**Evaluating Glycemic Benefits of an AI-driven Glucose Prediction App Via Digital Twin Technology**

**Background & Aim**

AI-driven glucose predictions enable CGM users to manage their glucose levels more proactively. The Accu-Chek® SmartGuide Predict app provides notifications for low glucose levels within 30 minutes (LGP) and nighttime hypoglycemia risk (NLP), as well as a continuous 2-hour glucose forecast (GP). This study evaluates the potential glycemic benefits of using the app through in-silico analysis.

**Methods**

Using the UVa digital twin methodology, 2458 days from 20 representative individuals from the REPLACE-BG dataset were simulated. Interventions consisted of 15g fast-acting carbs following LGP notifications, 30g slow-absorbing carbs following high NLP risk prediction at 22:30, and advancing/adding correction boli if GP forecast >220 mg/dL. Baseline intervention included a GP-like hyperglycemia mitigation strategy, wherein predictions were substituted with current CGM measurements. All interventions employed hypoglycemia treatments that were aligned with ADA guidelines. Nighttime meals/boli were omitted to better assess NLP.

**Results**

LGP reduced %time <70mg/dL (4.2±1.5 vs 0.46±0.28 p<1e-4). GP reduced %time >180mg/dL (25.3±10.2 vs 22.0±8.6 p<1e-4). NLP decreased overnight %time <70mg/dL (5.6±2.2 vs 3.8±1.2 p<1e-4). Combining all features significantly reduced time outside range.

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| **Table 1.** Mean±Std per 24h/night population outcomes (n=20) for the different evaluated interventions. The night period is defined as 22:30-05:30.

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| **Scope** | **Intervention** | **Mean CGM****(mg/dL)** | **% Time < 70 mg/dL** | **% Time in [70,180] mg/dL** | **% Time** **> 180 mg/dL** |
| 24h | BASELINE | 147.7±16.9 | 4.2±1.5 | 70.3±9.8 | 25.3±10.2 |
| 24h | LGP | 153.8±15.9\*\*\* | 0.46±0.28\*\*\* | 72.9±9.9\*\*\*  | 26.5±10.0\*\*\*  |
| 24h | GP | 143.6±14.5\*\*\* | 4.4±1.4\* | 73.5±8.4\*\*\* | 22.0±8.6\*\*\* |
| Night | BASELINE | 134.5±14.2 | 5.6±2.2 | 76.2±7.5 | 18.1±8.4 |
| Night | NLP | 141.0±12.1\*\*\* | 3.8±1.2\*\*\* | 75.4±7.2\* | 20.7±7.6\*\*\* |
| 24h | LGP+GP+NLP | 150.1±13.4\* | 0.51±0.29\*\*\* | 76.1±8.3\*\*\* | 23.3±8.4\*\* |

\* (p < 0.05) \*\* (p < 0.01) \*\*\* (p < 0.0001)  |

**Discussion/Conclusion**

The Accu-Chek® SmartGuide Predict app has the potential to enhance glycemic control in T1D. Limitations include the in-silico nature of the study and the assumptions made in the user behaviour models.