typically have been eligible for Medicaid only if they were residents of an institution, while Virginia served individuals who would have spent down to Medicaid within six months of admission. Preadmission screening programs found that some nursing-home applicants did not choose to enter facilities and that some individuals may have applied for nursing-home care in order to gain community services. Thus, these client-identification methods and targeting criteria were not completely efficient: about one-half of the control or comparison groups used nursing homes. Nonetheless, comparative-group nursing-home use among actual applicants was 4–10 times greater than in projects using presumed risk of institutionalization, rather than the fact of application, as the method of client identification.

A second factor in the achievement of cost-effectiveness by programs using preadmission screening as the method of client identification may be noted. South Carolina's and New York State's upstate sites were able to limit both the proportion of users and the intensity of paraprofessional services through formal caps on service use and care-planning-practice patterns. For example, South Carolina offered waivered services to about 35% of the treatment group, and average monthly costs for waivered services and case management were lower than Medicaid costs for two nursing-home days for the sample as a whole (Blackman, Brown, & Lerner, 1984). These findings suggest that with careful management, relatively low levels of services may be adequate to assist families in maintaining a very disabled individual in the community.

Case management in the Medicaid preadmission-screening and service-expansion programs, however, used approaches to service allocation similar to other Medicare and Medicaid CLTC demonstrations. Uniformly, these programs allocated more paraprofessional home care than any other service, did not limit the duration of benefits, and did not predictably vary service packages as a function of client demographic, functional, and informal-support characteristics (Capitman & Arling, 1986; Capitman et al., 1987; Moscovice et al., 1988). All three of these studies find that administrative and organizational factors have a greater influence than measures of client need on community-service use by preadmission screening participants diverted to the community. It appears that considerably greater sophistication in community-care resource allocation can be developed.

In summary, findings from the community-care demonstrations suggest that programs can be shown cost-effective if they (1) identify patients through nursing-home application, (2) target individuals eligible or near-eligible for Medicaid who satisfy nursing-home entry criteria, and (3) limit the intensity, if not the duration, of community care. Achieving cost-effectiveness for Medicare-only participants seems elusive, both because of the small and highly restricted role of the Medicare program in financing long-term care and the clinical and organizational issues inherent in reducing other use of Medicare-reimbursed services by the long-term-care users, especially problems in maintaining continuity between acute- and long-term-care providers. Findings suggest cost-effectiveness cannot be achieved by models based on prevention of long-term-care use by disabled community residents who are not actively considering nursing-home placement.

Medical Systems of Long-Term Care

Attention has turned in recent years to development of community-oriented long-term-care systems that are organizationally or clinically linked to medical-care delivery systems. At least three broad models for system integration can be identified: hospital-based community long-term care; medical-care and transition management for the chronically ill; and integrated financing and delivery systems. While these systems are new and there is less information available on them, early returns can be reviewed and further research efforts can be focused based on extant studies.

Hospital-Based Community Care

Several programs have attempted to develop community-oriented long-term care based in hospitals. Most notably, Hughes and her colleagues described the results of a quasi-experimental evaluation of long-term-care services offered by a consortium of five Chicago-area hospitals. The study did not find evidence for cost-effectiveness or clinical efficacy of the program (Hughes et al., 1987; Hughes et al., 1988). Similarly, Capitman and his colleagues provide descriptive information from hospitals that participated in the Robert Wood Johnson Foundation's Hospital Initiatives in Long-Term Care (HILTC) Program (Capitman, Prottas, MacAdam, Leutz, Westwater, & Yee, 1988; Capitman, MacAdam, & Yee, 1988). Some of the HILTC hospitals offered services that were also financed through the Medicaid 2176 waiver program in their states, while others developed programs more similar to the early Medicare demonstrations. In general, these descriptions suggest that few of the programmatic elements that had been shown effective in prior CLTC studies were adopted by the hospital-based programs. The major observation about hospital-based community care is that locating community-care services within the hospital does not by itself assure better continuity of care, a clearer focus on the medical aspects of long-term-care needs, or less reliance on a fixed technology of paraprofessional home care.

Medical and Transition Management

Another model for integration between the medical and long-term-care delivery systems has been demonstrated in several studies conducted through the Veterans Administration's medical centers and by participants in the HILTC. These models are unique in using a multidisciplinary team approach to coordinating medical and postacute service needs of chronically ill persons. Medical-management programs, sometimes referred to as "geriatric assessment units," focus on patients identified while they are inpatients or users of clinic services. (See Chapter 5 by Rubenstein & Wieland.) They attempt to assure appropriate, timely, and coordinated medical and allied professional services, although they rely on existing payment sources for these services. They do not coordinate paraprofessional home care and generally have no access to expanded sources of payment for such services. Transition-management programs, by contrast, target hospital inpatients needing specialized assistance with discharge planning. They coordinate care provided upon discharge until the patient is self-sufficient or an appropriate community agency has assumed responsibility.

Rubenstein et al. (1984) evaluated the cost-effectiveness of a geriatric assessment unit within the Veterans Administration medical center system. This study found strong evidence for reductions in hospital length of stay and resulting overall reductions in costs of care for the model. Reductions in postacute use of nursing-home care were observed as well. But given the very long hospital stays noted in this study, the applicability of these findings to the Medicare context is questionable.

Several studies have explored a geriatric-consultation team model focused on improving the appropriateness and coordination of medical-care services during the inpatient stay. (Barker, Williams, Zimmer, VanBuren, & Vincent, 1986; Becker, McVey, Saltz, Fessner, & Cohen, 1987). None of these programs actually performed discharge planning, although they made recommendations to existing discharge planners, and none provided care coordination, medical services, or expanded community-care services during the postacute period. While there is evidence that these services can affect patterns of service use and outcomes during an inpatient stay (Barker et al., 1986; Becker et al., 1987), results do not suggest reductions in postacute nursing-home placements or repeat hospitalizations (Barker et al., 1986; Saltz, McVey, Peter, John, & Harvey, 1988). HILTC participants using the geriatric-consult team approach also reported significant difficulties in gaining referrals from attending physicians and difficulty gaining access for their patients to recommended community services, primarily because of financial barriers (Capitman, Prottas, et al., 1988).

Transition-management programs outside of the Veterans Administration context have not been the subjects of rigorous evaluations. HILTC programs using this model appear to serve some of the most medically complex and functionally disabled of the populations studied (Capitman, MacAdam, & Yee, 1988). Further, these programs have been able to demonstrate increased use of postacute community-based services through establishment of organizational linkages between the hospital and community providers. Thus, while this model appears hopeful, there are few data relevant to its assessment currently available. In general it would appear that, paralleling the findings in CLTC programs, medical- and transition-management programs have had difficulty forging the necessary linkages between care delivery setting while also assuring continuity of medical supervision. These dual changes in treatment patterns require further investigation.

Financial and Organizational Integration

Representing a radical departure from other approaches to reforming the delivery system for long-term care, several models build on the organizational and financing principles of health maintenance organizations. Continuing Care Retirement Communities (CCRC) combine adapted and supportive housing with prepaid insurance for all home and nursing-home care. Communities pick members carefully to control risks and thus serve patient groups not readily comparable with other noninstitutionalized elders. Because CCRC entrance and maintenance fees are high, this model has been viewed as primarily geared to the most affluent elders and has not been examined from a public cost-effectiveness perspective. But Cohen, Tell, and Wallack (1988) have shown that while similar factors predict nursing-home use in these communities and the general population, nursing-home stays tend to be both more frequent and shorter than in other contexts.

Two multisite demonstrations have begun to explore prepaid programs that combine comprehensive medical-care coverage with CLTC benefits: the Community Care Organizations for Dependent Adults (CCODA) and the Social Health Maintenance Organization (SHMO). The CCODA, modeled on the programs of On Lok Senior Health Services in San Francisco (Zawadski & Eng, 1988), provides integrated financing and delivery of acute and long-term care. Targeted to very frail elders who chose to enter the coordinated community-care program over permanent nursing-home placement, these programs pool Medicare, Medicaid, and private financing in an all-inclusive capitation payment. Adult day-health-care centers are the cornerstone services of these programs, with medical- and long-term-care provision and management offered by a multidisciplinary team. In a new multisite demonstration, supported by the Health Care Financing Administration and the Robert Wood Johnson Foundation, six replication sites are being developed: East Boston Neighborhood Health Center; Beth Abraham Hospital of The Bronx, New York; Bienvivir Senior Health Services of El Paso, Texas; Community Care Organization of Milwaukee, Wisconsin; Providence Medical Center of Portland, Oregon; and Palmetto Senior Care of Columbia, South Carolina. These providers are accepting clients for care on a fee-for-service basis, until capitation rates and waiver authority have been finalized.

Unlike the CCODA, the SHMO model targets a fully representative cross-section of elders as do other Medicare-financed prepaid delivery systems such as HMOs and competitive health plans. Unlike other HMOs, however, the SHMO also offers a long-term care benefit (Leutz, Greenberg, Abrahams, Prottas, Diamond, & Gruenberg, 1986). There are four sites in the SHMO demonstration currently supported by the Health Care Financing Administration and private foundations: Elderplan, Inc. of Brooklyn, New York; Kaiser Permanente Center for Health Research of Portland, Oregon; SCAN Health Plan of Long Beach, California; and Seniors Plus of Minneapolis, Minnesota. The new long-term-care benefit offered by these plans is not intended to cover permanent nursing-home placement or extended and very costly community care; rather, participants can receive about $600–$1,000 per month (depending on the site) in covered community-care services if they are judged eligible for nursing-home care under state guidelines by the site's care-management unit. Two sites offer some long-term-care benefits to moderately disabled members as well. While two sites included an existing HMO as a sponsor or cosponsor for the plan, the other sites were based in long-term-care organizations that have developed formal linkages with medical-care providers. In either case, the financing approach assures ongoing coordination between acute- and long-term-care systems. While preliminary data on targeting, service use, and overall fiscal performance are available, the independent evaluation using several quasi-experimental comparison groups will not produce results until 1992 (Leutz, Abrahams, Greenlick, Kane, & Prottas, 1988).

Leutz et al. (1988) show that while about 5% of the participants in each SHMO meet nursing-home level-of-care requirements, there are broad differences across the sites in the proportion of members who access the expanded-care benefits, such as adult day-care, paraprofessional home-care, durable medical equipment, home modification, medical transportation, and extended skilled treatments and therapies. These differences arise from variations in targeting criteria and care-planning practices (Abrahams, Capitman, Leutz, & Macko, in press). Capitman and Karon (1988) showed that client features were strongly predictive of service-use patterns, unlike results obtained in prior demonstrations. The significance of these differences for financial performance and client outcomes has yet to be assessed, but early returns suggest that marketing efforts need to be made both less expensive and more successful. In addition acute-care use has to be limited further, whether or not members access the long-term-care benefit if the plans are to achieve reasonable financial stability.

In summary, inadequate information is currently available on most current approaches to integrating medical and long-term care. Available data appear to indicate that hospital-based community-care systems that transfer the features of Channeling and its predecessors to a hospital-centered delivery system may also tend to replicate the findings of little impact on patterns of service use or client outcomes. Further, available reports suggest that medical-management systems using geriatric-consultation teams fail to reduce postdischarge use of nursing homes or subsequent hospitalizations. It appears that the absence of critical organizational and financing linkages with nonhospital providers is a major factor in this result. By contrast, transition-management programs seem to have more of the organizational elements required for reducing rehospitalization and nursing-home use, though more rigorous investigations of these programs are needed. The various options for integrated financing and delivery systems, such as the SHMO and CCODA, have yet to be evaluated, but early returns suggest that there are major marketing and client-management issues yet to be tackled.

IMPLICATIONS FOR RESEARCH AND PRACTICE

Research and demonstration efforts devoted to long-term-care patients and the effectiveness of community-oriented care have raised many new questions. The determinants of formal service use are better understood: service use appears to depend as much on needs for assistance with daily personal and household activities that are unmet by informal sources as on patterns of acute and chronic illness and the associated use of the medical-care system. Further, formal long-term-care use appears to involve heterogeneous and complex patterns of change in care needs and the settings for receipt of care. But little theory or data are available for characterizing subpopulations or anticipating the trajectories of services needs associated with underlying illness and psychosocial conditions such as poverty, isolation, and adjustment to aging. The linkages between functional loss, morbidity, and medical-system use need to be examined from cross-sectional and longitudinal perspectives. More information is needed on the factors that determine the dimensions of formal-care use and the relationships among these dimensions.

The linkages between acute- and long-term-care use have taken on greater significance with the 1987 enactment of the Medicare Catastrophic Coverage provisions that extend the duration of reimbursable skilled nursing and home-health care and cap total out-of-pocket payments by beneficiaries. Research has yet to explore CLTC systems well suited to reductions in traditionally covered Medicare service or the newly assumed Medicare responsibility for individuals with exceptionally high medical utilization. Responding to the needs of medically unstable long-term-care users and meeting Medicare's new challenges will require further efforts in three areas: (1) clinical practice models for identification of potential users of catastrophic levels of medical services whose patterns of utilization can be altered through care management and community-service expansions; (2) methods for forging workable organizational arrangements between medical- or transition-management programs and community providers; and (3) service-allocation models that are sensitive to variability in the intensity and duration of resource requirements.

The new focus on the intermingling of medical and long-term care should not obscure the fact that some chronically disabled elders and some periods during complex careers of long-term-care use are characterized by needs best met through low-level nursing-home care or primarily paraprofessional home care. Medicaid nursing-home preadmission-screening programs combined with case-managed community care seem to provide a mechanism for meeting these needs when they are targeted to Medicaid enrollees or those expected to become eligible for this coverage within established time frames. The relative size of the potential client pool for these programs is not well understood. Further, policy analysis and clinical practice must address issues related to resource allocation, such as the best ways to offer equitable care packages that are sensitive to differences in informal support and other patient characteristics. At the same time, reimbursement structures for community services that recognize variations in the intensity and duration of care needs, while also providing incentives for efficient production of care and maximal patient rehabilitation, have not been explored in the context of Medicaid CLTC programs.

It should be noted that Medicaid CLTC programs linked to nursing-home preadmission screening and case management (as opposed to free-standing care-management agencies) are available on a statewide basis in only a handful of states. Further expansion and promulgation of these models, combined with clinical-practice training and technical assistance to states, could be expected to improve the cost-effectiveness and accessibility of long-term care for the poor and near-poor who have service needs comparable to nursing-home residents.

These expansions, however, would leave two groups relatively untouched: (1) potential nursing-home users with incomes and assets well above the Medicaid limits who still experience economic hardship from private payment of nursing-home charges and (2) individuals with stable long-term-care needs below the nursing-home level. For both subpopulations, inadequate access to community services or appropriately adapted residential care and catastrophic potential expenditures clearly remain as policy challenges. Private or public/private partnership financing of long-term-care insurance or comprehensive prepaid programs hold promise, but the market potential and effectiveness of these solutions remain untested. Policy and program debate must address two areas: (1) the appropriate roles of government in asset protection and stimulation of a profitable private market for long-term-care insurance products and (2) appropriate public roles in meeting residential and care needs that are very personal or bound to cohort, class, and culture differences in lifestyle preferences.

CLTC research findings suggest that proposals for major new federal long-term-care policies may be premature because of gaps in our understanding of formal service use and appropriate models for care delivery. The enhanced-financing proposals fail to focus attention on treating medically unstable persons within the long-term-care population, since they target services based on functional criteria only and do not require development of an infrastructure to support coordination between existing medical- and long-term-care providers. Insufficient experience and data are available on comprehensive-financing and integrated-delivery models to propose their optimal roles in a national program. Proposals from both perspectives fail to address treatment and maintenance services for those with minimal personal-care disabilities but significant needs for assistance in daily life.

Available research seems to provide a rationale for a more incremental approach to filling the federal policy void in long-term care. In the context of current law, further promulgation of the proven nursing-home preadmission-screening, case-management, and expanded-community-care model under Medicaid is possible. Modest investments in improving infrastructure and clinical practice are also needed to support national implementation of this model. Meeting the needs of less-indigent elders through broadened eligibility seems desirable but will require more significant public investments or public/private partnership. These programs need to be complemented by a more active role of Medicare and the traditional Medicare providers in management of transitions between settings and levels of care.

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