

8th Euro Global

Diabetes Summit and Medicare Expo

November 03-05, 2015 Valencia, Spain

Continuous estimation of glycosylated hemoglobin (*HbA1c*) based on self-monitoring blood glucose (SMBG) data and laboratory *HbA1c* measurements

Petteri Väisänen¹, Pekka Lönnroth¹, Markku Saraheimo² and Ari Sinisalo¹

¹Quattro Folia Oy, Finland

²Neliapila Oy, Finland

Background: The measurement of *HbA1c* is one of the most well established means to monitor glycemic control in persons with diabetes. Typically *HbA1c* measurements are done 2-4 times per year, even though *HbA1c* levels can change substantially in 3-4 weeks. This ultimately leads unmonitored gaps. Therefore, we sought to define continuous *HbA1c* estimate (*eA1c*) to guide in day-to-day diabetes management. We present an adaptive method to calculate *eA1c* level using SMBG data and previous *HbA1c* measurements.

Materials & Methods: An estimation algorithm was constructed based on correlations between blood glucose distribution parameters and laboratory *HbA1c* measurements. The best linear combination of those parameters was applied to the model and individually updated scaling factors were introduced. The derived mathematical model was tested with 30 diabetic subjects. Retrospective analyze with leave-one-out cross-validation was used for model performance evaluation. Mean absolute relative deviation (MARD) of *eA1c* from reference *HbA1c* and *eA1c-HbA1c* correlation were calculated. Also, an error grid analysis was made.

Results: MARD was 6.17% and correlation between *eA1c* and reference *HbA1c* was strong ($r=0.83$). Error grid analysis showed that 82.55% of *eA1c* values were within 10% from reference *HbA1c* and 98.61% within 20% from reference.

Conclusions: Adaptive mathematical model was developed to calculate a continuous *eA1c* to each diabetic using their laboratory *HbA1c* and SMBG measurements. Results in this study show that algorithm is able to calculate *eA1c* reliably for diabetics with regular SMBG measurements, and algorithm works even with biased and irregular measurement patterns.

Biography

Petteri Väisänen completed a BSc and is pursuing Biomedical Engineering as his major for MSc in Tampere University of Technology, Finland. He is the Data and Algorithm Specialist at Quattro Folia, a high-tech proactive self-care service provider to those who have chronic illnesses such as diabetes.

petteri@quattrofolia.com

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