

Early Weight Change as a Predictor of Long-Term Treatment Response in a Behavioral Lifestyle Program for Diabetes Prevention in Clinical Practice

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Background: Evidence-based behavioral interventions for diabetes prevention have demonstrated efficacy in reducing diabetes risk, primarily through weight loss. Variation in treatment response is high, yet is poorly understood when such programs are implemented within real-world clinical settings. The ability to identify potential non-responders early during a behavioral lifestyle program (BLP) presents an opportunity to assess if more intensive treatment is needed. We sought to develop and validate a predictive model for the early identification of non-responders to a 12-month BLP.

Methods: Data were derived from the electronic health records of a northern California healthcare delivery system. We included BLP participants ≥ 18 years of age, with ≥ 4 weight measurements recorded during the first 12-week of the program, and a weight measurement at 12-months follow-up. We defined non-response as weight gain or no weight loss at 12-months from program initiation. We used logistic regression with percent weight change at 12-weeks from program initiation as the sole independent variable to predict non-response at 12-months. A secondary model included patient characteristics as independent variables. We performed 10-fold cross-validation for model assessment. We examined model performance with the area under the receiver operating characteristic curve (AUROC), sensitivity, specificity, and positive and negative predictive values (PPV, NPV).

Results: The study cohort included 961 BLP participants; 30% were classified as non-responders. For the model with percent weight change as the sole predictor, the AUROC was 0.785, corresponding to fair discrimination of non-responders from responders. The addition of patient characteristics resulted in slightly poorer discrimination (AUROC=0.755). For the simpler model, sensitivity and PPV were maximized at 0.56, with a specificity and NPV of 0.81. With this model, BLP participants with a predicted probability of non-response of $\geq 41\%$, corresponding to $< 1.83\%$ weight loss at 12-weeks from baseline, would be flagged as potential non-responders and candidates for treatment intensification assessment.

Conclusions: In this cohort of BLP participants in a real-world clinical setting, percent weight change in the first 12-weeks, alone, predicts non-response at 12-months. Clinicians can apply this algorithm to identify and assess patients in potential need of treatment intensification, thereby improving long-term treatment response through an individualized, patient-centered approach to diabetes prevention.