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TITLE

Dynamic Stress Factor (DySF): a Significant Predictor of Severe Hypoglycemic Events in Children with Type 1 Diabetes

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Objective: To compare the Dynamic Stress Factor (DySF), a newly reported metric that quantifies glycemic volatility based on patient-specific transition density profiles, with the hemoglobin A1c (HbA1c) and with currently used glucose variability metrics in predicting severe hypoglycemia in children with type 1 diabetes.

Research design and methods: DySF, the daily weighted number of large monotonic glycemic transitions that occur within one hour, was calculated for 441 total subjects with type 1 diabetes (146 children 8-14 yrs) to assess the magnitude and frequency of glucose transitions per day. Severe hypoglycemic episodes (HE) were quantified for all subjects and evaluated against existing measures of glucose variability, including HbA1c, SD, MAGE, MODD, and CONGA using logistic regression models.

Results: DySF was found to be a predictor of severe HE in children ($p = 0.018$) with the likelihood of a child, 8-14 yrs, experiencing severe hypoglycemia increasing by up to 20% with decreasing values of DySF. Similarly, patients of any age who had one or multiple severe hypoglycemic episodes had on average a lower DySF when comparison to those with no HE. Additionally, DySF/Mean was a preliminary predictor of severe HE in patients with $HbA1c \leq 6.5\%$ ($p = 0.062$).

Conclusions: DySF is a quantitative measure of daily glucose “volatility” that separates patients, within the same strata of HbA1c, into visually distinct patient profiles. DySF can be used as a preliminary predictor of clinically severe hypoglycemia in children and “well-controlled” patients with $HbA1c \leq 6.5\%$.