

Diabetes in The Elderly A unique set of management challenges

Nancy J.V. Bohannon, MD

PREVIEW

Diabetes management is a juggling act in any patient, and in the elderly patient the complexities multiply. Other illnesses, such as hypertension, cardiovascular disease, and arthritis, might well be present, as may a variety of physical changes that occur with aging, such as an elevated renal glucose threshold and visual and auditory impairment. Finally, socioeconomic and psychological circumstances may complicate diagnosis and treatment. As explained by Dr Bohannon, an awareness of these factors on the physician's part, followed by tailoring of the management plan, can lead to improved care for the elderly diabetic.



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- In 1985, 27 million people living in the United States were over the age of 65.
- Half the people who have ever lived to the age of 65 are alive today.
- Currently; the elderly population of the United States is larger than the entire population of Canada.

These statistics are dramatic, and they are particularly important to a discussion of Diabetes management, for the majority of diabetics are over the age of 55. Ten percent of the population over age 60 and 16% to 20% over age 80 have Diabetes. This is twice the prevalence in the younger population.(1) Currently, the number of diabetics is doubling every 15 years, mostly because of increased longevity.

The peculiarities of Diabetes in the elderly

Presenting signs of Diabetes in the elderly are often quite different from those expected in younger people. Because of an increasing renal glucose threshold with increasing age, the polyuria and subsequent polydipsia typical of Diabetes are often not seen, even with blood glucose levels well above 200 mg/dl. Also, weight loss may not be seen, since with the high renal threshold there may not be such massive losses of glucose (and thus calories) in the urine in older people as are seen in younger people. More common in elderly diabetics are complaints of blurred vision (which may mistakenly be attributed solely to cataracts but which in actuality may not only coexist with Diabetes but be partially a result of the high blood glucose), skin or vaginal infection, or sluggishness blamed by the patient on "old age."

Although physicians may tend to consider Diabetes as less worrisome in the elderly than in their younger counterparts, some of the complications of the disease occur more rapidly (with a shorter duration of disease) in older patients.(2) Physicians may also be tempted to be less assertive when dealing with elderly diabetics, believing them to have a decreased life expectancy. However, patients who have lived to become elderly have already proven themselves as "survivors." They have not succumbed to the many infectious diseases rampant when they were children (before the age of antibiotics) or to premature cardiovascular disease. These people tend therefore to have a much longer life

expectancy than would an infant born today: While the infant's life expectancy would be about 74 years, a man now 70 years old has a life expectancy of 81.5 years and a woman now 70 of 86 years.

The prevalence of retinopathy increases with advancing age.(3) More than 92% of all diabetics who become blind are over the age of 50. and 40% are older than 70.(4) Since a correlation between retinopathy on the one hand and Diabetes duration and degree of diabetic control on the other has been shown (5) (although a correlation with age alone has not), it behooves us to treat elderly diabetics carefully, not only to control symptoms but also to reduce complications. It is well known that cataracts occur earlier (6) and progress more rapidly in diabetics than in nondiabetics. Cataract removal may accelerate the progression of retinopathy. Even so simple a surgery as cataract extraction has twice the rate of complications in diabetics as it does in nondiabetics.

Amputation rates in diabetics increase from 12/10,000 in those below age 44, to 45/10,000 in those aged 45 to 64, and to 100/10,000 in those over age 64.(7,8) Diabetes is the third leading cause of death by disease nationally. Although most deaths among elderly diabetics are cardiovascular, acute infection or another stress may trigger an acute complication that is more likely to be fatal in this group than in younger diabetics. Thirty percent of the cases of hyperglycemic, hyperosmolar, nonketotic coma occur in patients not previously diagnosed as having Diabetes (ie, it is the first manifestation of Diabetes in these patients). Most often this occurs in the elderly.(9,10) In one study,(11) acute uncontrolled Diabetes led to death in 3% of patients under 50, in 16% of those aged 50 to 59, in 18% of those aged 60 to 69, in 23% of those aged 70 to 79, and in 41% of those aged 80 to 89 years. Mortality rates for diabetic ketoacidosis increase dramatically after age 65.(12)

Etiology

Several factors contribute to Diabetes in the elderly. For the most part, these are reflected in decreased tissue sensitivity to insulin. Some, such as the link between obesity and type II Diabetes. are well known. As people age, their relative amount of body fat tends to increase, even if their weight stays stable, and muscle mass tends to decrease.(13)

Hyperlipidemia may contribute to decreased insulin sensitivity with age. Also, exercise level, which affects insulin sensitivity, generally decreases with age relative to the level in young adulthood. Even "active elders" usually move somewhat more slowly than they did when younger and also more "efficiently" (eg, stacking items at the top and bottom of stairwells throughout the day in order to decrease the number of trips up and down).

The major problem in most elderly diabetics is insensitivity to insulin's action in the peripheral tissues.(14,15) Some elegant studies have shown normal suppression of liver glucose production by physiologic insulin levels with normal aging.(16,17) However, glucose uptake is decreased at the periphery at constant insulin and glucose levels, indicating that the insulin is not as efficient at moving glucose across the cell membranes in the elderly. In normal-weight elderly people with normal carbohydrate tolerance, this slight insulin resistance is compensated for by mild postprandial hyperinsulinemia.(14)

Complicating factors in the elderly

Elderly diabetics often have medical, socioeconomic, or environmental factors that impact on their Diabetes. Hypertension is the disease most commonly occurring with Diabetes; it is present 2 to 2 1/2 times as often in diabetics as in nondiabetics of all ages.(18) In some hypertensive diabetics, further complications arise from the presence of orthostatic hypotension, which can result from autonomic neuropathy or as a side effect of medications.

Vascular problems are common among the elderly. Smoking certainly contributes to these. The potential for vasoconstriction with smoking is well recognized: Smoking two cigarettes lowers cutaneous blood flow in the toes of a normal person by 40% and raises vascular resistance by 100%.(19) Smoking also appears to be a risk factor for nephropathy (which is more likely to develop in the presence of hypertension) and can lower the subcutaneous absorption of insulin by as much as 15% to 20%. Physicians should insist that all diabetics, but particularly elderly diabetics, not smoke.

If blood glucose level is allowed to remain above 200 mg/dl, a patient's resistance to infection

is decreased as a result of impaired leukocyte function.(20,21) Infection may be asymptomatic but is potentially life-threatening. Even in the elderly debilitated patient in a nursing home, blood glucose level should be kept below 200 mg/dl or the patient will be at increased risk for development of urinary tract infections (especially from indwelling catheters), infected decubitus ulcers, and pneumonia.

Diabetics are twice as likely to require surgery as nondiabetics,(22) both for complications of Diabetes and for a variety of disorders occurring more commonly in Diabetes,(22) such as cataracts, gangrene, and cholecystitis.(23) Surgery is a stress that often destabilizes the otherwise well-controlled diabetic.

Among persons over 65 years of age, 85% take prescription drugs,(24) and the average number taken is three. Many of these medications can contribute to the development of Diabetes or complicate its management. It is well known that beta blockers (especially propranolol [Inderal] but even cardioselective beta blockers in higher dosage) can lead to severe and prolonged hypoglycemia in patients who are taking insulin. Not so well recognized is the fact that beta blockers can contribute to hyperglycemia in the non-insulin-dependent diabetic by interfering with endogenous insulin secretion. Diuretics often are used by the elderly and may also interfere with insulin secretion. Other drugs that can cause interactions include anticoagulants, monoamine oxidase inhibitors, and nonsteroidal anti-inflammatory drugs, including aspirin.

Alcohol, which may be secretly abused by some of the elderly because of social isolation, loneliness, or other problems, has an effect in diabetics that is not well understood. Many people think that since alcohol has a high caloric density, it raises blood glucose levels. In fact, the acute effect of alcohol is to lower glucose levels, potentially into the hypoglycemic range, especially in patients taking insulin or oral hypoglycemic agents.

Impaired hearing may complicate Diabetes control in the elderly in that it can lead patients to misunderstand instructions about disease management and thus undermine Diabetes education. Over 30%(25) of elderly persons have a

significant hearing loss, whether or not it is recognized.

Cataracts can result in misreading of visually read glucose monitoring strips (as can diabetic retinopathy). The cataracts cause a brownish-yellowish misperception of color, so even though a patient gives no history of color blindness, he or she may not be able to visually interpret the strips properly. Laser therapy also interferes with subsequent color perception, so visual strips should not be used if a patient has ever had laser retinal treatment.

Impaired cognitive function in old age can, of course, make Diabetes control somewhat more difficult. In some cases, however, what appears to be impaired cognitive function may actually be something else. Depression can masquerade as early dementia and hyperglycemia can cause depression, so attempts at control of blood glucose are certainly worthwhile and, in some cases, can result in improved cognitive function.

Diagnosis

The American Diabetes Association criteria for the diagnosis of Diabetes are [1] a random plasma glucose level of at least 200 mg/dl, plus classic signs and symptoms of Diabetes mellitus, [2] a fasting plasma glucose level of 140 mg/dl or greater on at least two occasions. or [3] a fasting plasma glucose level of less than 140 mg/dl, plus sustained elevated plasma glucose levels during at least two 75-gm oral glucose tolerance tests wherein both the two-hour plasma glucose level and at least one other glucose level measured within the two hours are 200 mg/dl or greater.

It is widely thought that 10 mg/dl per decade can be added to each of these values to adjust for changes with aging. In fact, fasting plasma glucose levels increase by only 1 or 2 mg/dl per decade after age 50 in the nondiabetic elderly population, although the postprandial increase may be 10 mg/dl per decade.(26-28) Thus, a patient aged 80 should still not have a fasting plasma glucose over 146 mg/dl, and virtually no fasting glucose level should be over 160 in any patient.

Monitoring

Blood glucose monitoring is the standard of care for all diabetics, including those who are elderly. Urine

glucose monitoring is especially deceiving in the elderly because of their higher renal glucose threshold secondary to both increased age and increasing duration of Diabetes; the increased threshold can even lead to negative urine glucose readings when plasma glucose approaches 300 mg/dl. Urinary retention is also common among the elderly. In women retention may be due to cystocele (possibly related to delivery of macrosomic infants before routine screening for gestational Diabetes), in men to the benign prostatic hypertrophy common in this age-group, and in both sexes to neurogenic bladder. With urinary retention, even in the presence of a relatively normal renal glucose threshold, results of urine glucose testing may be misleading.

In the outpatient elderly population, techniques for self-monitoring of blood glucose level usually can be taught effectively and performed at home if enough time and attention is spent teaching proper technique. In many cases this is best done by a Diabetes nurse educator.

Treatment

The standard treatments for Diabetes-diet control, exercise, and pharmacologic therapy- may be complicated in the elderly by several factors that are more prevalent in this age-group than in younger patients.

DIET CONTROL - This can be difficult when patients lack teeth or well-fitting dentures, cannot afford nutritious foods, or are unable to understand diet instructions. Social factors such as eating meals alone (in which case it may be easier to have a bowl of cereal three times a day than to cook a well-balanced meal) or eating meals out (which may result in high-calorie, high-fat foods but not good nutrition) may also interfere with proper eating. Depression is another factor that may lead to poor eating habits. For those who are living alone or are not motivated to cook, social programs such as Meals on Wheels may be helpful. Many of the prepared foods available for microwave cooking or other easy preparation might also be appropriate.

Impaired taste perception, especially for saltiness and sweetness, is common in the elderly and often leads to over-salting or over-sweetening of foods. These problems can be overcome by the use of potassium chloride (which to many people

with normal taste perception is "too salty") and saccharin or aspartame (which can be added ad lib to increase the perception of sweetness).

Gastrointestinal problems, especially constipation, are common among the elderly. The physician can suggest that dietary fiber, be increased to help the elderly patient maintain better regularity and also as a reminder to eat a well-balanced diet, thus addressing two potential problems at once.

Alcoholism is commonly coupled with poor nutrition and, as has already been mentioned, may be an underlying problem in the elderly.

Many elderly people have inadequate dietary knowledge, and much of their nutrition information comes from advertising that may be misleading or even false. Referral to a dietitian who will evaluate their likes and dislikes, determine their eating habits, and assist them with a personalized diet plan that they will be more likely to follow is far preferable to an "exchange-list" diet handed over without individual counseling. Since many elderly people are sedentary, only 20 to 25 calories/kg of ideal body weight is often necessary, of which 50% to 60% should be carbohydrate, 15% to 20% protein, and less than 30% fat.

EXERCISE – Exercise for the elderly may be more problematic than for younger persons in that cardiovascular disease or arthritis is more likely to be present. Nonetheless, 30 minutes daily of exercise suited to the patient's cardiovascular and musculoskeletal system is usually appropriate and can be of benefit in regulating blood glucose levels. The exercise should not be jarring if the patient is overweight or has arthritis. Weight-bearing exercise, such as walking, is preferable to swimming if osteoporosis prevention is a goal. Walking in chest-deep water might be beneficial if arthritis or osteoporosis causes back, hip, or knee pain.

The American Heart Association recommendation that a person undertake aerobic exercise in which the heart rate reaches 70% of maximum (maximum predicted heart rate = 220 - age) for 20 to 30 minutes can apply to elderly diabetics, although in these people the usual frequency of three or four times weekly should be increased to daily. This level of exercise should be undertaken only after cardiovascular evaluation, and

the regimen must be adjusted for the presence of beta-blocking drugs or other agents that would affect the pulse rate.

PHARMACOLOGIC THERAPY -

Pharmacologic therapy of Diabetes in the elderly includes oral hypoglycemic agents and/or insulin. The second-generation agents are usually chosen for initial therapy since their efficacy is generally equal to that of the first-generation ones but their side effects are fewer. Oral agents should be started at very low dosages in the elderly (glyburide [DiaBeta, Micronase], 1.25 mg daily. or glipizide [Glucotrol], 2.5 mg daily) and gradually increased at weekly intervals, with monitoring of blood glucose response. In the presence of a creatinine level of 3.0 mg/dl or greater, oral agents should probably not be used.

Insulin therapy may be more difficult in the elderly than in younger patients because such factors as unsteadiness, weakness, and lowered manual dexterity limit the patient's ability to measure the dosage and self-inject. Several devices are commercially available to simplify the injection process for patients with tremor or aversion to self-injection, eg, Autojector, Inject-Ease, Instaject II.* In cases where accurate measurement is a concern, the visiting nurse or a friend or relative might premeasure the patient's insulin into syringes and leave them in the refrigerator for the patient to inject at the appropriate time. Even though premixing of some insulin brands may cause some conversion of regular to intermediate-acting insulin, if the brands and dosages remain the same and are always premixed at least 24 hours in advance, then the effective administered dose will remain stable. If the patient can physically draw up a dose of insulin but there is concern about his or her ability to remember how much of each insulin to draw and fear of accidental inversion of the dose in a stable regimen, fixed-ratio commercially available insulins can be prescribed or the pharmacist can premix a given proportion in a vial. For example, a mixture of 15 units of regular to 25 units of NPH insulin can be premixed in a vial, allowing the patient to draw up 40 units of the mixture which will be in the proper proportions.

Poor vision may make withdrawal of insulin dosages difficult. For patients with this problem, magnifiers that clip onto the syringe are available,

as are 50-unit and 30-unit disposable syringes that have wider spaces between markings to ease measurement of smaller doses of insulin.

Hypoglycemia is often a more serious concern in the elderly than in younger patients because of their increased likelihood of having borderline myocardial or cerebral perfusion and the danger of precipitating arrhythmia, myocardial infarction, or stroke. Chlorpropamide (Diabinese) may be especially dangerous in the elderly because of its very prolonged duration of action. Physicians should also be aware that disopyramide (Norpace), an antiarrhythmic, can cause severe hypoglycemia.

Psychological factors

Because diabetics are not isolated but continue to function in society, many psychological factors come into play and need attention. It may be helpful to give patients a respected model with whom they can identify and to point out what that person was able to do during his or her lifetime in spite of Diabetes. For example, a retired engineer might be informed that Thomas Edison had Diabetes. Many elderly people could identify with Spencer Tracy, Jack Benny, or James Cagney, all of whom had Diabetes. Sports fans might benefit from knowing that Bill Talbert, Bill Carlson, Catfish Hunter, and Bobby Clark have Diabetes. Dana Hill, Claudia McNeil, and Mary Tyler Moore are diabetics who have had successful film and television careers.

Encourage patients to control their Diabetes by pointing out that if they do not control it, it will control them--via nocturia, blurred vision, impotence, foot infections, and its many other complications. Expect them to succeed, and give lots of positive feedback whenever they are doing anything right. If a negative event occurs (eg, deterioration of blood glucose control after weight gain or lack of exercise), use it as a positive learning experience and point out that once they have seen what happens to their glucose level as a result of their indiscretions, they can use that information to improve their control in the future.

Give patients a goal. It is surprising how many patients have no idea what their blood glucose level should be. Let them know that levels should remain under 200 mg/dl at all times and under 140 mg/dl in the fasting state if that is achievable without undue risk of hypoglycemia. Keep them up

to date on new developments, including the many new blood glucose monitoring devices, new methods of injecting insulin, new oral agents, and other aspects of research, thereby implying that you expect them to succeed and to survive long enough to reap benefits from these developments.

*Autojector, Ulster Scientific, Highland, NY; Inject-Ease, Palco Laboratories, Santa Cruz, CA; Instaject II, Jordon Enterprises, Garden Grove, CA.

SUMMARY

The overall goals in regard to management of Diabetes in the elderly are twofold. First, blood glucose control should be kept as near normal as possible (certainly always less than 200 mg/dl) without inordinately increasing risks related to therapy; this will decrease the risk of acute complications and hopefully of long-term ones as well. Second, overall functional status should be maintained or improved. Although a number of factors peculiar to old age complicate the management of Diabetes, with careful planning these goals should be attainable.

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