Managing Asthma with Mobile Phones: A Feasibility Study

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Abstract

Asthma is a chronic disease and a growing health problem worldwide. The objective of this pilot study was to test the feasibility and utilization of tracking asthma symptoms through an innovative mobile phone application. The subjects for this research project consisted of 4 individuals who are currently receiving treatment for asthma from a primary care physician in Ingham County, Michigan. Participants took their peak flow reading each day and used the short message service (SMS) function on their phone and sent it to a Web server. If they did not send it by 11 AM, they received a reminder via an automated SMS to their phone. The resulting data suggest that this method of management is feasible. The data also demonstrate participants' satisfaction in monitoring their asthma in this manner. Using mobile phones for asthma management could improve compliance with asthma action plans and reduce adverse asthma events. Future research could further demonstrate that mobile phones are a new and effective method for providing healthcare.

Key words: mobile phones, asthma

Introduction

Due to the increasing prevalence of asthma1 and the associated cost of the disease2 this research set out to develop a low-cost monitoring system utilizing mobile phone short message service (SMS, i.e., text messaging) capabilities, which allowed subjects to use their personal mobile phone and network provider (Verizon, Sprint, etc.). The research conducted was a pilot study to demonstrate the feasibility of this technology in asthma management. The application utilized the text-to-email conversion capabilities of the mobile phone companies in the United States. This permitted subjects to keep their personal phones and plans, and did not require use of costly off-the-shelf products.

This pilot study used the following research questions to determine subjects' perceptions of feasibility, usefulness, and utilization of the mobile phone asthma management application.

RQ1: What are the participants' perceptions of utilizing their mobile phone to record their asthma?

RQ2: How did the participants utilize the application?

Methodology

This study used a convenience sample selected by a physician, which included 4 subjects (aged 18–32), with a diagnosis of mild to moderate asthma (not including exercise induced), to participate in a month-long (per each individual) innovative asthma management program.

The subjects were asked to participate in this study by the physician and attended an informational meeting conducted by the researcher. Once they provided consent, subjects were given information on the study, how to use their mobile phone to send in readings, and training in accessing a Web site used for this study that allowed them to view their daily asthma entries in table (Fig. 1) and graphical forms (Fig. 2).

The subjects were already trained on how to use their peak flow meter (PFM) properly from the physician and had an individual asthma action plan. This asthma action plan is provided by the physician and provides the patient information on their asthma and what to do if their reading falls in the yellow or red zone. The application developed for this study used the patients' yellow zone reading as the indicator the individual needs to begin to take action.

Subjects were instructed to begin to send their PFM reading the morning following the training. If at any point a subject did not send in a reading, the server generated a reminder text message at 11 AM (Fig. 3). If the reading sent by the subject was in their green range, they received a confirmation from the system to their mobile phone. If the reading was in the yellow range, they received a confirmation...
Subjects’ text messages to and from the server were collected for data analysis. At the end of the study period, subjects participated in a telephone interview, at which time they answered open-ended questions and a questionnaire developed for this study.

Results
Small sample sizes are common in pilot studies in telemedicine research. Because this research was a pilot study to determine the feasibility of monitoring asthma via a SMS application through use of a single physician’s practice, the sample size was low (n = 4).

Research question 1 investigated subjects’ overall perceptions of the SMS asthma management application, specifically regarding its usefulness, effectiveness, and satisfaction. Subjects agreed the application was useful in monitoring their asthma (M = 4.56). Participants also agreed this method of managing their asthma was effective (M = 4.13). Overall, participants stated they were satisfied with this method of using their mobile phone to manage their asthma peak flow and
symptoms (M = 4.13). The participants also reported that the application was easy to use (M = 4.47). During the open-ended interviews, subjects stated they liked the reminder feature and felt more knowledgeable about their disease.

Research question 2 utilized the data captured by the application’s database. These data include the subjects’ daily readings and whether a reminder was sent. Participants, on average, used the system for 32.5 days. Of those days, participants needed a reminder on average of 12.9%. Participants did not respond on average 6% of the time or approximately 2 days. Subjects reported they were aware of the Web application, but none of the subjects utilized it. This was confirmed by examining the log-in records.

In summary, the pilot study demonstrated the feasibility of monitoring asthma with mobile phones. This research demonstrated that the application was perceived to be a satisfactory, useful, and effective tool in asthma management. Subjects were compliant with monitoring their asthma using their mobile phone; however, they did not use the Web site. The participants also felt they had a better method with which to communicate to the physician regarding their asthma.

LIMITATIONS

Some limitations of this study include the selection of subjects. This research used a convenience sample selected by the study’s referring physician. Another limitation also related to the sample was its size; however, many studies of this nature tend to have a low sample size to demonstrate feasibility. A full study using randomized control groups with a larger sample should be conducted in the future to further demonstrate results and health outcomes. The readings sent in by the subjects were self-reported, which can lead to potential data entry errors. Lastly, the subjects used the application for only a month, thus limiting the amount of health outcome data available and ongoing compliance information.

Conclusions

This pilot study demonstrates that this low-cost SMS mobile phone application is feasible in allowing people to manage their asthma utilizing their personal phone and service provider. This research attempted to lay a foundation of future work highlighting this need for effective and cost-efficient methods of managing chronic diseases. This future work using a larger, randomized control sample could have implications for cost reductions in asthma management, including less time away from work or school, and fewer trips to the emergency department. Also, health outcomes and improved quality of life for asthma patients could also be demonstrated. This type of health delivery platform may prove to be important as more people worldwide have access to mobile phones.

Disclosure Statement

No competing financial interests exist.

REFERENCES


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