Blood Glucose Monitoring and Data Management Systems

Before you buy a blood glucose monitor (also known as a blood glucose meter), check with your doctor and diabetes educator. Make sure the one you choose is well suited to your particular needs.

THIS YEAR MARKS the 30th birthday of the blood glucose monitor, a technology that health care providers agree is central to good diabetes care. Blood glucose monitors (or "meters") help you keep track of your glucose levels wherever and whenever you want, and it's those results that allow you to make appropriate medical and lifestyle choices.

In the early days of this technology, devices were bulky, difficult to use, and far from error-proof. Today, they are reliable, highly portable, and require very little blood.

Still, all monitors are not alike, and finding the right one for you can be confusing. To help you in your search, here are a few things to look for:

Accuracy. You make treatment decisions based on the numbers your monitor provides, so you need one you can trust. If used properly, all monitors have a fairly high degree of accuracy. Still, they can become less accurate over time, so it's important to check your monitor at least monthly or according to the manufacturer's instructions.

The easiest way to check your monitor for accuracy is to use a control solution. This small bottle of liquid is typically provided with your monitor; control solution can also be purchased at pharmacies. If you find that your monitor fails the control-solution test, let your diabetes care provider know right away. Manufacturers also have toll-free numbers you can call if you

have a problem with your monitor, and they often send replacement monitors free of charge if there is any question about whether your monitor is functioning properly.

Another way to test your monitor's accuracy is to bring it with you to a doctor's appointment and check your blood glucose within a minute or two of having a blood sample drawn there. Your monitor's result and the one provided by your doctor's laboratory should be similar (within 15 percent or so) if your monitor provides what is called a "plasma glucose" reading, as virtually all newer monitors are calibrated to do. Check your box of test strips to see if they give plasma glucose readings. In the event your monitor provides something other than plasma glucose readings, talk with your doctor or diabetes educator about how best to compare the readings.

Cleaning and coding. All monitors need to be taken care of in order to function properly. Some need more cleaning and maintenance than others, and this may be another factor to consider in choosing a monitor. Be sure to follow the manufacturer's instructions regarding proper care of your monitor, and make sure your health care team can offer training on the monitor you plan to buy. This is important because a monitor may provide inaccurate readings if it is dirty, old, or stored at extreme temperatures.

Your other monitor supplies need to be used properly as well: Testing strips can be the source of bad readings if they are outdated or if they've been stored improperly.

If a monitor is not "coded" properly, that, too, can affect its performance. Coding refers to the need to enter a code into your monitor that corresponds to a code that is provided with each lot of test strips so that the monitor and the test strips can "talk" to one another. Some studies have shown that readings can be off by as much as 43 percent with certain miscoded monitors. If your monitor requires a code strip or code chip, or it requires you to input code numbers into the

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Pairing Your Monitor With Software

These blood glucose monitors interact with computer software.

Abbott Laboratories
Abbott Diabetes Care
Monitors: Precision Xtra, FreeStyle, Freestyle Flash, FreeStyle Freedom, FreeStyle Lite
www.abbottdiabetescare.com
1-888-522-5226

AgaMatrix, Inc.
Monitors: WaveSense Keynote, WaveSense Jazz
www.agamatrix.com
(603) 328-6000

Arkray USA
Monitors: Advance Micro-draw, PocketChem EZ, QuickTek
www.arkrayusa.com
1-800-818-8877

Bayer HealthCare, LLC
Bayer Products
Monitors: Breeze 2, Contour
www.bayerdiabetes.com/us
1-800-348-8100

Bionime
Monitor: Bionime Rightest GM300
www.bionime.com

CardioCom, LLC
Monitors: GlucoComT GC100
www.glucocom.com
1-800-678-1446

Diabetic Supply of Suncoast
Monitors: Advocate, Advocate Speaking, Advocate Duo
www.dsosi.com
www.pharmasupply.com
1-866-373-2824

Diagnostic Devices, Inc.
Monitor: Prodigy Autocode
www.prodigymeter.com
1-800-366-5901

Home Diagnostics, Inc.
Monitors: Prestige IQ, TrueTrack Smart System, Sidekick
www.homediagnostics.com
1-800-342-7226

LifeScan
Monitors: OneTouch (Basic, Ultra 2, UltraSmart, SureStep)
www.lifescan.com
1-800-227-8862

Links Medical Products
Monitor: Microdot
www.linksmed.com
1-888-425-1149

Roche Diagnostics
Monitors: Accu-Chek (Active, Aviva, Compact Plus, Advantage)
www.accu-chek.com
1-800-858-8072

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monitor, make sure you follow the proper coding process every time you use a new box of strips. Some newer monitors do not require coding, and this may also factor in your decision when choosing a monitor.

Ease of use. All monitors on the market today are fairly easy to use: They're small, lightweight, and portable. But some require less blood than others, and some require fewer steps to operate than others. Most monitors provide results in less than a minute, and some provide results in as little as 5 seconds.

Your diabetes educator should have a number of different monitors available to allow you some "hands-on" experience before you decide which monitor to buy. He or she may even be able to provide you with a free monitor. You may also want to check with friends and relatives to see what their experience has been with various monitors. Remember that most monitor manufacturers have Web sites and toll-free numbers for customer questions.

Expense. If you aren't able to receive a free monitor from your health care team, you can usually obtain a substantial discount when you purchase a monitor at a retail pharmacy by taking advantage of special rebate and trade-in offers.

The cost of a monitor and diabetes care supplies is often covered by health insurance. But don't just assume your insurance will reimburse you; find out what your plan covers and get approval before you buy. Some insurance companies and health care systems have special arrangements for certain monitors and monitoring systems. You should also discuss cost with your health care team before you make a choice.

The biggest cost of monitoring over time will be for blood glucose test strips. While the cost per test is generally competitive between monitors, check to see what your health plan will cover. You'll also want to take into account how often you'll be monitoring your blood glucose, as this will obviously affect your overall expenses. Health plans differ in terms of how many strips they will pay for over a period of time.

Test site. Some monitors allow you to check your blood glucose by using samples from areas other than your fingertips, such as your forearms and thighs. This is often referred to as "alternate site testing," and it can be less painful than using fingertips.

When a person's blood glucose is not changing rapidly (such as before a meal), the results from a fingertip test and an alternate site test will be very similar. They won't be similar, however, after a meal or during an episode of hypoglycemia (dangerously low glucose levels) when glucose levels are rising or plummeting. That's because measurements taken from the fingertips reflect your "real time" glucose levels, whereas the glucose levels in alternate sites take 20 to 30 minutes to catch up.

Therefore, if you feel that your blood glucose may be low, you should test your levels by drawing a sample from your fingertip so you don't get a false reading. The same rule applies when you have treated low blood glucose with a snack: A fingertip reading will more accurately tell you whether you have successfully treated your low.

Audible ("talking") monitors. Some monitors give audible instructions throughout the testing procedure, and they also "tell you" your test result. Some even "speak" Spanish. These monitors can be particularly useful for people who are visually or physically impaired.

If you are in the market for a talking monitor, work through the testing process with different models to find the monitor that best meets your needs.

Record keeping. Even if your monitor has memory, keeping a written log of your blood glucose results will help you recognize patterns and provide a valuable summary of your blood glucose control over time. Be sure to record other important information as well, including details about your meals and physical activities. Your health care team can provide log books that are specially designed to record all of this critical information.

Your blood glucose monitor is a powerful tool that can help you gain better control over your diabetes. Take the time to find the monitor that best meets your needs. This will ensure that you use it regularly and get the most out of your investment.

Continuous Glucose Monitors

A new generation of blood glucose sensors, known as continuous glucose monitors, promises to change the way patients and their care providers manage diabetes. Several products have recently been approved by the U.S. Food and Drug Administration.

Unlike traditional monitors that provide one-time snapshots of your blood glucose, continuous glucose monitors deliver readings every few minutes around the clock. This enables patients and their doctors to constantly measure trends, chart ups and downs, and identify problems and make adjustments to insulin, meal, or exercise regimens.

The monitors have alert systems to let you know if your blood glucose is on the way up or down. Safety alarms also alert you to hypoglycemia and to hyperglycemia (dangerously high glucose levels).

Although each product has unique features, all continuous glucose monitors work in a similar way. A tiny flexible catheter, similar to the catheters used with insulin pumps, is inserted "subcutaneously" (under the skin). The catheter houses the glucose sensor, which measures changes in glucose levels in the interstitial fluid (the tiny layer of fluid under the skin), and sends the information either to a beeper-sized box or to a compatible insulin pump, which stores the results. Three or four days' worth of blood glucose readings can be stored at a time.

Because it sometimes takes a while for the glucose level in the interstitial fluid to match the glucose level in your blood, you should double-check your results with a fingerstick reading before treating a high or low that shows up on your continuous glucose monitor.

Talk with your doctor about the availability of these products and whether a continuous glucose monitor makes sense for you.

Data Management Programs

Data management software programs automatically record various aspects of your diabetes control each time you check your blood glucose. They can be installed on your personal computer or used through the Internet. These programs can store hundreds of test results and other information (depending on the system), such as the dates and times of your blood glucose measurements, insulin types and doses, meals, and physical activity. The software helps organize this information into various charts and graphs. These may be helpful to you and your doctor, in that you can more easily see patterns

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CONTINUOUS GLUCOSE MONITORING SYSTEMS

Product Name (Manufacturer/Distributor)	Components	Description
DexCom Seven (DexCom)	Sensor, wireless transmitter, receiver	DexCom Seven is a continuous glucose sensor approved for up to 7 days of continual use. The Seven System continuously measures glucose and provides real-time glucose readings (1–7 days, hourly), trends, and user-settable high and low glucose alerts. Sensor is inserted under the skin by the user for up to 7 days. Receiver displays real-time readings and trends. Water resistent. 26G insertion needle. Receiver software interface and microprocessor for sensor data processing. Data management and analysis software. Stores up to 30 days of data, downloadable to computer. Uses DexCom Data Manager 2 software.
Guardian REAL-Time (Medtronic Diabetes)	Sensor, MiniLink transmitter, monitor	The Guardian RT consists of three components: sensor, MiniLink transmitter, and monitor. Glucose readings are taken every 10 seconds and averaged every 5 minutes for 24 hours a day (288 times per day). Predictive and rate-of-change alarms warn users of significant glucose changes before they become dangerous. Trend graphs show effect of diet, exercise, medication, and lifestyle in 3-, 6-, 12-, and 24-hour increments. Trend arrows point up or down to show direction and rate of change. Glucose data can be downloaded using CareLink Therapy Management software.
MiniMed Pediatric REAL-Time (Medtronic Diabetes)	Sensor, MiniLink transmitter, monitor	Same as the Guardian REAL-Time (above) but alerts users to sensor drops below 90 mg/dl and is specifically designed for children 7 to 17.

BLOOD GLUCOSE MONITORS AND DATA MANAGEMENT SYSTEMS

Name (Manufacturer/Distributor)	Size (inches)	Weight (ounces)	Test Strip Used*	Range (mg/dl)	Test Time	Battery	
Accu-Chek Active (Roche)	4.6 X 1.07 X 0.9	2.01 without battery	Accu-Chek Active	10–600	5 sec.	(1) 3-volt	
Accu-Chek Advantage (Roche)	3.3 X 2.8 X 0.8	1.8 without batteries	Accu-Chek Comfort Curve	10–600	26 sec.	(1) 3-volt coin cell #2032	
Accu-Chek Aviva (Roche)	3.7 X 2.0 X 0.86	2.11 with battery	Accu-Chek Aviva	10–600	5 sec.	(1) 3-volt	
Accu-Chek Compact Plus (Roche)	4.4 X 1.9 X 1.2 (without lancet device)	4.2 with batteries and test drum (without lancet device)	Accu-Chek Compact	10–600	5 sec.	(2) AAA	
Advance Intuition (Arkray)	3.9 X 2.3 X 0.8	2.2	Advance Intuition	30–550	10 sec.	3-volt (CR 2032)	
Advance Micro-draw (Arkray)	3.0 X 2.5 X 0.5	1.5	Advance Micro-draw	20–600	15 sec.	(1) 3-volt (CR 2032)	
Advocate Meter **4223 A Speaking Version** **4233 B Non-speaking Version** (Diabetic Supply of Suncoast)	3.5 X 1.75 X 0.7	2.6 with batteries	Advocate	20–600	7 sec.	(2) AAA	
Assure 3 (Arkray)	3.9 X 2.3 X 0.8	2.2	Assure 3	30–550	10 sec.	(1) 3-volt (CR 2032)	
Assure 4 (Arkray)	3.9 X 2.3 X 1.0	2.5 without batteries	Assure 4	30–550	10 sec.	(2) AAA	

*These are test strips approved by the manufacturers. In some cases, manufacturers cannot guarantee results or provide assistance if any other test strips are used.

	Warranty	How Calibrated	Control Solution	Features
	3 years	Snap-in code key	Yes	Two-step procedure. Meter turns on automatically when strip is inserted. Alternate site testing; results are downloadable; small sample size; 7- and 14-day averaging. Rubber grips. English and Spanish instructions including a "First Time Guide." Toll-free call center available 24 hours a day, 7 days a week, with multilingual reps.
	3 years	Snap-in code key	Yes	Uses small sample size, capillary action, and large target area for easy dosing. Results are downloadable; 480-value memory with time and date; 7-, 14-, and 30-day averaging. Rubber grips. English and Spanish instructions including a "First Time Guide." Toll-free call center available 24 hours a day, 7 days a week, with multilingual reps.
	3 years	Snap-in code key	Yes	Wide-mouth dosing area attracts and holds blood sample allowing patients to fill the strip easily. Large, wide strip and rubber monitor grips provide easy handling. Alternate site testing; results are downloadable; 500-value memory with time and date; 0.6-microliter sample size; 7-, 14-, and 30-day averaging. English and Spanish instructions including a "First Time Guide." Toll-free call center available 24 hours a day, 7 days a week, with multilingual reps.
	3 years	No coding required	Yes	Detachable Accu-Chek Softclix Plus lancet device and no strip handling. Underdosed strip detection. Alternate site testing; results are downloadable; 300-value memory with time and date; 1.5-microliter sample size; 7-, 14-, and 30-day averaging. English and Spanish instructions including a "First Time Guide." Toll-free call center available 24 hours a day, 7 days a week, with multilingual reps.
	5 years	Code chip	Yes	Two-step testing. Automatic on/off with strip insertion. 3-microliter sample size. One-button memory recall. Stores up to 10 tests. Large display screen. Guide-Me-Curve strips guide the finger to application site where blood is wicked onto test strip. 10-second test time.
	5 years	Code chip	Yes	Test strips wick the blood onto the end of the strip. 1.5-microliter sample size. Digital display, 250-test memory with time and date stamp. 14- and 30-day average and downloading capabilities with GlucoBalance data management software. Finger or palm testing.
	1 year	Built-in button	Yes	Two models available: 4223 A Speaking Version (English and/or Spanish); 4223 B Non-speaking Version. Small blood sample (0.7 microliters). Alternate site testing; large display; 450-test memory, 7-, 14-, 21-, 28-, 60-, and 90-day averaging. Biosensor technology. Inserting test strip turns monitor on. Capillary action; error fill detection on strips. Downloadable software and training videos available.
	5 years	Code chip	Yes	Two-step testing. Automatic on/off with strip insertion. 3-microliter sample size. One-button memory recall. Stores up to 10 tests. Large display screen. Guide-Me-Curve strips guide the finger to application site where blood is wicked onto test strip. 10-second test time.
	5 years	Code chip	Yes	To calibrate, insert the code chip, and the monitor is ready. Inserting a test strip turns monitor on. Apply sample and obtain plasma-referenced result in 10 seconds. Guide-Me-Curve test strip provides easy handling and requires a small 1.5-microliter sample size. Easy access 50-test memory.

BLOOD GLUCOSE MONITORS AND DATA MANAGEMENT SYSTEMS *continued*

Name (Manufacturer/Distributor)	Size (inches)	Weight (ounces)	Test Strip Used*	Range (mg/dl)	Test Time	Battery	
Assure Pro (Arkray)	4.1 X 2.4 X 1.0	2.5 without batteries	Assure Pro	20–600	10 sec.	(2) AAA	
Breeze 2 Blood Glucose Monitoring System (Bayer HealthCare, LLC)	2.5 X 4.1 X 1.0	3.8	Breeze 2; 10 test strips in one disc	20–600	7 sec.	(1) 3-volt lithium	
Contour Blood Glucose Monitoring System (Bayer HealthCare, LLC)	3.0 X 2.2 X 0.7	2	Contour	10–600	5 sec.	(2) 3-volt lithium	
Fifty50 Control Blood Glucose Monitoring System (Fifty50 Medical)	3.6 X 2.1 X 0.9	1.9 with batteries	Control	10–600	5 sec.	(1) CR 2032 lithium battery	
FreeStyle (Abbott Diabetes Care)	3.8 X 2.0 X 1.0	2	FreeStyle	20–500	7 sec. average	(1) CR 2032, 3-volt lithium coin cell	
FreeStyle Flash (Abbott Diabetes Care)	3.0 X 1.6 X 0.8	1.4	FreeStyle	20–500	7 sec. average	(2) CR 2032, 3-volt lithium coin cell	
FreeStyle Freedom (Abbott Diabetes Care)	3.3 X 2.0 X 0.63	1.43	FreeStyle	20–500	5 sec. average	(1) CR 2032, 3-volt lithium coin cell	
FreeStyle Lite (Abbott Diabetes Care)	1.57 X 2.9 X 0.65	1.4	FreeStyle Lite	20–500	5 sec. average	(1) CR 2032 3-volt lithium battery, replacable	

*****These are test strips approved by the manufacturers. In some cases, manufacturers cannot guarantee results or provide assistance if any other test strips are used.

	Warranty	How Calibrated	Control Solution	Features
	5 years	Code chip	Yes	Full-featured system offers ProGuard, 24-hour reminder to conduct daily control solution testing. A "hypo" warning alerts users of low blood glucose readings and four programmable alarms can be used as test reminders. Small blood sample (1.5 microliters). Test strip is inserted into convenient top-of-monitor port. Results in 10 seconds. Large display with adjustable backlight. Strip release button. ProGrip helps secure hold on monitor and reduces slipping on surfaces.
	5 years	Automatic	Yes	Disc-based monitor; no coding technology. Underfill detection. Each function button does only one thing. Eliminates individual strip handling and performs 10 tests without reloading. Test strip automatically draws the amount of blood required. Downloadable memory for PC tracking. Stores up to 420 results. Alternate site testing. No cleaning necessary.
	5 years	Automatic	Yes	No coding technology; automatic hemocrit correction; control marking; temperature control; and underfill detection. Small sample size (0.6 microliters); optional quick and easy meal markers; 480-test memory with time, date, and 14-day average. Easy viewing of sample fill. Alternate site testing. Downloadable with WinGlucoFacts data management software.
	Lifetime	Plasma equivalent	Yes	Alternate site testing; biosensor technology; results in 5 seconds; 1-microliter sample size; 250-test memory and 7–90 day averaging.
	5 years	Built-in button	Yes	Small blood sample (0.3 microliters). Offers various testing sites. Large display. Strip insertion turns monitor on. Sample is pulled into the strip by capillary action. More blood can be added, using the same target area on the strip, for up to 1 minute. 250-test memory with date, time, 14-day average. Data can be downloaded to a PC or managed with FreeStyle Co-Pilot PC data management system.
	5 years	Built-in button	Yes	Up to four programmable daily alarms. Backlight display. Test port light. Small blood sample (0.3 microliters). Offers various testing sites. More blood can be added, using the same target area on the strip, for up to 1 minute. 250-test memory with date, time, 14-day average. Data can be downloaded to a PC or managed with FreeStyle Co-Pilot PC data management system.
	5 years	Built-in button	Yes	Small blood sample (0.3 microliters). Offers various testing sites. Large display. Strip insertion turns monitor on. Sample is pulled into the strip by capillary action. More blood can be added, using the same target area on the strip, for up to 1 minute. 250-test memory with date, time, 14-day average. Data can be downloaded to a PC or managed with Precision Link 2.6 data management system.
	5 years	No coding required	Yes	No coding required. Small blood sample (0.3 microliters). Various testing sites. Strip insertion turns monitor on. Capillary action. More blood can be added, using the same targe area on the strip, for up to 1 minute. 400-test memory with date, time, 7-, 14-, and 30-day average. Data can be downloaded to a PC or managed with FreeStyle Co-Pilot PC data management system.

BLOOD GLUCOSE MONITORS AND DATA MANAGEMENT SYSTEMS *continued*

Name (Manufacturer/Distributor)	Size (inches)	Weight (ounces)	Test Strip Used*	Range (mg/dl)	Test Time	Battery	
GlucoComT GC-100 (CardioCom, LLC)	3.2 X 2.4 X 0.8	1.71	GlucoComT	20–600	7 sec.	(1) CR 2032, 3-volt lithium coin cell	
Microdot (Links Medical)	3.0 X 2.37 X 0.5	2	Microdot	1–599	10 sec.	(1) 3-volt, CR 2032	
OneTouch Basic (LifeScan)	4.3 X 2.6 X 1.2	4.1	OneTouch	0–600	45 sec.	(2) AAA alkaline (home change)	
OneTouch UltraMini (LifeScan)	4.25 X 1.26 X 0.67	1.2 with batteries	OneTouch Ultra	20–600	5 sec.	(1) 3-volt CR 2032 lithium	
OneTouch Ultra2 (LifeScan)	3.12 X 2.25 X 0.9	1.5 with batteries	OneTouch Ultra	20–600	5 sec.	(2) 3-volt CR 2032 lithium	
OneTouch UltraSmart (LifeScan)	3.8 X 2.3 X 0.9	2.8 with batteries	OneTouch Ultra	20–600	5 sec.	(2) AAA alkaline (home change)	
PocketChem EZ (Arkray)	3.15 X 2.56 X 0.63	1.5 with battery	Pocket Chem EZ	20–600	10 sec.	3 volt (CR 2032)	
Precision Xtra (Abbott Diabetes Care)	2.94 X 2.1 X 0.64	1.48	Precision Xtra	20–500	5 sec. glucose; 10 sec. ketones	(2) AAA home change (1) CR 2032 lithium battery	
Prestige IQ (Home Diagnostics, Inc.)	4.0 X 2.75 X 0.8	3.6	Prestige Smart System	25–600	10–50 sec.	(1) AAA	
Prodigy Autocode Meter (Diagnostic Devices, Inc.)	1.79 X 3.79 X 1.0	1.86	Prodigy Autocode	20–600	6 sec.	(2) AAA	
QuickTek (Arkray)	3.9 X 2.0 X 0.75	2.1	QuickTek	20–600	10–30 sec.	(1) 3-volt CR 2032	

*These are test strips approved by the manufacturers. In some cases, manufacturers cannot guarantee results or provide assistance if any other test strips are used.

	Warranty	How Calibrated	Control Solution	Features
	3 years	Code key	Yes	0.7-microliter blood sample. 7-, 14-, 21-, 28-, 60-, and 90-day averages. 450-test memory. Alternate site testing. Data can be downloaded and shared with physician through AutoLink telemonitoring transmission device to produce trended glucose reports and electronic logbook via a secure Web portal.
	1 year	Strip batch code	Yes	Automatic fill check, beeper to assist testing, large display, strip eject button, 4 programmable alarms, 500 data memory and PC download. 0.6-microliter sample size.
	3 years	Built-in single button	Yes	75-test memory with optional display of date and time; simple, 3-step test procedure; large, easy-to-handle test strips; single-button coding. Data downloading with OneTouch software.
	3 years	Built-in buttons	Yes	50-test memory; large screen; 3-step testing; fits in a pocket or purse; alternate site testing.
	3 years	Built-in buttons	Yes	Before- and after-meal averages for the past 7, 14, and 30 days; 500-test memory; ability to flag results with comments; alternate site testing; data downloadable with OneTouch diabetes management software; diabetes educational DVD and booklet; 2-way scroll buttons; built-in backlight.
	3 years	Built-in buttons	Yes	Electronic logbook and blood glucose monitor in one. Small blood sample; easy blood application; confirmation window; 3,000+ test and logbook; 7-, 14-, 30-, 60-, and 90-day test averaging. Data downloading with OneTouch diabetes management software. Warning to check ketones at 240 to 600 mg/dl.
	5 years	Code chip	Yes	Two-step test with a large, easy-to-read display. Small sample size (1 microliter). Choice of palm or fingertip testing. 250-test memory with time and date stamp. Results in 10 seconds. Results can be downloaded.
	Lifetime	Calibrator in each box of test strips	Precision high/low and normal control solution	Measures blood glucose and blood ketone levels. SmartChip technology provides automatic test strip upgrades. TrueMeasure technology minimizes effects of agents like Tylenol, vitamin C, and uric acid for glucose-specific results. Two-step testing; end-fill/top-fill design; downloadable 450-test memory; large backlit display. New blood ketone strip requires only 1.5-microliter blood sample; results in 10 seconds.
	5 years	Button	Yes	Accurate results, data management including date and time and 14- and 30-day averaging, large digital display, and data uploading capabilities, allowing patients to track, graph, record, and share test results. Test strips are highly absorbent. Sample size confirmation on back of test strip.
	1 year	Automatic; no coding required	High/low	Autocode eliminates coding errors. Audio in English and Spanish. 0.6-microliter sample size. 450-test memory. Results in 6 seconds. 7-, 14-, 21-, 28-, 60- and 90-day averaging. Alternate site testing. Data downloadable with diabetes management software.
	5 years	Built-in button	Yes	250-test memory with time and date. Data downloading with GlucoBalance data management software. Large test strip for easy handling, small sample size (3.5 microliters), 2-step testing.

BLOOD GLUCOSE MONITORS AND DATA MANAGEMENT SYSTEMS *continued*

Name (Manufacturer/Distributor)	Size (inches)	Weight (ounces)	Test Strip Used*	Range (mg/dl)	Test Time	Battery	
ReliOn Ultima (Wal-Mart Pharmacies)	2.94 X 2.1 X 0.64	1.48	ReliOn Ultima	20–500	5 sec.	(1) CR 2032 lithium battery	
Rightest GM300 (Bionime)	3.3 X 2.3 X 0.86	2.9	Rightest GS 300	20–600	8 sec.	(2) AAA	
Sidekick Testing System (Home Diagnostics, Inc.)	1.7 X 1.5 X 2.5	1.6	Built in	20–600	<10 sec.	Built in	
TrueTrack Smart System (Home Diagnostics, Inc.)	3.5 X 2.1 X 0.67	1.7	TrueTrack Smart System	20–600	10 sec.	(1) CR 2032 or 3-volt lithium	
WaveSense KeyNote (AgaMatrix, Inc.)	2.8 X 1.6 X 0.6	1.56	WaveSense	20–600	Variable; 4 sec.	(2) 3-volt lithium	
WaveSense Jazz (AgaMatrix, Inc.)	3.3 X 1.8 X 0.7	1.59	WaveSense	20–600	Variable; 4 sec.	(2) 3-volt lithium	

*These are test strips approved by the manufacturers. In some cases, manufacturers cannot guarantee results or provide assistance if any other test strips are used.

COMBINATION BLOOD GLUCOSE MONITOR, LIPID, AND KETONE TESTS

Name (Manufacturer/Distributor)	Size (inches)	Weight (ounces)	Test Strip Used	Range (mg/dl)	Test Time	Battery
Advocate DUO Speaking Glucose + Blood Pressure Monitor 2 in 1 System 3223A (Diabetic Supply of Suncoast)	2.5 X 3.0 X 4.0 (with wrist cuff)	5.5 with batteries	Advocate	20–600 glucose 0–300 mmHg	7 sec. glucose 45–50 sec. blood pressure	(2) AAA
CardioChek (Polymer Technology Systems, Inc.)	5.5 X 3.0 X 1.0	4.3 without batteries	Individual PTS panel strips for glucose, cholesterol, ketones, triglyceride, and HDL	20–600 (glucose) 100–400 (cholesterol) 2–70 (ketones) 50–500 (triglycerides) 25–85 (HDL)	30–60 sec. (depending on test)	(2) AAA
DuoCare (GenExel-Sein, Inc.)	2.25 X 3.25 X 2.25	16	DuoCare	20–600 glucose 40–200 bpm pulse 20–330 mmHg	5 sec. glucose 30–45 sec. 30–45 sec.	(2) AAA

	Warranty	How Calibrated	Control Solution	Features
	1 year	Calibrator on each box of strips	No (available via toll-free phone number)	0.6-microliter sample size. Fingertip or forearm testing. End-fill test strips, with 7-, 14-, and 30-day averaging. Large display with Spanish capability. Download results. Wallet-sized carrying case, lancing device, 10 lancets, and logbook included. Individually wrapped strips.
	5 years	Snap-in smart code key	Yes	Large strip is easy to handle; large display screen; 300-test memory capacity; results in 8 seconds; monitor is palm-sized; 1.4-microliter blood sample size; one-step code number setting; PC download for self-management; batteries are replaced easily.
	N/A	No coding required	No	Vial of 50 test strips with blood glucose monitor built onto top of vial. No coding required. All the basic features of traditional monitor including fingertip or forearm testing, 1-microliter sample size, and test results in less than 10 seconds. Discard vial when empty (or upon expiration date).
	5 years	Code chip	Yes	Biosensor technology. Test results in 10 seconds with a 1-microliter blood sample. Alternate site testing.
	N/A	Code	Yes, 2 levels	Variable test time; 3–4 seconds; 0.5-microliter sample (see blood enter strip). Large rubber grips. Monitor activates automatically after strip insertion. Mealtime and 14-, 30-, and 90-day averages/graphs on large, backlit display. Six alarms, including hypo/hyperglycemic alerts.
	N/A	No code	Yes, 2 levels	Same features as the WaveSense KeyNote. No coding required. Large, backlit digits. 1,865-test memory. 3-day, 2-week, and 1-month graphs. Glucose variability tracking. Seven reminder alarms. Positive feedback on good test results. Pre/post tagging and averaging.

	Warranty	How Calibrated	Control Solution	Features
	1 year	Built-in button	Yes	Check glucose and blood pressure with the same product. Small blood sample (0.7 microliter). Compact; gives heart rate; large display. 450-test memory; 7-, 14-, 21-, 28-, 60-, and 90-day averaging. Audible results in English and Spanish. Biosensor technology. Capillary action and error detection on test strips. Downloadable software and training videos available.
	1 year	Automatic calibration curve: Input from MEMo Chip, included in each box	Yes	Multiple blood chemistry testing (glucose, total cholesterol, ketone, triglyceride, and HDL); 3-step testing; internal result storage/review. Auto or manual shut off. CLIA-waived; sold over the counter. Test strips sold separately.
	3 years	Automatic	Yes	Monitor combines blood glucose and blood pressure. Compact. 0.5-microliter sample size. Stores 150 blood glucose values. Wrist monitor stores 60 blood pressure measurements. Comes with lancing device with replacement lancets, test strips, carrying case, and logbook.

BLOOD-SAMPLING SUPPLIES

Name (Manufacturer/Distributor)	Features and Supplies
Accu-Chek Multiclix Lancet Device (Roche)	Eleven depth settings provide precise control of penetration depth to help avoid contact with nerves. Linear track design minimizes painful side-to-side motion. Uses the Accu-Chek Multiclix lancet drum of six preloaded lancets. Includes clear cap for alternate site testing. Includes two drums (12 lancets).
Accu-Chek Multiclix Lancet Drums (Roche)	For use with the Accu-Chek Multiclix lancet device. Drum of six preloaded lancets. Lancets are self-contained for enhanced safety. 30G lancets. Comes in packages of 102 and 204 (17 and 34 drums).
Accu-Chek Softclix Lancet Device (Roche)	Eleven depth settings provide precise control of penetration depth to help avoid contact with nerves. Linear track design minimizes painful side-to-side motion. Uses Accu-Chek Softclix lancets. Includes clear cap for alternate site testing. Includes 25 lancets.
Accu-Chek Softclix Lancets (Roche)	For use with the Accu-Chek Softclix and Accu-Chek Softclix Plus lancet devices. Comes in packages of 100 and 200. Tips are silicon coated.
Accu-Chek Soft Touch Lancet Device (Roche)	Five depth settings with an adjustable dial provide a personalized level of skin comfort while obtaining an adequate blood sample.
Accu-Chek Soft Touch Lancets (Roche)	Fits most lancet devices. Comes in packages of 100 and 200.
Advocate Lancing Device (Diabetic Supply of Suncoast)	Compact. 3.75 inches long. 5 depth adjustments. Works with most standard lancets.
Advocate Lancets (Diabetic Supply of Suncoast)	30G. Tribevel tipped. 100 per box. Consistent depth penetration. Universal fit to work with most standard lancing devices. Available in pull top and twist top.
Aimsco Adjustable Lancet Device (Aimsco Delta Hi-Tech)	Five depth settings. Use with Aimsco Lancets.
Aimsco Lancets (Aimsco Delta Hi-Tech)	28G and 30G. Compatible with most lancet devices.
Ames Gluco System Lancets (Bayer HealthCare, LLC, Diabetes Care Division)	Can be used in either Autolet or Glucolet.
Auto-Lancet (Palco Labs, Inc.)	Adjustable-tip, reusable lancing device. Five depth settings, linear tracking and quality design for maximum comfort and least capillary damage. Standard size. Fits most lancets. Two lancets included. Lifetime warranty.
Auto-Lancet Custom (Palco Labs, Inc.)	New design includes custom color and logo and an optional elastomer barrel for improved grip. Fits most lancets. Comes with a lifetime warranty.
Auto-Lancet Mini (Palco Labs, Inc.)	Same features and design as the Auto-Lancet, except in compact, mini size. Adjustable tip with 5 settings. Two lancets included. Lifetime warranty.
Auto-Lancet Prima (Palco Labs, Inc.)	Needle-lock function immobilizes lancing activation, eliminating accidental sticks and potential blood contamination. Provides precise blood samples, while reducing sensation of pain. Ergonomic shape and feel; advanced needle tracking system available. Needle-eject function ejects used lancet in a single motion, making it easy and safe to change lancets.
Autolet Impression Lancing Device (Owen Mumford)	Small pen-style device with multiple adjustments for control and comfort. Seven penetration depth settings, adjustable spring force, alternate site testing capabilities, and Comfort Zone Technology, which helps mask the feeling of puncture. Universal lancet compatibility.
Autolet Mini (Owen Mumford)	Two devices in one package; two depth platforms offer choice of blood flow, contour grips assist handling, includes 10 Unilet ComforTouch lancets and multilingual instructions; compatible with most lancets.
BD Microtainer Contact-Activiated Lancet (BD)	Safety-engineered lancet. Single-time use. Lancet and lancing device in one. 30G. Package of 200.
BD Ultra-Fine 33 Lancets (BD)	Thinnest lancet. 33G.
BD Ultra-Fine II Lancets (BD)	30G lancet; ultra-thin for greater comfort. Fits most other lancet devices.

Name (Manufacturer/Distributor)	Features and Supplies
EZ-Ject Lancets (Can-Am Care, LLC)	Fits most lancing devices; available in traditional lite-angle, assorted colors, and thin gauge. Sold in 100- and 200-count.
EZ-Lance (Palco Labs, Inc.)	Advanced design for single-use, disposable safety lancet. Four sizes. Ergonomic and intuitive to use. High-quality design and performance reduce pain and finger damage. Safety features prevent reuse and contamination.
EZ-Lancets (Palco Labs, Inc.)	Three sizes: 21G, 26G, and 30G. High-quality needle edges for maximum comfort and least capillary damage. Fits most reusable lancing devices, including Auto-Lancet. Packages of 100 and 200 count.
FreeStyle Lancets (Abbott Laboratories)	Available in packages of 100. 25G.
Gentle Draw Lancing Device (Home Diagnostics)	Highly portable; lightweight. Five depth settings for optimal skin penetration. Easy to use. One-hand lancing with comfortable trigger button.
Glucolet Automatic Lancing Device (Bayer HealthCare, LLC)	Comes with 10 lancets, one opaque regular puncture end cap, multilingual instruction insert.
Haemolance (Arkray)	Single-use disposable lancet with built-in needle protection system; needle retracts automatically to eliminate risk of cross-contamination and accidental needle punctures.
Haemolance Plus (Arkray)	Single-use disposable lancet that eliminates the need for a separate lancing device. Design protects the needle point after the protective cap is removed. In use, needle is not seen. Lancing is a one-motion process. After use, the needle automatically retracts to protect against accidental punctures.
Lady Lite Lancet (Medicore)	Designed for the feminine fingertip; fine, delicate tip for comfort; floral cap; fits most lancet devices. Made in the United States.
Lite Touch Lancets (Medicore)	Precision ultrafine ground tip for maximum comfort. Fine gauge. Fits most lancing devices.
Lite Touch Lancing Device (Medicore)	Stainless steel for durability. Adjustable; uses most lancets. Supercompact pen style. Soft spring for maximum comfort.
Medi-Lance Lancets (Medicore)	Precision tri-bevel comfort tip; fits most lancing devices. (For those with callused fingers or those in need of a large sample.) Made in the United States.
Medi-Lance II Lancets (Medicore)	Tri-bevel comfort tip; extralong body; fits Glucolet, Autolet, and Medi-Let.
Microlet Adjustable Lancing Device (Bayer HealthCare, LLC)	Ergonomic design has easy cocking mechanism and five adjustable settings to control depth of puncture. A clear end cap is also provided for multiple site testing.
Microlet Lancets (Bayer HealthCare, LLC)	For use with Microlet Automatic Lancing Device and Microlet Vaculance Lancing Device; 28G.
Microlet Vaculance Lancing Device (Bayer HealthCare, LLC)	Vacuum action draws blood to skin surface, allowing patient to choose lancing sites less painful than fingertips, such as forearm, palm, abdomen, or thigh. Four lancing depths. Uses Microlet lancets.
Monolet Original Lancets (Can-Am Care, LLC)	Fits most lancing devices; designed for those with more callused fingertips or who have difficulty getting the right amount of blood.
Monolet Thin Lancets (Can-Am Care, LLC)	Fits most lancing devices; designed for those who have sensitive fingertips or who easily produce an ample droplet of blood.
MPD Lancet (Medical Plastic Devices)	North American–made lancets with shallow point design, sterile tip, and tri-bevel stainless steel needle that permits smooth insertion into the skin.
OneTouch FinePoint Lancets (LifeScan)	25G; single-use lancets fit most lancing devices; available in boxes of 100; protective cap snaps over needle for disposal; polished and coated for less painful blood sampling.

BLOOD-SAMPLING SUPPLIES *continued*

Name (Manufacturer/Distributor)	Features and Supplies
OneTouch Lancing Device (LifeScan)	Lipstick-sized; includes blue cap for finger testing; clear cap for forearm and palm testing; 11 depth settings; uses OneTouch UltraSoft lancets and OneTouch FinePoint Lancets.
OneTouch Penlet Plus Adjustable Blood Sampler (LifeScan)	Pen-shaped with seven easy-to-dial depth settings; hands-free lancet removal; uses OneTouch UltraSoft lancets and OneTouch FinePoint lancets.
OneTouch UltraSoft Adjustable Blood Sampler (LifeScan)	Pen-shaped with a thin tip for less painful penetration; includes OneTouch UltraClear Cap for forearm testing; seven depth settings; uses OneTouch UltraSoft lancets and OneTouch FinePoint Lancets.
OneTouch UltraSoft Lancets (LifeScan)	28G; single-use lancets fit most lancing devices; available in boxes of 100; protective cap snaps over needle for disposal; polished and coated for less painful blood sampling.
Renew Advance Lancing System (Can Am Care, LLC)	Circular design with five depth settings. Comes with one cartridge of 20 microlancets.
Renew Advance Cartridge Refills (Can Am Care, LLC)	Sold with five cartridges per pack. Each cartridge contains 20 single-use microlancets.
Select Lite Lancing Device (Arkray)	Pen-shaped device is compatible with most lancets; adjustable tip; five settings.
Sterile Lancets (Home Diagnostics)	Tri-bevel. Ultrathin tip for smooth, controlled skin penetration. Protective cap for safe disposal after use.
Store brand lancing device (Can-Am Care, LLC)	Compatible with most lancets; offers five depth settings; packaged with one lancing device and sample lancets. Available in various store brands.
TechLite Lancets (Arkray)	Fits most devices; available in 26G and 28G; packages of 100 or 200.
Tenderlett (ITC)	Surgical blade produces shallow 1.75-mm incision, minimizing pain; permanently retracting steel blade for safety. Appropriate for use when slightly more blood is needed. Individually packaged and sterilized.
Tenderlett Jr. (ITC)	Same surgical blade features and action as the Tenderlett, but produces a shallower 1.25-mm incision for use with children. Appropriate for use when fingers are slightly callused or when fingers have poor peripheral circulation.
Tenderlett Toddler (ITC)	Same surgical blade features and action as the Tenderlett, but produces a shallower 0.85-mm incision. Incision yields one drop of blood, appropriate for most blood glucose checks. Individually packaged and sterilized.
UltiCare Lancets (UltiMed, Inc.)	UltiCare 30G lancets for use with most lancing devices; comes in packages of 100.
Unilet ComforTouch (Owen Mumford)	Super thin 30G lancet for use with most lancing devices; comes in packages of 100 and 200. Safety cap ensures safe disposal and identification of a used lancet.
Unilet ExceLite (Owen Mumford)	23G lancet that fits most automatic lancing devices; designed for increased blood flow with maximum comfort. Available in 100- and 200-count boxes.
Unilet ExceLite II (Owen Mumford)	28G ultrathin lancet that fits most automatic lancing devices; designed for increased blood flow with maximum comfort. Available in 100- and 200-count boxes.
Unilet G.P. Ultralite (Owen Mumford)	Fits most lancing devices. Ultrathin 28G lancet with tri-bevel point; suited for sensitive fingers; package of 100 or 200.
Unilet G.P. Superlite Lancet (Owen Mumford)	Fits most automatic lancing devices; package of 200; white; 23G.
Unistik 2 (Owen Mumford)	Single use for safety and disposability; punctures and retracts automatically; five models available for different levels of blood flow needs. Normal (yellow); Extra (orange); Super (burgundy). Available in boxes of 50, 100, and 200.

BLOOD-SAMPLING SUPPLIES *continued*

Name (Manufacturer/Distributor)	Features and Supplies
Unistik 3 (Owen Mumford)	Preset single-use lancet for safety and easy disposal. Visual lock-out feature indicates the device has been used and is ready for disposal. Normal and comfort; easy to use; available in boxes of 25, 50, 100, and 200. Features Comfort Zone Technology to mask the feeling of puncture.
Various store brand lancets (Can-Am Care, LLC)	100 and 200 count (Standard, Thin, and Ultra/Super Thin). Sold by CVS, Walgreens, Albertson's, Wal-Mart (ReliOn), Medicine Shoppe, Kroger, Leader, Longs, Kmart (Value Plus), Meijer, Sunmark, Good Neighbor, Shop Rite, Preferred Plus, Hyvee.
Vitalcare Lancets (Diagnostic Devices, Inc.)	Pressure-activiated safety lancets, pull top, twist top, thin lancets in 21G, 26G, 28G, and 30G. 100 per box.
Vitalcare Lancing Device (Diagnostic Devices, Inc.)	Universal lancet device with clear cap. One per box.

GLYCOHEMOGLOBIN TESTS

Name (Manufacturer/Distributor)	Comments
AccuBase A1c Glycohemoglobin Test Kit (Diabetes Technologies, Inc.)	Fingerstick A1C mail-in test kit. FDA-approved for over-the-counter use. Sample mailed to CLIA-licensed, CAP, NGSP reference method lab. Lab procedure screens for abnormal hemoglobins such as S, C, F, abnormal peaks and/or red blood cell disturbances (anemia) and reports an interference-free A1C answer. Positive patient ID, HIPPA compliant (confidential patient reporting). Approved for diabetes screening. Results reported by mail, fax, e-mail (PDF), or DTI Web site. www.diabetestechnologies.com.
A1c At Home (FlexSite Diagnostics, Inc.)	Home sample collection kit for mail-in laboratory A1C testing. Dried blood sample from fingerstick is mailed to FlexSite Diagnostics' CLIA-licensed laboratory. Results reported by mail, fax, or electronically. FDA-cleared for over-the-counter sales. Test method certified by the National Glycohemoglobin Standardization Program. www.flexsite.com.
BioSafe Hemoglobin A1c Test Kit (BioSafe Medical Technologies, Inc.)	Includes collection kit, prepaid postage to the lab, processing, results mailed back to the patient, and a toll-free customer support line to answer questions about the test or results. FDA-approved for over-the-counter distribution. CLIA-licensed and CAP-accredited laboratory assures reporting standards. www.ebiosafe.com.

MONITOR SUPPLIES

Name (Manufacturer/Distributor)	Features
Sure Drop (Captek/Science Products)	Fits over the LifeScan OneTouch Basic; directs blood onto the test spot.
Sure Guide Strip Guide (Captek/Science Products)	Aids in collecting blood sample for the Sure Step blood glucose monitor. Notched groove directs blood sample to the monitor strip.

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and make appropriate changes to your diabetes therapy.

Some monitor manufacturers provide data management programs free of charge. Others are available for purchase separately. Once you have a data management program in place, you'll need a cable to connect your monitor to your computer, and these cables are available through monitor manufacturers.

Before choosing a data management program, talk to your health care team about what information they consider most important, then choose a system that meets those needs. Your team may also be able to help you decide which programs would be easiest for you to use.

Your doctor may have a computer and a data management program available in his or her office, and this may be accessible to patients so they can download information from their glucose monitors during regular office visits. If you go this route, you'll need to be sure that your monitor is compatible with the computer and data management systems that are being used in the doctor's office so that they'll be able to "talk" to each other.

Remember, data management systems are nice to have, but they're not necessary. They can be costly, particularly if you also need to invest in a new computer and printer. Consider your needs and talk with your health care team about whether one of these systems makes sense for you. For some people, a well-kept, handwritten logbook may provide all the information necessary for good, comprehensive diabetes management.

Products for Testing Glycohemoglobin

The American Diabetes Association recommends that all people using insulin have glycohemoglobin (A1C) tests quarterly, if treatment changes or the patient is not meeting goals, or twice a year otherwise. Those not using insulin should have the tests every 6 months, or as often as necessary to maintain good blood glucose control. These tests provide an estimate of average blood glucose control over the previous 2 to 3 months.

Traditionally, people visit their doctors for these tests. However, kits are now available for performing A1C tests from home. Always check with your doctor about the use of A1C kits. And make sure that if you do use the home kit, you have a good understanding of how to use it and what the results mean.

When using these kits, you will either place a drop of blood on a test strip, send the sample to a lab, and receive the results by mail, or you will see the result immediately. You should perform the first couple of tests under the supervision of your diabetes specialist to ensure that you are doing the test properly.

Keep in mind that you should continue to discuss the results of these tests with your doctor so he or she can track your progress. (Some people with blood disorders and other medical conditions may have A1C levels that do not accurately reflect their glucose control, and that's another reason to consult with your doctor.)

Blood-Sampling Supplies

Lancets and automatic lancing devices are frequently provided as part of blood glucose monitoring kits. Most lancet devices come with short and long lancet covers to provide different degrees of penetration, and many have adjustable covers or caps. Generally, people who are first-time users, children, or people with delicate skin prefer a longer cover for more shallow penetration of the lancet. People who have tougher or thicker skin or poor circulation often choose a shorter cover for deeper penetration by the lancet. An individual may need to use different lancet covers for different fingers or when finger temperature affects blood flow.

Lancet devices vary in terms of how easy they are to reset after they've been activated. Some products require the cover to be removed so that the lancet can be pushed back into position. Others have a simple push-pull mechanism that resets the spring. The latter may be preferable for children or people with coordination problems. You should use a new lancet each time you test your blood glucose; lancets become dull after one use and dull lancets can be painful to use.

It's a good idea to keep an automatic lancing device at each place you may test—at home, at work, at school—so you won't have to carry one from place to place. These devices are inexpensive and durable, so owning more than one should be affordable. You should never share your automatic lancing device because of the risk of transmitting disease by contaminated blood.

Discuss these considerations and others, such as lancet reuse and sterilization, with your health care provider.