Interactive Digital Health: Engaging Healthy Behaviors & Clinical Outcomes

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Background

The use of self-monitoring of blood glucose (SMBG) has been a standard of care for people with type 2 diabetes. While the use of SMBG as routine practice has been challenged, SMBG remains a cornerstone in the clinical management of both insulin and non–insulin-treated PWD[1]. Incorporating technology into self-management activities and more interactive and active engagement of both patients and clinicians may have improved patient outcomes as the utility of SMBG data for guiding self-management decisions is well known[2]. Smartphone technology is ubiquitous and has the capability of providing 24/7 support. FDA clearance of Software as a Medical Device (SaMD) acknowledges the role that software can play in health care. Health plans support SMBG through the provision of meters and testing supplies but have limited data regarding patient engagement with this service.

In addition to glucose monitoring, lifestyle therapy is an important part of self-management. With the introduction of connected devices such as fitness devices, weight scales, and blood pressure monitors, digital health solutions can integrate this data with glucose data to deliver automated coaching and education to enhance self-management and clinical outcomes[3].

Objectives

This observational real-world study with a large health plan, a blood glucose meter company and a digital health solution was conducted virtually. The study was designed to evaluate the impact of the FDA-cleared One Touch Reveal Plus® app (OTRP) powered by Welldoc's BlueStar® on BG control through a pre-post study of glucose control, participant engagement, and health care utilization and cost.

Methods

Health Plan members with Type 2 diabetes, with an A1C of ≥ 7.5%, who were testing blood glucose (BG), and taking any diabetes medication were contacted electronically. There was limited outreach to 500 members. Interested participants completed an on-line consent form and were offered at no-cost the OTRP app, and the Lifescan Verio Flex meter for 6 months. No additional outreach was provided after participants received access to the app. Customer care support was available for technical issues. .

Results

Data analysis included health plan data and with-in app meter and patient-generated health data (PGHD). The study was 6 months duration with measurement at 3 and 6 months for the 291 participants who activated the app. The population of commercial health plan members who participated in the study represented the typical Type 2 diabetes member. (Health plan data analysis completed by Healthagen).

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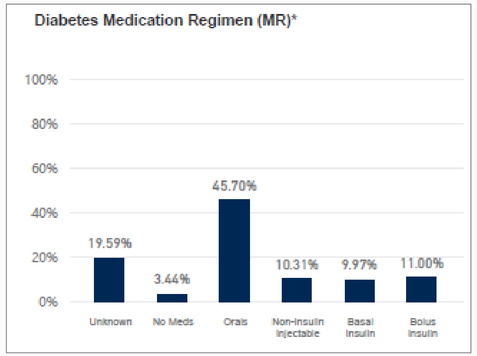
Results

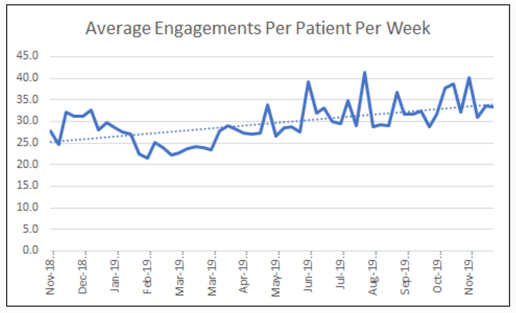
Participant Baseline Characteristics

Category	Sub-Category	Value
Sample Size	Activated	291
Gender	Male	54%
	Female	46%
Age	21-39	11%
	40-54	39%
	55-64	47%
	65+	3%
Medication Regimen	Non-insulin	59%
	Insulin	21%
	Unknown	20%
OTR+ Entries in APP	Glucose	39,749
	Medication	20,960
	Food	34,615
	Activity	8,498
	Education	3,260



Of the 291 participants, 54% were men and 47% were in the 55-64 age group; with 3% over age 65 which indicates the appeal for technology in these categories. Also the distribution of medications including non-insulin therapies (59%) and insulin (21%) are representative of the type 2 population. Of note, 20% chose not to list their medications for tracking and reminders. Entries into the app both via syncing and manual entry were evaluated for engagement and glucose control.

Participant Engagement with OTRP App (Week and Month)



An average of **~30 digital engagements per week** was observed for those who activated and engaged, suggesting an effective mechanism to improve patient self-management of diabetes

For those who activated and engaged, the **daily-to-monthly active user ratio** (DAU:MAU) **was ~0.5**, indicating that 50% of those who used the OTR+ APP at least once each month also engaged at least once each day

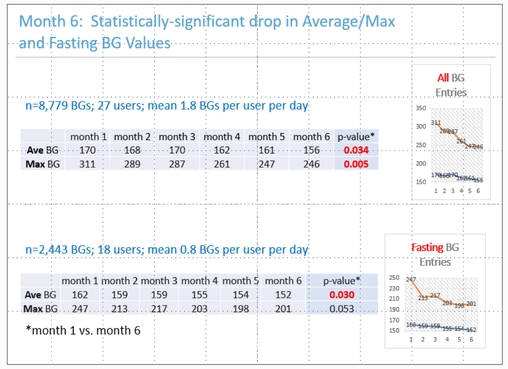
The OTR+ APP was observed to be **used** by **members** on **differing medication regimens**, and demonstrated a **balanced engagement** with management of BG, food, medications, activity, sleep and curriculum-based education, suggesting a "beyond BG-only" approach to diabetes self-management

Healthcare Utilization:

Diabetes related and all-cause ER visits and costs decreased from baseline to follow-up. **Reductions** in **Diabetes-related costs** were **highest** for those members who began using OTR+ with **A1c > 8. Average pharmacy costs increased** when compared to baseline reflecting the increased usage of insulin and non-insulin drugs..(164 patient generated reports were sent to healthcare team).

Results

Glycemic Control



During the **first 3 months** of OTR+ APP engagement, **statistically-significant reductions in MAX BG and POST-PRANDIAL BG** were observed, suggesting an initial effect of the OTR+ APP through lifestyle management During the **subsequent 3 months** of OTR+ APP engagement, **statistically-significant reductions in AVERAGE BG and FASTING BG** were observed, suggesting a gradual shift towards overall diabetes/glucose management through the OTR+ APP.

There was a 0.54 average reduction in A1C, Paired, All Starting A1c Ranges (n=35, p-value=0.021). There was a **1.83 average reduction**, Paired, Starting A1c > 8 (n=12, p-value=0.0023)

Conclusions

"Intelligent Monitoring" and Technology-powered Outcomes:

This study suggests that real-time availability of data-driven insights assists users and their own providers to improve glycemic control and shift to data-driven care. Leveraging 'intelligent monitoring' engages patients beyond just glucose testing to include lifestyle monitoring with automated coaching and sharing of data with the healthcare team and subsequent treatment optimization may be the "active ingredient" to influencing clinical outcomes and reducing cost. This scalable approach to intelligent monitoring and aggregation of user data to provide automated real-time coaching, allows providers to visualize glycemic trends and patterns, enhances communication pathways and influences behavior.

References

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[2]Greenwood D, Gee P, Fatkin K, Peeples M. A Systematic Review of Reviews Evaluating Technology-Enabled Diabetes Self-Management Education and Support. *Journal of Diabetes Science and Technology*. 2017 Sep;11(5):1015-1027.

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