

Evaluating the Automated Detection of Blood Glucose Control Problems

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Objective:

The Data-Driven Diabetes Decision Support (4 Diabetes Support) system aims to help physicians manage patients with diabetes. It detects 12 types of problems in blood glucose control based on continuous glucose monitoring (CGM), finger stick, insulin, and daily life-event data. This study evaluates the system, comparing results to those of a preliminary study, and considering potential clinical use, where CGM and/or life-event data may be unavailable.

Method:

Twenty-six patients with type 1 diabetes (T1DM) on insulin pump therapy enrolled in the study. Twenty-three patients completed the study, supplying background information and 5 weeks of insulin pump data. Pump data were extracted from Medtronic's CareLink system. Daily life-event data were approximated by a patient's typical schedule for meals, exercise, work, and sleep. CGM data were available only for patients using CGM routinely. Automatically detected problems were reviewed by the patient's physician.

Result:

The software detected a mean of 2.6 (± 1.8) problems per patient per week vs 4.9 (± 2.7) problems per patient per week in the preliminary study. This was significant ($p = 0.005$), although patient groups did not differ significantly on hemoglobin A1c, age, gender, marital status, work status, years with diabetes, or number of finger sticks. Physicians validated that 98% of automated problem detections were correct. No patients dropped out due to data entry time demands, although this was a problem in the preliminary study.

Conclusion:

The 4 Diabetes Support System automatically detected blood glucose control problems in T1DM patients on insulin pump therapy, even with limited CGM and life-event data. CGM and daily life-event data enabled automated detection of significantly more blood glucose control problems per patient per week. Additional work is needed to provide device/software interfaces allowing patients to provide these data quickly and conveniently.