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Increased Interaction with Weight Loss App Increases Likelihood of Sustained Weight Loss

William D. Grant[1], Laila Kobrossy[2], Zoe Koulouris[3], and Wendy Scinta[4*]

[1]Department of Emergency Medicine, State University of New York, Upstate Medical University, New York, USA
[2]Office of Career Advising, Le Moyne College, Syracuse, NY, USA
[3]Pound Health, Syracuse, New York, USA
[4]Department of Family Medicine, State University of New York, Upstate Medical University, New York, USA

Abstract

Weight loss is difficult for individuals to achieve and even harder to maintain. Two investigations including an independent analysis of data derived from a comprehensive smart phone app specifically designed to address National Weight Control Registry long-term success strategies and motivational mobile application success characteristics have demonstrated that those patients who interact with the app on a regular basis - which includes the provision of feedback to the individual's medical care team- result in significant weight loss and the sustaining of that loss. Motivational attributes may be assessed through analysis of the daily regularity of interactions with the app. It is not the number of interactions that matter, rather that there is logging, accountability and two-way communication between the patient and the care team.

Keywords: Weight loss; Patient database

Introduction

Change in individuals - whether for modification or cessation of behaviors (smoking, alcohol intake, exercise, weight, personal interactions, etc.) - is a complex process. The difficulties and motivational influences were articulated over 30 years ago and have been reaffirmed through continuous study [1,2]. Although this issue has been clearly known, many mobile app developers do not consider these factors in the development of behavioral or life-style motivational apps. Instead, focus is placed on the number of app downloads as the criterion for success. A recent analysis of apps for physical activity change found that behavior change techniques were not widely marketed in these apps [3].

We know that individuals in the United States use their smartphones extensively. The Nielsen group found that while individuals spent 185 hours per month watching TV, they spend 34 hours and 21 minutes using their smartphones-far more than the 26 hours and 58 minutes they spend online [4]. The time distribution of smartphone use suggests that of the time spent, 46% is spent on "me time" and 19% on social interactions with other people [5].

The National Weight Control Registry has been tracking 10,000 individuals who have been successful in losing large amounts of weight and maintaining their weight loss [6]. They have identified seven behavioral strategies for long-term success:

1) Engaging in high levels of physical activity

2) Eating a diet that is low in calories and unhealthy fats

3) Eating breakfast daily

4) Weighing in daily

5) Logging food on a regular basis

6) Maintaining a consistent eating pattern

7) Catching "slips" before they turn into larger regains

3Pound Health, LLC has developed a mobile app for use by patients, physicians and other health care providers to address the shortcomings of previous applications by paying significant attention to motivational and interactive factors which contribute to successful weight loss and maintenance. It is this specific engagement that brings the patient actively into the entire system to assure weight loss success. The Euco™ system is a patient engagement platform consisting of a coaching dashboard and, for patient journaling, either a mobile phone or web-based application. The coaching dashboard uses a proprietary "patient success score" based upon an assessment of risk that stratifies patients from least to most engaged, thereby making it easier for coaches to identify and focus on patients needing intervention. The mobile phone or web-based application allows patients to simply and securely enter five parameters: nutrition, exercise, measurements, labs, and medications in accordance with their individualized plans.

Euco fulfills each of the 7 success factors in the NWCR, enhances the patient-physician relationship and can improve physician reimbursement, patient satisfaction, and through sustained weight loss, reverse expensive, patient satisfaction, and through sustained weight loss, can reverse expensive and life-threatening obesity related diseases.

Materials and Methods

The development and implementation of a successful randomized controlled trial to provide the highest level of research evidence in support of effectiveness requires the implementation of pilot tests. The pilot tests provide evidence of project feasibility in terms of ability of the research team to gather data that may be used to address the research question, as well as provide data that will guide the development of the final research protocol. The purpose of the pilot test is not to provide definitive and fully defensible success evidence. However, pilot data which fails to provide data which points to the high probability of large

scale study success requires consideration of alternative approaches to answering the research question.

Two different pilot analyses were undertaken for the development of the prospective research protocol to demonstrate the effectiveness of Euco™. Results from both efforts provide strong evidence of the effectiveness of the Euco™ system in leading to successful weight loss and the maintenance of that loss.

Results and Discussion

Initial pilot investigation

An initial study performed over a period of 16 weeks was conducted at a private weight loss program (September 16, 2013 – January 5, 2014) [7]. The main elements of the Euco platform utilized during the study were:

A patient management dashboard used by clinical staff (also referred to as "coaches") and featuring the following components:

a. Patient database containing an interactive list of participants

b. An option to enter and/or edit a patient's nutrition or activity plan

c. An overview of patients' participation and engagement levels

d. A historical view of patients' entries in the Nutrition and Activity categories to help track progress and identify gaps that require timely intervention.

e. An option to view, enter and edit patient measurements and labs

f. A secure two-way patient-clinician messaging component with individualized and batch messaging capabilities.

A personalized journaling tool in the form of a mobile iOS App used by patients and featuring the following categories:

a. Nutrition journal: includes an overview of their preset nutrition plan, and a historical view of their entries. Activity journal: includes an overview of their preset activity plan and a historical view of their entries.

b. Measurements database: includes a historical view for tracking progress.

c. Labs database: includes a historical view for tracking progress

d. A secure two-way patient-clinician messaging component

Thirty-seven adult patients already in the practice for at least four months (and using iOS devices) were recruited to participate in this study. A Central IRB approval was obtained and all patients signed an Informed Consent and HIPAA authorization forms before the commencement of the pilot.

Participants were instructed to download the Euco App and utilize it as an additional tool in their weight loss process. Patients were free to engage in the platform as they chose, with no special instructions on frequency or level of participation. There were no modifications in clinical procedures or frequency of in-person patient interactions with staff. Patient information, medical records, and health data were handled in a HIPAA-compliant manner.

At the end of the pilot study, focus groups were scheduled independently with the private medical weight loss clinical team clinical team and with study participants in order to obtain qualitative feedback

concerning utilization of and satisfaction with the platform.

Initial pilot investigation findings

Of the 37 patients recruited, 22 (18 women, 4 men) took part in the study divided into four segments (I-IV), of 28 days each: Phase I (Sep16-Oct13), Phase II (Oct14-Nov10), Phase III (Nov11-Dec8), and Phase IV (Dec 9-Jan 5). During this time period there were: 13,938 total journal entries; 123 secure messages; and 12,974 nutrition entries.

Patients were most engaged with keeping track of their keeping track of their diet and logging into their nutrition journal into their nutrition journal an average of five times each day. Euco's™ exercise journal was utilized an average of three times per week, as demonstrated by the "Activity" category data, where both cardiovascular and strength training were represented. An average of one message was securely exchanged daily between the clinical team and patients during the study, with communication peaking in the second phase (total aggregate).

Potential changes in weight management trends for patient participants before and after joining this study were evaluated. This analysis resulted in three groups of participants, based on their weight management trends:

1. Group A (or "maintainers"): Participants who maintained their weight during the study, following either weight loss or maintenance "before". This group represented 45% of total study participants (n=10).

2. Group B (or "winners"): Participants who either continued to lose weight during the trial or who improved their weight management trajectory compared to "before". This group represented 27% of total study participants (n=6).

3. Group C (or "gainers"): Participants who either continued a trend of weight gain or initiated weight gain during the study. This group represented 27% of total study participants (n=6).

This analysis shows that 72% of study participants maintained their weight, continued to lose weight, or reversed their weight management trajectory during the study period.

An acceptable level of engagement was defined as completing an average of four or more active days of journal entries per week, for at least two phases of the trial. Based on this classification, it was shown that 50% of participants were actively engaged with Euco during the study period, regularly logging into their nutrition and activity journals and communicating with their clinical team. There was an encouraging correlation between engagement with Euco and positive weight management outcomes. In brief:

• 91% of patients actively engaged in self-monitoring and journaling via Euco belonged to Groups A or B. In other words, 91% of patients who were actively engaged with Euco either maintained or successfully improved their weight.

• A smaller subset of a small subset of patients who actively engaged with Euco belonged to group C engaged with Euco belonged to Group C. Only 9% of patients engaged with Euco continued to gain weight or initiated weight gain during the study period.

• A smaller subset of study participants who were non-engaged with Euco were either "winners" or "maintainers".

Patient Feedback

Patients who participated in the study provided the following feedback regarding their experience with the Euco tool:

1.	Knowledge that the healthcare team was monitoring their entries increased patient motivation to self-monitor.

2.	Investing time daily to journal through Euco was worthwhile with respect to achieving and accelerating their weight loss goals.

3.	The connection to the clinician and medical staff was one of the main differentiators of the Euco platform from other electronic journaling tools.

4.	Overall, patients expressed that the App was easy to navigate and that it could be easily be incorporated into their daily life.

5.	Patients felt that discussing Euco with clinicians regularly during office visits would enrich patient-provider interaction.

6.	Patients expressed that the messaging tool could be especially beneficial during times when their typical schedule is interrupted; such as during holidays, vacations, or while traveling.

7.	Patients indicated that additional positive reinforcement in the form of automated emails and personalized messages would be beneficial in helping them to continue to journal.

Clinical Team Feedback

Clinicians identified several aspects of the Euco coaching dashboard that they considered valuable. These included:

a.	Ability to review patient journal entries to detect dietary and physical activity trends and assess patient compliance.

b.	Ability to more easily identify patients in need of help and intervene in a timely manner.

c.	Access to the secure messaging feature.

d.	Clinicians reported that they spent the majority of their time on Euco either reviewing patient journal entries, creating nutrition plans, or and imputing patient measurements.

e.	Clinicians identified benefits of utilizing Euco in place of paper journals, citing the ability to easily access historical data and nutrition and activity plan details as differentiating factors.

Pilot Test Independent Analysis

To further explore the initial findings, an independent research and statistical expert was provided a comprehensive large data set. This investigator provided pro bono analysis of the data in order to assure independence from the study. The following summarizes these findings.

Second Pilot Data Exploration

An examination of the data for 170 patients in weight reduction under physician supervision was undertaken. The program relies on regular patient contact with a physician, self-monitoring, and a digital patient enhancement platform which includes the ability to not only provide activity and nutrition documentation, but also on-going communication with the physiciann but also on-going communication with the physician.

This initial data exploration is intended to provide information for the on-going development of a proprietary patient success score which would improve weight loss and the coaches' ability to identify and focus on patients who might need specific intervention to increase outcome success. Thus this exploration forms the basis for an initial feasibility study of the ability to gather and use the data in a meaningful manner.

Data was extracted from a proprietary database and augmented by

Gender	Mean Age	N	Std. Deviation
Female	47.993	138	11.4091
Male	44.188	32	13.4990
Total	47.276	170	11.8816

Table 1: Demographic distribution of participants

Model		Unstandardized Coefficients		Standardized Coefficients	t	Sig.
		B	Std. Error	Beta		
1	(Constant)	-17.856	2.510		-7.113	0.000
	Food Total	-0.139	0.027	-0.375	-5.249	0.000
2	(Constant)	-31.371	4.503		-6.967	0.000
	Food Total	-0.137	0.026	-0.368	-5.326	0.000
	Gender Recode	16.446	4.615	0.246	3.564	0.000
3	(Constant)	-30.151	4.497		-6.705	0.000
	Food Total	-0.163	0.028	-0.439	-5.746	0.000
	Gender Recode	14.862	4.632	0.223	3.208	0.002
	Act Total	0.187	0.090	0.161	2.084	0.039

a.	Dependent Variable: WtLoss
Table 2: Regression analysis results, food entries and gender.

data from the patient electronic medical record. Data was entered into a MS Excel spreadsheet and analyzed using IBM-SPSS v 22 and MedCalc 14.12.0. All data was de-identified prior to analysis.

The age and gender distribution of the study group is shown in Table 1. Three potential patient involvement variables were selected for analysis. As the intent was to determine patient engagement, those variables that demonstrated direct active patient involvement were selected for initial analysis. These variables were: the number of times that a patient entered a food item into the system; the number of time that the patient journaled in the activity category; and the number of messages sent by the patient to their clinician on a given date. Rather than counting the number of times entries were made, counts were made of the number of days of contact. These were then also stratified into the total number of contacts, the average number of contacts made in a two-week period, and the average number of contacts made in a four-week period. Weight loss was determined using data from the electronic medical record rather than data entered directly by the patient to assure consistency. Weight loss was determined by defining the difference between maximum initial weight reported to minimum weight reported. Data covered the period from June 1, 2014 to July 30, 2015.

Multiple regression using a forward stepwise approach was initially applied to the data set. Results of that analysis suggest that the total number of days food entries were made, the patient's gender, and the total number of days activity entries were made were statistically significant predictors of weight loss (Table 2). Note that gender status carries the highest influence.

To investigate an initial determination of the number of food entries that might help distinguish between those who lose significant weight and others, the sample was divided into two groups. The significant weight loss groups were identified as those who demonstrated more than a 1 standard deviation loss from the rest of the group. Based upon these criteria, the initial data suggests that those who entered food activities an average of once every other day were more likely to lose more than 1 SD of weight when compared to the group. This analysis provides a sensitivity of 0.50 and a specificity of 0.94 (Figure 1).
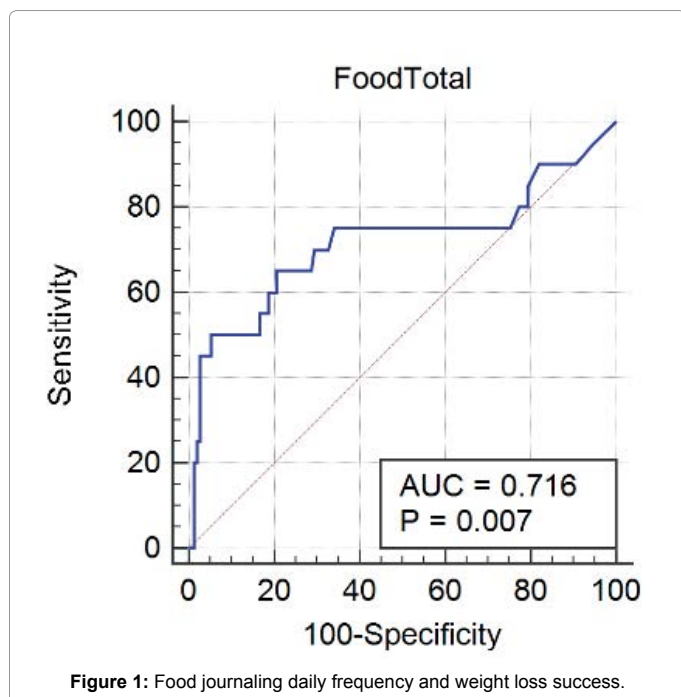
Figure 1: Food journaling daily frequency and weight loss success.

Conclusions

These two studies clearly demonstrate that the EUCO™ system addresses the requirements of successful mobile apps and their supporting activities and also address the guidelines of the National Weight Control Registry. Further, both investigations provide strong evidence that those individuals who actively engage with the software including documentation of nutrition are more successful in their loss of weight and maintenance of that loss. It is clear that these investigations meet the requirement of demonstrating project feasibility and likelihood of demonstrating the effectiveness of the program. What is now needed is a strong randomized control trial to demonstrate the added value of the Euco™ system to weight loss programs to assure patient success.

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