

BEST PRACTICES IN: Continuous Glucose Monitoring and Multiple Daily Injections

It is well accepted that intensive insulin therapy significantly decreases the risk of long-term complications of type 1 diabetes.¹⁻³ Yet intensive therapy also is associated with an increased risk of severe hypoglycemia.¹

How CGM Works: Continuous glucose monitoring (CGM, Sensor) systems report glucose levels measured in interstitial fluid every 1 to 5 minutes.⁴⁻⁶ Sensors can be worn from 3 to 7 days, depending on the device. These systems can be programmed to alert at preset high and low glucose levels, thereby helping address the risk of hypoglycemia with tight control.⁴⁻⁶

Benefits of CGM: Access to CGM data has been associated with significantly reduced time spent at hyperglycemic or hypoglycemic glucose levels and increased time at the target glucose range across all glycated hemoglobin (A1C) levels (Figure 1)⁷ as well as improvements in type 1 diabetes patients using either multiple daily injections (MDI) or continuous subcutaneous insulin infusion (CSII).⁸

Compared to self-monitoring of blood glucose (SMBG) alone, CGM also led to significantly lower A1C levels over 26 weeks without increases in hypoglycemia (Figure 2).⁹ These findings, from a Juvenile Diabetes Research Foundation study, have been sustained over 12 months.¹⁰ The 6-month extension study also found a reduction in the incidence rate of severe hypoglycemia,



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from 21.8 events to 7.1 events per 100 person-years in the first and last 6 months, respectively.¹⁰ These improvements are directly associated with increased usage of CGM (6 days/week).

CGM in MDI and CSII: Both MDI of insulin and CSII are acceptable methods of managing type 1 diabetes intensively.¹¹ Although CGM can be used with either technique, it is a common misperception that it is primarily meant for use in conjunction with CSII.⁸ Several studies including patients using MDI or CSII have demonstrated improved glycemic control with CGM.^{6,7,12} Regardless of which insulin therapy regimen is used, the sensor used will provide glucose data, trends, and alarms to act proactively and avoid glucose excursions.

Education Required Implementing CGM: A common misconception is that CGM requires significant education and time to train patients on its use. The time required to train on the various CGM devices depends on the brand; however, some CGM devices are designed with simplicity in mind and offer online product training for patients to watch, in addition to education from their health care professional.

In larger diabetes practices such as my office, a certified diabetes educator educates the patients on CGM, focusing on setting appropriate expectations for CGM use, device training, and CGM therapy education. The patient returns for follow-up in 2 to 4 weeks to ensure proper use of the technology, trending data, and review of sensor download reports. Additional follow-up occurs every 3 months.

Some of the important aspects of CGM therapy training are to discuss insulin pharmacodynamics, variability in digestion and absorption of food, and the difference in glucose readings and lag time between SMBG and CGM. Lag times vary with each CGM device, from 4.5 ± 5 minutes for the DexCom™ SEVEN® to 15 ± 7 minutes for the Abbott Navigator®.¹³ This is why the emphasis on CGM as a trending tool is so important.

Insurance Coverage – Improving: Perception of lack of reimbursement also may deter physicians from prescribing CGM. Most commercial payers cover CGM if medical necessity is proven and criteria are met. Documenting hypoglycemic episodes is sufficient to demonstrate medical necessity, but some payers (eg, Aetna) may only require that adult patients have type 1 diabetes.

Anecdotal Experience: My clinical experience supports the value of CGM. One 74-year-old male patient with type 1 diabetes for 62 years used to have frequent hypoglycemia. None of the (many) insulin therapies including use of an insulin pump had changed his glucose control and frequency of hypoglycemia until we tried CGM. Now, after 3 years of using the sensor, his A1C is <7%, down from 7.5%, and his wide glucose excursions have significantly decreased with elimination of severe hypoglycemic episodes or emergency room visits (Figure 3).

Summary

CGM is among the most important recent advances in diabetes technology for better diabetes management. CGM provides patients with real-time glucose information, direction and rate of change, and glucose trends. There are currently four CGM devices available: the DexCom™ SEVEN® PLUS, Medtronic MiniMed Paradigm® REAL-Time, Guardian® REAL-Time, and Abbott FreeStyle Navigator®. CGM is currently approved by the US Food and Drug Administration as adjunctive to SMBG, and SMBG should be used for treatment decisions. The use of CGM has been documented to decrease time spent in hypo- and hyperglycemic excursions, reduce glycemic variability, lower A1C values, and reduce hypoglycemic episodes.⁷⁻¹⁰ CGM has proven to be useful in patients with type 1 diabetes, regardless of insulin delivery method, as well as for patients with high A1C levels and those well controlled.

Figure 3. Sensor Use in a 75-Year-Old Patient With Type 1 Diabetes and a History of Frequent Hypoglycemia

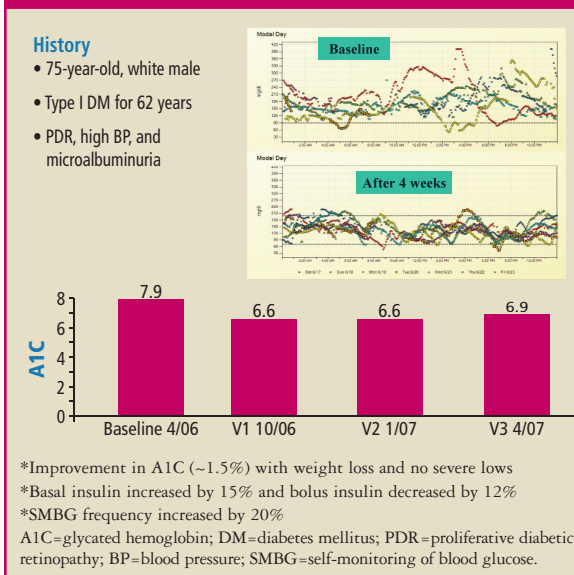
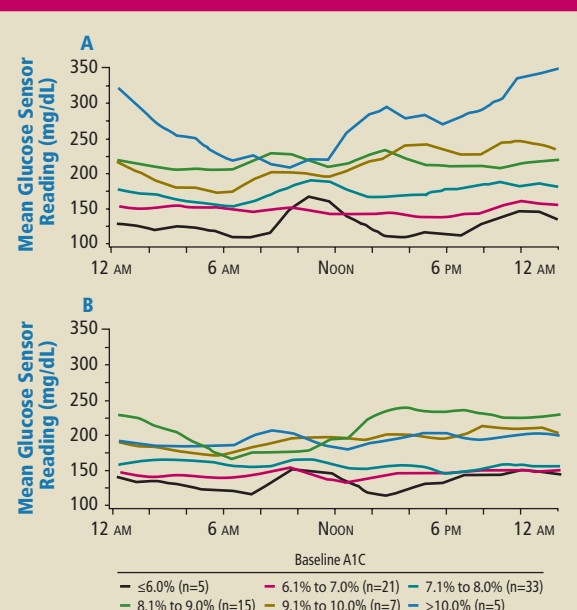
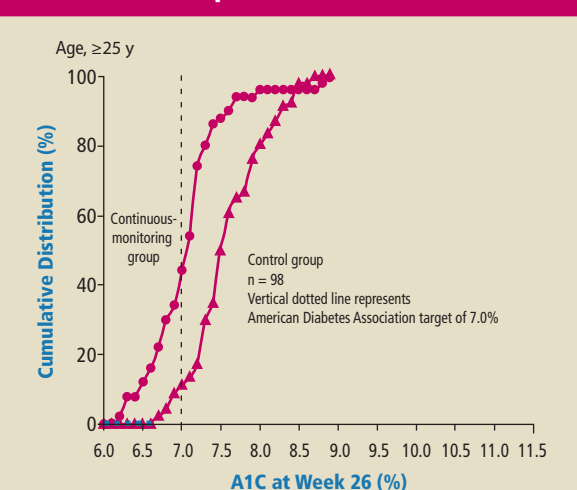


Figure 1. Modal Day by Baseline A1C Subgroup



Illustrates improvement in glycemic control and overall glucose excursions (blinded versus display).
A: Blinded CGM data collected (insertion period 1).
B: Real-time CGM data collected (insertion periods 2 and 3).
A1C=glycated hemoglobin; CGM=continuous glucose monitoring.
Source: Garg and Jovanovic.⁷ Used with permission.

Figure 2. CGM Led to Lower A1C Levels Compared With Control Group



CGM=continuous glucose monitoring; A1C=glycated hemoglobin.
Source: Juvenile Diabetes Research Foundation Continuous Glucose Monitoring Study Group.⁹ Used with permission.

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