

Poster

Utilization, Reliability, and Validity of a Smartphone App for Chronic Pain Management: A Randomized Controlled Trial

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Abstract

Background: There has been an explosion of smartphone applications (apps) that have been used to track health data and change the management of chronic diseases. However, there have been very few studies designed to comprehensively examine the usability, acceptability, reliability, utility, and content and face validity of a smartphone pain app.

Objective: The overall aim of this study was to determine the effect of introducing a smartphone pain app, for both Android and iPhone devices, that enables chronic pain patients to assess, monitor, and communicate their status to their providers.

Methods: This study recruited 105 chronic pain patients to use a smartphone pain app. The patients were randomized to either receive 2-way messaging or a standard message on the smartphone app using a stratified randomization table. Those in the experimental group (n=53) received 2-way messaging of weekly supportive text messages and feedback about their progress by the study research assistant (eg, "Hello Dave! It looks like your pain, mood and activity interference this week have improved - way to go!"). Those in the control group (n=52) received a standard reply of "Thank you. Your message has been received" every time the participants sent a message through the app. All subjects completed baseline measures and were asked to record their progress every day for 3 months, with the opportunity to continue for 6 months. All participants were supplied a Fitbit to track daily activity. Summary line graphs were posted to each of the patients' electronic medical records, and physicians were notified of their patients' progress.

Results: Ninety patients successfully downloaded the pain app. Average age of the participants was 47.1 (range 18-72), 63.8% were female, and 32.3% reported multiple pain sites. Adequate validity and reliability was found between the daily assessments and standardized questionnaires ($r=0.50$) and in repeated daily measures ($r=0.69$ pain; $r=0.83$ sleep). Patient satisfaction survey results showed that the app was easy to use and easy to navigate, and those subjects with more daily assessments were found to be more satisfied with the app compared with those who used the app less often ($P<.05$). Those patients assigned to the 2-way messaging condition on average tended to use the app more and submit more daily assessments (95.6 vs 71.6 entries) and found the app more appealing, easier to use and to navigate, and less bothersome than those without the 2-way messaging ($P<.05$), but differences between groups in adherence to the pain app over time were not significant. Seven pain management physicians and six pain fellows completed an anonymous satisfaction survey at the end of the trial. A total of 85.7% reported being satisfied with the way the app was used in the clinic and liked receiving the pain app summary messages. Also, 85.7% believed that using the app would improve their overall practice, while none of the physicians felt that the pain app was an added burden to the clinic.

Conclusions: This study highlights some of the benefits and challenges in utilizing smartphone apps to manage chronic pain patients, and provides insight into those individuals who might benefit from mHealth technology. Overall, the smartphone pain app was found to be usable, valid, reliable, and easily accepted among patients and providers alike. The 2-way messaging feature was also found to moderately improve compliance with daily assessments. Mobile application technologies possess advantages

and possibilities that have not previously existed and future programs are needed that tailor to the needs of the individual to engage and motivate the user to make changes that enhance health care management.

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KEYWORDS

chronic pain; innovative technology; pain app; mHealth; smartphone

This poster was presented at the Connected Health Symposium 2016, October 20-21, Boston, MA, United States. The poster is displayed as an image in [Figure 1](#) and as a PDF in [Multimedia Appendix 1](#).

Figure 1. Poster.

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Objectives
The overall aim of this study was to determine the effect of introducing a smartphone pain app, for both Android and iPhone devices, that enables chronic pain patients to assess, monitor, and communicate their status to their providers (Figs 1 and 2).

Methods
This study recruited 105 chronic pain patients to use a smartphone pain app and half of the subjects (N=52) were randomized to 2-way messaging available through the app. All subjects completed baseline measures and were asked to record their progress every day for 3 months, with the opportunity to continue for 6 months. All participants were supplied a Fitbit to track daily activity. Summary line-graphs were posted to each of the patients' electronic medical records and physicians were notified of their patient's progress.

Results
Ninety patients successfully downloaded the pain app. Average age of the participants was 47.1 (range 18-72), 63.8% were female and 32.3% reported multiple pain sites. Adequate validity and reliability was found between the daily assessments and standardized questionnaires (r=0.50) and in repeated daily measures (r=.69 pain; r=0.83 sleep). Patient satisfaction survey results showed that the app was easy to use, easy to navigate, and those subjects with more daily assessments were found to be more satisfied with the app compared with those who used the app less often (p<0.05; Table 1). Those patients assigned to the 2-way messaging condition on average tended to use the app more and submit more daily assessments (95.6 vs. 71.6 entries), and found the app more appealing, easier to use and to navigate, and less bothersome than those without the 2-way messaging (p<0.05; Table 2), but differences between groups in adherence to the pain app over time were not significant. Satisfaction survey results of 13 physicians revealed that 85.7% were satisfied with the way the app was used in the clinic and they liked receiving the pain app summary messages. Also, 85.7% believed that using the app would improve their overall practice, while none of the physicians felt that the pain app was an added burden to the clinic.

Table 1: Patient post-study satisfaction questionnaire responses for those with 30 or less daily assessments and those with more than 30 daily assessments (N=63)

VARIABLE (0-10)	Total sample (N=63)	≤30 assessments (N=23)	>30 assessments (N=40)	p
How easy to use the program?	1.8±2.2	2.5±2.8	1.5±1.8	NS
How useful were the daily reports?	3.6±3.5	4.3±3.6	3.3±3.4	NS
How appealing was the program to use?	2.9±2.8	4.3±3.3	3.7±2.9	<0.05
How bothersome were the daily prompts?	2.2±2.4	3.7±2.9	1.5±1.7	<0.05
How easy was the app to navigate?	2.5±2.9	2.7±3.3	2.4±2.7	NS
How willing to use the program every day?	2.3±2.8	3.1±3.3	2.0±2.6	NS
How easy to send a report?	1.5±2.6	3.2±3.4	0.9±2.0	<0.05
How responsive was your provider to the reports?	3.7±4.0	3.0±3.9	3.9±4.1	NS
How helpful was the program in coping with your pain?	4.7±3.4	5.0±3.3	4.5±3.5	NS

Table 2: Patient post-study satisfaction questionnaire responses for those with 2-way messaging (experimental) and those without 2-way messaging (controls; N=63)

VARIABLE (0-10)	Total sample (N=63)	Experimental (N=32)	Control (N=31)	p
How easy to use the program?	1.8±2.2	1.2±1.7	2.5±2.5	<0.05
How useful were the daily reports?	3.6±3.5	3.3±3.1	3.9±3.7	NS
How appealing was the program to use?	2.9±2.8	2.4±2.7	3.3±2.8	<0.05
How bothersome were the daily prompts?	2.2±2.4	0.8±1.2	3.4±2.8	<0.001
How easy was the app to navigate?	2.5±2.9	1.5±2.3	3.4±3.1	<0.05
How willing to use the program every day?	2.3±2.8	2.0±2.7	2.7±3.0	NS
How easy to send a report?	1.5±2.6	1.8±3.2	1.2±1.7	NS
How responsive was your provider to the reports?	3.7±4.0	5.3±4.5	2.4±3.1	<0.05
How helpful was the program in coping with your pain?	4.7±3.4	4.5±3.5	4.8±3.4	NS
Mean daily assessments*	69.3±71.8	80.9±88.2	59.2±62.9	NS
Average daily steps for one week - Week 1	5152.8±2743.0	5527.6±3048.9	4894.7±2318.1	NS
Average daily steps for one week - Month 3	5357.4±3064.4	5579.6±2627.4	5093.5±3586.6	NS

Discussion
This study highlights some of the challenges and benefits in utilizing smartphone apps to manage chronic pain patients, and provides insight into those individuals who might benefit from mHealth technology. Overall, the smartphone pain app was found to be usable, valid, reliable, and easily accepted among patients and providers alike. The 2-way messaging feature was also found to moderately improve compliance with daily assessments. Mobile application technologies possess advantages and possibilities that have not previously existed and future studies are needed to address the best ways that mobile technologies might enhance health care management.

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Multimedia Appendix 1

Poster.

[PDF File (Adobe PDF File), 1MB-Multimedia Appendix 1]

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