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Clinical Study

The usefulness of a mobile device-based system for patient-reported outcomes in a spine outpatient clinic

Chi Heon Kim, MD, PhD[a,b,c], Chun Kee Chung, MD, PhD[a,b,c,d,*], Yunhee Choi, PhD[e], HyunJeong Shin, MS[e], Ji Won Woo, RN[b], Sung-Mi Kim, RN[b], Hyuk-Joon Lee, MD, PhD[f]

[a]*Department of Neurosurgery, Seoul National University College of Medicine, 103 Daehak-ro, Jongno-gu, 03080 Seoul, South Korea*
[b]*Department of Neurosurgery, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, 03080 Seoul, South Korea*
[c]*Clinical Research Institute, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, 03080 Seoul, South Korea*
[d]*Department of Brain and Cognitive Sciences, Seoul National University College of Natural Sciences, 1 Gwanak-ro, Gwanak-gu, 08826 Seoul, South Korea*
[e]*Medical Research Collaborating Center, Seoul National University Hospital, 101 Daehak-ro, Jongno-gu, 03080 Seoul, South Korea*
[f]*Department of Surgery and Cancer Research Institute, Seoul National University College of Medicine, 103 Daehak-ro, Jongno-gu, 03080 Seoul, South Korea*

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Abstract

BACKGROUND CONTEXT: Patient-reported outcomes (PROs) are typically collected using a paper form, but this format is cumbersome to incorporate into outpatient clinic visits as well as in research. Therefore, we developed a mobile device-based system (mobile system) for spinal PRO. We hypothesized that this system may improve the quality of care in an outpatient clinic.
PURPOSE: This study aimed to analyze the patient-reported efficacy of a mobile system through a survey of patients' responses compared with a paper system.
STUDY DESIGN/SETTING: A prospective observational study was carried out.
PATIENT SAMPLE: Surveys were conducted for 103 patients who had experience using both the paper and electronic systems in the outpatient clinic.
OUTCOME MEASURES: Patient-reported positive response score (PRS) was the outcome measure.
METHODS: The survey included the characteristics of the patients (sex, age, use of smartphone, familiarity with smartphone applications, proficiency of typing with mobile device, site of pain, and education level) and eight questions in four domains: (1) efficacy in the waiting room, (2) efficacy during the clinic visit, (3) overall satisfaction, and (4) opinion about the use of this system. The response to each question was scored from 1 to 5 (1, negative; 5, positive response). The patient-reported PRS was calculated by adding the scores of the 8 questions and converting the total range to 0–100 (60, neutral).
RESULTS: The mean PRS of the 8 questions was 79.8 (95% CI, 76.7–83.9). The mean PRS was 78.9 (75.6–82.2) at the waiting room and was 80.5 (77.1–83.9) during the clinic. The PRS for overall satisfaction and use of this system were 83.3 (79.6–87.0) and 77.1 (71.9–82.3), respectively. The use of smartphones and the proficiency of typing were independently significant predictors of PRS with an R^2 value of 0.325.

FDA device/drug status: Not applicable.

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The disclosure key can be found on the Table of Contents and at www.TheSpineJournalOnline.com.

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* Corresponding author. Department of Neurosurgery, Seoul National University College of Medicine, 101 Daehak-ro, Jongno-gu, 03080 Seoul, South Korea. Tel.: +82 2 2072 2352; fax: +82 2 744 8459.

E-mail address: chungc@snu.ac.kr (C.K. Chung)

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CONCLUSIONS: The mobile device-based system improved the patient-reported efficacy in spine outpatient clinics. However, various factors such as the use of smartphones need to be considered when developing and applying mobile systems.

Keywords: Computer; Disability; Mobile applications; Mobile telephone; Outcome assessment; Pain; Spine

Introduction

For patients with spinal disorders, various questionnaires have been developed to evaluate patient-reported outcomes (PRO), which are regarded as important for evaluating the efficacy of treatment [1]. Typically, patients answer a questionnaire via a paper form. These paper forms must be printed, distributed to the respondents, completed, and collected [2]. For direct use in clinic settings, the responses should be organized and the scores added to determine the patient's PRO; these tasks are not easily accomplished in outpatient clinics [2]. In research, the responses must be manually entered into a computer database [2]. Moreover, errors such as multiple responses, non-responses, or mistakes in transferring data may lead to an unreliable assessment of outcomes [3]. The above-mentioned limitations of paper-based questionnaires may be obviated by using web-based questionnaires [4]. Web-based questionnaires have become increasingly popular in health research [5]. Additionally, with the development of information technology, the introduction of mobile devices into the medical field is expected [2]. As a pilot study, we developed a program for acquiring answers to the Oswestry disability index/neck disability index (ODI/NDI) questionnaire and visual analogue pain score (VAS) with a tablet personal computer (PC). The results of each questionnaire and the total scores were immediately displayed on the monitor of the clinicians' desktop. The results could be copied and pasted into the electronic medical record. We hypothesized that the mobile device-based system may improve the quality of care in outpatient clinics, and we surveyed the patients' responses to this system.

Materials and methods

This study was prospectively designed. The development of the study, application of the program, and distribution of the prospective survey at the outpatient clinic were approved by the institutional review board (H-1207-088-418) and were registered at clinicaltrials.gov (NCT 02387073). We previously obtained responses to the ODI/NDI questionnaire and VAS of neck/arm/back/leg pain with a paper form (paper system) in the spine outpatient clinic for more than 10 years. Patients were asked to fill out the questionnaire at the waiting room of the outpatient clinic. In October 2013, a tablet PC-based questionnaire system was introduced. The contents of the questionnaires were the same in both the paper- and mobile device-based systems (mobile system). Both systems were available in the outpatient clinic. The contents of the questionnaire included patient information (the characteristics of pain [onset, nature, and relieving or aggravating factors], previous medical or medication history, previous spine operation or procedure history, smoking status and presence of urinary or defecation problem), ODI/NDI, and VAS of neck/arm/back/leg pain. The nurses and nurses' aides were trained in the use of the mobile system for 1 month, and the mobile system was recommended for most patients thereafter. From November 2013 to December 2013, surveys were conducted for patients who had experience using the paper system during May 2013 through September 2013 (within 6 months of the survey). The surveys were requested for 103 consecutive patients after meeting with doctors on the condition of anonymity, and surveys were conducted by a research nurse who did not participate in the treatment of the patients and was not previously aware of the patient information collected by the survey. The survey started with questions about the characteristics of the patients (sex, age, the use of smartphones, the familiarity with smartphone applications, the proficiency of typing with mobile devices [smartphone, tablet PC], the site of the pain, and the level of education). Then, to evaluate patient-reported efficacy, the questionnaire with eight questions in four domains was developed: (1) efficacy in the waiting room compared with the paper system (waiting time, representation of the patient's condition, input time), (2) efficacy during the clinic compared with the paper system (doctor's understanding of the patient's condition, sufficient counseling, time to understand), (3) overall satisfaction, and (4) opinion about the widespread use of this system (Table 1). Time factors (waiting time, input time, and time to understand) were not objectively measured, but subjective feeling was assessed through the survey.

Use of mobile devices

The nurses and nurses' aides were trained in the use of the mobile system for 1 month. In the waiting room of the outpatient clinic, the operating instructions for the mobile device were briefly explained by the nurses or nurses' aide to the patients. The paper-based system was also available for patients who had never used the mobile device. The tablet PC was fixed to the questionnaire program, and switching to another application or Internet access was not allowed without unlocking by the administrator. The waiting lists of patients were displayed on a screen on the wall and the tablet PCs were distributed to the first five patients. To start the mobile system, a hospital identification number was entered with a bar code scanner or touch keyboard (Fig. 1). The barcode was printed on the hospital identification card or the receipt. Then,