Basics of home glucose monitoring

By Louise Townsend

Statistics from the American Diabetes Association reflect that 20.8 million children and adults — 7% of the population in the United States — have diabetes. Of these, 14.6 million have been diagnosed, while the remaining 6.2 million are not aware that they suffer from the disease. The disease is one in which the body does not produce or properly use insulin, a hormone needed to convert sugar, starches, and other foods into energy. The major types of diabetes include type 1, type 2, gestational diabetes, and pre-diabetes. Landmark studies have demonstrated that tight management and control of blood glucose is a critical component of diabetes management and can significantly reduce the long-term complications of the disease.

Today, many diabetes patients monitor their blood-glucose levels at home, work, or school with a variety of blood-glucose meters. The convenience of checking blood-sugar levels aids patients in knowing whether or not they are taking the appropriate amount of diabetes medication at the appropriate time. It allows them to monitor the effects of meals on their blood-glucose levels. And it helps patients manage their exercise and/or activity levels and track how those affect their blood-glucose levels. Even people without diabetes who own diabetic pets have become cognizant of blood-glucose testing; entire websites are devoted to the dedicated owner of a diabetic pet.

Meters and home testing

A plethora of blood-glucose meters (at least 25 different types are commercially available) and needed accessories are also in the marketplace for home use. Just type into Google the phrase: home glucose monitoring, and voila! Perhaps the most familiar meter is that of jazz great B.B. King. He touts the fact that his fingers are spared from being pricked for his blood-glucose checks. What B.B. does not tell us is that his meter allows him to test his forearm or his fingertip. Some newer glucometers can measure blood-sugar levels with small amounts of interstitial fluid. But forearm testing has special requirements: Patients can only forearm test before or two hours after a meal, physical exercise, or an insulin dose; otherwise, their test results may be inaccurate, since studies have shown that test results using forearm blood samples may differ from fingertip samples during the periods listed.

Most of today’s glucose meters are small enough to fit in the palm of a patient’s hand. All meters now include a clock and memory to capture test results in order that patients have a record of trends and patterns of their blood-glucose levels. One-use test strips purchased separately from the meter are impregnated with glucose oxidase and other components and are discarded after the test is performed, while diskettes for some models are used for several tests. The test strips are the costly element of the home monitoring meter; type 1 diabetics test up to 10 to 12 times a day. Each glucose strip can cost from $.35 to $1. These strips and meters can be very expensive. Some insurance companies cover the cost of the meter; others cover the cost of the strips.

Other causes for elevated or lowered glucose

In August 2000, Diabetes Care reported: “Diligent and timely control of blood-glucose levels has recently emerged as a crucial element in diabetes therapy.” Since that time, home blood-glucose monitoring has helped diabetics keep track of their blood-sugar level all day long. With frequent monitoring, they can make changes in their treatment right away to keep their blood sugar under control. Self-monitoring is an important part of keeping tight control of diabetes. Tight control helps to limit the complications of diabetes. But the accuracy of monitoring blood-glucose levels has become an emphasis, since “routine errors in self-monitoring may be an important determinant of the outcome of diabetes therapy.”

Other diseases or conditions can result in elevated glucose levels, too: acromegaly, acute stress, chronic renal failure, Cushing syndrome, excessive food intake, hyperthyroidism, pancreas cancer, and pancreatitis, as well as drugs — from corticosteroids, tricyclic antidepressants, diuretics, epinephrine, estrogens, lithium, phenyltoin, and salicylates. Low glucose levels (hypoglycemia) are seen with adrenal insufficiency, alcohol intake, extensive liver disease, hypopituitarism, hypothyroidism, insulin overdose, starvation, insulinomas (insulin-producing pancreatic tumors), and drugs — acetaminophen and anabolic steroids.

Other choices

Home monitoring is essential in the context of diabetes education for self-management in order to enable the patient to make appropriate treatment or lifestyle choices. While some proponents argue that self-monitoring “empowers” patients with diabetes to observe the effect that eating and exercise have on their blood-glucose concentrations and, thus, take action to alter their diet and physical activity, some evidence exists that home blood-glucose monitoring has an adverse effect.

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on quality of life, with higher levels of distress, worry, and depressive symptoms, particularly if patients test more than once a day. 12

There are other diabetes management tests:
  ■ glycosylated hemoglobin — widely used in routine monitoring of patients with diabetes mellitus. There are now many different ways to measure glycosylated hemoglobin. Tests vary in cost and convenience, but some can be done at home. The values of these tests can vary, too. Patients with diseases affecting hemoglobin (e.g., anemia) may get wrong values with this test. Vitamins C and E, high levels of lipids, and liver and kidney diseases may all cause the test results to be wrong. 5
  ■ glycosylated serum proteins — One common test is the fructosamine test, which gives information on glucose status over a one- to two-week period, and is good for watching short-term changes in glucose status during pregnancy or after major changes in diabetes therapy. If a patient has any other disease that can change his serum proteins, or if he has large amounts of ascorbic acid (Vitamin C) in his diet, these tests may give wrong values. 5
  ■ urine glucose — Only patients who are unable to use blood-glucose meters should use the urine-glucose tests. Three major drawbacks are that 1) urine-glucose testing does not tell about low (below 180 mg/dL) glucose levels, since at lower levels, glucose does not enter urine; 2) urine-glucose readings change when the volume of urine changes; and 3) a urine-glucose level is more of an average value than a blood-glucose level. Several dipstick tests, however, are available in the marketplace. 5
  ■ microalbumin — To test for albumin in the urine of diabetes patients is important for detecting early signs of kidney failure. Healthcare providers may use specific tests to find low levels, and urine may be collected for several 24-hour periods; urine dipsticks are used to test for large amounts of albumin. 5
  ■ cholesterol — Diabetics have a higher risk of heart and blood-vessel disease, so testing for total cholesterol, total triglycerides, and high-density lipoproteins, then control it with lifestyle changes or prescription medication. 5

For the diabetes patient who wishes to maintain optimum health, getting educated about the details of monitoring blood-glucose at home, learning about other tests that might be useful under certain circumstances, and studying the latest glucose meters and their accessories are crucial steps toward that goal.  

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References