

Continuous Glucose Monitoring Comes of Age

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Current iterations of continuous glucose monitoring (CGM) evolved from enzyme-based electrochemical glucose sensors developed in the 1960s at Cincinnati Children's Hospital in Ohio, USA. Glucose oxidase (GOx) placed on a platinum electrode catalyzed the oxidation of glucose to gluconolactone in the presence of oxygen, producing hydrogen peroxide and water as by-products. In the 1980s, oxygen was replaced with a synthetic redox electron acceptor, improving the accuracy of second-generation biosensors. Proprietary technical improvements resulted in an array of GOx CGM systems obtaining regulatory approval for routine use.

Despite considerable initial reluctance from many leading diabetologists to include CGM in diabetes management, clinical evidence has accumulated from research encompassing adult and pediatric populations with diabetes (1,2), hypoglycemia (3), use with sensor-augmented pumps (4,5), stand-alone use with multiple daily injections (6), outcomes during pregnancy (7), utility in type 1 and type 2 diabetes (8,9), and effects in real-life clinical settings (10). The article on p. 3 of this compendium offers a detailed discussion of published randomized clinical trials to date.

A recently introduced factory-calibrated intermittently scanned interstitial glucose monitoring system, also known as flash CGM (FCGM), is also based on GOx CGM technology and represents a new option with clinical benefit comparable to real-time CGM (11). FCGM received regulatory approval as a substitute for blood glucose testing and could conceivably replace traditional self-monitoring of blood glucose in diabetes management for people with diabetes who test multiple times per day (Figure 1).

The maturation of CGM technology and research is not only facilitating imminent development of closed-loop insulin delivery (12), but also substantiating the collection

and analysis of continuous data as a routine treatment modality in major clinical guidelines (13,14). CGM-derived metrics such as time in range and coefficient of variation are now regarded as viable parameters for everyday diabetes management, as well as for clinical research (15).

As newer CGM systems with patient-centered features (see the article on p. 8 of this compendium) become a clinical reality

for individuals with type 1 or type 2 diabetes, appropriate educational and technical support for both people with diabetes and health care providers will be needed to solidify the emerging status of continuous glucose data as a standard of care for daily diabetes management.

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FIGURE 1

Sample display of continuous data provided by FCGM.