

Effect of Automated Bolus Calculation on glycaemic variability and its relation with psychological measures in patients with diabetes



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Objective

Background

It has been shown that patients with diabetes struggle to correctly count carbohydrate and adjust their insulin accordingly, even patients with a long duration of diabetes still experience difficulties with this.^{1,2} Additional training in carbohydrate counting may be of benefit. The subsequent dose calculation can also be automated. After carbohydrate consumption there will be a recommendation for insulin that covers the consumed carbohydrates and a correction to the target blood glucose (figure 1). In case of a low blood glucose there will be an advice for consuming carbohydrates

Objective

The main purpose of this study is to evaluate whether training and automation of the bolus calculation offers psychosocial and glycaemic benefits.

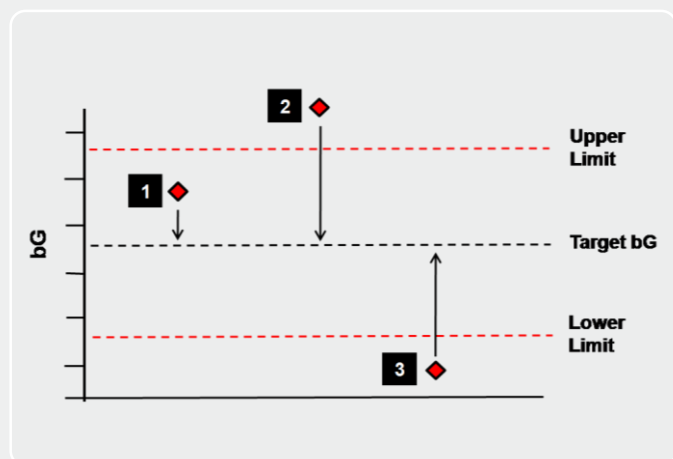


Figure 1: The underlying correction principle in the Accu-Chek® Aviva Expert system after carbohydrate intake

Method

Patients

Inclusion criteria were age >18; Diabetes Mellitus type 1 or 2 for at least 12 months; treated with multiple daily injections and an HbA1c between 48-86 mmol/mol.

Study design

This was a 16 weeks, single center, single arm study. After administering baseline questionnaires patients were scheduled to receive group trainings in both carbohydrate counting and in the use of the blood glucose monitor and automated bolus calculation. 16 weeks after baseline, questionnaires were administered, HbA1c was determined and the self-monitored blood glucose value were registered.

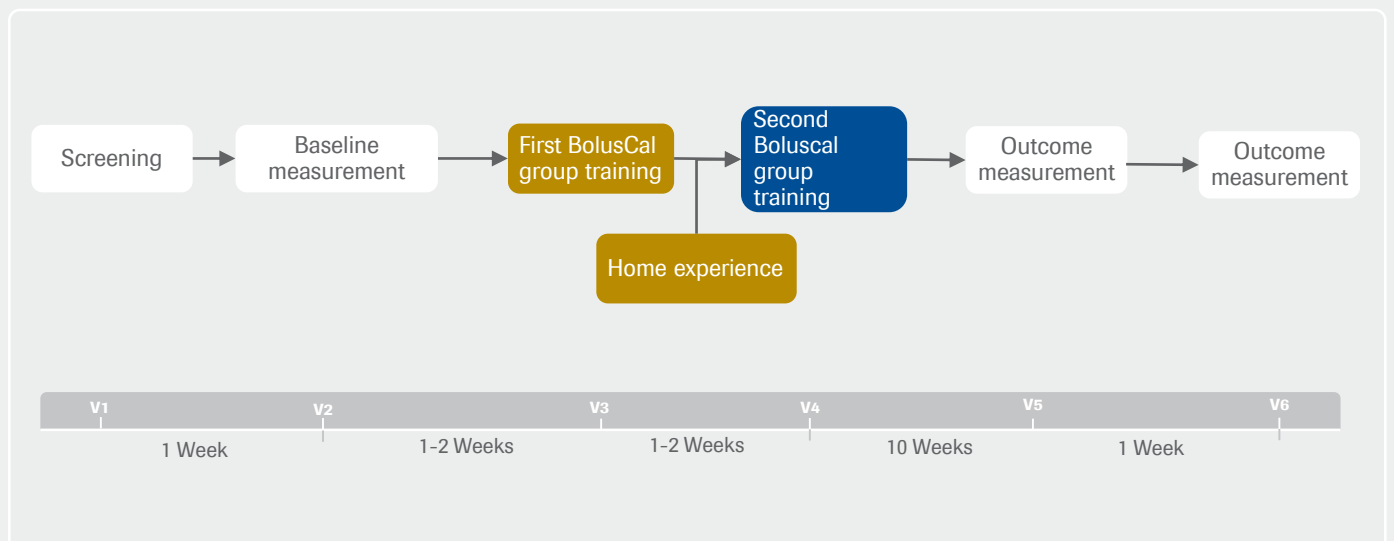


Figure 2: Visit overview

Results

In total 17 patients completed the study. Participants were 54 ± 14 years old and consisted of type 1 patients (64%) and type 2 patients (23%) with an average diabetes duration of 17 ± 14 years and an average HbA1c of 64 ± 7 mmol/mol. After 16 weeks the HbA1c lowered 5 mmol/mol ($p = 0.0124$) and the low blood glucose index (LBGI) was reduced by 0.4 points. Other parameters for the glycaemic control derived from self-monitored blood glucose values remained unchanged. In addition participants showed a decreased depression score of 4.06 ± 5.84 while the questionnaire scores for sleep quality, diabetes related stress, fear of hypoglycaemia, confidence in diabetes selfcare and cognitive failure remained unchanged.

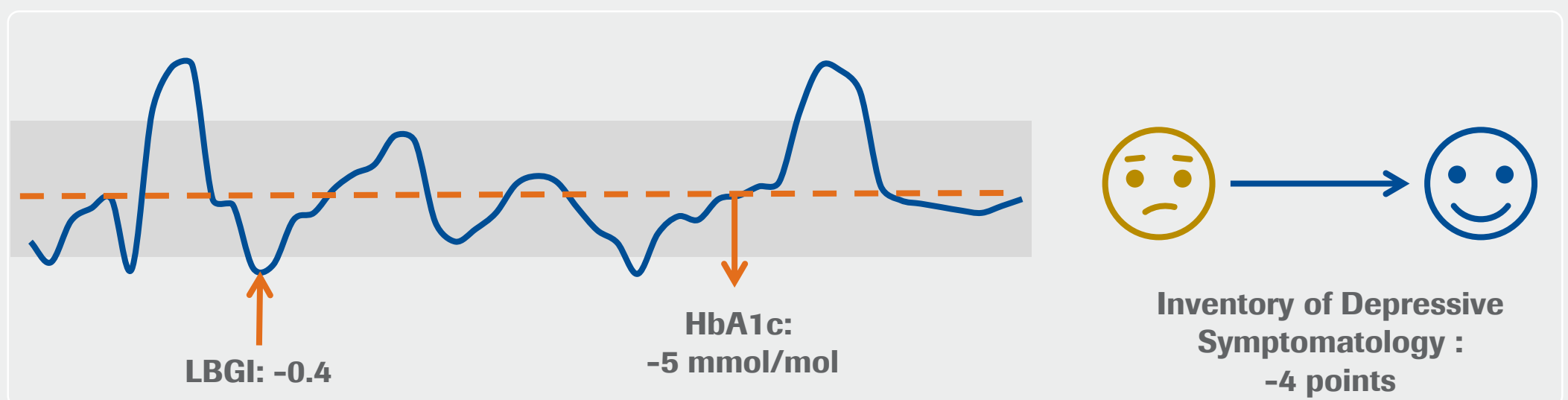


Figure 3: Clinical results.

Conclusion

The present study indicates that training together with an automated bolus calculator might lead to significant improvements in HbA1, LBGI and depressive symptoms.

References

- 1 - Smart, C. E. et al. Can children with type 1 diabetes and their caregivers estimate the carbohydrate content of meals and snacks? *Diabet. Med.* 27, 348-353 (2010).
- 2 - Ahola, A. J. et al. Many patients with Type 1 diabetes estimate their prandial insulin need inappropriately. *J. Diabetes* 2, 194-202 (2010).

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