Blood Sugar Monitoring, Adult

GLUCOSE METERS FOR SELF-MONITORING OF BLOOD GLUCOSE

As a person with diabetes, it is important to be able to correctly measure your blood glucose. You can use a blood glucose monitor (a small battery-operated device) to check your glucose level at any time. This allows you and your caregiver to monitor your diabetes and to determine how well your treatment plan is working. The process of monitoring your blood glucose with a glucose meter is called self-monitoring of blood glucose (SMBG). When people with diabetes control their blood sugar (*glucose*), they have better health.

To test for glucose with a typical glucose meter, place a small sample of blood on a disposable "test strip." Place the strip in the meter. The test strips are coated with chemicals that combine with glucose in blood. The meter measures how much glucose is present. The meter displays the glucose level as a number. Several new models can record and store a number of test results. Some models can connect to personal computers to store test results or print them out.

Newer meters are often easier to use than older models. Some meters allow you to get blood from places other than your fingertip. Some new models have automatic timing, error codes, signals or barcode readers to help with proper adjustment (*calibration*). Some meters have a large display screen or spoken instructions for people with visual impairments.

INSTRUCTIONS FOR USING GLUCOSE METERS

- Wash hands with soap and warm water, or clean the area with alcohol. Dry your hands completely.
- Prick the fingertip with a lancet (a sharp-pointed tool used by hand).
- Hold the hand down and hold the finger until a small drop of blood appears. Catch the blood with the test strip.
- Follow the instructions for inserting the test strip and using the SMBG meter.
- Record the test result.
- Read the instructions carefully for both the meter and its test strips. Meter instructions are found in the user manual. Keep this manual to help you solve any problems that may arise. Many meters use "error codes" when there is a problem with the meter, the test strip or the blood sample on the strip. You will need the manual to understand these error codes and fix the problem.
- New devices are available such as laser lancets and meters that can test blood taken from "alternative sites" of the body other than fingertips. However, use standard fingertip testing if your glucose changes rapidly. Also, use standard testing if:
  - You have just eaten, exercised or taken insulin.
  - You think your glucose is low.
  - You tend to not feel symptoms of low blood glucose (*hypoglycemia*).
  - You are ill or under stress.
- Clean the meter as directed by the manufacturer.
- Test the meter for accuracy as directed by the manufacturer.
- Take your meter with you to the caregiver's office. This way, you can test your glucose in front of your caregiver to make sure you are using the meter correctly. Your caregiver will also take a sample of blood to test using a routine laboratory method. If values on the glucose meter match the laboratory method, you and your caregiver will see that your meter is working well, and you are using good technique. Your caregiver will advise you about what to do if the results do not match.

FREQUENCY OF TESTING

Your caregiver will tell you how often you should check your blood glucose. This will depend on your type of diabetes, your current level of diabetes control and your type of medications. The following are general guidelines, but your care plan may be different. Record all your readings and the time of day you took them for

review with your caregiver.

- Diabetes type 1.
  - When you are using insulin with good diabetic control (either multiple daily injections or via a pump), you should check your glucose 3 times a day.
  - If your diabetes is not well controlled, you may need to monitor more frequently, including before and 2 hours after meals, at bedtime and occasionally between 2 and 3 a.m.
  - You should always check your glucose before a dose of insulin or before changing the rate on your insulin pump.
- Diabetes type 2.
  - Guidelines for SMBG in diabetes type 2 are not as well defined.
  - If you are on insulin, follow the guidelines above.
  - If you are on medications, but not insulin, and your glucose is not well controlled, you should test at least twice daily.
  - If you are not on insulin, and your diabetes is controlled with medications or diet alone, you should test at least once daily, usually before breakfast.
  - A weekly profile will help your caregiver advise you on your care plan. The week before your visit, check a before-meal glucose and 2-hour after-meal glucose at least daily.
- Gestational diabetes.
  - Frequent testing is often necessary. Accurate timing is important.
  - If you are not on insulin, check your glucose 4 times a day: before breakfast and 1 hour after the start of each meal.
  - If you are on insulin, check your glucose 6 times a day: before and 1 hour after the first bite of each meal.
- General guidelines.
  - More frequent testing is required at the start of insulin treatment. Your caregiver will instruct you.
  - Test your glucose any time you suspect you have low blood sugar (*hypoglycemia*).
  - You should test more often when you change medications, when you have unusual stress or illness, or in other unusual circumstances.

OTHER THINGS TO KNOW ABOUT GLUCOSE METERS.

- **Measurement Range**. Most glucose meters are able to read glucose levels over a broad range of values from as low as 0 to as high as 600 mg/dL. If you get an extremely high or low reading from your meter, you should first confirm it with another reading. Report very high or very low readings to your caregiver.
- **Whole Blood Glucose vs. Plasma Glucose**. Home glucose meters measure glucose in your whole blood. In a lab, the glucose is measured in your plasma (one component of blood). The difference can be important. It is important for you and your caregiver to know whether your meter gives its results as "whole blood equivalent" or "plasma equivalent."
- **Display of High and Low Glucose Values**. Part of learning how to operate a meter is understanding what the meter results mean. Know how high and low glucose concentrations are displayed on your meter.
- **Factors that Affect Glucose Meter Performance**. The accuracy of your test results depends on many factors and varies depending on the brand and type of meter. These include:
  - Low red blood cell count (*anemia*).
  - Substances in your blood (such as uric acid, vitamin C and others).
  - Environmental factors (temperature, humidity, altitude).
  - Name brand versus generic test strips.
  - Calibration. Make sure your meter is set up properly.

NEW TECHNOLOGIES FOR GLUCOSE TESTING:

Alternative site testing:

Some glucose meters allow testing blood from alternative sites. These include the:

- Upper arm.

- Forearm.
- Base of the thumb.
- Thigh.

Sampling blood from alternative sites may be desirable. However, it may have some limitations. Blood in the fingertips show changes in glucose levels more quickly than blood in other parts of the body. This means that alternative site test results may be different from fingertip test results not because of the meter's ability to test accurately, but because the actual glucose concentration can be different.

Continuous Glucose Monitoring:

- Devices to measure your blood glucose continuously are available, and others are in development. These methods can be more expensive than self-monitoring with a glucose meter. However, it is uncertain how effective and reliable these devises are. Your caregiver will advise you if this approach makes sense for you.

IF BLOOD SUGARS ARE CONTROLLED, PEOPLE WITH DIABETES REMAIN HEALTHIER.

- SMBG is an important part of the treatment plan of patients with diabetes mellitus. Below are reasons for using SMBG:
  - It confirms that your glucose is at a specific, healthy level.
  - It detects and prevents hypoglycemia and severe hyperglycemia.
  - It adjusts care in response to changes in life-style for individuals requiring medication.
  - It determines the need for starting insulin therapy in temporary diabetes that happens during pregnancy (*gestational diabetes mellitus*).

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