
Getting Clinicians Involved: Testing Smartphone Applications to Promote Behavior Change in Health Care

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Abstract

In this paper, we address the importance of clinician involvement with patient use of Smartphone health applications (apps) to modify behaviors and manage their chronic conditions. Our study has three components: 1) conducting a needs assessment among physicians, behavioral therapists, and patients with chronic conditions; 2) developing a cognitive-behavioral therapy-based app that incorporates behavioral theory and recommendations from best practice; and 3) testing the new app in a clinical setting with controlled experiments. We believe involving clinicians in all phases of the smartphone app development can increase the credibility of the app, induce stronger compliance from the patients, and hold both health professionals and patients accountable for their actions with a supporting mechanism in place.

Author Keywords

Smartphone, applications, apps, behavior change, chronic illness, headache, cognitive behavioral therapy.

ACM Classification Keywords

H.5.m. Information interfaces and presentation (e.g., HCI): Miscellaneous; J.4. Social and behavioral sciences: Psychology.

General Terms

Design, Human Factors.

Introduction

Chronic diseases (e.g. diabetes, asthma, headache) and unhealthy behaviors (e.g. smoking, drinking, overeating, inactivity) have gained attention due to the large prevalence of these conditions or habits and their significant economic burden on health care and society. Research suggests that harm from these diseases and habits could be gradually alleviated through modification of the patient's health behaviors [8]. While encouraging individuals to adopt healthy habits and practices has been a major effort in public health, behavioral change is hard to accomplish based solely on a person's motivation. Supporting mechanisms play a critical role in an individual's success.

We attempt to address the importance of clinician involvement in designing information technologies (smartphone applications in this context) and more engagement with the new technology in their standard care to help patients modify behaviors and manage their chronic conditions in everyday settings. Our study explores how a supporting system can be built where health professionals and patients are held accountable for better outcomes.

Background

Studies of mobile technology supporting health behavior change have been largely limited to the use of a Short Message Service (SMS) as a reminder system [2], and telemonitoring (i.e. telephone-based symptom monitoring, providing treatment information, and keeping the patients in touch with health providers via a telephone communication channel) [5]. Most recently,

an explosion of smartphone health apps has occurred due to relatively recent advances in technology (e.g., the latest iPhones), wide availability and ubiquitous fashion, and easily being tailored to individual uses.

Indeed, the newer Smartphones have remarkable functionality that can be designed to support health-related information management and communication. Among a few things, it allows users to record health data conveniently, receive tailored and more targeted reminders, gain constant access to the internet, and obtain feedback from health professionals. For instance, Quinn et al. [6] developed web-based software to be installed on mobile phones to transmit diabetic patients' data to an Internet server for automatic computation and feedback to the patients; then patients can use the information to guide further treatment or modify behavior to manage their illness.

Currently, there are thousands of Smartphone health applications on the market¹. Surprisingly, however, very few studies have examined how smartphone apps are designed to support behavior change. One exception is a study by Abrams et al. [1], which examined 47 iPhone apps for smoking cessation and concluded that the design of these apps rarely adhere to established guidelines for smoking cessation.

We do not know whether the results from investigating smartphone apps for smoking cessation also hold true to other types of the smartphone apps that address chronic conditions such as diabetes, obesity, sleep disorder, chronic headache that all require significant

¹ iPhone health/medical apps alone number more than four thousand, based on our exploration in July, 2011.

and long-term behavior change. However, most of the documented studies indicate limited success with users adopting to mobile technology and, as a result, boosting only short-term health behavior changes (six weeks or less [3]). How a better designed smartphone app can facilitate and support users' health behavior over the long-term remains unclear. Furthermore, little is known whether health professionals have been involved in the development of health apps, and if so, whether these specially-designed apps make any significant difference from a clinical perspective.

The huge gaps in literature and missing representation of health professionals' involvement in developing mobile technology have inspired our initial exploration of this topic. By searching the iTunes store, we chose 65 iPhone apps to review, which covered a broad range of chronic diseases, unhealthy behavior, and popular wellness topics, including diabetes, headache/migraine, sleep disorder, high blood pressure, heart disease, smoking, and diet and fitness in general.

Our preliminary analysis of these iPhone apps revealed that some apps claimed to have "scientific proof" of functionality and success, but failed to provide study references or links to authoritative sources. This raised credibility issues and we saw a clear separation between standard care (performed by the health professionals) in clinical encounters and information technology effort made by non-clinical personnel with good intentions.

These initial observations led us to explore critical issues concerning stakeholders: 1) what a patient's experience with smartphone apps is like (e.g. issues with searching, selecting, self-perceived usefulness,

usability, motivation), and 2) how health professionals perceive the role of this technology (e.g. clinically measurable outcome, usefulness, compliance with guidelines). Our central concern is that whether a better designed smartphone app (with cognitive-behavioral therapy and guideline embedded) can be adopted in a standard care practice by both clinicians and patients to achieve desired outcomes.

Study Design

Our study will target patients with chronic headache disorder (including migraine, tension-type headache, etc.). Approximately, one out of six Americans has mild to severe chronic headache. The symptoms can be largely alleviated by a healthy life style changes rather than taking controlled substance [7]. Therefore, promoting healthy behavior change is a central concern in addition to prescribing necessary medications to patients in standard care.

The proposed study has three components.

Stage 1: Needs Assessment

We will conduct semi-structured interviews with 20 stakeholders, including neurology physicians and behavioral therapists who treat chronic headache disorder patients, and coach them for their behavior change, and patients who have a certain level of experience with mobile devices to assist their illness management. This is to investigate any issues perceived by the stakeholders (from the perspectives of usefulness and usability) and thus determine important design elements. We also want to explore practical incentive mechanism that will not only motivate patient behavior change but also help them sustain healthy life style. Whether to develop an adjunctive treatment app

(more involvement from physicians and behavioral therapists in the use) and/or stand-alone app (any patients can use it without feedback or involvement of their physicians or behavioral therapists) will be also determined by this investigation.

Stage 2: Development of the Apps

Following results from needs assessment, we will use an iterative process to design and produce a cognitive-behavioral therapy (CBT) based app, to enhance outcomes in a headache population. The application will be designed to help patients recognize and change behaviors/triggers that cause headaches. Coaching techniques will include programs for improving sleep, diet, and exercise schedule and relaxation techniques to reduce stress. Techniques will also be used to help patients manage their pain especially when being withdrawn from over used medication. Our development team will include one licensed behavioral therapist who treats patients, design and usability experts, neurologist specializing in headache, clinical pharmacist specializing in neurology, and software engineer. The product will be repeatedly tested before being used by the patients in controlled experiments.

Stage 3: Controlled Experiments

We will first conduct a pilot study in a group of selected patients with chronic headache, determining the feasibility and initial effectiveness of the app when incorporated into standard care. Based on the results, we may need to refine the product design, and then test in a controlled experiment. Independent variables to evaluate feasibility can be patient use vs. no-use of the app, controlling for clinician involvement in the use vs. no involvement. Other independent variables for efficacy include changes in headache frequency,

headache severity, quality of life, and activities of daily living. Dependent variables will be a heuristic measurement of the situation determined by the treatment outcome. We will recruit neurology physicians, behavioral therapists, and their patients for this controlled experiment.

Significance

Cognitive behavioral therapy (CBT) has been found to be effective for management of headaches [4]. However, CBT is expensive and qualified CBT therapists are not easily accessible. We expect that a CBT-based app and an app that includes clinicians in the product development would improve patient outcomes.

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