Development of Mobile App for Self-Management Performance of Patients with CHB

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Abstract. This study aimed to develop a mobile application (app), for the self-management performance of patients with chronic hepatitis B (CHB). The mobile app was developed in five stages by analysis, design, development, implementation, and evaluation. And 19 systems were modified. Mobile app for self-management performance of patients with CHB was developed. Developed a mobile app is expected to be helpful in managing self-management can be a disease-related knowledge and promote self-efficacy in CHB.

Keywords: Hepatitis B, Self-Management, Mobile, Application, Development

1 Introduction

About 70% of primary hepatocellular carcinoma is caused by CHB [1], and about 20-30% of CHB patients die due to the progression of CHB to chronic liver diseases such as hepatic cirrhosis and hepatocellular carcinoma [2]. Therefore, CHB patients should prevent progression to severe liver diseases by actively performing self-management such as regular hospital checkups and the management of daily living from the beginning of the disease throughout the lifetime [3].

The factors that influence self-management performance of the hepatitis B patients are the knowledge on the disease and self-efficacy. Previous research has shown that the more knowledgeable about the disease, the more self-management was performed [4, 5], and also the higher the self-efficacy, the more self-management was performed [6]. Therefore, to improve the self-management performance of CHB patients, a strategy that can improve disease-related knowledge and self-efficacy is needed.

Recently, health-related mobile apps are being developed and used to help with self-management in various diseases [7].

On the other hand, there were 23 mobile apps related to viral hepatitis, one of the representative chronic diseases, worldwide, and among those apps, 20 were hepatitis B related. Due to the low ratings of the developed apps, however, most of their usage...
is low [8]. Especially, there are hardly any apps developed for CHB in South Korea. Accordingly, the present study attempted to develop a mobile app so that CHB patients can perform self-management by improving their knowledge and self-efficacy on the disease.

2 Methods

2.1 Study Design

The study is a methodological research for developing a mobile app for performing self-management of chronic hepatitis patients.

2.2 Development Process

The mobile app of the present study was developed by using both ADDIE instructional design model [9] and Driscoll and Alexander model [10]. Therefore, it is composed of five stages of analysis, design, development, implementation, and evaluation. And the model was constructed with five developmental stages so that at each stage, stages can be checked and modified if necessary.

The analysis stage analyzes the requirements of the mobile app of CHB patient, and it is the process that searches and analyzes other apps and evidence-based literature for contents organization of the app.

The design stage is the process of designing functional requirements and user-interface screens that are needed for app development. At the development stage, a database and the actual app were developed.

The development of the mobile app was carried out from December 20, 2014 to March 19, 2015.

The implementation stage is that actually trying out the developed mobile app for performing self-management of the CHB patients. The developed master version was distributed to four app development specialists and five CHB patients, and asked them to try out the app for a certain period.

At the evaluation stage, the usability was evaluated after the master version of the mobile app was used by specialists and CHB patients. After the usability evaluation, the results were reflected in the modification of the mobile app to complete the final version.
3 Results

3.1 Analysis

The average age of participants for analysis of mobile app needs was 46.2 years. The functions needed when the app is developed include ‘disease-related knowledge delivery’ (27.1%), ‘medication calendar’ (16.8%), ‘references to information’ (15.5%), ‘record test results’ (14.6%). On the question of intent to use the app once it is developed, participants responded ‘will actively use it’ (59.9%) and ‘will use when needed’ (33.2%).

Apps related to hepatitis B were searched in Google Play Store and Apple App Store in October, 2014. A total of 12 apps related to hepatitis B were found among the apps searched with the keywords “hepatitis B”, “HBV”, and “hepatitis”. Twelve apps were in English. The detailed areas of disease related knowledge of CHB were classified by referring to domestic and foreign literature [2, 3] into nine areas, which include anatomical structure and function of the liver, overview and causes, pathophysiology, symptoms, infection route, diagnosis, treatment, daily living, dietary habits, and vaccination.

3.2 Design

Detailed items to be organized to accomplish improvements in self-management performance, which was the ultimate goal of the present study, were organized into regular checkup, medication, diet, drinking, exercise, weight, and view results, focusing on lifestyle habits and eating habits.

The system interface to implement the app was as follows. Once the app is downloaded using the user’s mobile and sign up, the phone is registered in the company server. In addition, the sign up ID is saved in the CHB app server. Based on the design above, screens were designed by visualization using Microsoft power point 2013.

3.3 Development

3.3.1 Database

The development of the app was based on the Android Operating System (OS). MYSQL, which is an open-source relational database management system using the SQL (Structured Query Language) included in the Android was used in designing the database. The relationship between functional unit table within the database and the table was represented by ER diagram.
3.3.2 User-Interface Screen

The developed mobile app was named as ‘Hepatitis B self-management’. Some of the user-interface screens are shown in Figure 1.

![User-Interface Screens](image)

Fig. 1. Screen on smartphone app: (a) main screen (b) self-management screen (c) disease knowledge (d) lab data screen (e) statistics screen

3.4 Implementation

The trial results of the developed app by nine evaluators from March 20 to 29, 2015 are presented in the evaluation section.

3.5 Evaluation

3.5.1 Evaluation by specialists

The results of the heuristics evaluations are separately arranged into the total number of modification suggestions by each evaluator for each heuristic item was 55. Accordingly, 16 modification suggestions that scored three or four points by 1 or more evaluators were selected for system modification and the modification was carried out.

3.5.2 Evaluation by participants

The results of evaluations carried out by participants using the MARS are Engagement, Functionality, Aesthetics, Information, and Subjective quality, that total 23 questions. 14 items received 3.0 or higher and six items received 4.0 or higher
evaluation scores. An examination of evaluation scores of the five sub-scales revealed that the Engagement area scored the lowest points of 14.41 (57.6%).

4 Conclusions

In the study, the development of the mobile app went through analysis, design, development, implementation, and evaluation stages, and a systematic development process was followed, and it was attempted to increase the system completeness by finding out problems through a usability evaluation. Therefore, since the acquisition of knowledge on the disease and improvement of self-efficacy are readily achievable regardless of time and place when the mobile app developed in the present study is used by CHB patients, it is expected to be helpful in performing self-management.

References

2. Korean Association for the Study of the Liver: Chronic Hepatitis B Treatment Guidelines (2011)