

# Continuous Glucose Monitoring

## What is glucose monitoring?

Glucose monitoring helps people with diabetes manage the disease and avoid its associated problems. A person can use the results of glucose monitoring to make decisions about food, physical activity, and medications. The most common way to check glucose levels involves pricking a fingertip with an automatic lancing device to obtain a blood sample and then using a glucose meter to measure the blood sample's glucose level.

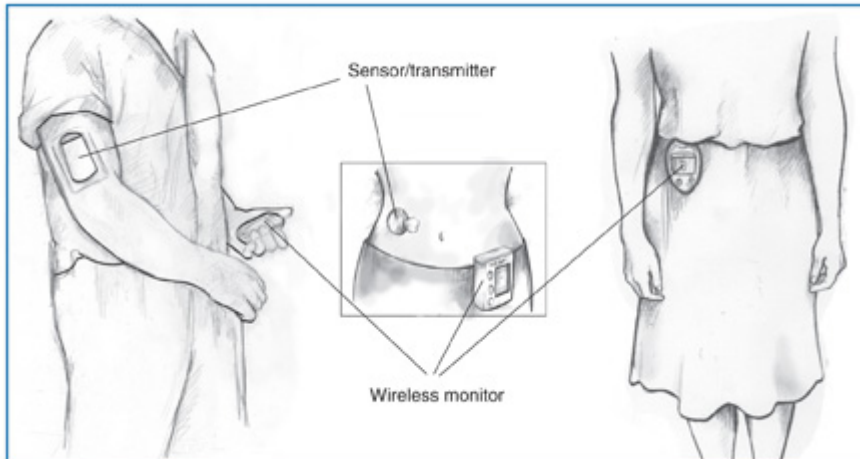


People with diabetes typically use a lancing device to obtain a blood sample and a glucose meter to measure the glucose level in the sample.

Many types of glucose meters are available, and all are accurate and reliable if used properly. See the American Diabetes Association's annual resource guide at [www.diabetes.org/diabetes-forecast/resource-guide.jsp](http://www.diabetes.org/diabetes-forecast/resource-guide.jsp) for more information. Some meters use a blood sample from a less sensitive area than the fingertip, such as the upper arm, forearm, or thigh.

## What is continuous glucose monitoring?

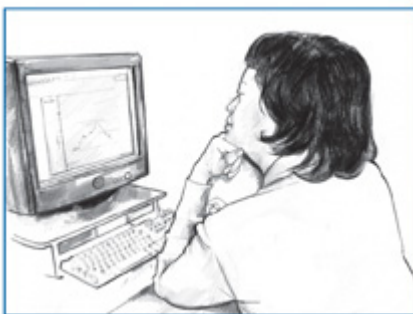
Continuous glucose monitoring (CGM) systems use a tiny sensor inserted under the skin to check glucose levels in tissue fluid. The sensor stays in place for several days to a week and then must be replaced. A transmitter sends information about glucose levels via radio waves from the sensor to a pagerlike wireless monitor. The user must check blood samples with a glucose meter to program the devices. Because currently approved CGM devices are not as accurate and reliable as standard blood glucose meters, users should confirm glucose levels with a meter before making a change in treatment.



CGM systems provide glucose measurements as often as once per minute. The measurements are transmitted to a wireless monitor.

CGM systems are more expensive than conventional glucose monitoring, but they may enable better glucose control. CGM devices produced by Abbott, DexCom, and Medtronic have been approved by the U.S. Food and Drug Administration (FDA) and are available by prescription. These devices provide real-time measurements of glucose levels, with glucose levels displayed at 5-minute or 1-minute intervals. Users can set alarms to alert them when glucose levels are too low or too high. Special software is available to download data from the devices to a computer for tracking and analysis of patterns and trends, and the systems can display trend graphs on the monitor screen.

Additional CGM devices are being developed and tested. To learn more about such monitors and new products after approval, call the FDA at 1-888-INFO-FDA (463-6332) or check the FDA's website section titled "Glucose Meters & Diabetes Management" at [www.fda.gov/diabetes/glucose.html](http://www.fda.gov/diabetes/glucose.html).



People who use CGM systems can download data to a computer to see patterns and trends in their glucose levels.

## What are the prospects for an artificial pancreas?

To overcome the limitations of current insulin therapy, researchers have long sought to link glucose monitoring and insulin delivery by developing an artificial pancreas. An artificial pancreas is a system that will mimic, as closely as possible, the way a healthy

pancreas detects changes in blood glucose levels and responds automatically to secrete appropriate amounts of insulin. Although not a cure, an artificial pancreas has the potential to significantly improve diabetes care and management and to reduce the burden of monitoring and managing blood glucose.

An artificial pancreas based on mechanical devices requires at least three components:

- a CGM system
- an insulin delivery system
- a computer program that “closes the loop” by adjusting insulin delivery based on changes in glucose levels

With recent technological advances, the first steps have been taken toward closing the loop. The first pairing of a CGM system with an insulin pump—the MiniMed Paradigm REAL-Time System—is not an artificial pancreas, but it does represent the first step in joining glucose monitoring and insulin delivery systems using the most advanced technology available.

### Points to Remember

- Glucose monitoring helps people with diabetes manage the disease and avoid its associated problems.
- The most common way to check glucose levels involves pricking a fingertip to obtain a blood sample and using a glucose meter to measure the glucose level in the sample.
- Continuous glucose monitoring (CGM) systems use a tiny sensor inserted under the skin to check glucose levels in tissue fluid. A transmitter sends glucose measurements to a wireless monitor.
- An artificial pancreas based on mechanical devices will consist of a CGM system, an insulin delivery system, and a computer program to adjust insulin delivery based on changes in glucose levels.

### Hope through Research

The National Institute of Diabetes and Digestive and Kidney Diseases (NIDDK) and the National Institutes of Health (NIH) have encouraged and supported research that has helped researchers explore and develop improved glucose sensing technologies. NIDDK support was instrumental in the development of two CGM devices. One device is on the market and the other is under review by the FDA. Research supported by the NIDDK and NIH is contributing to the development of an artificial pancreas that will combine continuous glucose sensing with insulin delivery in a “closed-loop” system.

Participants in clinical trials can play a more active role in their own health care, gain access to new research treatments before they are widely available, and help others by contributing to medical research. For information about current studies, visit [www.ClinicalTrials.gov](http://www.ClinicalTrials.gov).

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## For More Information

### **National Diabetes Education Program**

1 Diabetes Way  
Bethesda, MD 20814-9692  
Phone: 1-888-693-NDEP (6337)  
TTY: 1-866-569-1162  
Fax: 703-738-4929  
Email: [ndep@mail.nih.gov](mailto:ndep@mail.nih.gov)  
Internet: [www.ndep.nih.gov](http://www.ndep.nih.gov)

### **American Diabetes Association**

1701 North Beauregard Street  
Alexandria, VA 22311  
Phone: 1-800-DIABETES (342-2383)  
Email: [AskADA@diabetes.org](mailto:AskADA@diabetes.org)  
Internet: [www.diabetes.org](http://www.diabetes.org)

### **Juvenile Diabetes Research Foundation International**

120 Wall Street  
New York, NY 10005  
Phone: 1-800-533-CURE (2873)  
Fax: 212-785-9595  
Email: [info@jdrf.org](mailto:info@jdrf.org)  
Internet: [www.jdrf.org](http://www.jdrf.org)

The National Diabetes Information Clearinghouse collects resource information about diabetes for the NIDDK Reference Collection. This database provides titles, abstracts, and availability information for health information and health education resources.

This publication may contain information about medications. When prepared, this publication included the most current information available. For updates or for questions about any medications, contact the U.S. Food and Drug Administration toll-free at 1-888-INFO-FDA (463-6332) or visit [www.fda.gov](http://www.fda.gov). Consult your doctor for more information.

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## National Diabetes Information Clearinghouse

1 Information Way  
Bethesda, MD 20892-3560  
Phone: 1-800-860-8747  
TTY: 1-866-569-1162  
Fax: 703-738-4929  
Email: [ndic@info.niddk.nih.gov](mailto:ndic@info.niddk.nih.gov)  
Internet: [www.diabetes.niddk.nih.gov](http://www.diabetes.niddk.nih.gov)

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Publications produced by the Clearinghouse are carefully reviewed by both NIDDK scientists and outside experts. This fact sheet was reviewed by William V. Tamborlane, M.D., Yale University.

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NIH Publication No. 09-4551  
October 2008