

Agreement between Glucose Trends Derived from Three Simultaneously Worn Continuous Glucose Sensors

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Abstract

Background:

Sensors detect the rate and direction of glucose trend. They need to be accurate and reproducible as could be evidenced by strong agreement between multiple sensors. We evaluated this relationship through simultaneously worn glucose sensors using several methods of slope analysis.

Methods:

Ten type 1 diabetic, insulin pump-treated subjects were studied while simultaneously wearing three CGMS[®] Gold sensors each. Sensors were placed in the right abdomen (reference), left abdomen, and left upper arm. Sensors were calibrated and chronologically aligned. Data were only interpreted and included if there were 24 hours of data simultaneously obtained from all three sensors.

Results:

Using a two-point derived slope, increasing the duration of the trend from 5 to 60 minutes improved agreement between sensors. Using a 20-minute rolling average trend (using every 5-minute glucose value during the 20 minutes) improved the agreement to 94.3%. Finally, using whichever of the two comparator sensor rolling average trends was closest to the reference (better of two), the agreement improved to 98.2%. However, for these trend analysis methods, when the absolute reference rate of change was more than 1 mg/dl/min, the agreement decreased. Even with the best analysis approach, at an absolute reference sensor rate of change of >2 mg/dl/min, the agreement between sensors was only 40.0%.

Conclusion:

Despite several methods of analysis, trend agreement from multiple sensors diminishes as the absolute rate of change of reference glucose increases.

J Diabetes Sci Technol 2008;2(5):839-843

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Abbreviations: (CGM) continuous glucose monitoring, (SD) standard deviation

Keywords: closed loop, continuous glucose monitoring, glucose trends, trend analysis

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