Continuous Glucose Monitoring: What is it and how does it work?

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What is it?

Blood glucose monitoring has entered a new era. The old methods of measuring glycemic control by glycated hemoglobin has its limitations. Continuous glucose monitoring is a new method of measuring interstitial glucose levels on a continuous basis in an ambulatory individual. It is a wearable technology that makes it easier to track the blood glucose levels over time.

How does it work?

There are a handful of devices available nowadays and all of them function in a similar manner.
Basic components of the device are-

- A sensor
- A reader
- A software for analyzing patient data

A small sensor is placed under the skin over the belly or arm with the help of an applicator and is kept in place with the help of adhesive tape. The sensor measures interstitial glucose levels every few minutes all day and night. Sensors can be electrochemical enzyme based or fluorescence based. For most of the devices, the sensor is changed every 7 to 14 days by the user at home. The software collapses all glucose readings from several days or weeks as if they occured in a single 24 hour period making it easy to visualize the glycemic patterns. Depending on the CGM system the glucose data is sent to either a handheld device (receiver), an app on the smartphone or insulin pump.
The user needs to learn to insert the sensor correctly, set alarms, transfer data to the computer or phone, and make changes to the care plan based on the collected data. Users can learn and understand the working of the CGM with the help of a qualified professional.

What are the advantages of CGM?

CGM provides a complete and accurate picture of the glycemic control over a time period. The traditional method of measuring glycemic control by glycated hemoglobin does not provide an intraday or interday excursion and variations which have been linked to both micro vascular and macro vascular complications of diabetes. Availability of CGM has made it easy to assess glycemic variability. While interpreting data, glycemic variability should also be used as a clinical marker of glycemic control.
The latest CGM devices utilize pre-calibrated sensors avoiding the need for frequent handpricks. Sensor insertion is virtually painless. CGM reduces the number of pinpricks users used to make, especially the patients on multiple insulin injections. Most of the CGM devices send an alert when glucose levels rise or fall below a certain level and can be of great value in detecting potentially dangerous complications. With this information the user can make changes accordingly. CGM data when coupled with food intake and

physical activity can help in recognising new glucose patterns that can help in better glycemic management. CGM data can also be used with insulin pump therapy and help in deciding insulin dose and rate of continuous subcutaneous insulin infusion.

Interpretation of CGM data

The ambulatory glucose profile represents a standardized glucose reporting format in the form of mean glucose, percent of time on range (70-180 mg/dl), percent of time spent in hypoglycaemia (<70 mg/dl), percent of time spent in hyperglycaemia (>180 mg/dl). The time spent in the target glucose range is called Time in Range (TIR). Estimated HbA1c levels can be calculated by the glucose management indicator formula. [1]

Side effects of CGM

Contact dermatitis is a side effect in devices that attach to skin. Identifying and eliminating the tape allergen is important to ensure comfort. When blood glucose levels rise rapidly the interstitial glucose concentration takes time for equilibration between venous and interstitial fluid compartment and this leads to lower glucose readings on CGM than venous readings. [2]

Patients on high dose vitamin C, paracetamol may show elevated CGM glucose values.

Is CGM effective?

Yeh HC et al compared effects of self monitoring of blood glucose and continuous glucose monitoring on outcome of type 1 and type 2 diabetes mellitus. Compared with SMBG, rt-CGM achieved a lower HbA1c level (between-group difference of change, −0.26% [95% CI, −0.33% to −0.19%]) without any difference in severe hypoglycemia.[3]

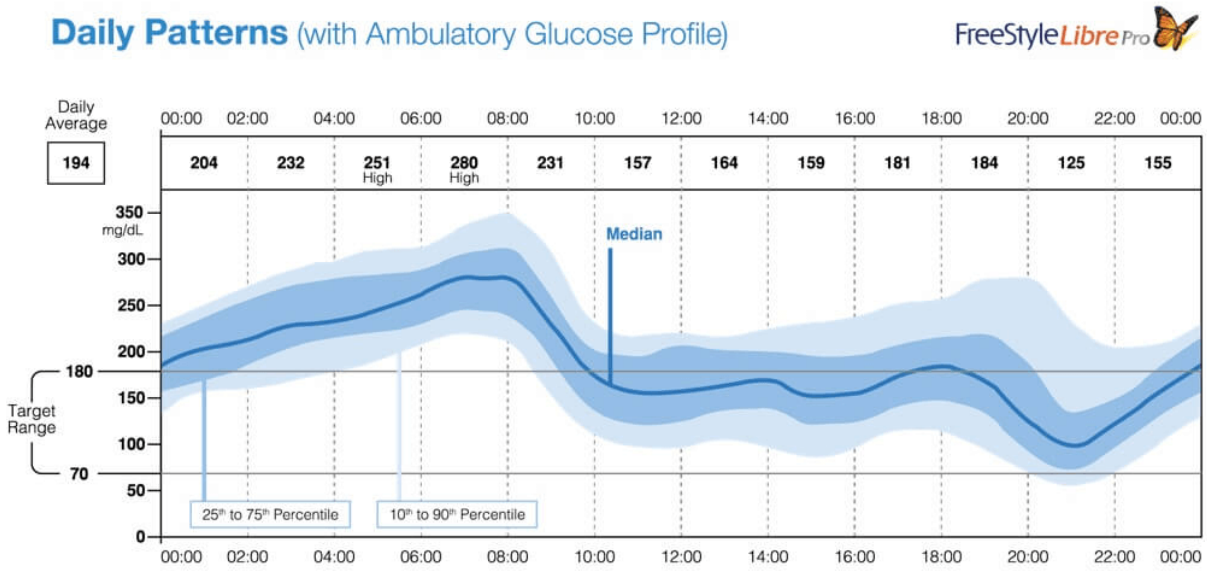
Battelino T, Phillip M, Bratina N, et al demonstrated reduction in hypoglycemia in a randomized, controlled clinical trial in children and adults whose HbA1c was <7.5% at screening. Of the 120 patients, 33% used MDI and 44% were children. After the 26-week intervention period, a greater reduction in time spent in hypoglycemia was demonstrated for the CGM group versus the SMBG group (0.48 ± 0.57 h/day vs. 0.97 ± 1.55 h/day respectively). HbA1c was also lower in the CGM group than the control group (difference −0.27%, 95% CI −0.47 to −0.07; P = 0.008). Time spent in the normoglycemic range was increased in the CGM group compared with controls.[4]

Available devices

Freestyle Liber pro of Abott is a CGM device available in the market. It comes with a handheld reader, and a glucose sensor worn on the patient's arm.The Sensor uses a very thin filament inserted just under the skin to automatically records glucose level every 15 minutes to provide more insightful patterns.The reader stays in the clinic where Healthcare Professional will use it to view glucose data. One reader can scan multiple patients, minimize waiting time and scheduling issues.

image of reader and sensor

The glucose data, generated by FreeStyle Libre Pro over several days or weeks, is collapsed into a single 24-hour period, creating a view of a modal day.This view reveals underlying patterns in glucose variability to a greater extent than using HbA1c by itself.



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