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Insulin Resistance Prediction from Surrogate Measures of Continuous Glucose Monitoring

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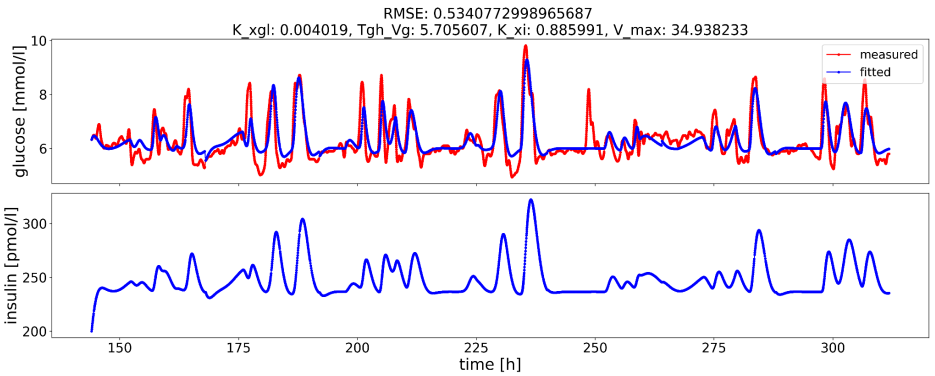
Background and Aims. Insulin resistance plays an important role in metabolic disorders. HOMA-IR, a widely used measure of insulin resistance, requires quantification of fasting glucose and insulin, limiting its use to clinical settings. Continuous glucose monitoring (CGM) systems allow insights into glucose levels at minimal burden, yet with standard time-in-range and average-based metrics, detailed insights into glucose-insulin homeostasis are lacking. We aimed to develop a method to estimate insulin resistance based on free living CGM only, offering an accessible surrogate marker.

Methods. The dataset, collected within the framework of clinical studies, included CGM data from individuals without pharmacotherapy, with concomitant fasting glucose and insulin measurements. Relying on the high frequency of CGM measurements, a non-linear fit of a modified Lotka-Volterra glucose-insulin response model was used to reproduce the glucose evolution by estimating the rate of glucose uptake from insulin-dependent tissues and the net hepatic output in excess of the glucose directly absorbed from meals. Following this, one model coefficient was fitted to a fixed threshold value and used as a binary classifier of the individual's insulin resistance status (HOMA-IR ≤ or >2).



Results. Data from 34 individuals, including healthy, obese, and pre-diabetic individuals, were analysed. HOMA-IR was >2 in 20, and ≤2 in 14 individuals. Comparison of CGM-only predictions with HOMA-IR showed an accuracy of 80% (27/34), with a sensitivity of 95% (19/20) and a specificity of 57% (8/14).

Conclusions. The results suggest that CGM alone may allow predicting insulin resistance. More data with proper validation are needed to verify these findings.