Early screening of patients at high risk for type 1 or type 2 diabetes mellitus is key to early diagnosis and comprehensive treatment. Because osteopathic physicians predominantly practice primary care, they are well positioned to serve a leadership role in the fight against the dual epidemics of obesity and diabetes. This overview provides some important and helpful practice “jewels” to guide a primary care approach to screening, diagnosis, and treatment of diabetes.

Ninety percent of patients with diabetes mellitus are treated by primary care physicians, including family physicians, internists, pediatricians, and obstetrician/gynecologists. Because osteopathic physicians are predominantly engaged in primary care, having always practiced comprehensive holistic medicine, they are in an excellent position to assume a leading role in diagnosis and the management of this disease. Diabetes is currently at an epidemic stage in the United States, attracting even the attention of major consumer publications, many of which have featured articles about diabetes and its risks.

In 1999, 2389 (66%) of the 3623 adult endocrinologists then in the US workforce were in office-based practice. Further, the number of endocrinologists entering the workforce annually has fallen continuously during the 5 years from 1995 to 1999, from 200 to 171. At such a low number, the supply of endocrinologists is unable to meet the demand to treat a significant number of patients with diabetes mellitus. Diabetic patients now number 17 million, increasing by about 1 million per year.2

Whereas the number of deaths attributable to diabetes is rising, the deaths from heart disease and cancer are dropping. From 1998 to 1999, the age-adjusted death rate for heart disease, the number one killer in the United States, declined 0.3% and the age-adjusted death rate from cancer, the second leading cause of death, decreased 0.5%, while the age-adjusted death rate from diabetes mellitus increased 3.3%.3

Possibly as many as 30 million patients have prediabetes, or impaired glucose tolerance (IGT). Of the 17 million people (6.2% of the population) estimated in 2000 to have diabetes, the disease was diagnosed in only 11.1 million, leaving 5.9 million people whose diabetes goes undiagnosed.2 Further, it can be anticipated that many people who have had their diabetes diagnosed are not actively or optimally treated.

Prevalence of Diabetes and Obesity
According to the Centers for Disease Control and Prevention (CDC), the prevalence of diabetes mellitus and gestational diabetes in most of the United States in 2001 was greater than 4%; in more than half of the states, it was then greater than 6% (Figure 1).4

The prevalence of obesity has also risen sharply. In 1991, no state had an obesity rate greater than 20%. By 2000, almost half of the states had a 20% or greater rate of obesity. Figure 2 demonstrates the upward trend in the median percent of respondents having a body mass index (BMI) greater than or equal to 30.05.5

The cost of diabetes care accounts for 1 in 7 health care dollars and 25% of the Medicare budget. In 2002, the cost of diabetes was estimated to be $132 billion a year, with the cost of lost productivity due to diabetic disability and early mortality at $40 billion.7

Facing the Dual Epidemics of Obesity and Diabetes
The dual epidemics of global obesity and diabetes cannot be ignored. Osteopathic physicians, as predominantly primary care physicians, can play a major role in preventing or delaying the development of diabetes by treating the patients in their practices, one patient—one face—at a time.

At least 10 million Americans who are at high risk for type 2 diabetes mellitus (T2DM) can sharply lower their chances of developing this disease. Diet and exercise are effective preventive or risk-lowering measures, according to the Diabetes Prevention Program study. In that study, the participants who were randomly assigned to intensive lifestyle intervention versus oral hypoglycemic agents had a reduction of 58% in their risk of the development of T2DM, compared with 31% risk reduction in the group assigned to receive metformin. It is noteworthy, however, that both groups showed significant risk reduction.

Risk Factors for Diabetes
Family history of diabetes mellitus is an important risk factor. Research is ongoing to identify genetic factors in the pathogenesis of familial early-onset T2DM, thereby facilitating early diagnosis and treatment of such at-risk patients and their families. Although a genetic link has been demonstrated, it is unclear at this time specifically how many people are genetically at risk. It is likely that they number in the millions.
The connection between obesity, diet, and sedentary lifestyle is no longer theoretical but well recognized. Osteopathic physicians can prevent or delay the development of clinical diabetes by instructing their patients to institute simple—not major—lifestyle changes, as will be discussed later.

Screening and Diagnosis
First, it is necessary to identify those patients who need treatment. According to the American Diabetes Association (ADA) criteria, all men and women older than 45 years should be screened, especially those whose BMI equals or exceeds 25. The American Association of Clinical Endocrinologists, the Centers for Disease Control and Prevention, and the National Institute of Diabetes and Digestive and Kidney Diseases also recommend early detection beginning at age 45 years. The American College of Endocrinology (ACE) recommends screening of high-risk individuals even earlier: at age 30 years, especially if their BMI is greater than 25.

Further, the ADA recommends screening for individuals aged 45 years and older and repeated at 3-year intervals or earlier if they:
- are overweight (BMI ≥ 25) and have other risk factors;
- have a first-degree relative with diabetes;
- have had gestational diabetes or an infant weighing more than 9 pounds at delivery;
- have previously identified IGT or impaired fasting glucose;
- have high-density lipoprotein cholesterol levels of less than 35 mg/dL and/or triglyceride concentration greater than 250 mg/dL;
- are hypertensive (blood pressure ≥ 140/90 mm Hg);
- have diabetes.
are members of a high-risk ethnic population; are female with polycystic ovaries; or have a history of vascular disease.

Clearly, a large population is at risk for diabetes. Thus, primary care physicians attend many patients in their practices who deserve early testing for diabetes before overt signs become evident.

Today, 50% of patients at the time of diagnosis of T2DM may already display signs of end-stage disease. This statistic implies that patients are not reporting symptomatology for testing in a timely manner. Apparently, these patients are not aware of the importance of early testing. Also, in busy practices, health care professionals sometimes may not take the time to sufficiently counsel patients to have testing (ie, fasting plasma glucose [FPG] or oral glucose tolerance test [OGTT]) done early. It is essential that both type 1 and type 2 diabetes mellitus be diagnosed before the development of irreversible end-stage disease.

Patients often present to the physician with complaints of fatigue, depression, or impotence, all of which may be due to underlying diabetes; therefore, the physician should screen all nondiabetic patients presenting with these complaints.

According to the ADA’s 2003 recommendations, screening (Figure 3) is simply accomplished by measurement of the FPG level. If the FPG level is greater than 126 mg/dL, the patient has diabetes; if it is between 110 mg/dL and 126 mg/dL, the patient has IGT. However, screening by laboratory evaluation measuring only the FPG level will not identify all patients who require treatment, in which cases, an OGTT will be necessary for diagnosis.

In a letter commenting on the study by Rohlfing et al using data from the Third National Health and Nutrition Examination Survey (NHANES III), Herman et al point out that in 705 (55%) of 1272 subjects, diabetes was diagnosed on the basis of the 2-hour (75-g oral glucose load) plasma glucose level. Diabetes was diagnosed by FPG alone in only 82 subjects. Thus, the 75-g OGTT is becoming increasingly important in detecting early diabetes mellitus and impaired-glucose-tolerant patients. When there is a high index of suspicion, appropriate screening should be done early.

Many adult patients with diabetes present with the metabolic syndrome, namely, hypertension, hyperlipidemia, and hyperglycemia. It is important to check lipid and glucose levels in patients who have high blood pressure and lipid levels and check blood pressure and lipid levels in patients who have high plasma glucose levels. If one of these values is high, chances are increased that all values are elevated. Figure 4 depicts the important mnemonic “ABC” for the essential approach to managing glucose levels, blood pressure, and lipid levels.

It is especially important to screen obese children. Type 2 diabetes is now being increasingly diagnosed in children as young as 4 to 8 years, especially in minority populations (ie, Native American, African American, and Hispanic and Latino Americans). If diabetes is not diagnosed early in young children, the prognosis for these children to survive until their 30th birthday is poor.

Television is recognized as a leading cause of obesity in children. In an Australian study, the mean BMI z-scores of children aged 5 to 13 years (n = 2862) was related to increased television viewing. However, such a relationship was not found for playing video games and using a computer. The children's use of hands and brains while using the computer or playing the video games possibly provided stimulation and activity for hands other than mindless food ingestion.

**Treatment**

A team approach for treating diabetic patients is required. Primary care physicians should head a multidisciplinary team that includes a diabetes educator, a dietitian, a pharmacist, a podiatrist, and an ophthalmologist to manage this disease. Primary care physicians need to formulate a diabetes management plan and direct the implementation of that plan.

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*Figure 3. Screening tests for diabetes and impaired glucose tolerance.*
plan. The ADA has a plan, the Texas Health Department has a plan, many insurance companies have plans. Primary care physicians can adopt one of these preformulated plans or adapt one of their own.

Once diabetes is diagnosed, treatment to hemoglobin A1c goal of under 7.0% should be instituted early and quickly. Treatment must be a dynamic, not a slow, process. It must also encompass a weight loss, diet, and exercise program.

Physicians recognize how difficult it is for patients to lose weight. Nonetheless, it is paramount that they inform patients that progression of their disease can be self-controlled by making lifestyle changes involving diet and exercise. Weight loss is important in both the prevention and management of diabetes. Fat cells were once thought to be benign, but scientists now know that many fat cells excrete harmful metabolites associated with the negative outcomes for diabetic patients with diabetes. Fat cells produce a substance that inhibits satiety. Thus, overweight patients who by definition possess more than normal numbers of fat cells continually want more to eat to feel satisfied.

At first mention of “diet and exercise,” most patients resist. They may react negatively: “I can’t do it, doc. I’ve tried it. It’s just impossible.” The good news is that as little as a 10% weight loss—that is, 15 pounds for persons weighing 150 pounds—offers significant health benefits, improving glycemic control, blood pressure, and cholesterol levels. Most patients will agree that they can accomplish this degree of weight loss, an important first step in treatment of the metabolic syndrome.

Because exercise improves insulin resistance, it provides benefit both to prevent diabetes and to treat patients with T2DM. Reducing sedentary behaviors and adopting a “relatively active lifestyle” can also reduce the twin risks of obesity and T2DM.

A total of 150 minutes a week of moderate exercise, even if broken up into 10-minute walks or bike rides three times a day—in the morning, at noon, and at night for 5 days per week—can improve glycemic control and decrease adverse outcomes up to 60%. Such a level of improvement from a simple starting exercise program will encourage patients to continue or increase such exercise, thereby improving their glycemic control.

An added benefit of exercise: Patients who have a BMI of less than 23 and who exercise regularly can eat just about whatever they want.

Life holds numerous stress events that can affect glycemic control. Physicians need to counsel diabetic patients in coping with stress and altering their lifestyles to minimize stress, consequently helping control their blood sugar level.

When lifestyle modifications including diet and exercise fail to bring about the desired results in 3 to 6 months, use of oral medication should be instituted immediately.

The A1c value recommended by the ADA is less than 7.0%. The ACE recommends 6.5%, but the real goal should be the lowest A1c possible without unacceptable symptomatic hypoglycemic events. Some patients will not be able to achieve an A1c level of 7.0%, because hypoglycemic events will limit the attainable level. Nevertheless, the attempt to reach that goal must be made to minimize adverse sequelae.

Treatment of patients to the A1c goal of 7.0% early and fast requires the ability to quickly change the medication regimen if testing demonstrates the need. At 30 days, there is a 50% change of A1c levels. Multiplying times 2 provides the A1c value needed for the physician to regulate the therapeutic program.

In treating patients with T2DM, it is important to protect the beta cells in the pancreas, the source of insulin. Beta cell decline is the inevitable effect of diabetes mellitus. This progression must be slowed. Large meals overstimulate the beta cells to suddenly produce large amounts of insulin. Small, frequent meals extend insulin production gradually over a longer period, thus sparing beta cell activity.

Insulin—When Oral Medication Fails

Diabetes is a progressive disease, and most patients will require more aggressive treatment over time. When oral medications fail, treatment with insulin should be instituted. Many patients do not receive insulin because their physicians—especially family physicians—may not be comfortable prescribing it. But, physicians need to learn to give insulin appropriately, including how to switch or add to insulin regimens early if oral medication fails to achieve goal.

Physicians do not all agree on the A1c goals. As previously noted, the ADA recommends that the glycemic control target for the hemoglobin A1c level be less than 7.0%; however, the ACE recommends a hemoglobin A1c level of 6.5% for assessing glycemic control.

Some literature recommends 6.0% or even lower. The curve of diabetes-related side effects begins to rise when the A1c level is as low as 5.4%.

The new long-acting, 24-hour (once-daily), basal insulin glargine is an excellent choice for addition to failing oral therapy. Many other insulin preparations are now in development, including new oral insulins, transdermal patch insulins, and inhaled insulin. Several insulin formula-
tions will soon be added to our armamentarium for diabetes care. Currently, though, the most important new insulin available is the once-daily, 24-hour-dosing insulin glargine. Because of its prolonged duration of action and smooth, nonpronounced peak profile, comparable or better glycemic control profile, lower risk of hypoglycemia, and safety profile similar to that of human insulin, it is rapidly becoming the long-acting insulin of choice in the treatment of diabetes.

**Additional treatment modalities**

All adult diabetic patients who have no known contraindications should take one 81-mg enteric-coated aspirin daily,26 because of a twofold to fourfold risk of dying of cardiovascular complications. However, during the period from 1988 to 1994, as few as 20% of adult diabetic patients were reported to be taking aspirin regularly (≥15 times in the previous month).28 It is estimated that increasing daily use of aspirin to 90% could prevent an additional 11,000 myocardial infarctions and save the lives of more than 8000 diabetic patients.29

**Comment**

If we are to make a difference in the lives of our patients with diabetes mellitus, we must diagnose early, treat to goal early and quickly, and be prepared to provide a lifetime of enabling support. Passionate commitment will assure success for both physicians and their patients.

**References**


15. American Diabetes Association. Use of ghb (HBA1c for undiagnosed diabetes patients were reported to be taking aspirin regularly (≥15 times in the previous month).28 It is estimated that increasing daily use of aspirin to 90% could prevent an additional 11,000 myocardial infarctions and save the lives of more than 8000 diabetic patients.29


