



Well-managed: The effectiveness of a digital health application on improving HbA1c self-management and secondary outcomes in patients with diabetes mellitus

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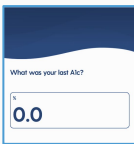


Introduction

Diabetes mellitus (DM) is a growing public health concern impacting over 400 million people worldwide¹. Patients managing DM often have success improving their glycemic control using self-management techniques and lifestyle behavioral changes; however, these methods can be challenging to sustain². Digital health interventions have introduced new ways for patients to track, manage, and improve their DM. While these technologies have shown promise in supporting self-management techniques, increasing access to care, and lowering healthcare costs for patients with DM, their clinical effectiveness and impact on direct health outcomes are not well studied³. Well – a new digital health platform – uses artificial intelligence (AI) suggestion logic, behavioral economics, and personalized member services to provide a tailored and effective experience for members that drives healthy behaviors and health outcomes. We intend to show that engagement with Well's platform drives encouraging improvements in diabetes self-management and hemoglobin A1c (HbA1c) values with promising secondary outcomes of depression severity and perceived stress.

Methods

We synthesized data from 373 active members on the Well platform with a DM diagnosis known via validated proprietary algorithms. The following app metrics were analyzed: active days on the platform, completion of content, and number of chat messages sent to the Well Guide service. Primary outcomes included baseline and most recent HbA1c values, and secondary member-reported outcomes included depression severity, diabetes distress, and perceived stress using validated PHQ-8, DDS2, and PSS questionnaires.



Results

Of the 373 members with HbA1c repeated measures, the following comorbidities were identified: hypertension (73.73%), depression (32.71%), and anxiety (36.99%). We observed a change in HbA1c measures demonstrated in **Table 1**.

Table 1: HbA1c Measures

Value	Mean	Std. Deviation
Baseline HbA1c	7.236	1.713
Latest HbA1c	7.069	1.644
% Change	-0.7	0.170
Difference	-0.166	1.440

Average baseline HbA1c was significantly higher for those with mild (p=0.018), moderate (p=0.001), and moderately severe (p=0.004) depression, compared to members presenting without depression, as reported on the PHQ-8 questionnaire (**Table 2**).

Table 2: Baseline HbA1C Stratified by Depression (PHQ-8) Severity Level

PHQ-8 Severity	Baseline HbA1c	Lower CI	Upper CI	p-value *
None	6.666	6.439	6.893	
Mild	7.124	6.746	7.501	0.018
Moderate	7.544	7.005	8.082	0.001
Moderately severe	7.927	7.077	8.777	0.004
Severe	7.360	6.124	8.596	0.270

*p-value for the test compares baseline HbA1c for each severity level against the none severity.

Members indicating high distress per DDS2 had on average, a higher baseline HbA1c score compared to those who indicated low distress (**Table 3A**, p=0.000).

Table 3A: Baseline HbA1C Stratified by Stress (DDS2) Severity Level

DDS2 Score	Baseline HbA1c	Lower CI	Upper CI	p-value *
Low	6.561			
High	6.999	6.572	7.426	0.000

*p-value for the test compares baseline HbA1c for each severity level against the none severity.

We did not observe a significant change in baseline HbA1c aggregated by perceived stress severity level (**Table 3B**).

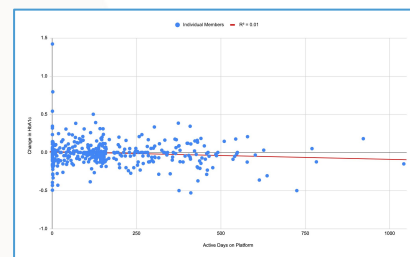
Table 3B: Baseline HbA1C Stratified by Stress (PSS) Severity Level

Stress level	Baseline HbA1c	Lower CI	Upper CI	p-value *
None	6.796	6.507	7.085	
Low	7.055	6.697	7.413	0.156
High	6.655	5.770	7.539	0.754

*p-value for the test compares baseline HbA1c for each severity level against the none severity.

Analysis of glycemic control in comparison to member activity on the platform revealed that the more days a member spent using Well, the more they trend toward HbA1c improvement (**Figure 1**, R² = .01).

Figure 1: Time Spent on Well's Platform and Change in HbA1c



A similar trend was observed comparing the number of actions completed on the Well platform, and chats sent to Well Guides with HbA1c improvement (**Figure 2**, R² = .01, **Figure 3**, R² = .038).

Figure 2: Actions Completed and Change in HbA1c

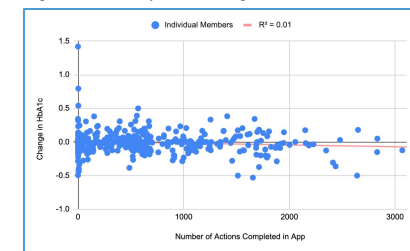
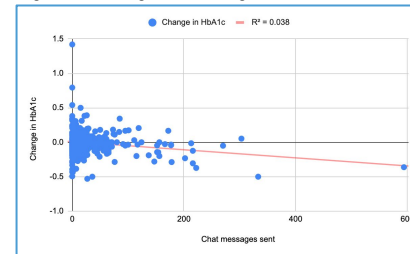


Figure 3: Chat Messages Sent and Change in HbA1c



Conclusion

This data suggests that engagement with the Well platform, represented by both time spent, actions completed, and chats with Well Guides may improve HbA1c values and glycemic control for members with DM through increased self-management techniques, more informed health education, and navigation to care. Furthermore, members with more severe baseline PHQ-8 and DDS2 scores report higher baseline HbA1c values compared to those with low or no depression or distress. Limitations of this study include a small sample size, and inadequate follow-up of secondary outcome measurements. Additional research will investigate if the HbA1c improvements seen as a result of interaction with the platform will positively impact the depression severity, perceived stress, and diabetes distress scores, in addition to other ICHOM measurements, over time.

References

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