

MANAGEMENT OF DIABETES MELLITUS

Perspectives of Care Across the Life Span

SECOND EDITION



Debra Haire-Joshu

21

Diabetes Mellitus and the Older Adult

Martha Mitchell Funnell and Jennifer Hayden Merritt

INTRODUCTION

Diabetes is surprisingly common among older adults, and thus health professionals who specialize in diabetes care and education need to understand the specific physiologic and sociocultural challenges that older persons encounter. In addition, health professionals who specialize in geriatric care and education need to keep abreast of advances in the treatment of diabetes. Diabetes is a serious disease, and its seriousness is often underestimated by the person with diabetes and occasionally by health care professionals, since its initial symptoms may make it appear harmless. However, persons with all types of diabetes risk developing all

CHAPTER OBJECTIVES

- Define the relationships among the impaired homeostasis of aging, impaired glucose tolerance, and diabetes.
- Describe the mechanism by which hyperosmolar nonketotic syndrome occurs.
- State two reasons why older persons are prone to concurrent disease interactions and polypharmacy.
- List the four areas of functional ability that need to be assessed with older adults.
- Define two developmental tasks related to this stage of the life span and the impact diabetes can have on each.
- Describe the psychosocial impact of diabetes on older adults.
- Describe the financial impact of diabetes on older adults.
- State three areas that need to be assessed before an educational program is initiated with newly diagnosed older adults.
- Describe two strategies that can be used to compensate for deficits related to the aging process when teaching older adults.
- State the value of an individualized diabetes care and education program for older persons.

its complications.¹²⁸ Also, the detection, treatment, and ongoing care of diabetes in the older population present a unique set of challenges.

Who are the older adults with diabetes? How does diabetes differ from glucose intolerance of aging? How does diabetes present atypically in older adults? How do other concurrent diseases, polypharmacy, functional decline, and sensory loss and the unique developmental and psychosocial issues of aging impact on the care of diabetes in older persons? What are the special considerations for the care of this age-group? What are the special considerations for the education of these persons? This chapter addresses these questions and describes the educational process for older adults with diabetes.

RELATIONSHIP BETWEEN DIABETES MELLITUS AND THE AGING PROCESS

Demographics

Currently, 12% of the population is over age 65, and studies show that the number of people over 65 is increasing at a rate three times greater than that of the general population. It is expected that by the year 2020, more than 20% of the population will be over age 65. Furthermore, persons over age 85 represent the fastest-growing segment of the population.⁹² These demographic changes will have a profound impact on the U.S. health care system.

Data from the Framingham Heart Study reveal that the development of diabetes in later life is associated with hypertension, vascular disease, elevated very-low-density lipoprotein (VLDL) cholesterol, use of diuretics, and obesity. Subjects who were more than 40% overweight had a greater prevalence of diabetes compared with those of normal weight.¹⁵⁸

Diabetes is increasingly common with age. It is almost 10 times as common among those over age 65 as those ages 20 to 44.¹⁰ Based on the National Health Interview Survey (NHIS) data, it was estimated that from 1986 to 1988, 9.5% of all persons in the United States over age 65 were diagnosed with diabetes (Table 21-1). Alternatively, approximately 43% of all

Table 21-1 Number of Persons With Diagnosed Diabetes and Percentage of Persons Aged 45 Years and Older in the U.S. Population, 1986-1988

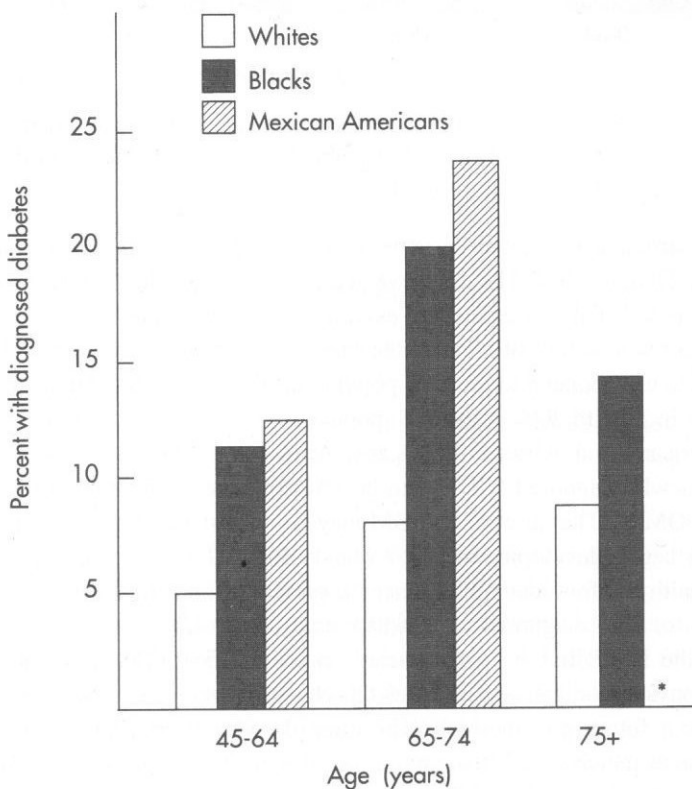
	Age (years)		
	45-64	65-74	75+
Number with diabetes (millions)			
Males	1.33	0.75	0.41
Females	1.30	0.90	0.65
Both sexes	2.63	1.65	1.06
Percentage of U.S. population			
Males	6.2	9.8	10.3
Females	5.5	9.3	9.5
Both sexes	5.8	9.5	9.8

From the National Health Interview Survey, 1986-1988, National Center for Health Statistics.

persons in the United States who were diagnosed with diabetes between 1986 and 1988 were over age 65.⁶¹

Prevalence of diabetes varies considerably by race. The NHIS data from 1980 to 1990 showed that the prevalence of non-insulin-dependent diabetes mellitus (NIDDM) is 50% higher among African Americans than Caucasians. African-American females show the highest prevalence, with a rate of 21%.¹⁵⁰ The higher prevalence is thought to result from a higher frequency of risk factors, a higher inherent susceptibility, or a greater effect of risk factors in this group.²² Among Hispanic Americans the rate is even higher (Fig. 21-1).⁶¹ African-American women over age 75 have the highest rate, with almost one in four having diabetes (Fig. 21-2).¹⁵⁰

Many studies have attempted to determine the degree to which diabetes exists but is undiagnosed. The broadest study of this kind was the National Health and Nutrition Examination Survey II (NHANES II) of 1976 to 1980, in which more than 15,000 persons



* Data not available

Fig. 21-1 Age-specific prevalence of physician-diagnosed diabetes among whites, blacks, and Mexican Americans in the U.S. population aged 45 years and older, 1982-1984. (From the National Health and Hispanic Health Nutrition Examination Survey, National Center for Health Statistics. In Harris MI: *Clin Geriatr Med* 6:703-729, 1990.)

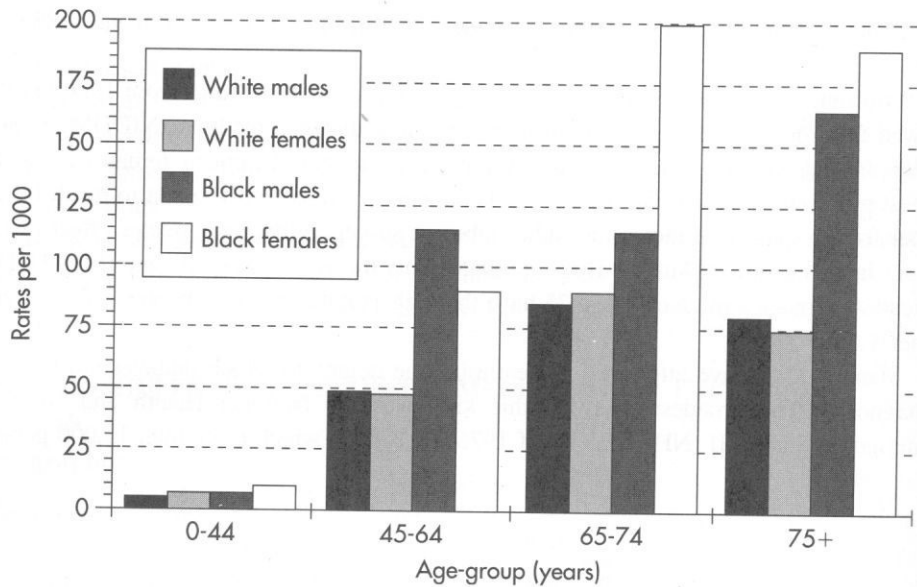


Fig. 21-2 Age-specific prevalence of diabetes by race, gender, and age, United States, 1988-1990. (From US Department of Health and Human Services: *Diabetes Surveillance, 1993*, Atlanta, 1993. Centers for Disease Control and Prevention.)

ages 20 to 74 participated in interviews and almost 12,000 had a physical examination and an oral glucose tolerance test. The data revealed that by World Health Organization (WHO) criteria, undiagnosed diabetes existed at essentially the same rate as a medical history of diabetes. In other words, half of all diabetes cases went undiagnosed. Table 21-2 shows the NHANES II data extrapolated to the U.S. population, 1986 to 1988.⁶¹ Undiagnosed diabetes may be present in 10% to 20% of the U.S. population over age 50, with higher rates among Hispanic Americans and African Americans. An interim study in Finland revealed the prevalence of newly diagnosed NIDDM to be 7%, compared with about 10% of previously diagnosed NIDDM.¹¹⁴ The onset of NIDDM may be at least 12 years before it is diagnosed, and retinopathy begins developing at least 7 years before NIDDM is detected. This represents a significant health risk for older adults, since the presence of macrovascular disease increases mortality rates for both diagnosed and undiagnosed diabetes.⁶²

Because the NHIS has been conducted annually since 1958, one can see how the prevalence of physician-diagnosed diabetes has changed over several decades and can make projections about future prevalence. In the three decades from 1960 to 1990 the rate of diagnosed diabetes increased 2.5-fold among persons over 65 (Fig. 21-3). Harris⁶¹ notes that this increase in prevalence is in addition to what can be expected as a result of the general aging of the population and projects that it will continue into the future.

IDDM Versus NIDDM

Largely because of improved survival rates, an increasing percentage of older adults have insulin-dependent diabetes mellitus (IDDM). To a lesser degree, IDDM may have its onset

Table 21-2 Estimated Prevalence of Undiagnosed Diabetes and Impaired Glucose Tolerance Among Persons Aged 45-75 Years in the U.S. Population, 1986-1988

	Age (years)	
	45-64	65-74
Undiagnosed diabetes*		
Number of persons (millions)		
Males	0.8	0.8
Females	1.6	0.8
Both sexes	2.4	1.6
Percentage of the U.S. population		
Males	3.9	10.4
Females	6.8	8.5
Both sexes	5.4	9.3
Impaired glucose tolerance†		
Number of persons (millions)		
Males	3.2	1.7
Females	3.5	2.2
Both sexes	6.7	3.9
Percentage of the U.S. population		
Males	14.8	22.5
Females	14.7	22.9
Both sexes	14.8	22.7

From the National Health and Nutrition Examination Survey II, 1976-1980, National Center for Health Statistics.

*Fasting plasma glucose ≥ 140 mg/dl and/or 2-hour plasma glucose after 75 g oral glucose ≥ 200 mg/dl.

†Fasting plasma glucose < 140 mg/dl and 2-hour plasma glucose after 75 g oral glucose of 140-199 mg/dl.

Number of persons is computed by applying these rates to population estimates of the U.S. Bureau of the Census for 1986-1988.

in late life, or older persons with NIDDM may convert to IDDM during the course of the illness. The key diagnostic test is a C peptide test performed both at fasting and at 90 minutes after a glucose load. A very low serum C peptide level at both times indicates minimal beta-cell function and the presence of IDDM.⁹⁵ Since such tests are rarely done in routine outpatient care, limited data exist on the prevalence of IDDM among older adults. However, the vast majority of older persons show characteristics of NIDDM, such as a strong association with obesity, positive family history, and improved glycemia with diet, weight correction, and oral hypoglycemic agents. One study showed the prevalence of IDDM in older adults to be only 0.3%.¹⁶⁰

Complications of Diabetes

Diabetes not only is common but also is serious, with long-term complications that are debilitating and demoralizing, especially as the person becomes more frail with advancing age.

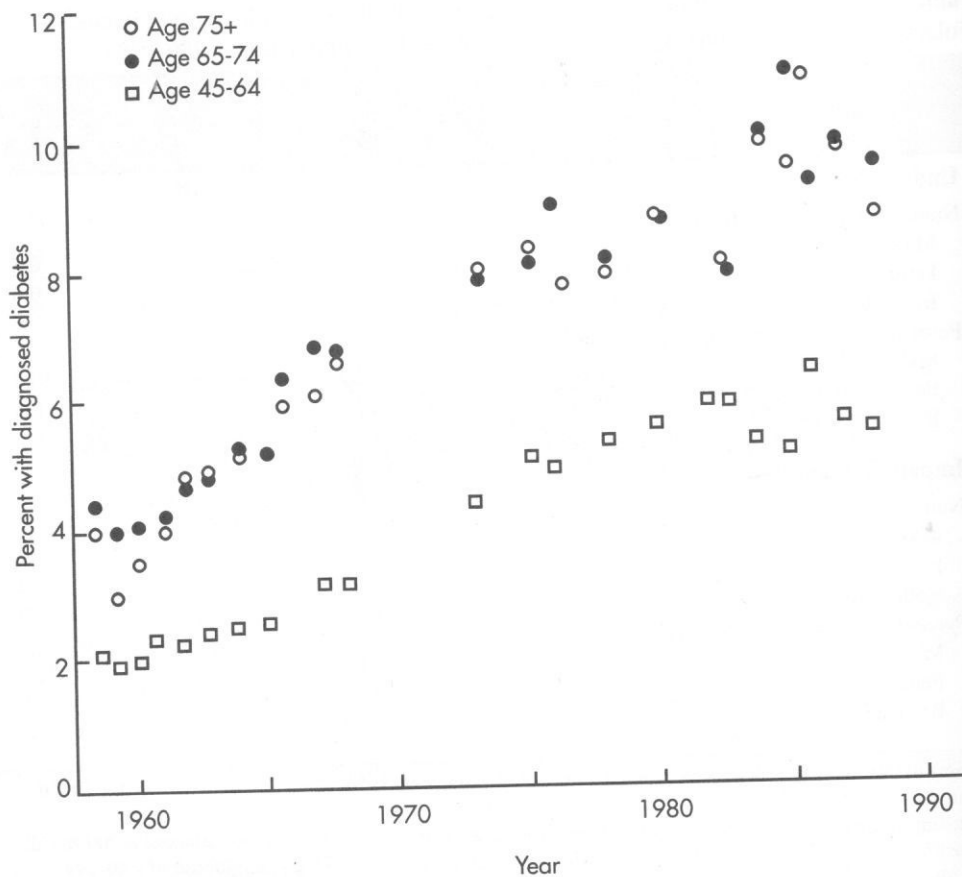


Fig. 21-3 Time trends in the percentage of the U.S. population aged 45 and older with physician-diagnosed diabetes, 1958-1988. (From the National Health Interview Survey, National Center for Health Statistics. In Harris MI: *Clin Geriatr Med* 6:703-729, 1990.)

When compared with persons of the same age without diabetes, those with diabetes are 25 times more likely to become blind, 17 times more likely to develop kidney disease, 20 times more likely to develop gangrene, 15 times more likely to require an amputation, and twice as likely to have a cerebrovascular accident (CVA, stroke) or myocardial infarction (MI).²⁵ The risk for developing these long-term complications of diabetes increases with longer duration of diabetes. Hospitalization rates and the rates for nursing home admissions are noted to be significantly higher for persons with diabetes compared with those without diabetes. Older adults with diabetes show a hospitalization rate 70% higher than that of the general population (Fig. 21-4).⁶¹ Diabetes is also a significant risk factor for rehospitalization among older adults.¹² The rate of nursing home admissions is 1.2 times greater among persons with diabetes.¹²² Mortality is increased as well; diabetes is the fifth ranking cause of death for Americans over age 65¹⁴⁹ and reduces the life expectancy of men by 9 years and women by 7 years.¹²⁴

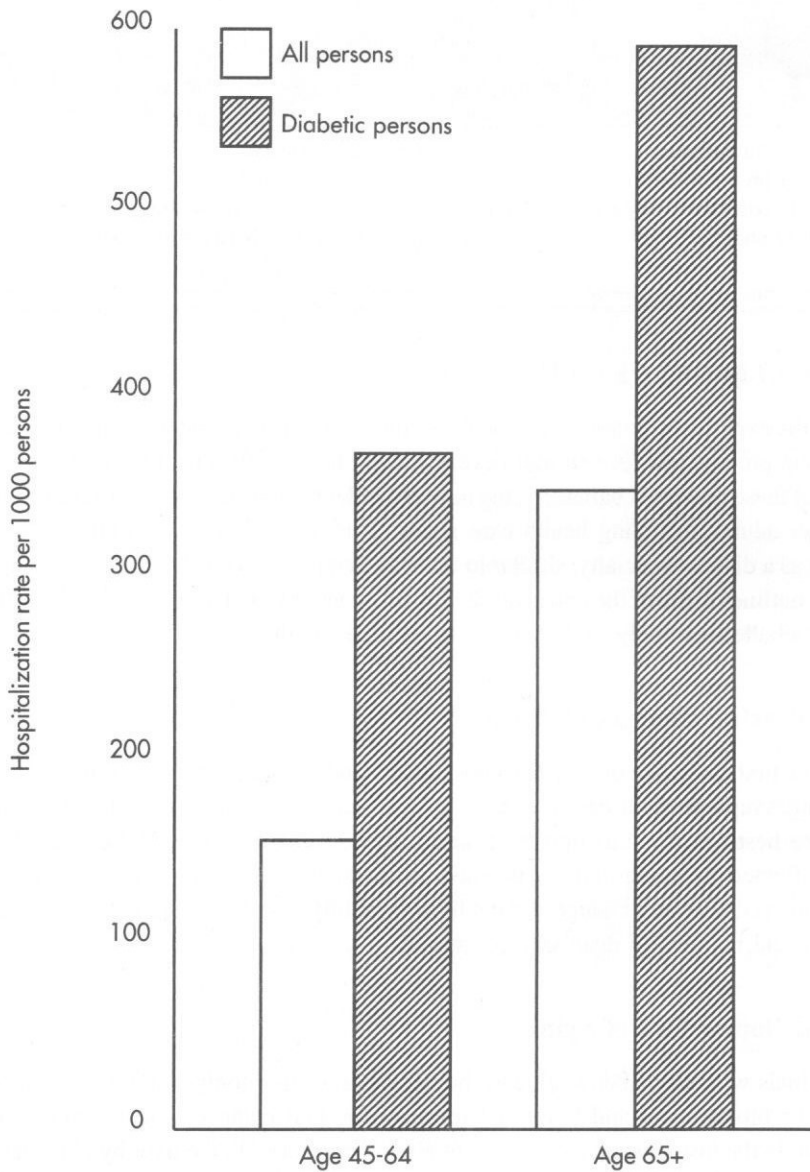


Fig. 21-4 Hospitalization rates among persons in the U.S. population aged 45 years and older, 1987. (From the National Hospital Discharge Survey, National Center for Health Statistics. In Harris MI: *Clin Geriatr Med* 6:703-729, 1990.)

BOX 21-1

CHALLENGES OF GERIATRICS

Impaired homeostasis	Iatrogenic disease
Atypical presentations	Physical and cognitive decline
Multiple concurrent disease interactions	Psychosocial and sociocultural issues
Geriatric pharmacology	Educational and behavioral issues

THE CHALLENGES OF GERIATRICS

Older adults experience common physical, cognitive, and psychosocial challenges as a result of the aging process and face similar developmental tasks as they near the end of their lives. Because of these inherent challenges, the needs of older persons tend to be different from those of younger adults, including health care needs. This has led to recognition of the field of geriatrics as a distinct specialty, similar to the way that pediatrics is recognized as a specialty. Box 21-1 outlines some of the common challenges of geriatrics. This chapter reviews the ways that these challenges apply to diabetes care for older adults.

Normal Physical Changes of Aging

Perhaps the first challenge of geriatrics is to understand what changes are “normal” aging and what changes represent a disease process. Physical changes related to aging that are considered normal are best described as universal, progressive, and irreversible.⁴⁴ Table 21-3 outlines systems affected by aging and the potential consequences of these changes.⁴³ It should be noted, however, that any changes or declines in ability should be evaluated for underlying pathology and not simply dismissed as normal.

Impaired Homeostasis of Aging

In individuals without diabetes, glucose homeostasis, or normoglycemia, is maintained by a complex of biochemical and hormonal mechanisms that balance glucose production with utilization. In the fasting state the amount of glucose produced in the liver by gluconeogenesis and glycogenolysis is equal to the amount utilized by the body's cells. In the postprandial state, when blood glucose levels are rising from digested food, the rise is limited by the release of insulin from the pancreas, which acts quickly to suppress gluconeogenesis and glycogenolysis and transport glucose into cells. As blood glucose then falls, so does the plasma concentration of insulin to maintain euglycemia. The counterregulatory hormones, including glucagon, epinephrine, growth hormone, and cortisol, work in concert to prevent hypoglycemia in this exquisite balancing act. With aging an impairment in this homeostatic mechanism often occurs, leading to higher causal glucose levels. The glucose levels may be sufficiently elevated for the diagnosis of *impaired glucose tolerance* (IGT).

Table 21-3 Physiologic Changes of Aging

System	Effect of aging	Consequences
Central nervous system	Decline in number of neurons and weight of brain Reduced short-term memory Takes longer to learn new information Slowing of reaction time	Do not impair function
Spinal cord/peripheral nerves	Decline in nerve conduction velocity Diminished sensation Decline in number of fibers in nerve trunks	Slowness of "righting" reflexes Diminished sensory awareness Reduced vibratory sensation
Cardiovascular system	Reduced cardiac output (normal?) Valvular sclerosis of aortic valves common Reduced ability to increase heart rate in response to exercise	Reduced exercise tolerance
Respiratory system	Decline in vital capacity Increased lung compliance Reduced ciliary action Increased residual volume Increased anteroposterior chest diameter	Diminished oxygen uptake during exercise Reduced pulmonary ventilation on exercise Increased risk of pulmonary infection Reduced exercise tolerance
Gastrointestinal tract	Decrease in number of taste buds Loss of dentition (normal?) Reduced gastric acid secretion Reduced motility of large intestine	Reduced taste sensation Possible difficulty in mastication Potential cause of iron deficiency anemia Constipation if coupled with low-fiber and low-fluid intake
Kidneys	Loss of nephrons Reduced glomerular filtration rate and tubular reabsorption Change in renal threshold Decreased concentrating ability	Decreased creatinine clearance Reduced renal reserve may lead to reduced glycosuria in presence of diabetes mellitus

Table 21-3 Physiologic Changes of Aging—cont'd

System	Effect of aging	Consequences
Musculoskeletal system	Decreased number of muscle fibers Shortening of tendons Slower turnover of bone Loss of bone density (normal?) Diminished lean muscle mass	Poor mobility; pain Decreased vertical height May predispose to fractures Change in posture Reduced strength
Endocrine system/ metabolism	Reduced basal metabolic rate (related to reduced muscle mass) Impaired glucose tolerance	Reduced caloric requirements Must distinguish from true diabetes mellitus
Reproductive system	Men: delayed penile erection, infrequent orgasm, increased refractory period, decreased sperm motility and altered morphology Women: decreased vasocongestion, delayed vaginal lubrication, diminished orgasm, ovarian atrophy	Diminished sexual response Decreased reproductive capacity
Skin	Loss of elastic tissue Atrophy of sweat glands Hair loss	Increased wrinkling; senile purpura Difficulty in assessing dehydration Reduced sweating

With IGT, blood glucose ranges are greater than normal but less than values diagnostic of diabetes. IGT is so common that controversy exists as to whether it is a “normal” aging change or a typical abnormality (Fig. 21-5). However, because it is not seen in a significant subset of older persons, it is prudent to consider it an abnormality common among older adults, especially since increases in macrovascular disease are associated with IGT.⁶⁰ When detected, IGT warrants interventions such as weight reduction and exercise to decrease the risk of progression to NIDDM. In prospective studies, about 20% of those with age-related IGT developed overt diabetes, at a rate of up to 5% per year.²⁴ In the past, persons with glucose levels in the IGT ranges were told that they had “borderline diabetes.” This term has now been replaced by IGT, since most do not develop diabetes. Blood glucose values of persons with normal glucose tolerance and diabetes are compared with values of persons with IGT, as now defined by the National Diabetes Data Group (NDDG) of the National Institutes of Health (NIH) (Table 21-4).¹¹⁵

Because serum insulin levels are higher among older persons with IGT (Fig. 21-6) and because insulin receptors are unchanged with aging alone, the belief has been that the primary defect that causes IGT is at the postreceptor site. However, this impairment is complex and

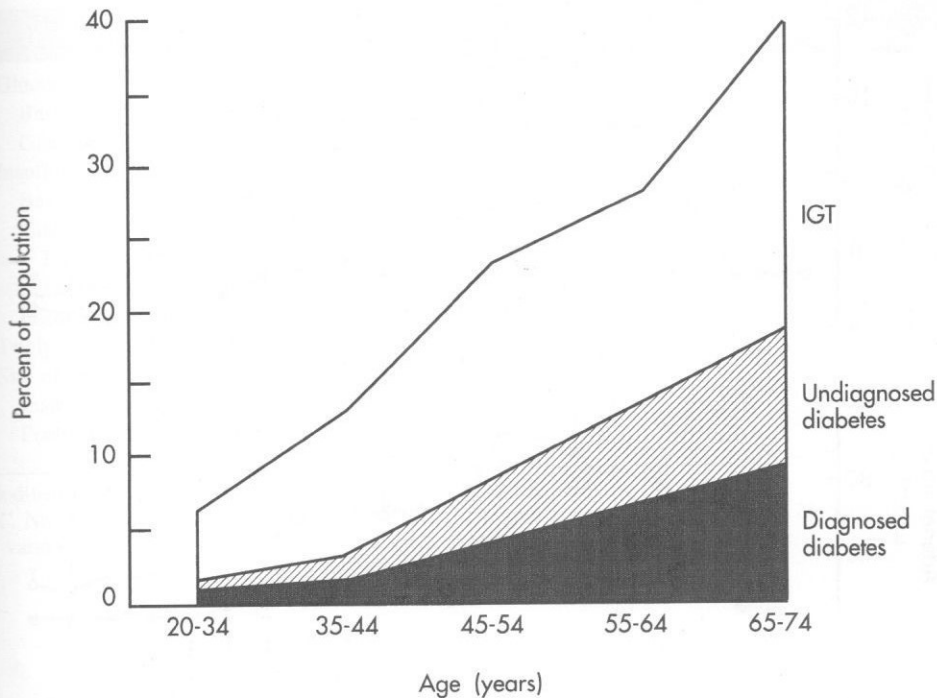


Fig. 21-5 Age-specific prevalence of diabetes and impaired glucose tolerance (IGT) in the U.S. population, 1976-1980. (From the National Health and Nutrition Examination Survey, National Center for Health Statistics. In Harris MI: *Clin Geriatr Med* 6:703-729, 1990.)

Table 21-4 Blood Glucose Values* Used to Differentiate Categories of Glucose Tolerance

	Normal	Diabetes mellitus	Impaired glucose tolerance
Fasting	<115	>140	<140
1 hour†	<200	>200	>200
2 hour	<140	>200	140-200

From National Diabetes Data Group: *Diabetes* 28:1039-1057, 1979.

*All figures refer to mg/dl venous plasma glucose levels in nonpregnant adults after a 75 g glucose load.

†Single reading at 30, 60, or 90 minutes.

not yet fully understood.⁷³ Research is currently under way to elucidate changes in insulin transport inside the cell that may be responsible for the defect. Regardless, the defects responsible for age-related IGT appear to be distinct from those associated with obesity and NIDDM (Table 21-5).⁷³

Defects in the glucose homeostasis of NIDDM are even more intriguing, since it appears that the elevations in glucose further worsen insulin resistance, resulting in positive feedback or self-perpetuation of the abnormality.³⁰ Figure 21-7 illustrates this phenomenon.

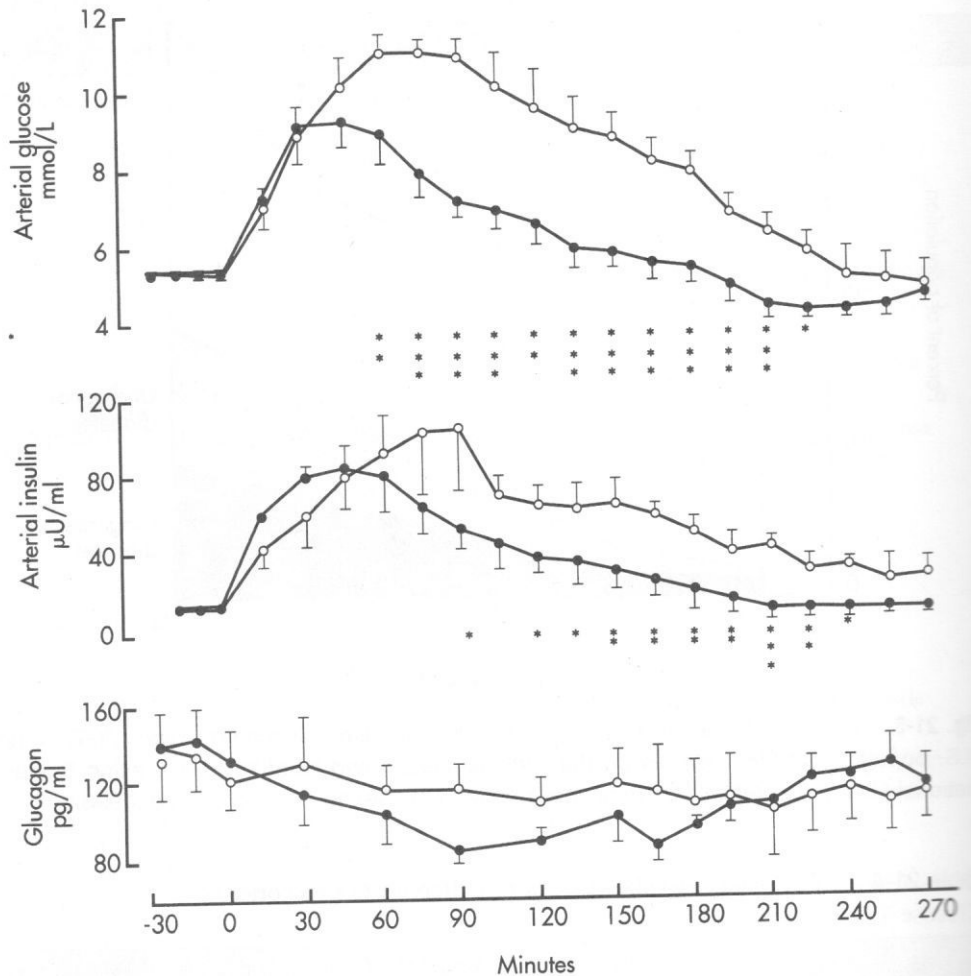


Fig. 21-6 Metabolic response to oral glucose loading in young (●) and older (○) subjects. * $p < 0.05$; ** $p < 0.01$; *** $p < 0.001$. (Reproduced with permission of the American Diabetes Association, Inc. From Jackson RA: *Diabetes Care* 13(suppl 2):9-19, 1990).

The diagnosis of IGT and diabetes are based on the NDDG criteria.¹¹⁵ It is believed that age-specific screening criteria are not warranted.¹¹ The best screening test for older adults is determination of fasting glucose levels.¹¹³ Two fasting blood glucose readings greater than 140 mg/dl are required to diagnose diabetes, unless there are unequivocal symptoms with a random glucose value greater than 200 mg/dl. A glycohemoglobin level 1% above the normal range is another indicator of an abnormality.¹⁰⁴ Generally, oral glucose tolerance tests are not recommended for older adults, since treatment will not be instituted if fasting glucose levels are lower than 140 mg/dl.¹¹³

Autonomic neuropathy, occurring as a complication of diabetes, can affect many other delicate homeostatic mechanisms. These include wider ranges in cardiac output, orthostatic

Table 21-5 Comparison of Metabolic Abnormalities in Aging, Obesity, and NIDDM

	Aging	Obesity	NIDDM
Glucose			
Basal	NC	NC	NC or ↑
Glucose tolerance	↓	NC	↓↓↓
Insulin			
Basal	NC	↑	↓ NC ↑
Glucose loading			
Initial response	D	↑	D
Later response	↑	↑↑↑	V
Feedback inhibition of secretion	↓	↓	↓
Triglyceride	NC	↑	↑
Site of defect			
Insulin receptor number	NC	↓	↓
Postreceptor defect	+	NC → +	+

Modified from Jackson RA: *Diabetes Care* 13(suppl 2):9-19, 1990.
 NC, No change; ↑, increased; ↓, decreased; ↑↑↑, very increased; ↓↓↓, very decreased; D, delayed; V, variable.

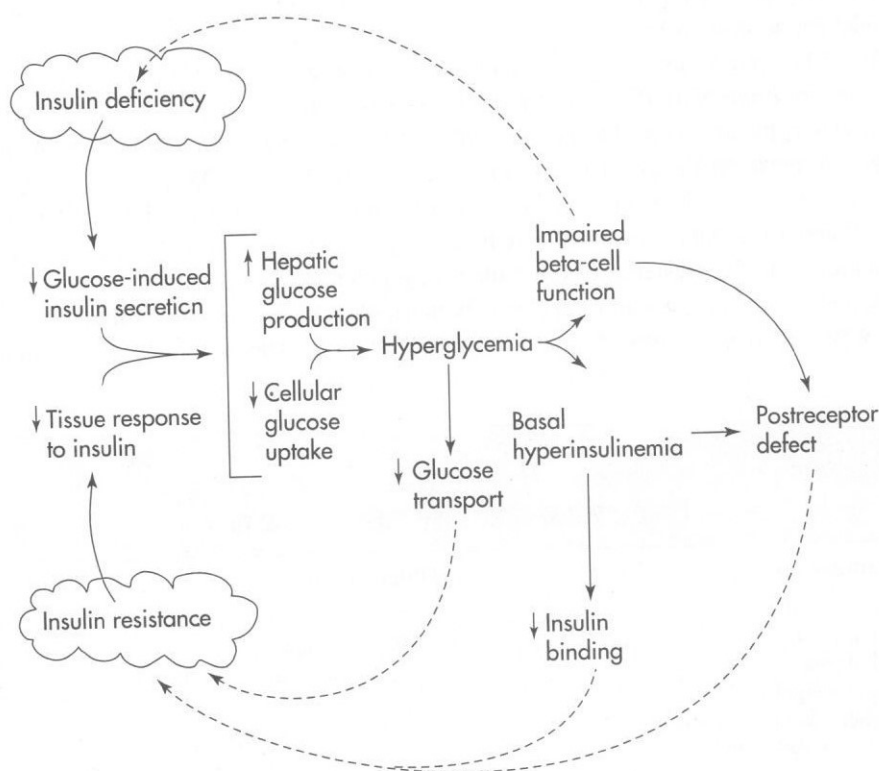


Fig. 21-7 Pathogenic sequence of events leading to development of insulin resistance in NIDDM. (Reproduced with permission of the American Diabetes Association, Inc. Modified from DeFronzo RA: *Diabetes* 37:667-687, 1988.)

hypotension, abnormalities in thermoregulation, and a tendency for dehydration.¹⁴¹ Impairments in the body's ability to maintain homeostasis with changing stresses significantly increases older persons' overall "frailty" and therefore their quality of life. With orthostatic hypotension, for example, many persons find it frustrating to have to arise slowly from a bed or chair to avoid dizziness, especially when they feel the urgency to urinate or answer the phone. This is an example of what may lead an elderly person to say, "It's awful to get old!"

Atypical Presentations of Diabetes and its Complications

Diabetes can present atypically in older adults, as can its acute and chronic complications. Whereas the classic symptoms of hyperglycemia in younger adults are polyuria, polydipsia, and polyphagia, these symptoms may be masked by other illnesses or entirely absent in older adults. Box 21-2 outlines symptoms of diabetes for younger and older adults. Detection of polyuria may be confounded by urinary incontinence. Thirst is typically blunted in older persons, increasing their chances of dehydration and electrolyte imbalance. Hunger may be blunted by the side effects of medication, depression, or gastrointestinal disease. Fatigue, also a common symptom of uncontrolled diabetes, may be discounted by the older person as "just part of getting old." Weight loss is sometimes profound but may be so gradual that it goes unnoticed for several years.

Acute complications of diabetes include *hypoglycemia*, *hyperosmolar hyperglycemic nonketotic syndrome* (HHNS), and *diabetic ketoacidosis* (DKA). These acute complications may present atypically in the older person, who may have a more difficult time physiologically coping with these challenges than a younger person. HHNS and DKA are relatively rare, especially DKA, since it occurs almost exclusively among persons with IDDM.¹¹² Efficient diagnosis and treatment are essential to reduce mortality but are often confounded by atypical presentations and the existence of other medical problems.

Hypoglycemia occurs almost exclusively in people taking insulin or sulfonylureas; thus those who are diet controlled are not usually at risk. The adrenergic symptoms of

BOX 21-2

TYPICAL PRESENTING SYMPTOMS OF DIABETES

Younger adults

Polyuria
Polyphagia
Polydipsia
Rapid weight loss
Diabetic ketoacidosis (DKA)

Older adults

None; if present may include:
Blurred vision
Worsening urinary incontinence
Increased nocturia
Gradual weight loss
Presence of long-term complications

hypoglycemia that result from the release of epinephrine (shaking, sweating, nervousness), may be blunted or absent in older persons. As a result, medications that block beta-adrenergic receptors, such as propranolol, are not recommended. When hypoglycemia occurs without symptoms to prompt treatment, the reaction can progress to the point where the person with diabetes requires the assistance of another person. This is called *hypoglycemia unawareness*. It not only is frightening, but also may threaten the person's level of independence in the eyes of others. It is precisely this issue that causes many health professionals to be concerned about avoiding hypoglycemia, often to the point where they are hesitant to treat asymptomatic *hyperglycemia*. This is the basis of the debate about what glucose range is best, since many older adults have few symptoms of hyperglycemia, even with average blood glucose levels of 350 to 400 mg/dl.

Generally, older adults have symptoms of chronic complications that are similar to those experienced by younger persons. However, there are some caveats to note when working with older persons. First, a chronic complication of diabetes such as peripheral sensory neuropathy or impotence may be the initial symptom of NIDDM that has actually been present for years. Second, the presentation of chronic complications may be atypical, may be misinterpreted, or may be overshadowed by other conditions. For example, a person may think the discomfort of peripheral neuropathy is "rheumatism" and attempt numerous over-the-counter arthritis preparations before consulting a health care professional. Small cerebral or myocardial infarcts may present "silently" and be diagnosed only when the older man's son or daughter brings him in "because Dad has really slowed down." Symptoms of peripheral vascular occlusive disease such as claudication may not occur in a person who does not exercise enough to induce the related ischemia. Men may perceive impotence as a sign of aging and not mention it to their provider. Third, retinopathy may go undiagnosed and untreated in an older adult who has dense cataracts.

Multiple Concurrent Disease Interactions

Although some older adults have no chronic diseases or only one, most elderly persons have more than one chronic illness. The prevalence of vascular, musculoskeletal, neurologic, ocular, urinary, foot, and gastrointestinal diseases is almost twice as great in persons age 65 and over as those ages 45 to 64.¹⁰⁷ Progression of diabetes and other chronic diseases can lead to their long-term complications. Thus older adults are prone to multiple chronic conditions that may occur as primary disease entities or as secondary complications, and these may interact with each other as previously described.

Hypertension increases in incidence with age, particularly in the African-American population.⁹⁸ High blood pressure alone increases the incidence of renal, cardiovascular, and cerebrovascular disease; diabetes compounds the risk. Treatment of hypertension can be problematic in older adults with diabetes, since diuretics may further impair glucose tolerance and lead to electrolyte disturbances. Beta blockers can also have a negative effect on lipid and glucose levels and can mask symptoms of hypoglycemia. Therefore, calcium channel antagonists and angiotensin-converting enzyme (ACE) inhibitors are preferred for monotherapy of hypertension. Of these, the ACE inhibitors appear to provide the greatest advantage

because they show some nephroprotective effect in many studies and have few side effects. Generally, the earlier an ACE inhibitor is used, the better the protective effect on kidney function.¹⁵⁷ Current research is examining the question of whether ACE inhibition is indicated in the absence of hypertension when microalbuminuria is present.⁹⁷

Coronary artery disease (CAD) is the most common condition present among older adults and, despite improvements in related mortality with the advent of cardiac intensive care units, it remains the number-one cause of death in people over age 65. CAD is more common among older persons with diabetes and has important implications for diabetes care. First, the avoidance of hypoglycemia is of particular importance for these persons. During a hypoglycemic reaction, the counterregulatory hormones that raise blood glucose also raise the blood pressure and pulse. This increases myocardial oxygen demands and can cause angina. Second, some research studies suggest that silent MIs are more common when diabetes is present, possibly as a component of autonomic neuropathy.¹⁵² When an MI occurs without the usual manifestations of angina (chest tightness or pain, often radiating to the left arm or jaw), diagnosis and treatment are often delayed, increasing mortality. The prognosis is often poor for persons with diabetes who survive MI.⁷⁸ Survival rates at 1 and 5 years after MI are 82% and 58%, respectively, compared with 94% and 82% for people without diabetes.⁹⁸ Women with diabetes appear to have poorer survival rates than men.⁵⁵

Diabetes is not a risk factor for osteoarthritis, but arthritic conditions are common in late life, and older persons may consider the related pain more serious than their diabetes. As an example, when an older woman with painful, debilitating osteoarthritis of the knees comes in for a routine appointment, advice about diet and blood glucose control may not seem relevant at that time. She may only want pain medication and instruction in using a cane. Also, arthritis pain may lead to depression, overeating, and decreased activity, which can worsen glycemic control in persons with NIDDM.

Parkinson disease, with its related tremors, muscular rigidity, and bradykinesia, can lead to difficulties with diabetes self-care practices. In its advanced stages the fine motor skills needed for self-monitoring of blood glucose (SMBG), insulin administration, and foot care may become impossible, causing frustration and an increased dependency on others. Dementia related to Parkinson disease, Alzheimer disease, or CVAs has a significant impact on diabetes self-care.

HHNS is an important example of an interaction in which acute and chronic diseases overlap. In this syndrome an older person with diabetes with compromised physiologic function usually has an acute insult such as pneumonia, MI, or CVA (Box 21-3).¹¹² The most common predisposing factor is infection.¹⁵³ The stress response to the insult leads to the secretion of stress hormones, including cortisol and epinephrine, which worsen hyperglycemia. As glucose is lost in the urine, dehydration and hyperosmolarity develop. The problem then becomes a self-perpetuating positive feedback loop instead of a self-correcting negative feedback loop; the more the person secretes stress hormones in an effort to cope with the stress, the more dehydration and hyperglycemia progress because of relative insulin insufficiency. In addition, older persons have a lower total body water content (60% or less) compared with young adults (70%) and may therefore have as much as 8 fewer liters of fluid with which to buffer changes in osmolarity.⁹⁹ Ketogenesis does not develop, partly because of the

BOX 21-3

RISK FACTORS FOR HYPERGLYCEMIC HYPEROSMOLAR NONKETOTIC SYNDROME (HHNS)

Events

Infection
 Burn
 Surgery
 Cerebrovascular accident (CVA)
 Renal failure
 Pancreatitis
 Myocardial infarction (MI)

Drugs

Diuretics
 Beta blockers
 Glucocorticoids
 Anesthetic
 Diphenylhydantoin

Modified from Morrow L, Halter J: *Geriatrics* 43(suppl):57-65, 1988.

availability of some circulating insulin; however, the mechanism is not fully understood. HHNS usually develops over the course of 1 to 2 weeks and has a significant mortality rate, reportedly as high as 40% to 70%, which is higher than in DKA.⁸³ The mortality rate is particularly high among older persons and those with higher serum osmolarities and more severe concomitant illnesses. One third of all cases of HHNS are diagnosed in persons with no prior history of diabetes.¹⁵³

The person with HHNS may have a lower level of consciousness, such as acute confusion, lethargy, or even coma. Because the primary problem is profound dehydration from hyperglycemic osmotic diuresis, signs of dehydration, such as orthostatic hypotension, tachycardia, and dry skin with poor turgor, are generally present. Serum osmolality is greater than 320 mOsm/L, indicating hypertonic dehydration. The plasma glucose value is typically more than 600 mg/dl and may be more than 1000 mg/dl.

The treatment of HHNS involves rehydration (which needs to be at a cautiously rapid rate in older adults), insulin, gradual reduction of hyperglycemia and osmolality, correction of electrolytes and pH, and diagnosis and treatment of the underlying cause. Table 21-6 summarizes the signs, symptoms, and treatment of HHNS. Health professionals need to be aware of the risk of HHNS in older persons with NIDDM and encourage them to monitor blood glucose levels, report any trends in high readings, and drink plenty of sugar-free fluids. HHNS is more common in nursing home residents and persons with dementia, so caregivers also need to be aware of signs and symptoms.⁸³ When a person with NIDDM is admitted to the hospital with infection or for surgery, glucose monitoring should be done frequently.

Geriatric Pharmacology

Persons over age 65 have an average of three prescriptions to manage and take 5.6 medications daily.¹⁰⁶ Although the 25 million Americans over age 65 constitute about 12% of the

Table 21-6 Hyperglycemic Hyperosmolar Nonketotic Syndrome (HHNS)

History/symptoms	Signs	Treatment
Complains of fatigue, weakness	Orthostatic hypotension Tachycardia	Rehydration Insulin
Caregivers note confusion, lethargy, or unresponsiveness	Dry skin, tenting Poor skin turgor Cold extremities	Correct electrolytes and pH Treat underlying problem
Recent infection or other illness/injury	Glucose >600 mg/dl Serum osmolarity	
33% deny history of diabetes mellitus	>320 mOsm/L	

population, they purchase 25% of drugs sold in the United States. Drug expenses may account for almost 20% of their personal budgets.¹⁰⁷ As a result, older persons with chronic conditions are at risk for problems related to *polypharmacy*. Not only does the possibility exist that a drug used to treat one illness may interact with another illness, but also that the drugs can interact with each other. To compound this problem, older adults are often taking a broad variety of over-the-counter (OTC) medications, such as antacids, pain relievers, cold preparations, and laxatives.

Performance errors with medications occur in all age-groups with alarming frequency, but there is no reason to believe that they occur more often among older adults than among younger persons.⁴ However, because older persons take more medications and because of their greater frailty, the risks for negative effects as a result of these errors are of greater concern. Older adults typically experience other problems with medications, including receiving and sharing medications with peers and family members and receiving medications from several care providers.⁹² Health professionals may fail to provide clear instructions about the correct use, dosage, and timing of medications they prescribe. Since older persons are often taking several medications, this increases the potential for errors. Many pills look alike, and one may be inadvertently substituted for the other. Discontinuing one drug to begin another is not always clearly explained, and individuals may take both. Therefore the use of both prescribed and OTC medications needs to be carefully assessed, including how, when, and why the person decides to take them.

Use of alcohol should not be overlooked in the challenge of geriatric pharmacology. Older adults often continue to enjoy alcohol in later life but may have a decreased tolerance. They are often unaware of the interactions between alcohol and other drugs, such as its synergistic effect with sedating medications, or that drinking alcohol may cause a mild Antabuse-like reaction when taking chlorpropamide. Depending on a broad array of factors, alcohol can promote hyperglycemia or hypoglycemia in the person with diabetes.¹⁰¹

The ingestion of alcohol, particularly for those with liver dysfunction, prolongs the hypoglycemic effect of many sulfonylurea agents (chlorpropamide, tolbutamide, acetohexamide, tolazamide, glipizide, glyburide).¹⁴¹ Depression, which may affect older adults, may increase alcohol use. It is important that health professionals elicit information about alcohol use in a nonjudgmental way from all individuals, especially those with diabetes.

BOX 21-4**IMPORTANT SULFONYLUREA INTERACTIONS****May diminish hypoglycemic efficacy**

Diuretics
 Diphenylhydantoin
 Glucocorticoids
 Lithium
 Rifampin
 Isoniazid
 Nicotinic acid

May enhance or prolong hypoglycemic effect

Sulfonamides
 Salicylates
 Clofibrate
 Dicumarol
 Monoamine oxidase inhibitors
 Nonsteroidal antiinflammatory drugs
 Beta-adrenergic blocking agents
 Alcohol

Data from Halter JB, Morrow LA: *Diabetes Care* 13(suppl 2):86-92, 1990.

Sulfonylureas can have interactions with other drugs, and these interactions can affect glycemic control and are important considerations when working with older adults (Box 21-4).⁵⁸ The choice of oral agent is especially important for the older adult who may have altered hepatic and renal function. Table 21-7 shows the daily dose, duration of action, and route of elimination for various oral sulfonylurea agents. Generally, drugs with a short duration of action and inactive metabolites are considered safer. Thus chlorpropamide is not a drug of choice for older adults because of its long duration of action.

Iatrogenic Disease

Iatrogenic disease is any adverse condition that results from the efforts of health care professionals to treat an illness or other type of condition. These include the complications of immobility when a person is confined to bed in a hospital and nursing home, acute confusional states resulting from drugs and anesthesia, and nosocomial infections after surgeries and other procedures. The person with diabetes may be at increased risk for iatrogenic diseases because of compromised physiologic function and the worsening of blood glucose levels with stress hormones. For example, HHNS can be triggered iatrogenically by the use of certain medications, surgery, or infection secondary to procedures such as placement of an indwelling urinary catheter.

Table 21-7 Comparison of Oral Sulfonylurea Drugs

Drug	Daily dosage range (mg)	Approximate duration of action (hours)	Route of elimination
Tolbutamide	500-3000	6-12	Hepatic metabolism; renal excretion of less active metabolites
Glipizide	2.5-40	8-12	Hepatic metabolism; renal excretion of inactive metabolites
Tolazamide	100-1000	12-16	Hepatic metabolism; renal excretion of less active metabolites
Acetohexamide	250-1500	12-24	Hepatic metabolism; active metabolism (Hydroxyhexamide has half-life of 5 hours and is excreted renally.)
Glyburide	2.5-20	24	Hepatic metabolism; renal excretion of less active metabolites
Chlorpropamide	100-750	40-72	80% hepatic metabolism; renal excretion of parent drug and less active metabolites

From Morrow LA, Halter JB: Carbohydrate metabolism in the elderly. In: Sowers Jr, Felicetta JV, editors: *The endocrinology of aging*, New York, 1988, Raven.

FUNCTIONAL ABILITY AND THE AGING PROCESS

This chapter has discussed normal aging changes, the prevalence of diabetes, and how chronic conditions can interact. But what about function? Two older persons, both age 70 with diabetes, cataracts, cardiovascular disease, and arthritis, may be taking the same medications, but one may be independent while the other is totally dependent on a spouse for help. Why is one person able to function independently while the other is not? Obviously one's functional capacity is not solely determined by age or by health problems and medications.

Functional ability is the degree of independence with which a person is able to perform common activities of daily living (ADLs). Each person's total functioning is divided into four major areas: physical, cognitive, emotional, and psychosocial.¹⁴⁷ The body's organs and integrated physiologic function are essential for life. The mind's ability to learn, think, remember, communicate, and judge is essential for independence. Positive experiences and expression of emotion are essential for satisfaction. Contact with others and the fulfillment of vocational, leisure, social, financial, and cultural needs are essential for quality of life. Thus the ability to function in all areas has an impact on total health and the ability to care for oneself. Physical health impairments have been linked to depression in older adults.⁶ In addition, the significant happenings in a person's life, the demands of family and friends, the environment of daily living, and personal values related to daily living all serve to make up a person's total functional ability.⁴²

ADLs are divided into two areas: basic or personal ADLs and instrumental ADLs (IADLs). Personal ADLs relate to basic self-care; IADLs relate to what is necessary for independent living. Box 21-5 lists examples of each; both lists could be considerably longer.

BOX 21-5

EXAMPLES OF ACTIVITIES OF DAILY LIVING (ADLS)

Basic ADLs	Instrumental ADLs
Eating	Writing
Bathing	Reading
Toileting	Cooking
Dressing	Menu planning
Grooming	Cleaning
Transferring (to/from bed/chair/bath)	Shopping
Ambulating (or other locomotion)	Doing laundry
Providing foot care	Climbing stairs
Monitoring blood glucose	Using the telephone
Communicating	Managing medications
	Managing insulin/hypoglycemia
	Managing money
	Traveling out of the home
	Maintaining upkeep of home

For example, basic ADLs could include shampooing hair and brushing teeth. IADLs could include cutting food, lifting pots, and turning faucets.

The essence of geriatrics is to assist each person to attain and maintain his or her optimal level of function, since cure of disease is often not possible.¹¹⁸ In order for older persons to live as independently as possible for as long as possible, they require not only health care but often the care of many others, both professional and nonprofessional.

Physical Changes With Aging

Older adults vary as to the age and the extent that the normal physical effects of aging occur. Although there are generally declines in physical functioning, normal aging changes alone do not interfere with a person's ability to achieve and maintain a high level of independence and fulfillment.

Sensory declines, which are common among older adults, have important implications for functioning. Among people over age 65, 18% to 20% have visual impairments, and the incidence of color blindness increases.⁸⁴ Cataracts and macular edema or degeneration are the most common visual problems among people over 65, but their symptoms are rarely reported. Early cataract development leads to a yellowing or browning of the lens and color distortions. Later cataracts lead to bothersome glare and blurred vision. Macular edema may cause double vision, whereas macular degeneration results in a loss of central vision, causing difficult reading.¹⁰⁵ Presbycusis, leading to hearing deficits, is present in one fourth to one half of all older persons.^{74,84} The number and size of taste buds may decrease and the sense of smell diminish, leading to a loss of interest in food.⁴³ Tactile sensation may also decrease.⁸⁴

Cognitive Changes With Aging

Healthy older adults vary greatly in the extent to which their cognitive abilities change with age, but research has shown that a significant decline is not inevitable.¹⁴⁷ Cognitive impairment affects about 5% to 10% of persons over age 65 and is severe in only half of those.^{92,155} Cognitive changes caused by normal aging include slowing but not elimination of the ability to create and retrieve memory, but no normal aging change by itself has to be a threat to an older person's ability to function independently.¹⁴⁷

INTERACTION OF DIABETES AND FUNCTIONAL ABILITY

Physical Considerations

Older persons with diabetes are at an increased risk for functional limitations. Peripheral vascular disease, peripheral neuropathy, diminished proprioception, postural hypotension, obesity, and cardiac disease may interfere with the ability to walk, climb stairs, and perform other physical activities and may increase the likelihood of falls and their debilitating results. Peripheral neuropathy and decreased circulation increase the risks for foot ulcers, infections, and resulting amputations. Carpal tunnel syndrome and diabetic amyotrophy may limit the ability to use one's hands for cooking, dressing, and other fine motor tasks.¹⁴⁷

The prevalence of diabetic retinopathy increases with aging, from 10% at age 55 to more than 30% by age 80.¹¹¹ The prevalence of glaucoma and cataracts also increases in older persons with diabetes. Visual impairment is a threat to independence because it impacts ADLs, work or hobby activities, the ability to drive, and social relationships.

Diabetes-related problems increase both the likelihood that older adults will need surgery and their risk for complications during and after a procedure. Frequent blood glucose monitoring is needed during all phases of the surgical process, and insulin may be needed until after the person has fully recovered.

Elevated glucose levels are associated with other conditions that are likely to impact the lives of older adults. Hyperglycemia leads to decreased red blood cell deformability, which may worsen peripheral vascular disease. Evidence indicates that elevated glucose levels increase platelet adherence, which increases the chances that a person may have an MI or CVA, and may also impair recovery from strokes.¹¹¹

Persons with diabetes report pain more frequently than other chronically ill persons. It has been suggested that hyperglycemia heightens pain perception.¹¹¹ Pain from other chronic conditions and neuropathies may therefore be more difficult to manage for the older person with diabetes.

Loss of bladder control is generally devastating to the person's social and physical functioning. Hyperglycemia and the propensity for bladder infections among older adults with diabetes exacerbate difficulties with incontinence.¹⁴⁷

Cognitive Considerations

It is fairly well established that persons with NIDDM perform more poorly on various cognitive tasks than those without diabetes.^{147,148} One study of older persons with NIDDM

and age-matched persons without NIDDM showed greater cognitive deficits among those with NIDDM even when they perceived themselves to be in good health.¹²⁹ All subjects were ambulatory, lived in the community, and were capable of undergoing several hours of cognitive testing. Poorer performance of relatively healthy older adults with NIDDM compared with the control subjects suggests that cognitive changes are related to the presence of NIDDM. Most of these differences parallel changes encountered with normal aging in that relatively minor differences are found for tests of immediate memory, whereas larger differences are found for more demanding tasks that require working memory. No significant diabetes-related differences have consistently been revealed in the realms of attention, short-term memory, or semantic memory. Although elevated glucose levels appear to contribute to cognitive deficits, the precise relationship is not clear. In addition, elevated triglycerides also appear to affect cognition negatively.¹⁴⁷ Older adults with more severe diabetes, as evidenced by higher glycosylated hemoglobin levels and peripheral neuropathy, show a relatively greater impairment in cognitive function.¹²⁰ However, verbal learning and memory may improve with better glycemic control,⁵³ although further research into the mechanism of this improvement is needed.¹¹⁹ The presence of emotional problems such as anxiety and depression adversely affect cognitive measures in subjects with and without diabetes.

Cognitive abilities are essential to an older person's ability to maintain independence. When older adults who have diabetes and cognitive deficits are challenged to coordinate a complicated treatment program, their independence is likely to be threatened.

In its early stages, cognitive impairment can cause problems such as inconsistently taking medication to manage diabetes and other health problems, but it may not be recognized. Erratic eating patterns may lead to erratic blood glucose levels, weight loss, malnutrition, and dehydration, which in turn may further worsen cognitive function. Early detection of and intervention for cognitive deficits often lead to better health outcomes in older persons and can potentially help them stay in their own homes, if appropriate community resources are used.

In more advanced dementia, such as later stages of Alzheimer type of dementia or severe multiinfarct dementia, the diabetes treatment program often needs to be redefined. For example, if an older person with diabetes develops Alzheimer's disease with resultant weight loss, simply helping the person obtain adequate nutrition may be more important than avoiding moderate hyperglycemia. In this situation, most of the goal negotiation, education, and feedback needs to be between the health care team and the person's caregiver.

NORMAL PSYCHOSOCIAL DEVELOPMENT

The changes that occur during the aging process are not only biologic but social and psychologic as well. As the developmental tasks of middle adulthood are completed, the tasks related to the end of the life span are begun.

Several theorists have proposed tasks that are specific to this stage of life. Erikson³⁵ described this phase, beginning at age 50, as *integrity versus despair*. During this stage an individual reviews his or her life for relevance and meaningfulness and develops a sense of integrity or acceptance versus a sense of despair or rejection of one's life.⁵ Havighurst⁶⁶

theorized that individuals must learn to adapt to new roles, situations, and relationships throughout the life span. He defined the adaptations of later maturity, beginning at age 60, as adjusting to a decline in strength and health, retirement, death of one's spouse, difficulty affiliating with one's age-group, and accepting death. More recently, Levinson and others⁹⁰ proposed a view of the life cycle as a series of eras, each lasting 20 to 25 years. The primary task of late adulthood, beginning at age 60, is to balance involvement with society with involvement with self.

The developmental tasks for this stage represent major life adjustments and many losses. Therefore this is one of the most stressful periods in the life span.¹⁶² Depression is believed to be an extremely common response to these losses, although it is largely undetected and untreated. It is so common that it has been suggested that older adults go through a developmental depressive crisis, similar to the developmental crisis of adolescence.⁴² The ability to make the many adjustments needed during this phase may be a function of what has occurred during the previous stages and whether earlier tasks were completed. This is not to say that growth and insight do not occur, because many older adults are able to review their lives, place events in perspective, and thus resolve lifelong conflicts.⁷⁹

Older adults who are members of ethnic minorities appear to be at greatest risk for the negative impacts of the aging process on income, health, and some measures of life satisfaction. Interestingly, however, on some measures of quality of life, differences in scores between Caucasians and minority groups diminish with age.⁷⁹ Thus aging appears to both enhance and level off the problems associated with being part of a minority group. It is also important to note that members of every ethnic group are heterogeneous and culturally reflect both personal and shared experiences.

Family Relationships

The family is one of the most basic institutions within American society. Most people are born into a family, live much of their lives within a family, and consider it to be a high priority in their values system.⁵ However, the family structure, roles and relationships within the family, and its purpose and function change over time.⁷⁹

The family has a dynamic life cycle that begins with marriage and ends with the death of one spouse. Several models for the life cycle of a family exist, but the stages that generally occur among older adults begin when children start to leave home. In a model adapted by Atchley,⁵ the last four phases are as follows:

1. Launching children (oldest child to youngest child leaving home)
2. Middle years (children gone to spouse's retirement)
3. Retirement (one spouse retired until start of disability)
4. Old age (one spouse disabled until death of one spouse)

The "empty-nest syndrome" is a relatively new phenomenon within the life of a family as people live longer and healthier lives. It generally refers to the years a couple spend together between the launching of their last child and the death of one spouse. Although the departure of the children is a disruption to the family and the parents, most research indicates that this is a time many parents look forward to, prepare for, and do not find exclusively stressful.⁸

Family units often include more than one generation. Research into family forms and functions has not borne out the expectation that the isolated nuclear family would emerge as the norm. With the increased longevity of the current population, four-generational families are becoming more and more common, and the generations frequently share many links. The common thread that binds the generations is a system of shared beliefs, norms, values, and cultural traditions in the family.²³

Ethnicity appears to play a strong role in family relationships. It is often assumed that minority persons have more extended family ties, including aunts, uncles, siblings, nieces, nephews, and cousins, than do Caucasians. This appears to be true for African-American adults, with older African-American women playing an important role in this network.¹⁴³ However, this does not appear to be true for older Hispanic-American adults. Extended family life is the tradition of this culture, but it is rapidly becoming irrelevant with the increasing urbanization and assimilation of Hispanic-American families. Although this has led to some tensions between generations, it seems that older adults are still respected and revered.⁷⁹ Many older Asian-American and Native-American persons may be suffering from isolation for similar reasons. Members of the Asian-American minorities have generally been economically assimilated, but the simultaneous accommodation to American values has left some older members isolated and alienated from their families. Older Native-American adults are traditionally held in high esteem by younger tribe members. Although they still play an important role within the extended family, increased urbanization is also causing erosion in this family structure.²³

The most important family relationship for many older adults is with their adult children.¹⁴³ About 80% of older Americans have living children, and most of them are not isolated from their offspring.⁵ Most studies show that older adults and their children see each other quite often. Distance appears to be the strongest determinant for frequency of contact, and visitation is more frequent along the female line of the family.⁷⁹ Among older Caucasians, socioeconomic status is the most significant predictor of the informal support network, with persons at a high socioeconomic level more likely to have a supportive relationship with children.¹⁴³

When asked, most parents and adult children report positive feelings for each other. Generally, older adults hold their children in high regard, and parents remain important to children throughout the life span. Most adult children are able to view their parents as individuals with strengths, limitations, and life histories.⁵

Despite these mutually strong feelings, almost all studies show that older adults prefer to live near, but not with, their children. Most appear to want "intimacy at a distance," citing the desire to preserve privacy and independence and to avoid conflict or interference with their children.⁷⁹ Most older parents are able to recognize that their children have the right to pursue their own lives.⁵ Caucasian older adults are more likely to move in with their adult children, whereas older African-American and Hispanic-American persons are more likely to have adult children move in with them.²³

Mutual aid is also considered to be a crucial intergenerational dimension. Research indicates that a two-directional flow of assistance occurs between parents and children. Financial and social support is provided by each generation to the other at different times over

the years.²³ Parents generally attempt to provide emotional and financial support to their adult children as long as they are able and healthy.⁵ The assistance provided consists of both informal, nonessential services (e.g., babysitting, transportation) and highly organized, essential services (e.g., financial aid, housing). The type of assistance offered and received depends on the gender of the parents and children, ethnicity, and social class.⁸⁰ For example, compared with other ethnic groups, African Americans are most likely to give or receive help and support across generations.²³ Older African Americans receive goods and services more often than younger ones, with reported frequency of help decreasing as age increases.⁶⁵

The two-way flow of support may persist until the death of one spouse or extreme frailty in the older parent.⁷⁹ More attention is being given to the extent to which middle-age people experience being in the middle between their children and their parents. Feelings of a sense of duty underlie many intergenerational relationships during this time.⁵ The expression "sandwich generation" identifies this dilemma. Many people believe that a role inversion or reversal occurs during this time. However, this should not be expected and may even be maladaptive. "Parentification" of the children and "infantilization" of the older parents not only leads to guilt, but also is demeaning to everyone involved. Such behavior is often a reflection on the past relationship between parents and children and conflicts that have never been resolved.¹³⁹

About 80% of older persons have living brothers or sisters. With the advent of old age, the death of a spouse, and an "empty nest," many older adults seek to renew sibling relationships. Men are generally closest to sisters, and sister-sister relationships are often extremely close. Siblings are especially important in the lives of older adults who never married or had children, since spouses and children are generally viewed as the first lines of support.⁵ Friends also serve a primary role in support networks for many older adults. Among African Americans, members of their churches are also a particularly important source of support and assistance.¹⁴⁴

Marriage and Divorce

The number of older married couples is increasing because of the greater longevity of the population, particularly among men. The average couple can expect 15 years together after the departure of the last child.⁷⁹ Most older couples have grown old together, and their relationship is often the focal point in their lives.

Most studies have shown that the pattern of marital satisfaction is high in early adulthood, declines through middle age, and rises steadily again after childrearing. Happy couples provide great comfort and support to each other, show a high degree of interdependence, share many activities, remain sexually intimate, and exhibit greater equity between partners than unhappy couples.⁵

Marital satisfaction is a primary factor for overall satisfaction with life. One of the functions of couplehood involves intimacy, including a sense of belonging, mutual affection, regard, trust, and sex. Sexuality is an important but often neglected component of intimacy among older adults. Sexual activity reflects physical capacity, emotional needs, and social

norms and means much the same to older persons as it does to others. For couples who remain physically healthy, the later years generally reflect feelings of greater appreciation and affection for each other and an increase in the time and opportunity for companionship. Diminished sexual function related to aging, poor health, or specific diseases, such as diabetes, can have a negative impact on marital happiness.⁵

Not all marriages become more satisfying over the years; a small proportion do not. The quality of the relationship and adjustments made in later life are probably a reflection of adjustments made earlier in life. Marriages among older couples reported as happy had generally been satisfying over the life span, whereas unhappy older couples reported difficulties from the beginning.²³ Higher proportions of unhappy couples reported children living at home, less than good communication, fewer mutual interests, differing values, poor communication, and low enjoyment of sex.⁵

The divorce rate is not high among older couples, but it has more than doubled since 1960. Older African Americans are almost twice as likely as older Caucasians to be divorced or separated.³⁴ The difficulty of adjusting to divorce increases as age increases, making it more stressful. Compared with younger divorced persons, older adults report greater unhappiness, fewer positive emotional experiences, greater pessimism, and long-term dissatisfaction.⁷⁹ Older women may experience a significant loss of income if they have no retirement funds of their own.⁵

Widowhood

The majority of older women are widows. The longevity gap between men and women has not been bridged completely, so the disproportion between the sexes increases with age.¹³⁹ The proportion of African-American and Hispanic-American widows is higher than Caucasians because of decreased longevity among African-American and Hispanic-American men.²³

Considerable variation exists in the experience of widowhood. Almost everyone is emotionally impacted by the loss of a spouse, but some people are impacted more severely and for a longer time. Lopata⁹⁴ has proposed four stages in the adjustment to widowhood: (1) the official recognition of the event, which is a time of crisis and mourning; (2) the temporary disengagement stage; (3) limbo, when one confronts life without one's spouse; and (4) the reengagement stage with the establishment of a new life-style, when one reorganizes one's life as a single person.

Although controversial, the adaptation process and difficulties encountered appear to be similar for men and women. The concurrent loss of a widower's occupational role may compound the loss of his wife, while widows often experience a loss in income.²³ Widowhood affects all family interactions, and widowed parents must adjust to different relationships with their adult children.⁵ For example, a widow may grow closer to an adult daughter. Loneliness is a primary problem, and having an effective social support network appears to soften the impact of a life event as stressful as widowhood.²³

Grief is defined as a reaction to loss, and *bereavement* refers to the state of having sustained a loss.⁸⁰ Grief can include physiologic, psychologic, and sociologic responses.

People who experience a loss tend to go through predictable stages in the adjustment process, including protest, despair, detachment, and reorganization.²³

Older adults in American society are not always provided with an opportunity to express their grief. Many people believe that since older persons should expect loss as inevitable, they should be able to "grin and bear it." The inability to express grief may lead to physical manifestations or symptoms that can be misinterpreted as dementia. Unresolved grief can also lead to increased risks for new illnesses, worsening of chronic illnesses, or even death.¹²¹

The person who becomes a widow(er) is confronted with a variety of personal and familial problems. Widowed persons consistently show higher rates of mortality, mental disorders, and suicides. The death of a spouse is particularly difficult for persons who depend heavily on their marital partner.²³ For persons with diabetes, this may be a time of worsening in blood glucose control because of stress, loss of support, or the gap left if the spouse was responsible for care activities or food preparation.

Remarriage

Remarriage may be desirable for many divorced or widowed older adults. The probability of remarriage decreases as age increases, however, partly because of the smaller numbers of eligible men among the older population. The opportunity for remarriage is even less for African Americans and Hispanic Americans.

The primary reason for marriage among older adults tends to be companionship. Some older persons remarry to allay their anxiety about poor health, to obtain financial security, and to avoid dependency on their adult children.⁵

Marriages between older adults generally appear to be successful, particularly when based on affection and mutual financial security. The approval of children also appears to contribute to success.⁷⁹ Having similar backgrounds and being well acquainted before marriage also increase the likelihood for success.²³ Impotence, which occurs frequently in men with diabetes, may hinder both the interest in and the success of a late-life marriage.

Grandparenting

Increased life expectancy, earlier marriages, shorter childrearing periods, and fewer children have exposed more middle-age and older adults to grandparenthood than ever before.²³ Many adults will spend 40 years as grandparents.⁵ About 75% of older adults are grandparents, but only a few adults over age 65 have young grandchildren.

Neugarten and Weinstein¹¹⁶ identified five major styles of grandparenting as the following:

1. Formal: maintain clearly defined lines between parenting and grandparenting and leave parenting exclusively to the mother and father
2. Fun seeking: informal and playful with an emphasis on mutual gratification
3. Distant figure: contact fleeting but benevolent
4. Surrogate parent: cares for children while mother works; usually grandmother
5. Reservoir of family wisdom: distinctly authoritative; usually grandfather

Older grandparents are more likely to have a more formal style of grandparenting, and women are more likely to look forward to the role of being a grandparent than men.²³

More attention is now being paid to the growing number of great-grandparents in the United States. There appear to be two styles of great-grandparenting: remote and close. Many similarities exist between grandparenthood and great-grandparenthood, but increasing age, frailty, and distance have an impact on the relationship.⁷⁹

Generally, grandchildren seem to have strong affection toward their grandparents.⁷⁹ Studies have shown that even as young adults, grandchildren rate relationships with their grandparents as very significant and keep in close contact.⁵ Although not meaningful to all older adults, most come to enjoy the role because it involves a minimum of responsibility and much personal fulfillment.²³ The age at grandparenthood, concurrent life events, and ethnicity all influence grandparenting styles.⁵

Hispanic Americans have the largest number and report the most frequent contact with their grandchildren, while African Americans have more contact than Caucasians, except among the oldest groups.⁷⁹ More older African Americans appear to offer child-raising assistance with their grandchildren than Caucasians. Among older-adult households headed by African-American women, 41% include children under age 18, compared with 9% headed by older Caucasian women. Native Americans also appear to be influential in raising grandchildren, particularly those who live on reservations.²³ In cultures such as these, where NIDDM is prevalent and the influence of grandparents is strong, one approach that may be helpful is to teach the importance of childhood nutrition to the grandparents in an effort to prevent obesity and the subsequent development of diabetes.

Retirement

Work and retirement are highly significant aspects in the lives of many older adults. Work shapes an individual's daily activities and contributes to his or her self-concept and life satisfaction. Retirement is therefore a major event. It marks a change in daily activity and economic status and is a symbolic transition to old age.¹⁶²

Retirement is a process that involves withdrawing from work and taking on the roles of a retired person. Being able to settle into a satisfying routine is important for retirement satisfaction. Atchley⁵ describes phases that persons may go through when adjusting to retirement as follows:

1. Pre-retirement: concerns about the financial aspects and activities during retirement begin; includes remote and near phases
2. Honeymoon: immediately following retirement, when freedom is enjoyed
3. Rest and relaxation: temporary low level of activity
4. Disenchantment: a letdown during adjustment to a slower pace
5. Reorientation: refocus of activities and routines as persons pull themselves together
6. Termination: return to work or loss of retirement role through illness or disability

Retirement is somewhat different for women and minorities than for Caucasian men. Most older women have had discontinuous work histories or no employment history. Gains that occurred during the Civil Rights movement of the 1960s occurred too late to have much

impact on the educational level or economic conditions of today's older minorities. As a result, older African Americans fare worse than Caucasians on a variety of economic indicators. The varied work histories of many African Americans, which include high levels of unemployment and overrepresentation in low-paying jobs, are reflected in their retirement incomes. Older African-American women generally have higher educational levels than African-American men but have generally had lower-paying jobs. African-American women are more likely to have worked steadily for all their adult lives than Caucasian women, but they are less likely to have retired.⁷⁹ Many older African Americans continue to work indefinitely and only yield to retirement because of health problems.¹⁷ Older African Americans with a discontinuous work life and the economic need to work intermittently may be more likely to assume a disabled-worker role, which is viewed as more advantageous than a retired role. The "unretired-retired" are those 55 and older who are no longer working, generally because of disability, but who do not consider themselves to be retired.⁴⁷ This group appears to be the most deprived of the older African-American adults and may often need to work for economic reasons despite poor health or advancing age.⁴⁶

Few Hispanic Americans have had lengthy work careers to prepare for retirement. The combined problems of low-paying, unskilled jobs and questionable citizenship or residential status has led to older Hispanic-American adults staying in the work force longer than older Caucasian adults.⁷⁹ In general, however, lower educational levels among minorities and past discrimination in the work place has led to lower incomes, lower Social Security benefits available, and the postponement of retirement for as long as possible.

Despite the grim picture that is often painted of retirement, studies show that most people look forward to retirement and see it as a positive time. The adjustment to retirement is thought to be determined in part by the person's attitude. Factors that impede the adjustment process include poor health, inadequate income, the inability to give up one's job gracefully, and any other situational changes that occur at the same time.⁵ Research has shown that the health of retirees often improves rather than worsens, as is generally believed. Because older African Americans were more likely to have been shut out of meaningful occupational positions, they may be less likely to find retirement disruptive.²³

Retirement before age 62 is considered to be early retirement. Very early retirees tend to be either in good health with high incomes or in poor health with very low incomes.¹⁶² Unfortunately, early retirees among older adults with diabetes generally fall into the latter category, since the pathology and morbidity related to diabetes are risk factors for early retirement.¹⁵⁴

Death and Dying

Death and the dying process are being viewed more and more as the terminal phase of the life cycle.⁸⁰ As people age and are confronted with the deaths of friends and family members, they are less able to avoid thinking about this stage in their own life and the inevitability of their own death.

The dying process is not conceptualized as an unbroken decline in health toward death. In the first or social stage, older persons are fighting the tendency of society to impose a

premature social death. They may bargain to hold onto symbols that represent the future, such as a cane when they are no longer able to walk. In the second or terminal stage, death is more imminent, and the person may bargain directly with God.⁸⁰

The meanings that people give to death vary as a function of age. Studies indicate that two meanings of death are of particular significance for older adults. One is death as an organizer of time. Anticipating the end of one's life may bring about a reorganization of time and priorities. The second is the meaning of death as loss. Facing death can make all possessions and other experiences appear to be transient and meaningless. The perception among older persons of the finitude of life is reinforced by both people and institutions. American society appears to perceive older persons as not deserving of a major investment of resources.⁸⁰ At the same time, health care professionals sometimes appear to value preservation of life whenever possible, whereas older persons who perceive their quality of life to be poor may want to avoid life-sustaining measures. The debate about how much societal values can supercede personal choice is increasingly an issue of concern among legislators and citizens.

Scientific studies about the effect of religious beliefs on attitudes toward death are inconclusive. The most common attitude toward death is fear, and the acceptance of death is viewed as true maturity. In general, studies have shown that older persons frequently are more accepting of death and have fewer anxieties about it. Among the aged population, those who report good health are most likely to be evasive about death, whereas those in poor health view death in a more positive manner.²³

IMPACT OF DIABETES ON NORMAL PSYCHOSOCIAL DEVELOPMENT

Sociocultural Considerations

A complex interplay exists between the physical and sociocultural aspects of an illness among older persons.²³ Many of the negative events that occur to older adults are both physical and social and impact total functional ability. For example, because of the dietary demands of diabetes, older persons may isolate themselves from eating in restaurants or gatherings of family and friends, leading to loneliness and decreased support to cope with their illness. Diabetes-related impotence may lead to isolation from one's spouse and marital difficulties.

Very little work has been done on the sociocultural impact of diabetes on older adults. However, it is believed that the impact is generally less severe than among young persons. A study by Linn and colleagues⁹¹ indicates that older adults are more likely to accept a chronic illness such as diabetes as a natural part of the aging process. Jenny⁷⁴ compared adaptation to diabetes among four age-groups: younger (mean age of 19.7), middle (mean age of 35.9), older (mean age of 57.3), and aged (mean age of 71.7) adults. The older and aged adults identified the fewest barriers to adherence and the least number of special concerns about diabetes. However, they also identified the greatest number of health problems that interfered with diabetes management and the least amount of social support. Among the four age-groups, diabetes was perceived as least severe by the aged subjects.

The issue of the sociocultural impact of diabetes is further complicated by differences in types of diabetes and treatment programs. One comparison of subjects with IDDM (mean age of 34.8), NIDDM using insulin (mean age of 58.7), and NIDDM not using insulin (mean age of 62.3) showed that subjects with NIDDM using insulin reported significantly more control problems, social problems, and barriers to adherence than persons with NIDDM not using insulin. IDDM and NIDDM participants using insulin reported similar perceptions of their risk for complications of diabetes, while NIDDM subjects not using insulin reported a significantly lower perceived risk.²⁷ Severity may also be related to glycemic control, with those in poorer control rating diabetes as more severe. In this sample, persons taking oral agents or insulin had higher glycosylated hemoglobin levels.¹²³ The perception of severity of diabetes compared with other chronic illnesses in late life has been largely unexplored.

Older adults' emotional response to diabetes is probably similar to that of younger persons. Depression appears more common among persons with either type of diabetes than among those without diabetes.⁴⁵ The older adult's self-esteem, bodily integrity, self-worth, autonomy, independence, and control all may be challenged by a diagnosis of diabetes. The ability to deal with these feelings is probably affected by previous coping style, social support, and economic factors.¹⁴⁷

Family and social support appears to impact glycemic control and self-management behaviors among older adults. Persons with NIDDM generally report receiving more social support than those with IDDM,⁸⁶ and most samples of older adults report receiving adequate support to care for their diabetes,¹⁹ although some report an increased sense of isolation. Little research has been done on how chronic illness impacts family relationships among older adults. Between husbands and wives, communication has been found to decrease and stress and loneliness increase. Many spouses (particularly wives) must accept care responsibilities and may find the demands overwhelming. The quality of the relationship between parents and adult children is also affected by a chronic illness. Negative feelings toward parents appear to increase as health declines and dependency increases.⁸⁹

Very little is known about the impact of diabetes on the spouses and families of older adults. The response to NIDDM may be complicated because it tends to run in families.¹⁴⁷ Two potential negative effects are (1) increased dependency on family members due to increased care needs related to diabetes and (2) increased social isolation due to dietary and other demands of daily diabetes care.

The incidence of chronic conditions and levels of physical limitations may give the impression that older persons view themselves as being in poor health and unable to function. This is false perception. In a large study of older adults, most viewed themselves as being in good to excellent health compared with others their age.⁷⁹

Socioeconomic Considerations

The importance of economic status among older adults cannot be overstated. Financial resources have a great impact on the ability to maintain control over one's life, participate in desired leisure activities, and adequately care for one's health.⁷⁹

Although older adults have fewer expenses than during their child-raising years, they still have to pay for the same basic needs as other people. In addition, declining health, increasing medical care costs, and the financial costs of a chronic illness such as diabetes raise the economic needs of older adults.²³

Older Americans consistently have lower incomes, about two-thirds that of younger adults. Newly retired persons (the young-old) are more likely to have adequate incomes than those over 75 (the old-old) years of age.²³ However, as a result of substantial improvements over the past 20 years, when noncash benefits are taken into account, a smaller percentage of older adults are now below the poverty line than the general population. Most older persons state that they are satisfied with their financial situation.⁷

Despite these gains, economic status clearly is a concern for many older adults. Hispanic Americans, African Americans, those living alone, those with less than 8 years of education, those living in central cities, and African-American women living alone are poorer than other older Americans. In the United States, older African Americans are the most economically disadvantaged of any group. Sixty-eight percent of rural, older African-American women live in poverty, compared with 21% of Caucasian females.²³ Because older adults spend proportionally more on health care, housing, and food than younger adults, these difficulties often manifest themselves in inadequate nutrition, housing, and medical care.⁷ Older Asian Americans are most similar to Caucasians in income.⁵

Social Security is the major source of income for persons over age 65. Ninety percent of older adults receive income from this source, which constitutes 40% of their income. Assets, pensions, and other earnings make up the rest of the income. More older Americans who have low incomes rely on Social Security than do those with high incomes.⁷

Health Care Costs

U.S. health care costs have increased at a rapid pace, particularly among older persons. In 1981 the medical bill for the older population was three times that of other adults. One of the reasons medical costs are higher among older persons is the prevalence of chronic illnesses such as diabetes. It was estimated that the total health care costs for those with confirmed diabetes in 1992 was \$85.7 billion, excluding nursing home costs.¹³⁷

The largest health care expenditures among older adults are for hospitalizations, nursing home care, and medical care. Expenditures for medical care per person are 50% higher for those over 65 with diabetes than those without diabetes.¹⁵⁶ Persons with diabetes are twice as likely to be hospitalized as those without this illness and are prone to longer hospital stays.⁷⁹ The total amount spent on nursing home care for persons with diabetes in 1987 was \$941.5 million.¹²²

Diabetes is also expensive on a daily basis. An estimate of the annual per capita costs of diabetes in 1992 was about \$9493 for all persons with diabetes and \$11,157 for those with confirmed diabetes. For all cases of diabetes, per capita costs for persons ages 65 to 74 were \$10,669 and \$10,346 for those 75 and older.¹³⁷ For older adults, about 20% of total costs are out-of-pocket expenditures and can represent a substantial burden to persons with limited incomes.¹⁵⁶

Insurance

Only about 8% of the total health care bill for older adults is covered by private insurance. The principal funding mechanisms for health care among older persons are Medicare and Medicaid.⁷⁹ Medicare was funded by Congress in 1966 to help alleviate medical costs incurred by older Americans. There are two parts to Medicare. Part A is compulsory hospital insurance and is provided at no cost to persons who receive Social Security, while Part B is optional and is available for a monthly fee. Part B partially covers physician visits, medical supplies, and other outpatient services. Per capita expenditures have tripled since the beginning of the program.⁵

Twenty-seven percent of the costs for diabetes in the United States is covered by Medicare.¹³⁷ Among a nationally representative sample of 2405 adults with diabetes, 98.8% of those 65 and over had health care coverage. Almost all those surveyed (96%) had Medicare coverage, and 71.7% had two sources of health insurance, generally Medicare and private fee-for-service plans.⁶³

Medicare does not cover all medical costs; for example, prescription drugs, therapeutic shoes, eyeglasses, and hearing aids are excluded.⁵ Medicare participants are still responsible for portions of their medical care costs through co-payments (usually 20%), deductibles, and uncovered expenses.⁷⁹ On average, 22% of the total expenses are paid out of pocket, and these costs can quickly become prohibitive. Some older adults augment their coverage with a "Medigap" or supplemental policy.¹⁵⁶ These policies generally cover the deductible and co-payment portions of hospital care and physician services and may provide coverage for medications and nursing home care. Such plans are expensive, are not extensively used, and have had limited impact. Alternatives to Medigap policies include major medical insurance, health maintenance organizations, and hospital indemnity policies.⁵

Sixteen percent of the costs for diabetes in the United States is covered by Medicaid.¹³⁷ Among adults with diabetes 65 years and older, 15.4% receive insurance coverage through Medicaid or other public assistance programs. Medicaid is available to low-income older adults and pays for some services not provided through Medicare, such as eyeglasses and prescription drugs.²³

In the past, critics of Medicare and Medicaid maintained that it covered only acute problems and did not provide for many preventive services or the daily needs of caring for a chronic illness. In 1989 Congress attempted to offer a more equitable system by providing reimbursement for evaluation and management services. This system took effect in January 1992 and is expected to have a positive impact on services for chronic illnesses such as diabetes.⁸⁷ Coverage for diabetes-related supplies and equipment has also improved greatly in recent years, particularly for persons who take insulin, and home care services may be covered. Generally, annual eye examinations, treatment of retinopathy, routine foot care, outpatient education, and blood glucose meters and strips may be covered for those with diabetes.^{1,15} Despite these difficulties, Medicare and Medicaid do represent legal entitlement to medical care for older adults.⁷⁹

TEACHING AND LEARNING IMPLICATIONS

The daily care of diabetes is complex. Recommendations for diabetes treatment often initiate the need to incorporate meal planning, medications, exercise, and blood glucose monitoring

into ADLs. Although some older adults find these self-care practices difficult because of decreased physical abilities, memory loss, or other cognitive deficits, others not only are capable of performing these tasks but are very interested in doing so. All older adults with diabetes should be offered an individualized treatment plan that includes education, nutrition counseling, an exercise program, and oral sulfonylureas or insulin as needed.⁶⁸

It is important that health care professionals not be guilty of "agism" by assuming that older persons are unable to learn or unwilling to care for themselves. Most of the limits imposed by the effects of the aging process can be compensated for in some way through careful assessment, planning, and implementation of the teaching process.

Individualized Treatment of Goals for the Aged Population

As with other age-groups, it is important for all older persons with diabetes or the persons primarily responsible for their daily care to establish individual goals and priorities in collaboration with the health care team. The person's goals should then be used to initiate consciously a program of either basic diabetes care or more intensive diabetes care as the treatment strategy. The primary purpose of basic diabetes care is to prevent the acute complications of hyperglycemia by maintaining fasting blood glucose levels of less than 200 mg/dl. This treatment program includes meal planning, exercise, and an oral sulfonylurea when needed. In contrast, the primary purpose of intensive diabetes care is to prevent the long-term complications of diabetes through maintaining fasting blood glucose levels of less than 140 mg/dl. Insulin is often recommended, along with diet, exercise, and home blood glucose monitoring. Some persons can achieve this type of control with one or two shots per day of an intermediate-acting insulin, but others will benefit from the addition of a short-acting insulin. More than two shots per day are rarely required in this population.¹¹³

Although the Diabetes Control and Complications Trial (DCCT) established the value of tight blood glucose control to prevent complications in IDDM,²⁸ most older adults have NIDDM. However, the effect of blood glucose on the developing complications is believed to be similar, and it is recommended that otherwise healthy persons with NIDDM strive to achieve tight control.² Metabolic control has been shown to be predictive of the progression of retinopathy among older adults.¹¹⁰ Although a short life expectancy is an argument used against more intensive insulin programs, a person age 65 has a life expectancy of 17 years, at age 75, 10 years, and at age 85, 6 years.¹¹³ Therefore, although the link between hyperglycemia and the long-term complications of diabetes other than retinopathy has not been firmly established for older persons, their prevalence and resulting morbidity among this population means that this issue cannot be ignored.⁵⁷ It has been recommended that fasting blood glucose levels of less than 140 mg/dl, postprandial levels of less than 180 mg/dl, and hemoglobin (Hb) A_{1c} concentrations about 1% above the normal range be the targets for adults with NIDDM.⁸⁵

The implementation of more intensive treatment programs is often challenging but can be facilitated by using a team approach and providing education and support.⁴¹ Intensive insulin regimens have been shown to be feasible and efficacious in reducing glycohemoglobin levels among older adults without adversely impacting weight, blood pressure, lipid levels, and quality of life.⁵⁹ It is important to recognize that quality of life is a highly personal and

individual perception, and health care professionals should not allow their own beliefs about the impact of these programs to influence the type of treatment offered. In addition, improvements in cognition with better glycemic control may actually enhance quality of life. As with all persons, older adults should be informed of treatment options, the costs and benefits of each option, and any other facts that they need to make a decision about their treatment programs.

The tools for the treatment of diabetes are the same for older adults as for other persons with IDDM and NIDDM. These include meal planning, weight control, exercise, and oral sulfonylureas or insulin. However, specific issues are related to older adults that need to be taken into account with each of these tools.

Diet is generally considered to be the cornerstone of metabolic control in diabetes. No differences exist in current dietary recommendations for older adults than for younger adults with diabetes, although age-related changes in functional and cognitive abilities do need to be taken into account.³⁸ Box 21-6 outlines dietary considerations for older persons with diabetes.

The basis for individual dietary recommendations may include achievement of an ideal or reasonable body weight, blood glucose control, a decrease in the intake of saturated fats and cholesterol, and a nutritionally adequate and balanced diet. The dietary intervention can involve a specific meal pattern to be more behaviorally focused. It is important to note, however, that radical dietary modifications are difficult at any age and may have a negative impact on quality of life.¹²⁵ The person needs to understand first and then weigh the potential advantages of any changes with costs and potential disadvantages.

Weight tends to decline gradually with age. In contrast to younger persons with diabetes, adult men over age 65 with NIDDM were found to be no more obese than age-matched controls but had more upper body fat mass.¹⁰⁸ Many persons with diabetes, particularly the very old, tend to have normal body weight or may actually be underweight. Among these persons, caloric restrictions may result in malnutrition. Eating similar amounts of food at regular times throughout the day may offer advantages in terms of blood glucose control. This can serve to smooth out blood glucose levels and prevent overtaxing a poorly functioning

BOX 21-6

SPECIAL DIETARY CONSIDERATIONS FOR OLDER ADULTS WITH DIABETES

Diabetes	Aging
Treatment methods and goals	Cost
Weight	Food preparation ability and skill
Merits of weight loss/control methods	Decreased taste and thirst sensations
Composition of recommended and current diet	Appetite
Cognitive ability	Dental status
	Constipation

pancreas.¹³⁶ Among persons with diabetes over age 60, 40% are overweight and an additional 15% are obese.¹³¹ Caloric restrictions are recommended for older adults who are more than 20% above desired body weight.¹³⁸ These persons often achieve significant reductions in plasma glucose levels during periods of reduced calorie intake or with a modest weight loss.¹³¹

Older adults with diabetes have the same problems related to nutrition as other older persons. Loss of appetite caused by lack of activity, other chronic illnesses, poor dentition, medication interactions, depression, and diminished senses of taste and smell are factors that can negatively impact nutritional status.¹³¹ Skipping meals has been shown to correlate with poorer metabolic control of diabetes, perhaps because it leads to snacking or overeating later in the day.¹³⁶ This can also impede weight loss. Many older persons, particularly those who live alone, are socially isolated, or have functional impairments that make food shopping and cooking difficult, may eat very little and tend to be malnourished. Approximately 16% of older Caucasian and 18% of older African-American adults consume fewer than 1000 calories per day. Among poor older persons, about twice as many consume less than 1000 calories per day.¹³¹ Because eating patterns can be so variable among this population, it is particularly important that when insulin is required, the dose is planned to fit the person's usual eating habits, not vice versa.¹²⁶

Increased physical activity may be effective in preventing NIDDM⁶⁷ and is generally believed to be a component of the treatment for diabetes. Few data address the effects of exercise training on older persons with diabetes. However, data on the positive effects of exercise among other groups of persons with NIDDM suggest that older adults could also receive the benefit of improved insulin action resulting from endurance training. Along with improved glucose utilization, the benefits of exercise for older adults include improved cardiovascular status, preservation and maintenance of joint mobility and range of motion, toning, improved appetite and bowel function, and an improved sense of well-being (Box 21-7). Because the potential risks of exercise related to diabetes are greater for older adults, a thorough history and physical assessment of diabetes control and complications are essential, and general exercise recommendations are usually more conservative. A complete physical examination and an exercise stress test should be done before an exercise program is initiated.⁵⁴ Aerobic exercises that do not cause excessive joint trauma, such as walking, swimming, or bicycling, are generally recommended.

Modifications may be needed to accommodate the reduced work capacity and special needs of older adults. An inactive person should begin at a low intensity for a short time, such as 50% of maximal capacity for 10 to 15 minutes, and gradually increase intensity and duration. Persons with peripheral vascular disease may benefit from a walk-rest-walk program.⁵⁴ Education about symptoms of cardiovascular distress, injury, prevention and treatment of hypoglycemia, and impact on long-term complications is particularly important for this population. Morning exercise programs may have the greatest benefit because this is the time of greatest insulin resistance; however, the timing of exercise needs to be individually planned, taking into account the person's treatment program and life-style.

Long-term adherence to exercise programs tends to be problematic for all ages, so every effort should be made for the exercise program to be a positive and enjoyable experience.¹⁴⁰ Walking with friends, a walking club, or exercise classes designed for senior citizens are

BOX 21-7

POTENTIAL BENEFITS AND RISKS OF EXERCISE FOR OLDER ADULTS WITH DIABETES

Benefits

Improved exercise tolerance
 Improved glucose tolerance
 Improved maximal oxygen consumption
 Increased muscle strength
 Decreased blood pressure
 Decreased body fat and increased muscle mass
 Improved lipid profile
 Improved sense of well-being

Risks

Sudden cardiac death
 Foot and joint injuries
 Hypoglycemia

From Morrow LA, Halter JB: In Kahn CR, Weir GS, editors: *Joslin's diabetes mellitus*, ed 13, Philadelphia, 1994, Lea & Febiger.

strategies to increase the likelihood that persons with diabetes will choose to exercise. Activity is often a neglected topic for older adults because of assumptions that they are not able to exercise. It is important to ask about past exercise levels and what physical activities the person is currently able and willing to do.

Oral sulfonylureas are widely used in the management of older persons with NIDDM. In fact, 50% of the oral hypoglycemics prescribed are for persons over age 65.⁹⁶ Of the second-generation agents, both glyburide and glipizide are effective in reducing blood glucose levels and are well tolerated by older adults.¹³⁵ However, sulfonylureas may not be adequate to achieve euglycemia in many persons. Also, the interaction of these pills with other medications that potentiate their hypoglycemic effects needs to be considered, particularly among older adults, who are frequently taking several medications for other chronic diseases.⁵⁸ Metformin has been tested in other countries and found to be effective in lowering blood glucose levels and has recently been approved for use in the United States.¹⁸

Hypoglycemia can occur with these medications, and older adults who tend to skip meals are particularly susceptible. These reactions are generally more severe and, because of their longer action time, are less amenable to treatment with a simple carbohydrate than those caused by insulin. Older adults taking either of the second-generation sulfonylureas are at risk for asymptomatic hypoglycemia.¹⁶ Hyponatremia is another potential side effect of oral hypoglycemic medications in older adults. Use of thiazide diuretics and changes in water metabolism with aging appear to increase the risks in older persons.¹¹³ Oral medications do offer the advantage of a medication in pill form rather than injections, making them easier to

BOX 21-8

SPECIAL CONSIDERATIONS FOR INSULIN THERAPY

Vision
 Manual dexterity
 Sensation in hands
 Access to injection sites
 Cost
 Ability to perform self-monitoring of blood glucose (SMBG)
 Cognitive function
 Family support

From Morrow LA, Halter JB: In Kahn CR, Weir GS, editors: *Joslin's diabetes mellitus*, ed 13, Philadelphia, 1994, Lea & Febiger.

take. Although persons with diabetes prefer oral medications over injections, studies have shown that compliance with pills is no better than with insulin.³¹ In addition, some oral agents are more costly than insulin.

Insulin treatment offers some advantages in that it is usually possible to lower plasma glucose values, and dosages can be more precisely adjusted to avoid symptoms and achieve the person's glucose goals. To avoid hypoglycemia, however, insulin needs to be implemented in small increments, with an appropriate meal plan; may require frequent physician visits for dose adjustment; and generally increases the importance and frequency of SMBG. Among older adults, opinions of health professionals, self-efficacy, SMBG, and knowledge about diabetes positively influence initiation and continuation of insulin therapy.¹⁶¹ Because older adults may have diminished hypoglycemia symptom awareness,¹⁰³ the ability to detect and appropriately treat reactions are important considerations before implementing insulin treatment. Box 21-8 lists other special considerations for insulin therapy in older adults.

The person's functional ability to draw up and administer insulin successfully, perform SMBG, follow a meal pattern, and manage hypoglycemic reactions must be taken into account before insulin therapy is initiated.¹²⁵ Although no differences in outcomes were noted, older adults (mean age of 66.8) were found to make more dosage errors when mixing insulins themselves compared with using premixed insulins.²¹ Functional factors are particularly important considerations when initiating insulin therapy on an outpatient basis, and the use of home care services may be a helpful and necessary resource during the initial phase. Visiting nurse assessment of the home environment for lighting, cleanliness, and insulin storage and use can be invaluable for care planning.

The use of insulin along with oral agents has been proposed for the treatment of some persons, particularly those with insulin resistance who do have some response to sulfonylureas. Although combination therapy has shown modest improvements in glycemic control,¹²⁷ benefits of its usefulness for older adults must be evaluated on an individual basis.

Older adults who are unable to achieve their desired glycemic control without excessive hypoglycemia or who are unable to recognize or treat hypoglycemia may be particularly good candidates. On the other hand, two different forms of therapy increase the complexity of the regimen and may increase the costs. Oral agents are often more costly than insulin and syringes. The benefits of using combination therapy for older adults remain controversial at this time.

Blood glucose testing is the recommended method for monitoring glycemic control. It can be used to achieve and maintain a specific level of glucose control, to assist in day-to-day decision making, to prevent and detect hypoglycemia and hyperglycemia, and to educate persons with diabetes about the impact of food, activity, medication, and stress on blood glucose. Older adults have shown acceptance of SMBG and report better medication compliance and no negative impact on quality of life.⁴⁹

The frequency of monitoring schedules will vary based on the intensity of the regimen and glycemic stability. However, in order for SMBG to be effective, the person with diabetes must be capable of learning the proper technique, willing to expend the effort, and be educated about and committed to modifying the treatment plan based on the results.³

The number of adults not using insulin who monitor has increased from 2% to 31% over the past 10 years. Although the number of persons with NIDDM using insulin who practice SMBG with some regularity has increased from 6% to 82% in the past 10 years, only 21% use the information to make adjustments in insulin dosages. The number of older adults using insulin who monitor is similar to the number of younger adults, although those over 64 were told to monitor less often than those 45 to 64 years of age (70% versus 85%).⁷⁰ Diabetes education and more frequent physician visits positively impact the likelihood of blood glucose testing. Frequency of blood testing has been shown to be highly related to age, with the probability of SMBG decreasing with each decade.⁶⁴

Although results of studies are mixed, evidence supports the value of home blood glucose monitoring for persons with NIDDM. In one study of persons with NIDDM (mean age of 56.3), less frequent blood glucose monitoring was significantly correlated with higher glycosylated hemoglobin values.¹³⁶ In another study of insulin-requiring NIDDM persons (mean age of 55.6), those who used daily fasting blood glucose measurements to make insulin dose adjustments based on an algorithm were able to bring their glycosylated hemoglobin values into the normal range.³⁶ Therefore older adults or their caregivers need to be taught not only how to perform home blood glucose monitoring, but also how to use the information to make adjustments in meal planning, activity, and insulin doses. SMBG can also be a useful tool for those taking oral medications and for those on diet therapy to provide information about asymptomatic hypoglycemia and concrete evidence to reinforce behavior. It may not be feasible because of the lack of reimbursement, but SMBG needs to be presented as an option, along with information about interpretation of the results. Meters that are more "user friendly" and less dependent on technique are generally most appropriate for older adults.

Educational Considerations

Older adults with diabetes appear to be a neglected population when it comes to diabetes self-management education. Jenny⁷⁴ found that aged adults (mean age of 71.7) received the

least amount of diabetes instruction of any age-group. Older adults (mean age of 57.3) had the highest level of motivation and the second lowest level of instruction. Hiss⁷⁰ found that in a study of 393 persons with NIDDM, 62% of those age 64 or under had attended a diabetes educational program within the past 2 years, compared with 52% of persons over age 64. When specific areas of educational information were examined in this same study, it was found that persons 64 and older reported that they had been told to exercise more often (62% versus 58%) but told to follow a diet less often (83% versus 92%) and to take special care of their feet less often (54% versus 58%) than persons 45 to 64 years of age.

In a large study of 2405 adults with diabetes, of the 2268 subjects with NIDDM, 58.5% of insulin-treated adults ages 18 to 39 and 53.7% of those ages 40 to 64 had ever attended a class or program about diabetes, compared with only 41.2% of those age 65 or older. Among subjects with NIDDM not treated with insulin, 34.6% of those ages 18 to 39 and 25.1% of those ages 40 to 64 had attended diabetes education, compared with 21.3% of those 65 or older. Among this sample of persons with NIDDM, younger age, African-American race, Midwest residence, more education, and presence of complications were associated with having had diabetes education.²⁰

Perhaps one of the reasons diabetes self-management education has been neglected among this population is because of the inherent difficulties of teaching older persons. Difficulty in comprehension does increase with age, and other cognitive and sensory deficits may be present.⁷⁴ However, this group deserves special attention and consideration because of the high incidence of diabetes in persons 65 and older and because they are at risk for developing its major complications. Interest in diabetes self-management education may actually increase as older adults face the inevitability of aging and become increasingly concerned about maintaining health and independence.

Older persons can be taught and can learn if educators adjust the teaching plan to meet their needs. Special considerations for teaching older adults include taking into account functional ability, particularly aspects that may be affected by the aging process; the treatment programs of any concomitant illnesses or diabetes-related complications; ethnic and cultural background; and the individual's personal strengths and goals related to health and treatment of diabetes. Older adults may be hesitant to ask questions and need to be encouraged to do so. Sitting down to talk during an appointment and listening carefully to what they have to say will help to build rapport.

Diabetes self-management does not occur in a vacuum and is carried out within the context of all aspects of a person's life. The educational program and choice of content needs to be selected based on jointly identified goals, interests, abilities, and needs.

Functional limitations among older adults have implications for both educational approaches and care practices. Visual or other sensory deficits may require the health care professional to make modifications to accommodate the needs of these persons. For example, if the teaching session involves using a chalkboard, white on black generally works best for persons with visual deficits. Glossy boards may create a glare, and colored markers may be difficult to see, especially red, yellow, blue, and orange.⁸¹ Older adults with early cataracts and decreased ability to distinguish colors are not good candidates for visual methods of blood glucose monitoring. Insulin administration techniques may need to be modified to compensate for a decline in visual acuity or double vision. Magnifying glasses may be useful, particularly

the types that attach to a syringe or can be worn around the neck, thus leaving the person's hands free. In some cases, insulin may need to be prepared by a family member or home care nurse ahead of time to be administered by the person with diabetes.

Booklets, pamphlets, videotapes, and other visual aids are frequently used as adjuncts to an educational program. Materials that use a lot of white space on each page, are written in a conversational style, use large type, and are black type on nonglossy white or yellow paper work best for older persons with visual deficits or impairments.³² The educator should highlight key points or write them down if no appropriate materials are available. Glossy boards should not be used to project video images because of the potential for glare, and the sound needs to be carefully modulated. Video materials that can be played more than once or at home may be especially helpful for older persons who need a longer time to process new information.⁸¹ Choosing written and videotape materials that feature both older adults and appropriate ethnic groups will increase the perception that the content is relevant to them.

Group classes may be less effective for persons with hearing deficits than one-to-one interactions, during which the educator can assess whether the individual is hearing what is said by asking him or her to repeat it back. In these interactions the educator should face the person and enunciate words clearly. Eliminating background noises and providing education in a quiet room is also helpful. Because the ability to hear high-pitched tones is often lost, speaking loudly does not necessarily help the person to hear better.⁸¹

Because of sensory and cognitive deficits, some older adults with diabetes respond more slowly to stimuli and may have a decreased ability to organize information. Adjustments in the teaching process need to reflect these changes to be effective. Content should be presented in a concrete, factual way so that it can be readily applied. Scheduling teaching sessions that are short, are focused on a limited number of concepts, are paced to allow time to synthesize, and provide adequate time to request responses so that understanding can be checked will increase the likelihood of success. Memory can be increased by helping the person "set the stage" for what is coming next by offering cues about the information that will be given.³² External cues to serve as a reminder are useful for persons with specific memory deficits. The cues should be specific and active, for example, taping a syringe to the bathroom mirror.⁴² Follow-up to education to evaluate knowledge deficits and difficulties with self-care practices is particularly important for this age-group to decrease self-care behavioral deficits.¹⁴⁷ Follow-up can be accomplished either in person or by telephone.

To care for diabetes, adults require knowledge, skills, appropriate tools, and practice. Many areas of care require both knowledge and skills. For example, participants need not only to hear about the importance of foot care, but also to have the opportunity to practice the associated skills before they can perform them at home.³⁹ When teaching skills to older adults, time must be given to process the instruction before the skill is performed. It is generally most effective to give the instructions and demonstrations one step at a time, allowing practice time between steps.⁸¹ The practice time not only allows the person to enhance skills but also provides the educator with the opportunity to observe the person's ability to perform the skill. If physical limitations exist, the educator needs to suggest and teach alternative methods to

carry out the skill. For example, persons with arthritis or tremors may find it easier to trigger a penlet device used to obtain the blood sample for monitoring by pressing the trigger down on a table top rather than trying to hold it steady to trigger the device.

The educational plan must take into account any concomitant acute or chronic illnesses and diabetes complications present. For example, with a person who has a prosthetic leg, getting up, putting on the leg, getting to the bathroom, doing a blood glucose test, taking medications, and finally getting to the kitchen, preplanning a simple breakfast or one that can be prepared the night before is an important consideration. The older person may also need assistance to manage several regimens, all of which may be complex and necessitate behavior change.

Ethnicity is an important consideration in the educational process. Individuals' ethnicity influences not only who they are, how they perceive themselves, and their moral beliefs, but also their beliefs and perceptions about health and health care. Food, language, and health care practices are all symbols of ethnicity and cultural beliefs. When health professionals and the person with diabetes are from different ethnic and cultural backgrounds, they may have different beliefs and expectations about health behaviors, which can lead to conflict. For example, many cultures have active folk medicine systems that may be tried first or along with conventional methods.¹³² Health professionals may not recognize some self-care activities because they do not fit with the traditional medical model. Ethnic food preferences need to be incorporated into the meal pattern and folk medicine practices recognized as part of the diabetes care plan.

Incorrect health beliefs that stem from cultural influences need to be addressed. Many older adults' experiences with diabetes lead to the belief that its complications are inevitable. When combined with the fatalistic attitude toward illness and the strong "sense of present" common to many ethnic groups, education about preventive or self-care practices may seem irrelevant and may not be implemented.⁷¹

The educational program and materials need to be culturally sensitive and relevant to the persons for whom they are provided. The language and words used must match the person's language. Even among adults with English as the first language, words may be used differently or have a different meaning among members of some ethnic groups. Literal translations of English materials into other languages may not convey the actual message as appropriately as translating the material into words that express its meaning. Literacy both in the person's native language and in English must be taken into account. Some adults who speak more fluently in their native language may actually read better in English.

Group classes for diabetes education have become increasingly popular, partly because of reimbursement structures. Persons with limited social support may profit from the experiences of others, interactions with persons who face similar problems, and peer support. Older adults may be intimidated by an educational program that is too formal or too much like school.⁸¹ However, older adults have been found to participate in and benefit from group educational programs.^{41,48,51} Group classes are probably most appropriate for older adults who have basic knowledge about diabetes and no sensory or cognitive deficits. In addition, peer support groups may be useful to improve psychosocial outcomes and glycemic control for some older adults.^{50,159}

One of the myths about aging is that older persons cannot learn. Health professionals and older persons alike may believe that the "elderly" are not educable. This is a false perception. Learning continues throughout the life cycle, although some older adults may learn more slowly and may be more discriminating about what is learned.⁸¹ Education is an important part of the care of persons with diabetes, and older adults deserve the same opportunity to learn as their younger counterparts.

Behavioral Strategies

The purpose of education is to provide new knowledge and understanding, and the purpose of health education is positive behavioral change.³³ Most behavioral intervention studies have not included age as a factor, but it is reasonable to conclude that older adults living in the community are as amenable to behavioral strategies (e.g., contracting, goal setting) as their younger counterparts.⁴ Teaching sessions that include a discussion of treatment benefits, techniques for making changes, specific information about ways to incorporate changes, and potential barriers may positively influence outcomes.¹³⁴ As examples, the *Sixty. . . Something* program developed targeted sessions for older adults with diabetes that emphasized social learning variables, particularly self-efficacy and problem-solving skills. Participants in the intervention were able to decrease weight, calorie intake, and percentage of calories from fat significantly and increase the frequency of blood glucose monitoring.⁵² In PATHWAYS, African-American women (mean age of 57) were able to lose weight using goal-setting and problem-solving skills taught in the program.¹⁰² In the DIABEDS study, a sample of older African-American females (mean age of 58) who were taught skill exercises and behavior modification techniques experienced significantly better self-care skills and adherence behaviors and improved metabolic control.¹⁰⁰ In addition, decreasing the complexity of the regimen and tailoring the intervention to the individual as much as possible are particularly relevant strategies for this age-group.⁴

Because older adults are prone to foot problems and resulting amputations, behavioral interventions to increase self-foot care behavior and influence provider behavior (e.g., remove footwear at all visits) can be effective in reducing abnormalities.⁹³ Although some older adults are hesitant to ask questions or speak up, it is likely that most are just as capable of becoming active participants in their diabetes care as younger adults, and strategies that help to activate and empower persons with diabetes are equally appropriate for both groups. Affirming the older adult as a person and recognizing self-care efforts are less likely to result in reporting behaviors to please the health professional (e.g., falsified monitoring records) than providing positive reinforcement for self-care outcomes.⁴⁰

It is important to recognize any underlying social, functional, and psychological changes related to the aging process when working with older adults. All aspects of functional states as well as all other acute and chronic illnesses must be taken into account when implementing any behavioral or life-style change programs.⁴ If significant cognitive impairment exists, a complex regimen requiring extensive education, behavior change, and personal involvement is likely to fail.⁸⁸

Assessment and Planning

As outlined in Table 21-8, assessment is the first step in the educational process. Appendix 21a at the end of this chapter provides an example of an educational assessment for older adults. The assessment may appear to be lengthy and time consuming, but it is an essential beginning to education. Ultimately the assessment can save time by assisting the health professional to focus the teaching process and plan for a more formal and extensive education program. Using information gleaned from the assessment prevents stereotyping of older persons into predetermined categories and allows the educational intervention to be tailored for individual needs. The assessment of newly diagnosed persons is extensive and provides a baseline diabetes and functional profile of each individual. However, the health status and functional abilities of older adults are not static and need frequent reevaluation. Thus the assessment process must be ongoing and incorporated into each interaction.³⁹ Noting the person's functional, sensory, cognitive, psychosocial, and educational status on a diabetes flow chart or education record is an effective strategy that not only helps the health care professional to follow the person's progress but also serves as a reminder for reassessment.¹¹⁷

Newly Diagnosed Older Adults

The initial assessment needs to include a review of the individual's existing functional abilities, including knowledge and beliefs about diabetes and its care, physical function, sensory ability, cognitive ability, literacy, emotional status, social support system, cultural factors, financial status, and readiness to learn. During the assessment, participants should be given the opportunity to express their own interests, beliefs, treatment goals, values, emotions, and attitudes about diabetes.¹³³

Diabetes knowledge and beliefs

Even when newly diagnosed, older adults have frequently had experience with diabetes through spouses, family members, or friends. Some have seen the harmful effects of the complications of diabetes and believe that diabetes automatically means blindness or an amputation. Other adults may view diabetes as a natural part of the aging process and not take it very seriously. Still others have learned inaccurate information or seen people with diabetes receive poor care or not take care of themselves. These experiences and beliefs can impact both the educational process and the person's willingness to care for his or her diabetes. Asking if the person has ever known anyone with diabetes and what effect it had on the individual is one way to obtain this information. Misconceptions about diabetes may need to be clarified and advancements in treatment options presented as the first step in the educational process. Beliefs about the impact of diabetes on longevity also need to be assessed.²⁹ Written knowledge tests might also provide some of this information, but their usefulness has not been fully evaluated among older persons.³⁹

Physical function

Age-related changes in physical function can affect diabetes self-care activities. These include anorexia, leading to hypoglycemia and inadequate nutrition; arthritis or tremors,

Table 21-8 Educational Process for Older Adults With Diabetes

Area	Assessment strategy	Educational strategy	Follow-up/reassessment strategies
Diabetes knowledge	"Have you ever attended a formal diabetes education program?" "What areas of diabetes would you like to learn more about?" "What are you doing now to take care of your diabetes?" "Describe your typical daily activities and eating patterns." "What are you doing to take care of your feet?" "Do you know anyone with diabetes?" "How does it affect them?" Ask the costs and benefits of treatment.	Develop plan. Provide specific content. Use teachable moments.	Evaluate educational progress and self-care skills and behaviors.
Current health practices	"What are you doing now to take care of your diabetes?" "Describe your typical daily activities and eating patterns." "What are you doing to take care of your feet?" "Do you know anyone with diabetes?" "How does it affect them?" Ask the costs and benefits of treatment.	Demonstrate skills and provide feedback. Provide specific content.	Evaluate progress toward goals.
Physical function/sensory ability	Ask what, when, and how the person performs skills. Observe participant performing a skill, (e.g, drawing up insulin, foot care routines). Summarize what was taught and ask participant to explain in own words. Ask participant to read some diabetes-related information and then explain it to you.	Concentrate on most pressing needs or questions first. Establish long-term and short-term goals. Help identify ways to incorporate skills into daily activities.	Evaluate progress toward goals.
Cognitive ability	Summarize what was taught and ask participant to explain in own words. Ask participant to read some diabetes-related information and then explain it to you.	Select appropriate teaching methods and materials.	Select appropriate teaching methods and materials.
Literacy	Summarize what was taught and ask participant to explain in own words. Ask participant to read some diabetes-related information and then explain it to you.	Select appropriate teaching methods and materials.	Select appropriate teaching methods and materials.

	Cognitive ability	Summary what was taught and ask participant to explain in own words.	Select appropriate teaching methods and materials.
	Literacy	Ask participant to read some diabetes-related information and then explain it to you.	
	Emotional status	<p>“What are your thoughts and feelings about having diabetes?”</p> <p>“What do you fear most about having diabetes?”</p>	<p>Listen and encourage expression of feelings and fears through reflective statements.</p>
	Social environment and support	<p>Observe if family members are present at appointments and educational sessions.</p> <p>“Who helps and supports you with your diabetes care?”</p> <p>“What community and diabetes resources do you currently use?”</p>	<p>Encourage expression of thoughts and feelings related to diabetes and aging.</p>
	Cultural factors	<p>“What do you think caused your illness?”</p> <p>“How serious do you believe diabetes is?”</p> <p>“How should a person with diabetes act?”</p>	<p>Plan education program interventions that are culturally relevant.</p>
	Financial status	<p>“What impact has diabetes had on your financial status?”</p> <p>“Does your insurance pay for the diabetes care supplies you need?”</p>	
	Readiness to learn	<p>“Are you interested in learning more about diabetes?”</p> <p>“What are your feelings and thoughts about having diabetes?”</p>	<p>Monitor emotional status and any changes.</p> <p>Coordinate diabetes home care and community resources.</p>

Modified from Funnell MM: *Diabetic Care* 13(suppl 2):60-65, 1990; Funnell MM, Anderson RM: *Pract Diabetol* 12(2):22-25, 1993.

interfering with insulin administration, SMBG, foot care, and food shopping and preparation; and concurrent illnesses with complex regimens that can interfere with the person's ability to implement them.¹¹¹ Many of these physical impairments can be compensated for, and strategies can be recommended to overcome deficits, if they are noted.

The person's ability to perform ADLs needs to be assessed. This assessment can range from informal questions to observing task performance to formal questionnaires. Because health professionals tend to overestimate functioning, a more systematic assessment is probably useful.¹¹⁷ Many functional assessment tools that measure items related to physical function in various ways are available, but no single tool is appropriate for all persons.^{42,76,117} Different tools uncover different problems to different degrees. The assessment instrument included in Appendix 21a includes questions related to overall physical functioning. Instruments specifically designed to test the functional capacity of older adults to perform self-management tasks, such as the Assessment of Diabetes Ability Performance Tool (ADAPT), may be useful.²⁶ This initial assessment needs to be followed up with repeat administrations of the tool or direct observations of the person's ability to carry out diabetes care tasks at each visit.

Pain from arthritis, peripheral neuropathy, or other problems may be present and more severe in older adults. The experience of pain has important implications for older adults and their ability to care for themselves, but it is difficult to measure. Because pain is completely subjective, asking about the presence of pain and how it limits ability to perform ADLs should be part of the assessment process. Pain may lead not only to decreased activity but also to sporadic intake of food and overeating, which can affect glycemic control. Treatment for any painful conditions is based on etiology.

Impotence occurs in 95% of the men with diabetes who are over age 70.¹¹¹ Because sexual functioning can play such an important role in marital happiness and total quality of life at any age, it needs to be assessed and addressed for both older men and older women.

Sensory ability

Altered vision can interfere with insulin administration and SMBG. Standardized visual acuity and color vision tests can be administered. In addition, asking participants to read

Table 21-9 An Informal Hearing Test for Older Adults With Diabetes

Test words	Response in hearing-impaired person
fill	fine
catch	cat
thumb	fun
heap	heat
wise	wives
wedge	red
fish	fifth
snows	phones
bed	bugs

Data from Miller LV: *Clin Diabetes* 4:74-76, 90, 1985.

standard newsprint or numbers on a syringe or to repeat back what was said to them can provide information to assist the health professional to adjust the teaching or care program. Annual ophthalmologic examinations are recommended for older adults, just as they are for all adults with diabetes.

Diminished hearing can negatively impact the ability to hear and understand the information needed for self-care. Informal tests of hearing can be conducted by standing behind the person, saying a list of key words, and asking the person to repeat what was said.¹⁰⁶ Table 21-9 lists an informal test of key words and common responses that would indicate mild to moderate hearing impairments. Some types of hearing loss can be helped through the use of hearing aids, and it is recommended that all persons with hearing deficits be referred to an audiologist for testing.

Cognitive ability

Cognitive abilities have an impact on the older person's ability both to learn about diabetes care and to carry out the treatment program. For example, choosing and measuring foods and deciding when to call a health care professional about a skin infection or blood glucose readings require both knowledge and judgment. Memory deficits are of particular concern for persons taking insulin. The ability to remember to take the insulin and whether a dose has been given or not has obvious safety implications for these persons. Principal areas of cognitive function that need to be assessed among older persons include orientation, attention, language, recall, calculation, and visuospatial ability.¹⁰⁷ All these can be screened with standard mini-mental status examinations such as the Folstein Mini-Mental State (see Appendix 21b at the end of this chapter) or other tests.^{37,42} Subtle changes in cognitive function usually require formal neuropsychologic testing, which can also help to identify the degree to which depression is affecting cognitive impairment. Frequent reassessment of cognitive ability is important for older adults to detect any changes.

Literacy

Older adults may have more difficulty comprehending diabetes print materials than younger persons.⁸² A survey of 105 persons with diabetes over age 64 found that 21% read at less than an eighth-grade level, 30% at an eighth- to twelfth-grade level, and 49% at above the twelfth-grade level.⁶⁹ Tests of frequently used diabetes education booklets revealed that the booklets were written at a mean grade level of 10.2, because the nature of health-related information and terminology skews reading level toward the higher grades.^{9,142} These studies demonstrate the importance of determining literacy and matching educational materials to each participant's reading and cognitive abilities. Simple tools of reading ability are available and can be incorporated as part of the assessment.

Emotional status

Depression is common in older adults but is not always recognized. Affective changes seen in younger persons may not be present in older adults. Signs and symptoms of depression, such as an unkempt appearance, decreased attention, reduced memory, and lack of initiative, are often mistaken for dementia. Standardized tests, such as the Geriatric Depression Scale, are available to assess levels of depression.^{42,163} In addition, asking participants about their

moods and feelings not only provides the health care professional with information but also lets participants know that these are important areas for discussion.

Older persons do experience strong feelings about having an illness such as diabetes, and these feelings need to be acknowledged and discussed. Because many older adults were brought up to be stoic and not to discuss their emotions, asking that they tell you their thoughts about diabetes may elicit more of a response than asking how they "feel" about it. The educator should use active listening techniques and reflective statements and should avoid attempting to make participants feel better by minimizing negative feelings.

Social support system

The lack of social support identified by older persons has already been discussed. Asking participants who helps them with their diabetes care and who they turn to in times of trouble can provide information about the amount of support participants perceive is available to them. In addition, asking who shops for and cooks most of the food is important when planning an educational intervention related to nutrition. Among many ethnic groups, extended families, friends, and church groups are likely sources of social support that need to be considered.

Cultural factors

The major values, beliefs, and behaviors related to diabetes that are culturally influenced must be assessed. General areas include ethnic affiliation, religious beliefs and practices, family patterns, food preferences, and health care practices.¹⁴⁵

Financial status

As already noted, diabetes is an expensive disease. Because income and expenditures are often less clearly defined among older persons, it is generally more useful to ask if their income is adequate or inadequate for their needs rather than to ask the amount of the annual income. Information about insurance coverage for diabetes care and supplies is also important before recommendations are made for a particular care program. In addition, persons with diabetes may not be aware of benefits to which they are entitled under changing Medicare and Medicaid guidelines and may benefit from this information.

Readiness to learn

Readiness to learn involves emotional and experiential readiness and reflects the individual's background of experiences, skills, attitudes, and ability to learn. Readiness can be affected by both physical health and current emotional status and can reflect health beliefs.¹³⁰ For example, individuals who are experiencing strong emotions (e.g., shock, denial) are rarely ready to learn. The educator needs to be sensitive to the fact that these factors are subtle and may not be readily apparent in the assessment process.¹³³

Ongoing Care

The continuing assessment during ongoing care provides the opportunity to answer questions, reinforce previous learning, and give positive feedback on self-care strengths. Asking

participants to tell what they are doing to care for their diabetes and observing their self-care skills, such as insulin administration and blood testing, are useful indicators of both changes from the initial assessment and current care practices. This information can be used to offer individualized recommendations and suggestions in areas of self-management declines or deficits. It is important, however, that the educator be nonjudgmental, be noncritical of the person's self-care efforts, and reflect a positive and caring attitude.¹³³

The ongoing assessment also includes continued follow-up with the individual to determine progress in meeting goals and to determine if other referrals or resources are needed.

Implementation and Evaluation

Specific diabetes content areas for the educational program are no different for older adults than other persons with diabetes. The content needs to be relevant to the type of diabetes they have, their stated interests, and treatment regimen and goals. Whenever possible, diabetes content should be presented sequentially over time and at a pace that meets the individual's needs. Because of the amount of content needed for diabetes self-management, one approach that may be useful is to divide the content into manageable sections to make it less overwhelming and to provide time for assimilation of new information.

One recommendation is to divide the content into three levels: initial management, home management, and home improvement in life-style. The *initial management* level includes only the survival skills needed for diabetes care. The person who is newly diagnosed, the person who has had diabetes for a time but has received limited formal education, or the person who is experiencing a major change in treatment (e.g., starting insulin) is generally at this level. The second, or *home management*, level contains information that can be used to perform the daily care of diabetes and to enhance persons' ability to manage their illness in a more flexible, realistic, and appropriate way. This level includes most of the content areas. The third level, *improvement in life-style*, contains information for individuals who have learned to manage their diabetes successfully on a daily basis and who need information on specific topics.⁵⁶ Table 21-10 provides an example of appropriate topics for each of these levels. The definition of each of these levels can vary according to individual needs, and some topics may need to be presented at more than one level in varying degrees of complexity.

Adherence Issues

No clear-cut evidence indicates that age is positively or negatively correlated with adherence. Issues that impact adherence among younger persons, such as regimen complexity, provider relationship, health beliefs, and social support, appear to have similar effects on older adults' adherence behaviors.⁴ In addition, the need to manage more than one complex regimen is more likely to impact adherence negatively among older persons, as are the physical limitations imposed by other chronic illnesses.

Older adults appear to identify the least number of barriers to adherence,⁷⁴ although cost may be a significant factor in ability to adhere for some older adults.¹²³ The perception of NIDDM as less threatening than IDDM or as just part of the aging process may also lead to

Table 21-10 Sample Educational Program for Older Adults With Diabetes

Initial management	Home management	Improvement in life-style
What is Diabetes?	More facts about diabetes	Tips for changing your health habits
Feelings about diabetes	Balance of food, exercise, and medicines	Coping with stress
What foods should you eat?	Living with diabetes	Your exercise program
Weight loss	How families can help	Travel
Diabetes pills	Why a "diet"?	What's in food?
Giving insulin	Healthy food choices	The exchange diet
Monitoring your diabetes	Practical tips for planning meals	What does the label say?
Foot care	Physical activity	Special diet foods and sweeteners
	Facts about insulin	Eating away from home
	How to use monitoring information	Fiber
	Low blood sugar (hypoglycemia)	Alcohol and diabetes
	High blood sugar (hyperglycemia)	Taking charge of your diet
	Sick-day care	Sexual health
	Personal care	Taking care of diabetes with other illnesses
	Long-term problems and risk factors	Older person with diabetes
	Complications of diabetes	Community resources
		Being a smart shopper
		Working with your health care team

decreased adherence with the treatment plan, particularly among those who do not use insulin.²⁷ Reinforcing that diabetes is a serious disease, without using "scare tactics," may be appropriate when working with some persons. Assisting older adults to cope with the demands and limitations of other illnesses and to organize self-care behaviors for all aspects of their health is also helpful to enhance adherence.

Role of the Diabetes Health Care Team

The diabetes health care team for older adults should include the same members as any other care team for adults with diabetes, with the addition of an expert in gerontology. Because most older adults strive to maintain their independence, social workers have a particularly important role to play. Appropriate referral to community resources can help older persons to remain in their preferred environment for as long as possible.

Nurse members of the team may include an advanced-practice nurse with expertise in diabetes and/or geriatrics, a nurse case manager, a diabetes educator, and a home health nurse. The advanced-practice nurse can provide primary care for routine and chronic illnesses, along with comprehensive health assessment, planning, and intervention and health education and counseling. Nurses in advanced roles are prepared to provide holistic care that integrates the psychosocial and physical components of the person and his or her health status.⁷² The

prevalence of chronic illnesses among older adults supports the value of advanced-practice nurses as the preferred primary care providers among this population. The nurse case manager can integrate and coordinate care for the older person with diabetes; provide comprehensive patient assessment; develop, implement, and modify the care plan; provide direct patient care; and facilitate communication with other members of the health care team.¹³ Both the advanced-practice nurse and the nurse case manager offer client-centered, cost-effective care that maximizes the team approach and minimizes fragmentation of care.

The role of the health care team is first to assess functional ability and put functioning, the severity of diabetes, and other health problems in perspective with the older adult's total health status. Treatment goals should be established by the person with diabetes and those involved with his or her daily care. The role of the team is then to assist older persons to carry out the diabetes care program, to meet their care goals, to maximize their self-care abilities, and to remain safe and independent for as long as possible. The team's activities include diabetes care and education, coordination of community resources and referrals, and communication with other health care providers who are involved in the person's total health care. This may include contact with pharmacists, podiatrists, neighbors, and extended family members, as well as community agencies.

For older adults who require foster, nursing home, or other institutional care, the health care team needs to provide information and serve as a resource to the facility staff. If desired, in-service educational programs that are either targeted for the specific needs of that individual or more general in nature can be provided.

Role of the Person With Diabetes and the Family

Diabetes is a chronic illness that requires long-term active participation to maintain metabolic control. The need for the older adults with diabetes to carry out daily self-management behaviors is no less important simply because they are older. However, many older adults do have unique difficulties and needs because of the physical limitations that may be imposed by the aging process and the presence of other chronic illnesses and complications. Although these events do cause some difficulties, many can be either treated or compensated for in some way.

Educational programs designed to meet the specific needs of older adults and their families need to be developed and provided. Including family members in the teaching process is of particular importance for older adults because of the likelihood that impairments related to the aging process will increase their need for assistance. It may be beneficial to assist individuals with diabetes and their family members to develop strategies to minimize the problems of social isolation related to diabetes, such as leaving insulin or monitoring supplies at a family member's house where they often eat dinner. In addition, it has been demonstrated that including spouses in diabetes education class for older male adults (ages 65 to 82) significantly improved metabolic outcomes, diabetes knowledge, and family involvement and reduced stress.⁴⁸

Although families can provide much assistance with and support for the diabetes care regimen, it is important to recognize that spouses may be frail or have chronic illnesses of their

own and therefore may be unable to support or care for a spouse with diabetes adequately. The daily nature of diabetes management may make it difficult for adult children with other family and work responsibilities to be involved in the routine aspects of care. In these situations the person with diabetes may need referral to outside resources for assistance. Home care agencies, visiting nurse associations, Meals-on-Wheels, or other community resources may be available to provide daily support. It may be helpful to suggest to family members that they can recognize the person's positive efforts toward self-care and still provide support and reinforcement even when daily assistance is not possible.

Outcome Evaluation

A number of measures have been suggested as outcome evaluation criteria for diabetes care and education. These include metabolic control, adherence, knowledge, skills, behavior, attitudes, use of health services, days missed from work, hospitalizations, complications, and costs. None of these has been found to be entirely satisfactory criteria.^{75,77} This is especially true for older adults, who frequently have concomitant medical problems and other disabilities. Evaluation measurements for older persons may be based best on maintenance or improvement in health status, quality of life, personal progress, goal attainment, and the ability of the individual or caregiver to manage diabetes effectively on a daily basis.³⁹

EXTENDED CARE

In 1977 it was estimated that 14.5% of U.S. nursing home residents had a diagnosis of diabetes. Rates of nursing home admissions are two times greater among people with diabetes, and residents with NIDDM tend to be in poorer health than demographically similar residents who do not have diabetes.¹⁵¹ In 1992 nursing home costs for people with diabetes were estimated to be \$1.83 billion, and this amount is expected to increase dramatically over the next 20 years.¹

Although two thirds of nursing home residents are treated with either insulin or oral hypoglycemic agents, intensity of treatment and appropriate blood glucose goals remain controversial.¹⁵¹ However, because of the increased risks for acute complications and decreased visual acuity and cognition that may occur as a result of hyperglycemia, blood glucose control aimed at control of hyperglycemia and prevention of symptoms and acute complications is appropriate.¹¹³ Control of hyperglycemia is achieved through diet and medications for most extended care facility residents, with exercise playing only a limited role. Because extended care facilities generally provide consistent meal patterns at regular times, no special dietary restrictions are recommended.³⁸ The decision to use sulfonylureas or insulin is based on achievement of glucose goals and symptom control.¹¹³ Blood glucose monitoring is needed for patients taking insulin, particularly those who are unable to recognize or report hypoglycemia. The monitoring schedule should be individualized and based on the resident's stability.¹⁰⁹ Frequent foot inspection and care are important components of treatment for these persons, who are vulnerable to injury, gangrene, and amputation. Because nursing home residents with diabetes are also vulnerable to bedsores and other infections, skin care and

hygiene are also important considerations. Monitoring for complications should be done with the same regularity as for other persons with diabetes.¹¹³

Foster care may be an option for some older adults with diabetes. Although some foster care facilities may be unable or unwilling to accept persons taking insulin, others will accept insulin-taking residents if appropriate support is provided by the health care team. Persons with diabetes requiring hospice care should be kept symptom free and comfortable.¹⁴

RESEARCH IMPLICATIONS

Research in diabetes among older adults and its impact is a newer area of interest, and much work still needs to be done. General areas include the physiologic impact of hyperglycemia in older persons; intensive treatment and other appropriate treatment modalities for older adults; the concomitant physical and psychosocial effects of diabetes, its complications, and other illnesses among this age-group; and educational and behavioral strategies that are most effective with this population.

Specifically, the effects of metabolic control on the long-term health of older adults need to be explored further. Persons with NIDDM and health professionals often do not appear to consider diabetes to be a serious disease in older adults. Documentation of the effects of diabetes are needed to verify or alter this perception. Also, studies of the treatment methods to achieve the needed levels of glycemic control for this population are needed. Insulin use and particularly intensive insulin programs remain controversial for treating older persons, and the efficacy, costs, and benefits of such programs require additional study and clarification. Because older adults frequently experience diabetic complications or have other chronic illnesses along with diabetes, both the physical and the psychosocial impacts of multiple health problems in this population need to be explored.

The psychosocial impact of diabetes and the personal meaning that older persons and their families attach to it require further study. Strategies that can be used to increase the effectiveness of teaching efforts when working with older adults need to be tested and implemented. Educational materials specifically for older adults and methods that would enhance learning among this population need to be developed and tested. Behavioral strategies that could be used to assist older adults to achieve their diabetes and other health care goals need to be designed and evaluated. In short, almost all components of diabetes care and treatment need further exploration for this special population.

COMMUNITY RESOURCES

In addition to diabetes-specific resources that may be available in a community, additional resources may be available especially for older adults. Most are located in the Yellow Pages under "senior citizens" or "social service agencies." Some examples include the following:

Senior Citizens Centers

Senior citizens centers provide activities, classes, and programs for those ages 55 and older. Some offer meals on a regular basis, and some have public health nursing services available.