

A Consensus-Perceived Glycemic Variability Metric

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Objective:

Glycemic variability (GV) is increasingly recognized as a significant component of overall glucose control. Excessive GV may trigger oxidative stress, which has been linked to increased risk of complications. Physicians readily recognize excessive GV in continuous glucose monitoring (CGM) plots; however, there is no automated screen in routine clinical use. One hindrance is the lack of a universally agreed upon way to measure GV. The objective of this study is to provide a consensus-perceived glycemic variability (CPGV) metric that could be routinely applied to CGM data.

Method:

Physicians actively managing patients with type 1 diabetes were recruited at the 2011 Diabetes Technology Meeting. Twelve physicians rated a total of 250 24 h CGM plots as exhibiting low, borderline, high, or extremely high GV. Physician ratings were averaged to obtain consensus and then used as input to two machine learning (ML) algorithms: multilayer perceptrons (MP) and support vector machines for regression (SVR). *In silico* experiments were run using each ML algorithm with either raw or smoothed CGM data and different combinations of 12 descriptive input features. Ten-fold cross validation was used to evaluate the performance of each developed model.

Result:

The SVR models approximated the consensus ratings of unseen CGM plots better than the MP models. When judged by the root mean square error, the best SVR models performed comparably to individual physicians at matching consensus ratings.

Conclusion:

Model refinement continues to develop an accurate and easy-to-use CPGV metric. The new metric could be used as a routine measure of overall glucose control to supplement hemoglobin A1c in clinical practice.