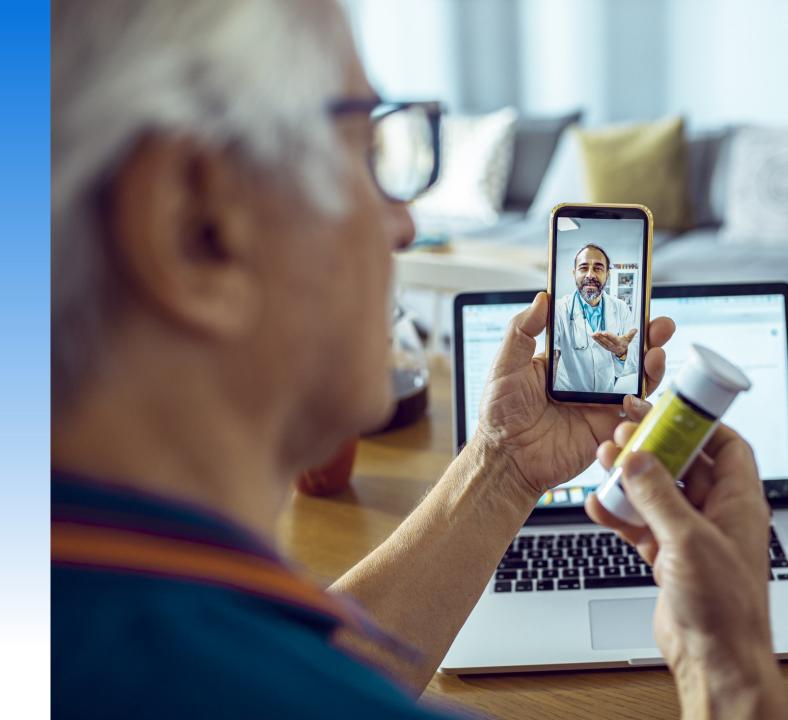# Using Early Engagement Data from a Digital Health Solution to Predict Future Engagement Patterns

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Welldoc® App Indications for Use

The Welldoc® App combines the FDA cleared medical device functionality of Welldoc Diabetes and Welldoc Diabetes Rx with other non-FDA cleared wellness and educational/self-management products.

Welldoc Diabetes is indicated for use by healthcare providers (HCPs) and their patients – aged 18 years and older - who have type 1 or type 2 diabetes. Welldoc Diabetes is intended to provide secure capture, storage, and transmission of blood glucose data as well as information to aid in diabetes self-management. Welldoc Diabetes analyzes and reports blood glucose test results and supports medication adherence. In addition, Welldoc Diabetes provides coaching messages (motivational, behavioral, and educational) based on real-time blood glucose values and trends. It includes software intended for use on mobile phones or personal computers in the home or in professional healthcare settings. The software also allows for entry of other diabetes-related healthcare information and provides educational information.

Welldoc Diabetes Rx adds the following prescription use only insulin management features:
- For bolus insulin users with type 1 or type 2 diabetes, Welldoc Diabetes Rx includes an insulin dose calculator* to allow patients to use their prescribed regimen to calculate a dose of bolus insulin for a given amount of carbohydrates and/or blood glucose value.
- For basal insulin users with type 2 diabetes, Welldoc Diabetes Rx includes an Insulin Adjustment Program (IAP) which calculates appropriate long-acting basal insulin doses for titrating insulin levels based on configuration by a healthcare provider. The healthcare provider must activate the IAP and configure it with patient-specific parameters.
- For bolus insulin users with type 2 diabetes, the Welldoc Diabetes Rx IAP calculates appropriate dose adjustments of bolus insulin based on configuration of a healthcare provider. Qualified type 2 diabetes patients are those who are not achieving glycemic targets despite optimization of their basal insulin dose or their current bolus insulin regimen.
- For premixed insulin users with type 2 diabetes, the Welldoc Diabetes Rx IAP calculates appropriate dose adjustments of premixed insulin based on the configuration of a healthcare provider. Qualified type 2 diabetes patients are those who are not achieving glycemic targets and who do not take other types of insulin.

Welldoc Diabetes and Welldoc Diabetes Rx are not intended to replace the care provided by a licensed healthcare professional, including prescriptions, diagnosis, or treatment.

Insulin Dose Calculator may also be referred to as Insulin Calculator

Other Welldoc App Non-Diabetes Functions
Hypertension, Heart Failure, Behavioral Health, Prediabetes
The other disease state-focused products in the Welldoc App are non-FDA-cleared wellness and educational/self-management products and DO NOT interact with Welldoc Diabetes or Welldoc Diabetes Rx functions. They are intended to help people with hypertension, heart failure, or mild mental health conditions better manage and live well. Visit www.welldoc.com for full labeling information.

Disclaimers

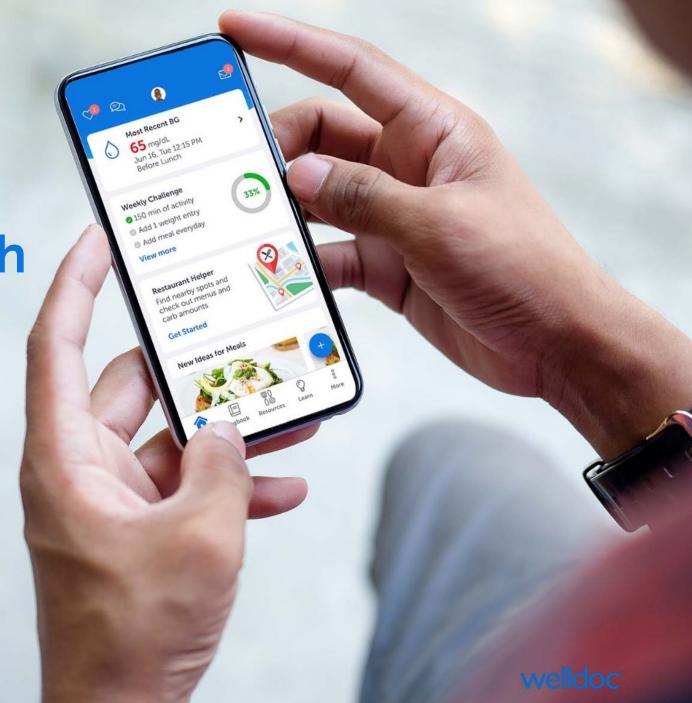○ Inclusion of Welldoc product information is for illustration and context purposes only.

○ Abhi Kumbara is an employee of Welldoc, Inc.

Agenda

1. Introduction

2. Methods

3. Results

4. Conclusions

Welldoc enables a digital first, total health approach for individuals living with chronic conditions

- Personalized AI-Driven Digital Coaching & Support
- Cost Effective Engagement and Outcomes
- Supports Individuals Across their Health Journey
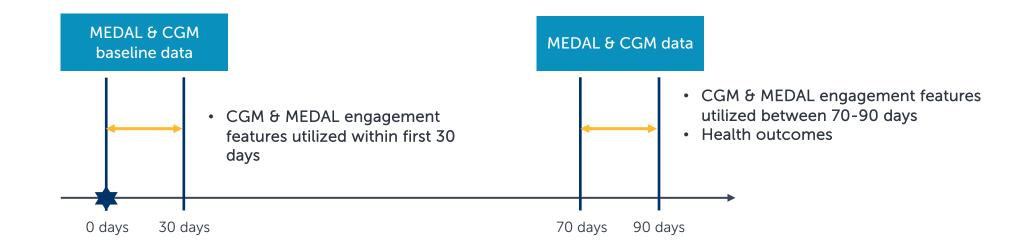- Empowers Individuals with Actionable Insights to Support Healthier Living

welldoc

Introduction

- Optimizing glucose management for people with diabetes requires

  1. Understanding an individual's glucose levels in real-time

  2. Self-management of the ADCES-7 (Association of Diabetes Care and Education Specialists) top behaviors, including medications, education, diet, activity and lab data (MEDAL)

- Continuous glucose monitoring (CGM) helps address the first requirement by providing critical, real-time glucose data to individuals with diabetes

- Welldoc research is focused on addressing the second area: How regulated, AI-driven, and personalized digital health solutions can leverage the power of dense CGM data to effectively help people with diabetes manage the MEDAL factors and improve their overall health

- We hypothesized that early engagement signals from both CGM wear time as well as interactions with a digital health tool could predict engagement outcomes later on in the patient's journey

Methods

- We reviewed real-world data from 499 patients with type 1 and type 2 diabetes, who were enrolled in a combined CGM-digital health coaching platform

- Both MEDAL as well as CGM wear time data from a baseline period was used to train a model to predict engagement outcomes at a later date

MEDAL & CGM baseline data		MEDAL & CGM data

- CGM & MEDAL engagement features utilized within first 30 days

- CGM & MEDAL engagement features utilized between 70-90 days
- Health outcomes

Timeframe

0 days   30 days   70 days   90 days

Methods – Model Training Features Summary

- Basic Settings
  - Baseline Period: 1, 2, 3 (each 10-day)
  - Outcome Period: 7, 8, 9

- Cohort Definition:
  - All 499 Patients

- Input Features:
  - CGM and MEDAL Engagement Features

- Outcome:
  - Engagement Outcome:
    - High Engagement: MEDAL Records >= 5
    - Low Engagement: MEDAL Records < 5

- Subgroup Analysis
  - Q1: All 499 Patients
  - Q2: Type 2 Diabetes Patients
  - Q3: Type 1 Diabetes Patients
  - Q4: Using Only CGM Features from History

- Model Training
  - Train / Test Split: 0.7 vs 0.3
  - PyCaret Package to test Different ML Models

Results

Question Variants	Data (Size)	Best Model	Accuracy	AUC	Precise	Recall	F1
Q1: All	499	Random Forest Classifier	0.8710	0.8958	0.8167	0.7150	0.7440
Q2: T2D	226	Random Forest Classifier	0.8667	0.8944	0.8167	0.7150	0.7440
Q3: T1D	273	Extra Trees Classifier	0.9000	0.9358	0.8117	0.7500	0.7621
Q4: Only CGM and Demo Info	499	Random Forest Classifier	0.7422	0.5510	0.3333	0.0708	0.1116

Conclusions

- Obtaining early CGM and self-management behavior data is useful in predicting engagement outcomes associated later points in the patient journey.

- Predicting engagement outcomes is important in:

  - Building the right capabilities within digital health solutions to integrate the power of real time data into meaningful and actionable trends, and

  - Helping providers and care teams design personalized treatment plans, in collaboration with individuals

  - Understand important engagement and health factors to develop improved prevention-based care models.

Thank You!