

The Future of Continuous Glucose Monitoring

Tadej Battelino, MD, PhD, *University of Ljubljana, Ljubljana, Slovenia*

The historical vision for continuous glucose monitoring (CGM) is becoming reality in day-to-day diabetes management, with the prospect of rapid growth in the foreseeable future. The latest U.S. Food and Drug Administration (FDA) approval of the first factory-calibrated CGM sensor will strengthen the path toward total elimination of cumbersome manual CGM calibrations. Medium- and long-term implantable sensors recently received regulatory approval in the European Union (EU) (1) and have been tested in the United States (2). Google, Microsoft, and other large companies are supporting the development of several minimally invasive glucose monitoring methods (e.g., microneedle patch platforms for continuous sampling of the interstitial fluid and tattoo-sensing technology using hydrogel glucose-sensing microspheres), as well as noninvasive technologies (e.g., an electrochemical battery-operated glucose oxidase sensor in a microchip sandwiched between two layers of a soft contact lens and hydrophilic organic electrodes that also are amenable to a contact lens design requiring no energy source) (3).

Additionally, the need for platforms that help people with diabetes and their health care providers understand and manage CGM-derived data more quickly and efficiently is of highest priority (4). Several prominent academic health care institutions have formally adopted professional platforms for uniformly uploading, analyzing, and presenting data from diabetes-related technology. Recently, the FDA approved a stand-alone CGM system enhanced with the Sugar.IQ diabetes assistant (Medtronic, Northridge, CA), which continually analyzes how food intake, insulin doses, physical activity, and other daily dynamics influence glucose levels. Similarly, the DreaMed Advisor Pro (DreaMed Diabetes, Petah Tikva, Israel), an automated diabetes management platform for health care professionals, has received regulatory approval in the EU and is currently being used in a clinical trial in the United States. The advanced algorithms in the Advisor Pro learn users' glucose patterns and recommend optimal pump setting adjustments, significantly augment the clinical impact of CGM, and reduce the burden of disease management for people with diabetes and their health care teams.

Likewise, several CGM-based closed-loop insulin delivery systems that are currently in pivotal trials sponsored by the U.S. National Institutes of Health, the Juvenile Diabetes Research Foundation, the Helmsley Charitable Trust, and various academic institutions will soon provide a variety of routine artificial pancreas options for individuals with diabetes, especially those with type 1 diabetes or type 2 diabetes treated with multiple daily insulin injections.

With respect to metrics, novel CGM parameters such as time in range and coefficient of variation will provide more patient-centered treatment goals that better match the reality of people's day-to-day lives. Ideally, this progress will increase the adoption of CGM systems by a wider range of people with diabetes and, through demonstrable clinical benefits including more sustained glycemic control and considerably improved quality of life, trigger reimbursement by public and private insurance entities.

Health care teams will continue providing top-notch education and training to people with diabetes and their home and school caregivers using advanced technological solutions (5).

Finally, the imminent vision of CGM, already experienced by some early adopters, is an integrated, Cloud-based environment connecting, monitoring, guarding, and advising individuals with diabetes, with the feasible goal of independently managing and treating this chronic condition.

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