Results

Hypoglycemia is a significant adverse outcome in patients with type 2 diabetes and has been associated with increased morbidity, mortality, and cost of care[1]. In addition, hypoglycemia is a major limiting factor for the optimization of insulin therapy. In patients with type 1 diabetes, continuous glucose monitoring (CGM) is commonly employed, but most patients with type 2 diabetes only check their glucose levels approximately one time per day. Our goal is to use self-monitored blood glucose (SMBG) values - from a sample size consistent with real-world testing frequencies - to accurately predict an individual’s risk for hypoglycemia the following day. Results could then trigger interventions through an automated mobile health coaching technology.

Methods

A probabilistic model using machine learning algorithms [2] was trained with de-identified, self-monitoring blood glucose (SMBG) data from a randomized controlled trial [3]. For each patient, 10 SMBG data points were used from the week prior to a hypoglycemic event (< 70 mg/dL). Then, SMBG data, sans the hypoglycemia data point, was applied to test and validate the model. Next, using additional data sets, the model was iterated over three generations to optimize performance.

Conclusions

Real-world SMBG frequency (~1x/day) can provide adequate data to predict hypoglycemia in type 2 diabetes

- Prediction can be consistent across populations (Gen.1) and any day of the week (Gen.2).
- Optimization of specificity and sensitivity (Gen.3) may provide performance results sufficient to off-load hypoglycemia BG analysis from human experts.
- Further study should test the models when used in real-time.
- An automated mobile health coaching technology could use the model’s predictions to provide interventions and education to manage or prevent hypoglycemia (Gen.3).

References