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Significant Improvement of Blood Glucose Control in a High Risk Population of Type 1 Diabetes Using a Mobile Health App – A Retrospective Observational Study

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BACKGROUND

Using mHealth tools for diabetes self-management may improve the quality of metabolic control. Based on a meta analysis the impact on glycaemic control of digital tracking and remote coaching has been indicated to be around -0.38% [95% CI -0.40 to -0.37]) in adult population[1]. However, relevant and sufficient real-world data convincingly demonstrating the usefulness of mHealth tools in clinical care or less controlled setting is lacking.
The mySugr App (registered class I medical device application) was developed to make logging of metabolic control data appealing and useful in day-to-day life, and is one of the market leading apps with nearly 1 million users (January 2017). In a retrospective analysis the logging function has shown significant results in well controlled populations, reducing estimated HbA1c by 0.3% (from 7.3% to 7.0%)[2], among real world users. The exploratory data presented here will be utilized to generate future research hypotheses to further test the clinical utility of mySugr in a prospective manner and to improve mySugr's features.

Objective

To investigate the potential impact of mySugr Logbook app usage on parameters of blood glucose (BG) control in a high risk population, as defined by having an estimated A1c above 8% at baseline.

Method

A randomly selected group of 440 of users was included; inclusion criteria: high engagement (logging ≥5 days/week for ≥6 months), mean blood glucose (t_0) ≥183 mg/dl (representing eA1c ≥8%), T1D. Population demographics: Age 30.8±15.3 years, 47.3% female. Changes in BG-results (mean, standard deviation (SD)), High Blood Glucose Index (HBGI) and Low Blood Glucose Index (LBGI) at baseline (t_0), week 2-4 (t_1) and month 3-6 (t_2) were analyzed. Baseline data (t_0) was processed using an intercept of regression model based on data from first week of use.

Results

Baseline BG-results were 210.75±69.36 mg/dl, at t_2 dropping to 173.08 ±63.26 mg/dl – a reduction in mean of 17.88% ($p<0.0001$), in SD of 8.79% ($p<0.005$). HBGI at t_2 dropped from 5.39 at t_0 to 3.36 (from Medium to Low risk)4, 5 ($p<0.0001$), whereas LBGI rose from 0.22 (t_0) to 0.44 (t_2) ($p<0.0001$). Based on the reduction of mean blood glucose between t_0 and t_2, this would correspond to a reduction of eA1c of approximately 1.3% (from 9% to 7.7%) using conventional conversion method[3].

In a secondary analysis the within population shifts between HBGI-levels was investigated. The respective analysis showed a consistent shift of patients from HBGI categories indicating high risk, to lower risk levels at t_2 ($p<2.2e-16$).

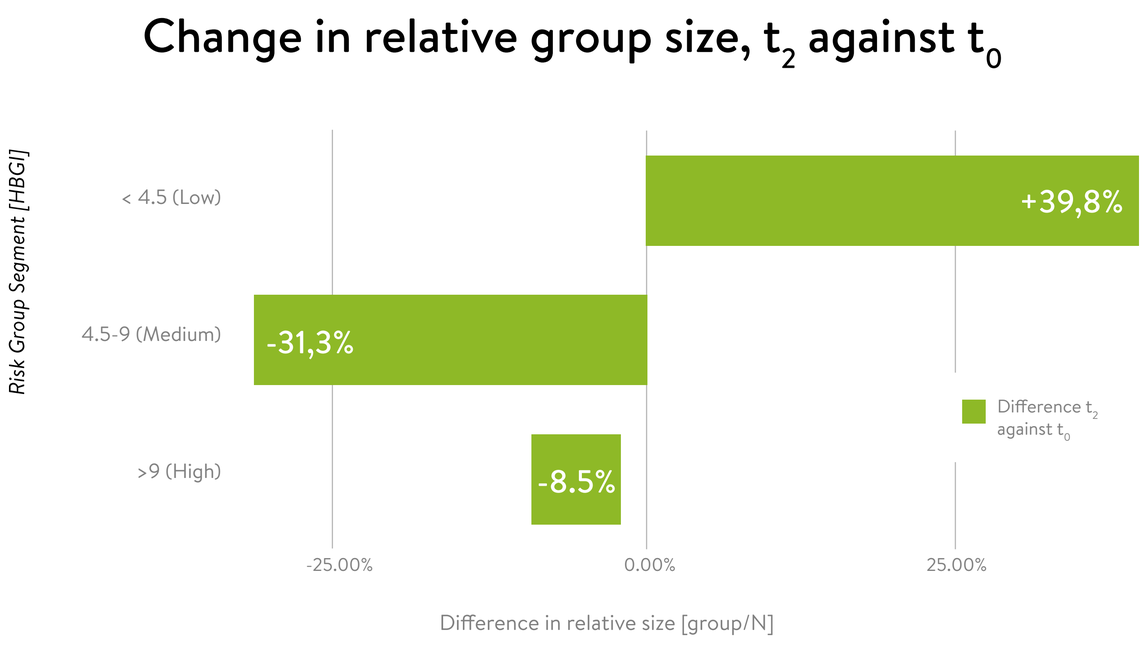
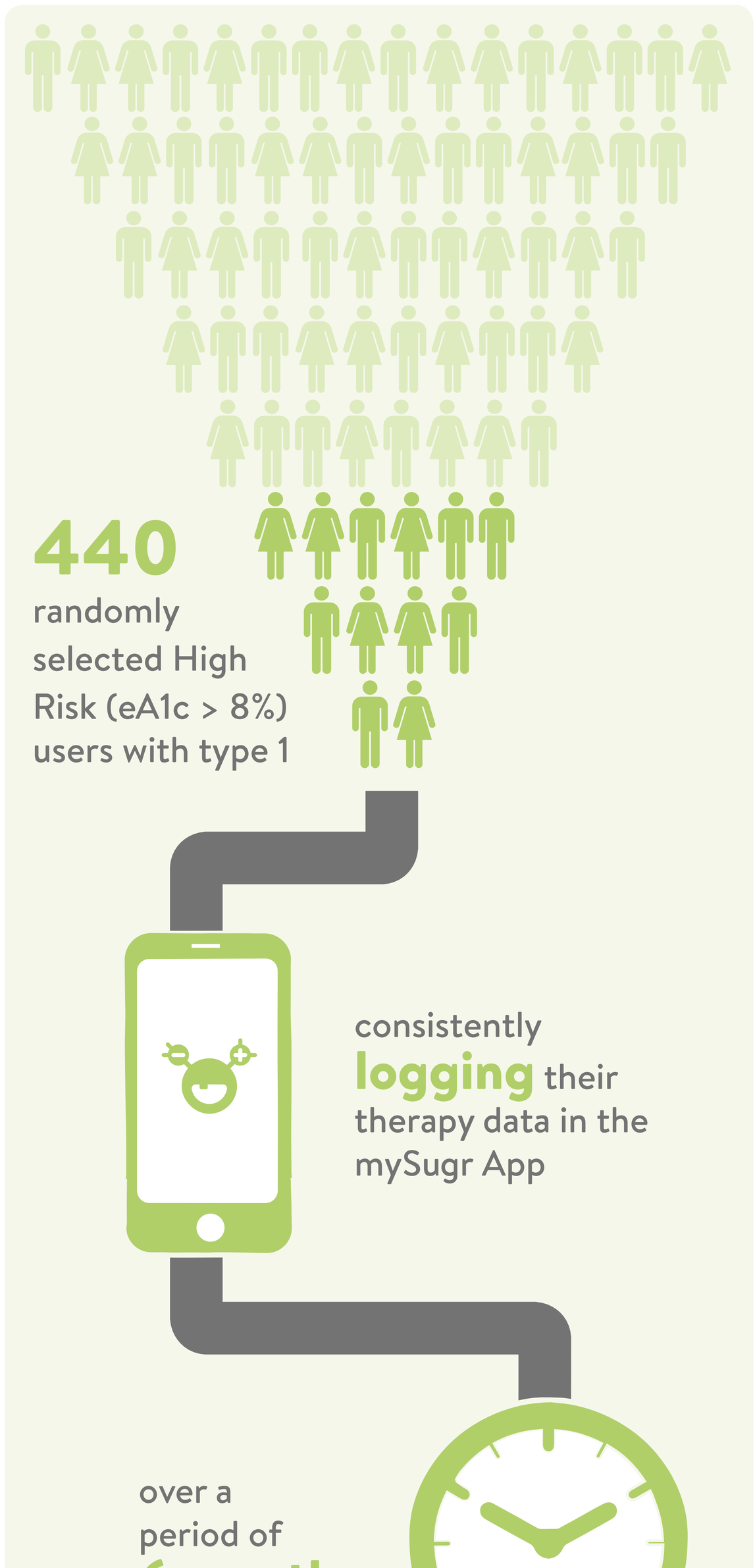


Figure 1. Figure 1. Shift in size of population groups segmented by risk levels of severe hyperglycemia as expressed in HBGI-risk-level, between baseline and t_2 results.[4,5]

Conclusions

The reduction of parameters indicative of BG variability, SD and CV, demonstrate that logging alone with the mySugr app may have improved the quality of BG control. These findings highlight the necessity for a prospective, controlled clinical study, which would take a closer look at an extended set of BG control parameters, e.g. also including 'time spent in range', LBGI/HBGI analyses. We hypothesize that the addition of Coaching and Bolus Calculator will result in further improvements of self monitoring behavior and glycemic control for highly engaged users, which will be looked into separately.



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