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Original Research

Confirming the theoretical structure of expert-developed text messages to improve adherence to anti-hypertensive medications

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Abstract

Background: Text messages can improve medication adherence and outcomes in several conditions. For this study, experts developed text messages addressing determinants of medication adherence: disease beliefs, medication necessity, medication concerns, and forgetfulness, as well as positive reinforcement messages for patients who were adherent.
Objectives: To validate expert-developed text messages to address medication non-adherence with a group of non-researchers.
Methods: A two-wave, card-sorting activity was conducted with students and staff at the University of Michigan. In the first wave, 40 participants grouped 32 messages addressing barriers for medication adherence (disease beliefs, medication necessity, medication concerns, and forgetfulness) according to their perceived relationship. Messages with poor grouping agreement were deleted or modified. In the second wave, positive reinforcement messages were developed and tested along with the previous categories (36 messages) by 37 participants. Similarity and cluster analyses were used to assess agreement between experts and participants.
Results: In the first card-sorting wave, participants grouped messages into between 2 and 13 separate categories. Similarity analysis showed four groupings of messages, however, some had an agreement below 50% and clusters appeared dispersed. In the second wave, and after messages being edited, participants grouped the messages into between 4 and 9 categories. Five groups (now including positive reinforcement

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messages) were identified with higher agreement in the similarity and cluster analyses.
Conclusions: The structure of expert-developed text messages to address medication adherence key barriers was confirmed. Messages will be used in future research to determine their impact on affecting medication adherence to anti-hypertensive medications using a reinforcement learning controlled text messaging service.

Keywords: Adherence; Card-sort technique; Mobile health; Text messaging

Introduction

Self-management of chronic conditions involves complex behaviors, and patients vary in their adherence to these behaviors.[1,2] Studies suggest that 33–50% of patients do not take their medications properly, contributing to nearly 100,000 premature deaths each year and $290 billion in health care costs.[3] Adherence to anti-hypertensive medications is of particular importance, as medication non-adherence is a major cause of uncontrolled hypertension and hypertension is a major cause of stroke, coronary heart disease, heart failure and mortality.[4,5] A one-year study of approximately 5000 hypertensive patients showed that most patients took their medications only intermittently with half of patients eventually discontinuing their medications against medical advice.[6] Improving medication adherence requires addressing multiple challenges because patients typically have a variety of reasons for not taking their medication as prescribed, including beliefs about their disease and its treatment, organizational challenges and cost barriers.[7–9]

Mobile health (mHealth) services such as patient text messaging have been used as a way of enhancing the communication between health care systems and patients.[10] Several studies have shown that mobile text message reminders can increase attendance at health care appointments[11,12] as well as patient adherence to follow-up appointments.[13,14] Text messages also have been used to improve medication adherence for patients with chronic medical conditions[15] such as cardiovascular disease,[16] coronary heart disease,[17] diabetes,[18,19] hypertension,[20] asthma,[21] allergic rhinitis,[12] HIV,[22,23] or schizophrenia.[24] Although some studies have not shown improvements in outcomes associated with text messaging,[25,26] others have found that text messages significantly improved allergic rhinitis symptoms,[12] asthma control,[27] diabetes control,[28,29] or hematologic parameters in children with sickle cell anemia receiving hydroxyurea.[30]

Messages used in text messaging services vary in their goals and targets, ranging from standard reminder messages (e.g., "remember to take your medication"[21]) to more personalized messages like "please decrease your long acting insulin by two units."[31] Some studies combined text messaging services with real time medication monitoring using electronic pill dispensers so that patients received text messages when they actually failed to take their medication.[19] Other tailored approaches to delivering text messages have included asking patients to send their lab value (self-monitored blood glucose levels) to an offsite researcher via the internet and the researchers sent recommendations for medication adjustment using text messages.[32] In a recent study, subjects were asked to complete a short assessment prior to the receipt of messages in order to determine their illness perception and tailoring the messages accordingly.[33] In other cases, messages were created based on theoretical models such as the Health Belief Model,[34] the Self-Determination Theory[34] or the Theory of Planned Behavior.[35] One study found that patients with diabetes preferred to receive text messages about general health compared to messages about necessary diet modification, physical activity and complications of diabetes.[36] Further, in considering the use of text messages, it is critical to recognize that patient informational fatigue may affect message effectiveness as the user becomes increasingly desensitized to the content.[37,38] Thus, devising a mechanism to keep messages variable and tailored is important,[34] and to do that, it is critical that service developers have a clear idea of what types of messages align with the key drivers of patients' adherence behavior.

In the present study, experts developed a library of text messages based on a theoretical framework for two key determinants of medication adherence: patient intention to take their medication as prescribed and patient remembering to take the medication given that they intend to.[39,40] Messages