Glycemic Benefits of Using an AI-Enabled Glucose Predictive App Assessed Through Digital Twin Technology

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Background and aims

- Glucose predictions inform users about upcoming glucose events.
- The Accu-Chek® SmartGuide Predict app (**Figure 1)** provides a suite of AI-enabled glucose predictive features including notifications for low glucose prediction within 30 minutes (LGP) and for nighttime low glucose prediction (NLP). **[1]**
- Through in-silico assessment of glycemic benefits derived from these predictive features, we aim to demonstrate their potential to enable preventive actions, thereby reducing undesired glycemic events for users.

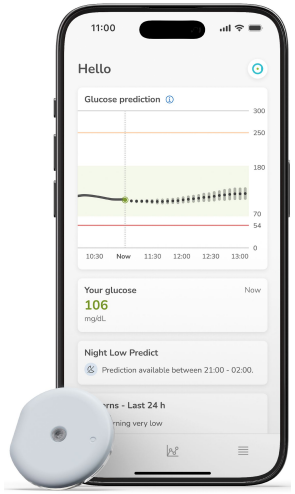

Figure 1. Accu-Chek® SmartGuide Predict app

Methods

- Using the UVa digital twin methodology, an ensemble of 2458 days from 20 representative subjects from the REPLACE-BG dataset were simulated*. [2]
- In the baseline simulation, the original hypoglycemia treatments were substituted with a probabilistic behavior model (ADA recommendations, 15g/15min rule when CGM<70mg/dL [3]) and overnight meals and boluses were removed to facilitate the evaluation of NLP.
- 15g of fast-absorbing carbohydrates were given following LGP notifications (30 min freeze period), and 30g of slower-absorbing carbohydrates were given at 22:30 whenever the NLP risk was high or very high.
- Interventions were compared against the baseline simulation using a paired t-test.

*The REPLACE-BG dataset (NCT02258373) is from Jaeb Center for Health Research. The analyses, content, and conclusions are solely the authors' responsibility and have not been reviewed or approved by the center.

Results

- Interventions following LGP notifications demonstrate a significant reduction in time below 70 mg/dL (2.73% vs. 0.27%, p<0.001).
- Interventions following NLP notifications result in a statistically significant reduction in the overnight time below 70 mg/dL (3.55% vs. 2.88%, p<0.001) and a reduction of overnight CGM alarms (46.0 vs. 38.6, p<0.001).

Conclusion

- Both LGP and NLP interventions significantly reduce hypoglycemia without inducing a clinically significant reduction in time in range.
- These results suggest that LGP and NLP enable preventative actions by users to reduce hypoglycemia.
- These findings underscore the potential benefits of the Accu-Chek® SmartGuide Predict app in enhancing glycemic outcomes for individuals with type 1 diabetes.

References

[1] Herrero et al. JDST 2024;18(5):1014-1026
[2] Aleppo et al. Diabetes Care. 2017;40(4):538-545
[3] ADA. Diabetes Care 2025;48 (Suppl_1):S128–S145

Table 1 - Mean daily/nightly glycemic outcomes

Scope	Arm	Mean CGM (mg/dL)	%Time < 54 mg/dL	%Time < 70 mg/dL	%Time in [70,180] mg/dL	%Time in [70,140] mg/dL	%Time > 180 mg/dL	# Hypos / # Days	#Days, or Nights, with CGM alarms †	# Notifications / # Days
24h	BASELINE	160.6	0.28	2.73	65.3	42.6	32.0	1.23	84.4	NA
24h	LGP	166.4 ***	0.04***	0.27***	66.0*	41.2***	33.8***	0.14***	20.8***	1.25
Night	BASELINE	149.8	0.20	3.55	70.1	50.3	26.4	0.52	46.0	NA
Night	NLP	154.4 ***	0.19	2.88***	68.6**	47.2***	28.6***	0.42**	38.6***	0.12

* (p < 0.05) ** (p < 0.01) *** (p < 0.001) † Average number of days per subject = 122.9