



Continuous glucose monitors (CGMs, sensors)

Sensors (or continuous glucose monitors) are devices that measure the sugar/glucose in body water (known medically as “interstitial fluid”). At present on the Canadian market there are three devices (discussed below) all of which involve insertion of a small teflon needle into the skin that is changed every 7-14 days. The needle is connected to a sensor which either

- A. automatically sends/pushes the interstitial fluid glucose value via bluetooth to a receiver every 5 minutes 24/7 (Dexcom G5/G6 and Medtronic Guardian Connect) or
- B. has data “pulled” from it by the waving of a receiver over the sensor/flash glucometer (Freestyle Libre, see below).

In the US and other countries (but not yet Canada) an implantable device, the [Eversense XL](#) is available. It is surgically implanted in a simple office procedure that takes around 5 minutes. This sensor remains active for up to 3 months.

Interstitial fluid glucose versus blood glucose

Although interstitial glucose values tend to lag blood glucose values (because blood levels change before Interstitial fluid), interstitial glucose values reported by CGMs are usually within 10-15% of blood glucose values. These differences are minimized by the use of algorithms within the sensor device. There are some special caveats: 1) Freestyle Libre values reported below 4.0 are often inaccurate & 2) users should be aware that if they correct a low sugar with rapid starch (pop, juice or sugar/candy) sensor levels may still show a trend downwards even while blood values are going up.

In general CGM/sensor glucose values are considered accurate enough to allow for insulin adjustment. In addition high and low alarms can be set (with Dexcom and Medtronic products and soon with the Freestyle Libre 2).

The majority of individuals who use CGM no longer need to poke their finger to test.

Freestyle Libre

The [Freestyle Libre](#) costs approximately \$6.50 per day and requires no blood glucose testing for calibration (ie no finger pokes!). The Libre requires that the user pass the Freestyle receiver over the sensor every 8 hours to “pull” the data from the sensor. This device is covered by most extended medical insurance plans providing the patient is on “intensive insulin therapy” with multiple daily shots or an insulin pump. [Read my blog](#) on the Freestyle Libre from 2016-Sept. A starter kit (two sensors each lasting 14 days and a receiver which lasts for >12 months) can

be purchased online for \$226 [from this site](#) - alternatively you can purchase a starter kit at most pharmacies for an additional 10%. Ongoing cost for the Libre is \$89 for every sensor which lasts 14 days. [Here are instructional videos](#) from the manufacturer.

With installation of [Librelink](#) app for iPhones (v 7 or later) users will not require the Freestyle Libre receiver, a saving of \$49. They can simply swipe the Freestyle sensor with their smartphone. As of 2018-Oct-25 Librelink for Android is not yet available on the Google Play store in Canada.

Third party vendors, [Miao Miao](#) (US\$199, see [this video](#)) & [Blucon Nightrider](#) (from US\$89, see [this video](#)) have devices that attach to the Libre and cause the Libre to push glucose values to your smartphone, like a Dexcom (see below). These devices allow the user not only to see data on their smartphone without swiping the Libre, but also allow the setting of high and low alarms. BCDiabetes notes that online reviews favor the Miao Miao over the Blucon. If buying the Miao Miao care should be taken to order the International version, rather than the Chinese version.

The [Freestyle Libre 2](#) was launched in Europe 2018-Oct-2. It features optional, customizable, low and high blood sugar alarms. The reader can make a sound and/or vibrate to tell the user that he/she is high or low, but only shows the actual blood glucose number when the user scans the sensor. It also offers an optional signal loss alarm, triggered after 20 minutes of communication loss between the sensor and the reader

Dexcom G5/G6

The Dexcom G5 costs \$6-10 per day and requires twice daily blood glucose calibration. The G5 will be replaced in Q4 2018 in Canada by the [Dexcom G6](#) which no longer requires finger poke calibration! Dexcom devices "push" values to the patient's smartphone or smartwatch (Apple or Android) every five minutes. The patient can set a "high" sugar alarm and more importantly a "low" sugar alarm at whatever threshold they like. At BCDiabetes we recommend a low alarm no lower than 4.5. This device is covered by some extended medical insurance plans for patients on intensive insulin therapy. [Read my blog](#) on the Dexcom G5 from 2017-Feb.

Dexcom users have a choice of software: either the official Dexcom app, or third party apps, Spike (iOS) or Xdrip (Android). One advantage of these third party apps is the ability to prolong the working life of the Dexcom transmitter beyond the factory default of 3 months.

For a head-to-head comparison of the Freestyle Libre & the Dexcom G5: see this from January 2018 <http://www.sugarsurfing.com/single-post/2018/01/06/Libre-vs-Dex-A-Sugar-Surfers-experience>

Medtronic Guardian Connect

Recent Medtronic insulin pumps ("Minimed") have their own excellent CGM, the [Guardian series](#), which talk to their latest pumps the Minimed 630G & [Minimed 670G](#) (which has automated basal insulin delivery). In 2018-August Medtronic received approval from Health Canada for its standalone CGM the [Guardian Connect](#). It is expected to come to market soon.