USING EARLY ENGAGEMENT DATA FROM A DIGITAL HEALTH SOLUTION TO PREDICT FUTURE GLYCEMIA RISK INDEX (GRI)

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BACKGROUND

As CGM use in clinical practice continues to expand, effective use requires common metrics for assessment of CGM glycemia and clear clinical targets. In 2019, the ATTD Congress published recommendations from an international panel of expert clinicians and researchers to define core metrics and targets, including various times in ranges and an estimation of A1C, the Glycemic Management Indicator or GMI.[1] Subsequently the Glycemic Risk Indicator (GRI) was developed as a composite metric from CGM data to assist with basic clinical interpretation of CGM data.[2] In an earlier study, we have demonstrated how the GRI can help characterize the behavior and outcomes of a population of CGM users and may be a useful tool for digital health software to coach individuals on self-management behavior based on baseline and progressive values of GRI.[3]

SPECIFIC AIMS/PURPOSE

Earlier work has shown that combining a digital health solution and CGM devices supports improvements in glucose management.[4] Dense data from CGM devices allows the calculation of a stable and composite metric like glucose risk indicator (GRI), which can be important in predicting future health outcomes. In this study we investigated if early digital engagement data could predict future GRI.

METHODS

A real-world data set of 499 CGM users with type 1 and type 2 diabetes (T1D and T2D) was created. Baseline was defined as the first 30 days of use from registration. The prediction period was between days 70 and 90 from baseline. Users with >70% sensor wear time in the prediction period were included in the prediction dataset (n=304). The GRI prediction variable was categorized as *in target* if the GRI score was <= 40 and *above target* if the GRI score was >40. A Gradient Boosting Classifier was used to predict future GRI outcomes in three population subgroups: Overall (n=304), T1D only (n=125), and T2D only (n=140).

Figure 1: The Five GRI Zones (2)

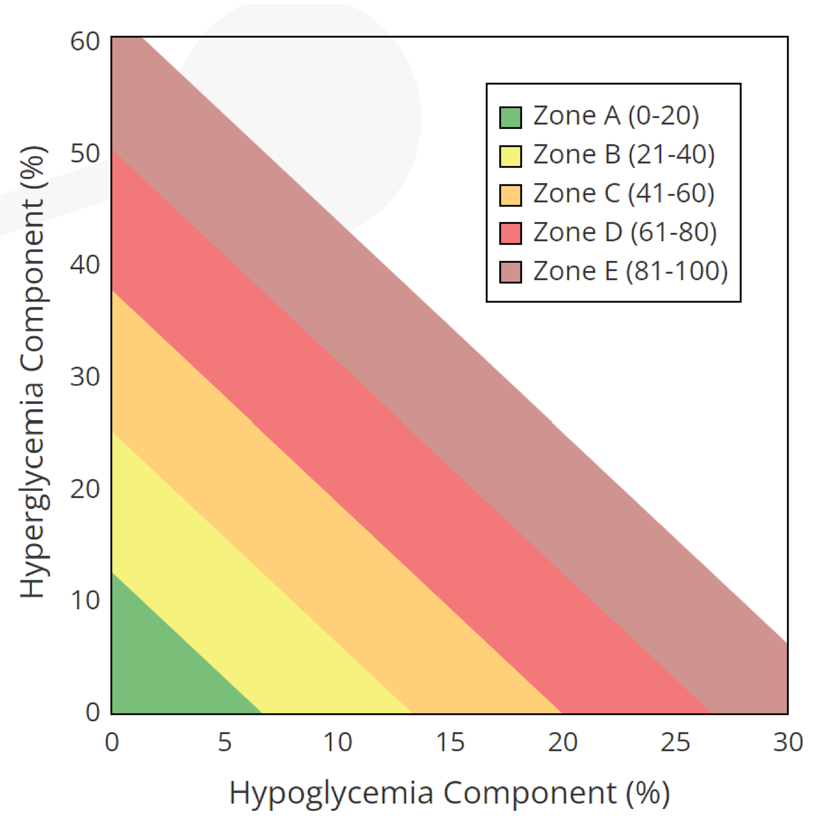


Figure 2: Screenshots of the Digital Health Solution

RESULTS

Figure 3: Population Demographics

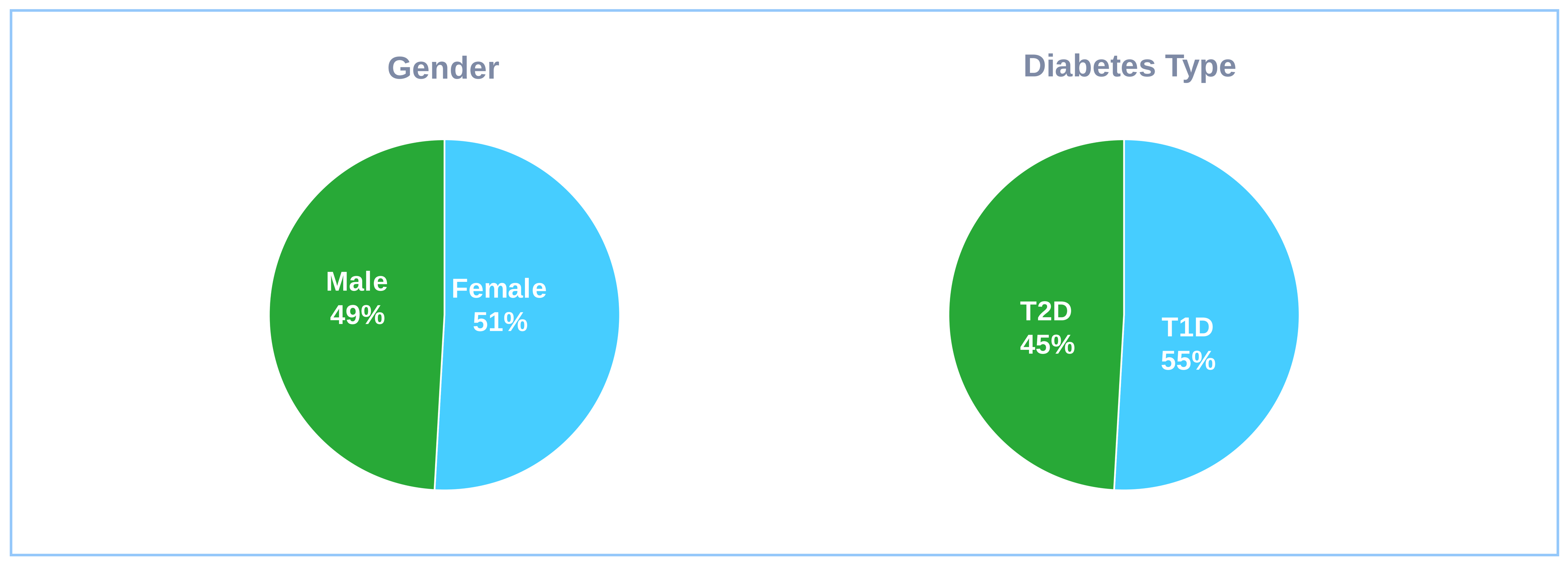
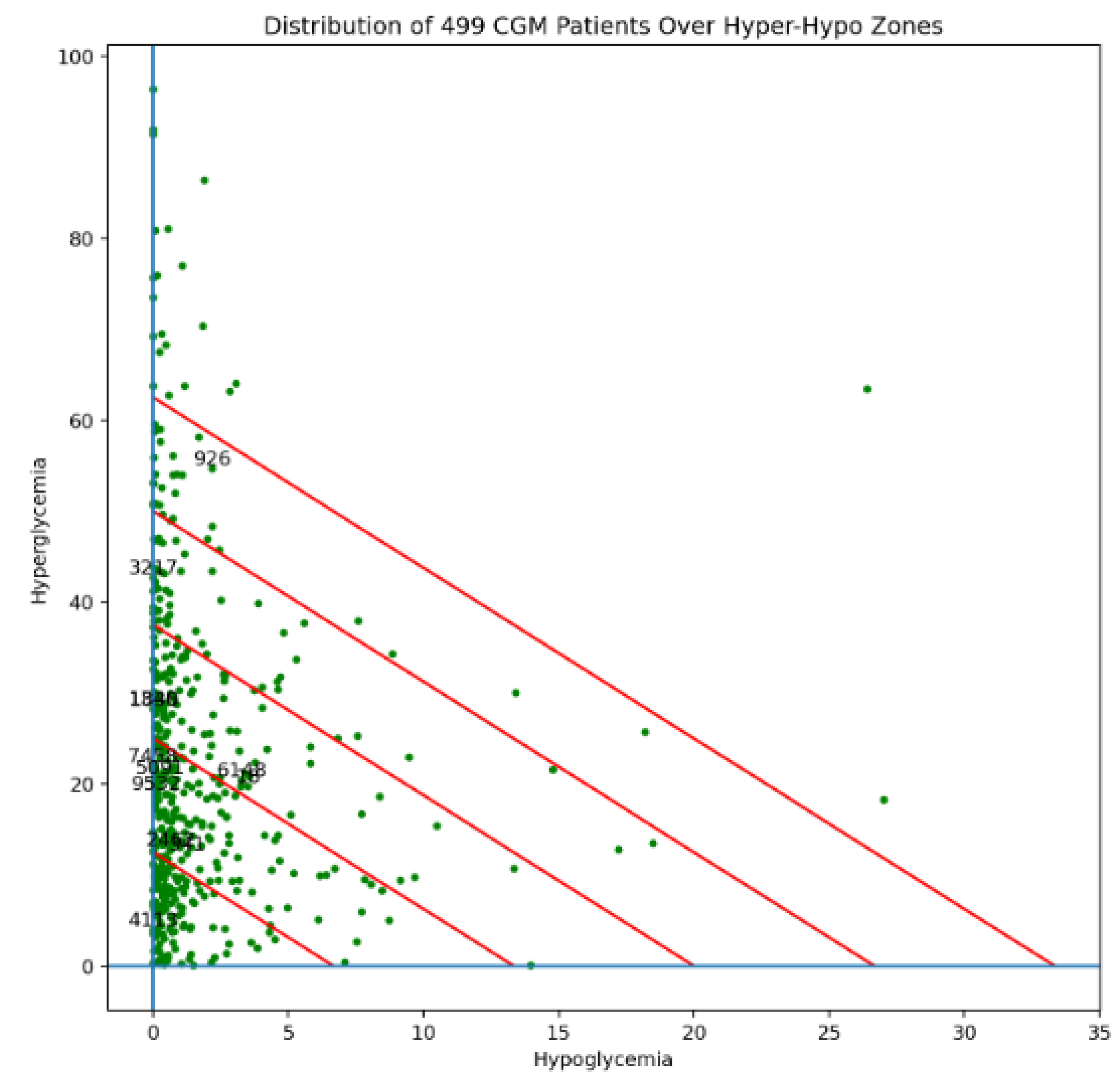


Table 1: Model Output Results

Sub-group	Data (n)	Best Model	Accuracy	AUC	Precise	Recall	F1
Baseline	304	Gradient Boosting Classifier	0.8353	0.9135	0.7355	0.7405	0.7287
T2D	140	Extreme Gradient Boosting	0.8033	0.8932	0.7988	0.785	0.7728
T1D	125	Light Gradient Boosting Machine	0.8864	0.9389	0.7917	0.7167	0.7157
No MEDAL Engagement	304	Extreme Gradient Boosting	0.8392	0.9210	0.7631	0.7381	0.7354

The Gradient Booster Classifier was highly accurate in predicting binary future, GRI outcomes in all subgroups. The overall model accuracy was 0,83, and 0,88 and 0,80 for the T1D and T2D subgroups respectively. All three models had AUC score >0.9.

Figure 4: GRI Distribution



CONCLUSIONS

- These data demonstrate the potential for early engagement data from a digital health solution to predict future GRI outcomes.
- Predicting GRI may help health plans and care teams to design highly-personalized treatment plans to optimize glucose management at both individual and population levels.
- This work is also foundational to leveraging real-time data like CGM to evolve digital health artificial intelligence capabilities.

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