What is continuous glucose monitoring?



Continuous glucose monitoring (CGM) is a method used to monitor glucose levels in real time throughout the day and night. Therefore, they provide a more detailed picture of a person's glucose levels and how they vary. CGM helps patients and clinicians monitor and optimise glucose control, reducing the risk of complications associated with diabetes and is a more convenient method of monitoring blood sugars for most people with diabetes.

How CGM works

CGM devices consist of a small sensor placed under the skin (usually on the abdomen or arm) that continuously measures glucose levels in the interstitial fluid (fluid found in the space around cells). The sensor is connected to a transmitter, which sends data to a receiver, smartphone, or insulin pump. This process provides real-time glucose readings, trends, and alerts about high or low glucose levels with continuous feedback.

Types of CGM systems

There are 2 primary types of CGM systems:

- 1. Real-time CGMs (rtCGM): These systems provide continuous data that can be accessed in real-time by the user or their healthcare team. Users receive alerts for high or low glucose levels, helping to prevent hypoglycemic or hyperglycemic events.
- 2. Intermittently scanned CGMs (isCGM): Then most commonly known is the Flash Libre device. These systems require the user to scan the sensor with a device or smartphone to obtain glucose readings. Alerts may be provided, but continuous real-time monitoring is not always available.

CGM is primarily used in the following clinical scenarios

- Type 1 diabetes mellitus (T1DM) CGM is widely used for insulin management, especially for individuals with frequent hypoglycemia or those using insulin pumps.
- Type 2 diabetes mellitus (T2DM) CGM can be used for patients with poor glycemic control, those using insulin therapy, or those with complications such as frequent hypoglycemia.
- Gestational diabetes CGM may be used in managing pregnant women with gestational diabetes to optimise glucose control.
- Patients on insulin pumps many insulin pumps are now integrated with CGM technology for more precise glucose control.

Benefits of CGM

- Improved glycemic control CGM helps in achieving tighter glucose control by providing more frequent and detailed data than traditional fingerstick measurements.
- Reduced hypoglycemia CGM can alert users to impending hypoglycemic events, allowing for quicker intervention and minimizing the risk of severe hypoglycemia.
- Data-driven decisions healthcare providers can use CGM data to:
 - Adjust insulin therapy based on real-time trends.
 - Monitor for nocturnal hypoglycemia, which is difficult to detect without CGM.

- Improve patient education regarding lifestyle factors that impact glucose control.
- Support decision-making for insulin regimen adjustments or lifestyle changes.
- Behavioural insights users can identify patterns in glucose fluctuations related to meals, exercise, stress, or medications, helping to refine lifestyle choices and diabetes management strategies.

Limitations of CGM

- Accuracy CGM readings reflect glucose levels in interstitial fluid, which may differ slightly from blood glucose levels. Calibration with blood glucose meters is sometimes required for accuracy.
- Calibration issues some CGMs require regular calibration using fingerstick blood glucose measurements, which can be cumbersome.
- Cost CGM systems can be expensive which can limit access for some patients.
- Sensor wear and comfort some patients may experience discomfort or skin irritation from wearing the sensor.

Challenges and considerations

- Technical challenges sensors may occasionally malfunction, leading to inaccurate reading, reuiring patients to be vigilant in checking blood glucose levels through fingersticks as a backup.
- Patient adherence While CGM is a powerful tool, it requires commitment from patients to regularly monitor their glucose levels, respond to alerts, and maintain sensor functionality.
- Integration with insulin therapy CGM is often used in conjunction with insulin pumps or multiple daily injections (MDI), requiring proper training and integration into daily diabetes care routines.
- Data overload For some individuals, continuous feedback can be overwhelming, leading to "alert fatigue" and reduced responsiveness to alarms.

Summary

Continuous glucose monitoring is a transformative tool in diabetes management, offering real-time insights into glucose dynamics, improving glycemic control, and reducing the risk of complications. While there are challenges regarding cost, accuracy, and patient adherence, the benefits of CGM in optimising diabetes care are clear. As technology continues to advance, CGM is likely to become even more integrated into personalised diabetes management strategies.

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