Automated Glycemic Pattern Analysis: Overcoming Diabetes Clinical Inertia

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Abstract

The OneTouch® Verio™ IQ Meter with PatternAlert™ Technology has been approved by the U.S. Food and Drug Administration as the first self-glucose monitor that can automatically determine glycemic patterns [high and low pre-meal blood glucose (BG)] for health care providers (HCPs) and patients. In this issue of Journal of Diabetes Science and Technology, Katz and coauthors demonstrate that this device was more accurate and quicker in detecting abnormal glucose patterns than the review by HCPs of 30-day handwritten BG logs and that its interpretations were positively accepted by the HCPs. Continued development of automated pattern analysis and decision-support software to overcome the “data-overload” associated with intensive glucose monitoring and diabetes management will reduce clinical inertia and could dramatically improve diabetes outcomes.


One of the major barriers to successful diabetes management is the time requirement, both for the patient and the patient’s health care provider (HCP). A survey of certified diabetes educators estimated that it takes approximately 3 h per day for a person with type 2 diabetes mellitus to perform all of the self-care needed to manage the disease.¹ When it comes to self-glucose monitoring and problem solving, the time it takes for the HCP to analyze the data critically, see abnormal glucose patterns, and change treatment at the time of an appointment is a major burden that often leads to clinical inertia. In the article entitled “Automated Glycemic Pattern Analysis Can Improve Healthcare Professional Efficiency and Accuracy,” Katz and coauthors² reviewed the performance of the OneTouch Verio™ IQ meter (LifeScan, Inc., Milpitas, CA) in determining glycemic patterns compared with HCPs’ reviews of handwritten blood glucose (BG) logbooks. They demonstrated that the OneTouch Verio IQ meter could assess 30-day glucose data more rapidly than HCPs could review handwritten BG logbooks with the same data (0.9 vs 7.3 min, respectively), and could detect specific glucose patterns (high and low pre-meal BG) more accurately compared with the HCPs’ 43% error rate. They also noted a high acceptance rate by the HCPs of such technology for diabetes management. This is the first commercially available automated system for BG pattern detection in a glucometer. It highlights the potential benefits of this technology for HCPs and their patients both in terms of time savings and pattern-recognition accuracy.

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Abbreviations: (4DSS) 4 Diabetes Support System, (BG) blood glucose, (CGM) continuous glucose monitoring, (HCP) health care provider

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Attempts to automate diabetes management over the past 5 years have ranged from the development of “diabetes dashboards,” which place all pertinent diabetes information (including clinical treatment algorithms) in one easily usable format in electronic medical records, to the development of automated glucose pattern recognition software. We have developed the 4 Diabetes Support System™ (4DSS) (Ohio University, Athens, OH), which uses the CareLink® platform (Medtronic, Inc., Minneapolis, MN) to automatically detect multiple, additional types of BG control problems and offers case-based decision support to correct them in patients using insulin pumps and continuous glucose monitoring (CGM). However, we have also shown that inclusion of life-event data (timing and composition of meals, exercise, stress, etc.) nearly doubles the capacity of the 4DSS to determine the cause of a specific glucose excursion as well as to offer more targeted therapeutic advice. For example, life-event data help pinpoint the lows that are exercise-induced, while CGM facilitates detection of post-meal highs. Automated software systems can be used between or during appointments to facilitate diabetes management. Patients now use smartphone applications for diabetes self-management (entering life-event data, food intake, and BG readings). Skrøvseth and coauthors have demonstrated that use of a smartphone with an application that supplies automated data analysis/pattern recognition directly to their users has provided relevant insight into their disease and has been accepted by many patients. In the near future, smartphones will be capable of compiling this information as well as transmitting additional information (CGM data and pump functions/settings) via the Internet “cloud” for analysis between office visits for diabetes management. In fact, “real-time CGM telemetry” could become a reality in the near future, with the capacity to communicate directly with patients by text messaging.

Katz and coauthors have taken important first steps by demonstrating the efficacy of automated BG pattern recognition in a commercially available meter. Twenty-first century HCPs should not be encumbered by inefficient, outmoded paper logbooks. We hope that more diabetes device manufacturers will incorporate automated pattern recognition and analysis capabilities into their systems and that cloud technologies will soon render these systems more interoperable.

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The software and methodology implemented in the 4 Diabetes Support System have been submitted to the U. S. Patent and Trademark Office, application number US60/901,703, and rights are co-owned by the Ohio University Technology Transfer Office, Dr. Marling, and Dr. Schwartz.

References: