Development and Evaluation of a Self-care Application Based on Herbal Medicine for Skin and Hair Diseases

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Abstract

Background: Self-care applications are effective in the control and treatment of disease symptoms. Today, the mobile phone is used as one of the tools that can help us in this regard. The present study attempts to develop and evaluate a functional self-care mobile-phone application for patients with skin and hair problems using treatment protocols of herbal medicine.

Materials and Methods: This study is a descriptive-applied type. At first, a questionnaire was prepared for data need assessment and also to determine the data items and required capabilities of the application. Based on the results, an application was designed using the Java programing language in the Android software environment. In the next step, the application was installed on the mobile phones of several specialists and patients, and the necessary corrections were made. Then, the final version of the application was evaluated.

Results: The most critical data elements of the mobile application for skin and hair patients included the application's functionality, temperament survey, and clinical information. After considering users' feedback, the screen functionality, the application's information and idiom, and overall functionality of the application were evaluated and approved by the users.

Conclusion: By and large, the developed application could help the patients to receive the best and high-priority treatment protocols based on their own temperament.

Keywords: E-health, herbal medicine, mobile health, telemedicine, traditional medicine

INTRODUCTION

Nowadays, many people visit health clinics to find a cure for their skin problems. The increasing trend of these visits indicates the growth of such diseases and people's higher regard for beauty compared to the past.[1] The majority of these patients have some problems with their appearance, which will result in mental tension and sometimes social abandonment due to their improper appearance.[2] People's awareness of the risks of chemical medications and the lower cost of herbal medicine are reasons for the prosperity of traditional medicine in various countries.[3,4] By herbal medicine, we mean the products that have been extracted from plants, spices, roots, stems, and other materials with a vegetal origin.[5] Herbal treatments are often considered alternative or safe treatments. They are even considered the only effective treatment for skin and hair problems. Additionally, people with hair and skin disease are showing a genuine interest in herbal medicine these days.[6] Such beliefs and attitudes toward herbal medicine are one of

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the primary motivations for the prosperity of traditional and herbal medicine.[7]

Information and communication technology have created new communication horizons through more straightforward and cost-effective accessibility of patients to healthcare services. Wireless and mobile networks, which are available at any time and place with minimal cost, have affected healthcare models to a large extent.[8,9] Mobile health is broadly defined as health care for anyone, anytime, and anywhere, with the removal of spatial and temporal constraints along with increased coverage and quality of health care.[10] Healthcare applications are still in their infancy; however, it has been shown that they can easily and quickly refer clinical data and information available to clinicians for analysis and response.[11] Studies illustrate the fact that about 19.2% of adults worldwide have used smartphone applications to search for health-related and medical information.[12,13]

Many applications or systems have been developed for self-care and diagnosis in the area of traditional medicine, but they have not been developed locally. Kim *et al.*[14] conducted a study entitled "A system for patient's self-health assessment based on Korean traditional medicine." The system requires training and categorization of the chronic disease database, which includes 60 diseases and 161 symptoms. Accordingly, this database and the diagnostic tests of the system as mentioned earlier have been evaluated and reviewed by Korean traditional medicine physicians. In another study, Yuan SLK *et al.* introduced a mobile application for patients with fibromyalgia self-care improvement based on an alternative medicine approach. The main objective of this project was to develop a mobile application for the improvement of self-care as the complementary electronic health for physical treatment and management of patients with fibromyalgia. This application was developed based on the analysis of the requirements and essential contents of the software.[15] Plachkinova *et al.*[16] developed a mobile application to use complementary and alternative medications. This mobile application provided a platform in which Complementary and Alternative Medicine (CAM) specialists could communicate together, exchange ideas, and share their experiences through their mobile phones. This mobile application was developed based on different users' requirements. It is evident that mobile applications in the healthcare section provide patients with better-personalized healthcare, disease management, and medical services.

The functional programs that are based on mobile applications have the potential to improve disease management and promote patients' health.[8,16] Considering the high number of people who are prone to skin problems and also considering the higher regard for beauty among the new generation as well as their suspicious attitude toward chemical medicines, mobile applications can help people with skin and hair problems to a great extent.

The present study aimed to design and evaluate a mobile application to familiarize herbal-oriented treatments to patients with hair and skin problems and promote their self-care. The following sections of this paper cover the study method, results (including mobile application development), data analysis, discussion, and conclusion.

MATERIALS AND METHODS

Identifying information requirements

This developmental and applied study was conducted at Tehran University of Medical Sciences to design and evaluate a smartphone-based self-care application for skin and hair problems using treatment protocols of herbal medicine. Initially, based on library review, a questionnaire was prepared to assess the information needs and determine the data items and capabilities required in the application. This questionnaire had four components. The first part included the characteristics of the person participating in the study, and the other three parts included the capabilities of the application, psychology, and clinical information of 19 diseases that traditional medicine physicians completed. The Content Validity Index (CVI) and Content Validity Ratio (CVR) were utilized to calculate qualitative content validity. Ten experts and professors of traditional medicine, as panel members, completed questionnaires (291 questions). Finally, the internal consistency was measured using Cronbach's alpha (α); α equal to 0.9 represents excellent internal consistency. The obtained data were analyzed using descriptive statistics and frequency distribution reports of SPSS software ver 22. Questionnaire items and detailed information related to the stage of extracting the required minimum dataset are provided in the first published paper of the authors.[13]

Designing the self-care application

According to the analysis of questionnaire results, the required information elements were identified, and the functional content of the application was prepared according to the notes of clinical consultants. Then, the Java programing language was used to develop the application for Android smartphones. Also, the SQLite database (version 3) was used to store and recover the data effectively. After designing a preliminary version of the application, it was given to six traditional medicine specialists to be used by them, and the necessary modifications were made.

Usability evaluation of the self-care application

Finally, the developed application was evaluated by a descriptive-analytical study. The standard User Interaction Satisfaction (QUIS) questionnaire was used to evaluate the usability of the application. The developed application was then given to 14 patients and 11 traditional medicine specialists. The survey questionnaire was designed based on a 9-option Likert scale and had 30 items. The first part of the questionnaire had three questions about the respondent's demographic information. The second section had six functional questions about the system's general usability, and the third section included four questions about the screen options. Also, the fourth section included six questions about vocabulary and idioms. The fifth section included some questions about the system's educational value for the users, and finally, the

sixth section included five questions about the application functions and capabilities. The minimum and the maximum scores for the questions ranged from 0 to 9. The scores were categorized into three distinct classes for data analysis; scores of 0–3 indicated a weak level, scores of 3–6 referred to a moderate level, and scores of 6–9 indicated a good level. The questionnaire's reliability and validity had been measured in previous studies ($\alpha = 0.76$).

The process of the methodology is depicted in Figure 1.

RESULTS

As mentioned previously, traditional medicine specialists were asked to note the extracted data elements necessary for developing the application. All participants who took part in the study were female, and all of them were traditional medicine specialists. Thirty participants took part in the study for the information needed for assessment. To determine the functional elements of the application, another questionnaire was given to 20 traditional medicine specialists who mostly had an average work experience of 5–10 years.

The required data elements

Among all data elements surveyed, the most critical data elements and sections required for the design of the

Figure 1: Process of our methodology design

application concerning peripheral skin and hair diseases with herbal medicine approach included (1) functionality of the application, (2) temperament survey, and (3) clinical information, which all were accepted for scores above 70%. Some of these elements are discussed as follows:

Functionality of the application

Figure 2 depicts the frequency distribution of specialists' responses regarding the necessity of data elements in the section of the application's functionality. The application functions comprised data elements such as temperament survey, information about traditional medicine centers, memos, reminders, and clinical information.

Temperament survey

The temperament survey section included some questions to determine the type of patient's temperament. According to traditional medicine specialists, a temperament survey plays a significant role in determining the treatment approach. Accordingly, to design the desired functional application, we selected items with a score higher than 70%. Table 1 illustrates the frequency distribution of specialists' responses regarding the necessity of determining the data elements needed in the temperament survey section.

Clinical information

In the clinical information section of the application, the data elements related to symptoms, causes of the disease, and specific treatment for each of the skin/hair problems based on the specialists' opinion have been outlined (including excessive weight loss, gray hair, split ends, spot baldness, dandruff, melisma, acne, etc.). Table 2 provides the frequency distribution of specialists' responses concerning the necessity of determining required data elements in the clinical information section. The details about the minimum data set are presented in our previous study.[16]

The application design

After specifying the necessary dataset (extraction of functional requirements and specification), the researchers attempted to design a preliminary application version. The self-care application was designed based on the SQLite database (version 3) for Android smartphones. Then, the final version of the application was implemented after designing a version and applying the necessary modifications.
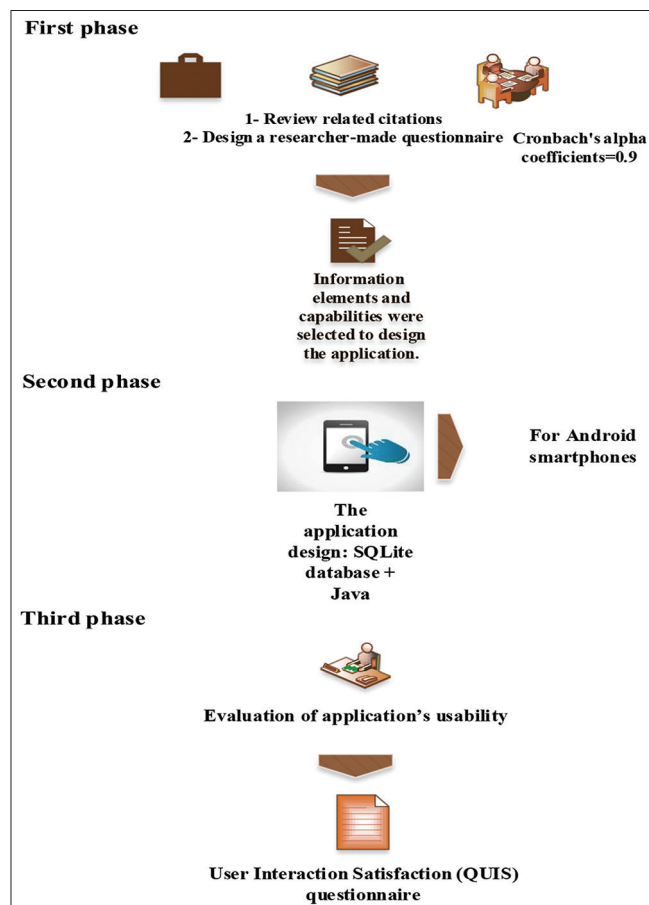
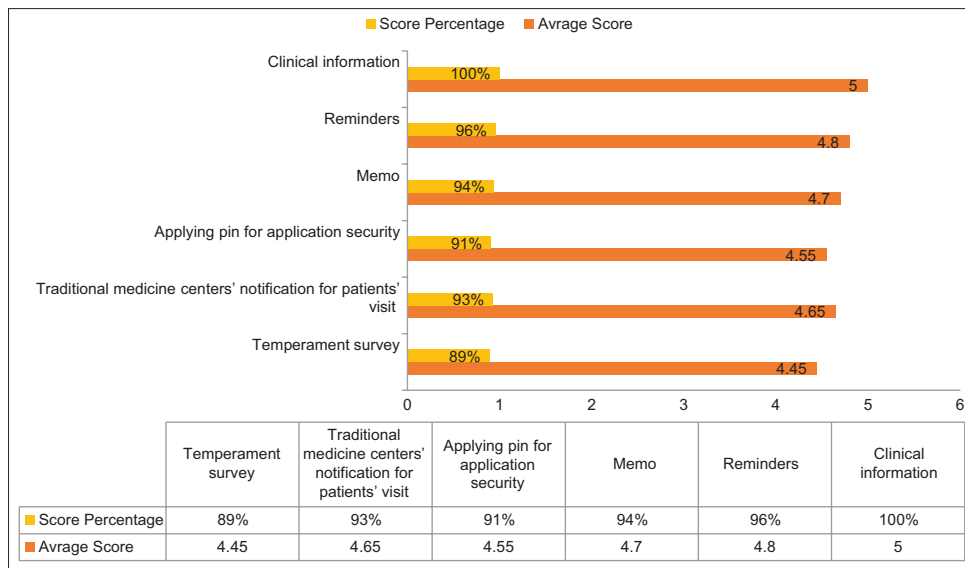| Table 1: Absolute frequency of some required data elements for temperament survey section (in brief)		
Data elements	**Average score**	**Percentage score**
What do other people say when they touch your hand? Is it hot or cold?	5	100%
How big is your palm?	5	100%
How fast are you affected by your surroundings?	5	100%
How do you pronounce several consecutive sentences while speaking?	5	100%
How fast do you get angry?	5	100%

Figure 2: Absolute frequency of the required data elements of the developed application

Table 2: The absolute frequency of some required data elements for clinical information section (in brief)

Data elements	Hair loss data elements	Average score	Score percentage
Symptoms	Loss of hair volume and excessive hair loss, in a way that the person feels his/her hair volume is reduced	4.85	97%
	Baldness in the upper part of the forehead which is more frequent in men than in women	5	100%
Causes	Excessive weight loss	4.25	85%
	Malnutrition or low nutrition	4.85	97%
	Temperament disorders such as cold, wet, and dry temperaments	4.45	89%
Treatment	Violet oil	5	100%

User's login: The users can log in to the application after signing up. The application login is shown in Figure 3. The designed application is in Persian because all its users are Persian speakers.

Application's home page: After selecting an item available in the home-page list, the relevant page is displayed for the user. Users may encounter different parts on the home page, such as temperament survey, disease, causes, and appropriate treatment. By clicking on the temperament survey section, a relevant test, which has been derived from the specialist's temperament test, will be shown. Then, the patient would be able to understand his/her temperament type by answering ten questions. The screenshot of the temperament test page is displayed in Figure 4.

Evaluation of application's usability

At first, after designing the primary version, the application was given to six specialists and five patients to be used by them and point out their suggestions and comments. After applying the suggestions and modifications, the application

had to be assessed in terms of users' satisfaction to find its strengths and weaknesses. The intended users of this application must have a smartphone with version 2.0 or higher Android, and also, they must have enough training and experience in the use of smartphone applications. The participants who all had the necessary skills in using smartphones were asked to test and rate the application by completing a questionnaire.

As discussed previously, the questionnaire designed for self-care application consisted of three distinct sections. The general results for some of these sections are illustrated in Figure 5. In the first section, the researchers evaluated the application's usability. Considering that the average score of related items was 8.40, we can conclude that the participants positively evaluated the application. The second section of the questionnaire evaluated the application's screen capabilities. According to the average score for related items (8.98), we concluded that the participants evaluated the application positively. The remaining part of the evaluation illustrated the frequency distribution of participants for evaluating the application's idiom and information. The average score for this section was 8.12; therefore, the participants were satisfied with the application's terminology and idiom. Also, the average score for evaluation of the learning capability of the designed application was 8.98, so we concluded that the participants had a positive view of the learning capability of the application. Finally, the general capabilities of our application were evaluated, and the average score of related items was 8.94, so we concluded that the participants had a favorable view of this item.

DISCUSSION

The present study attempted to investigate the development of a mobile phone application for skin/hair patients with herbal medicine approach. This study aimed to improve
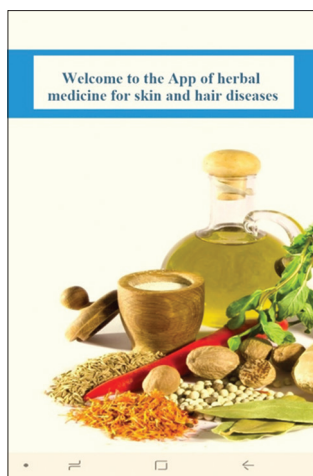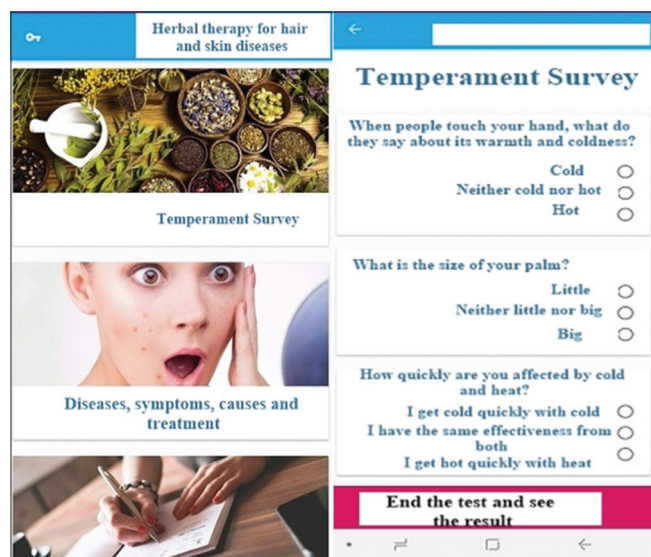
Figure 3: The first page of the application

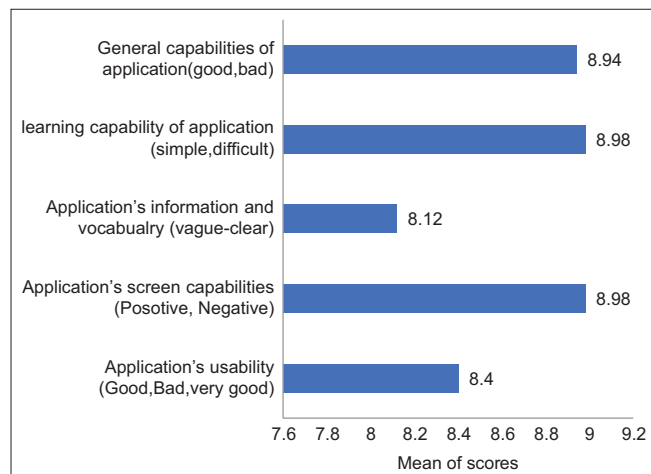**Figure 4:** Temperament survey section

Figure 5: The results of application evaluation questionnaire data analysis

patients' health and reduce unnecessary medical visits, relevant costs, and the side effects of chemical medications.

Therefore, the main purpose of this study was to create a self-care mobile phone application for skin/hair patients that can be accessible to users through the Android platform. This application can provide patients with helpful information on the most frequent symptoms and causes of skin/hair diseases based on the herbal medicine approach to improve their health status. Thus, this application can be considered a role model for developing systems such as software and applications for medication management and healthcare that aim to control diseases, improve well-being, and lower the side effects of chemical medications.

Bjering, in a study, attempted to create an electronic medical record system that provides patients with consultations on Chinese and complementary medicine. The main purpose of this study was to develop a consultation system for Chinese and traditional medicine specialists, which is capable of responding to their needs for signing in, data storage, data recovery, display, and support. This system was designed to manage the medical services provided to patients and included sections for storing patients' consultation data, patient doctor's background management, and decision support while being connected to a source of traditional medicine information. The system was capable of notifying the physician in case of medication contraindications and interaction with other drugs, which will increase patient safety.[17]

Concerning this study, we can say that it will result in higher decision-making efficiency, increased patient safety, and reduced medical errors. This system is only a tool for storing and retrieving patients' information, which the medical practitioners have used to optimize medical services. On the contrary, the primary purpose of the present study was to develop an application for receiving herbal medicine consultations in a particular field (i.e., skin and hair). In other words, the main objective of our application is to provide consultations and promote self-care and self-management of patients (not physicians).

In another study, Spanakis aimed at providing an electronic system for managing medication interactions in complementary medicine. The main purpose of this study was to develop a web-based application for electronic health, which provides all pharmaceutical contraindications and interactions, pharmaceutical self-management, and medical warnings in the area of alternative and complementary medicine. Herbal medicines are introduced to users by this application. This study also attempts to develop a mobile-based application for Android and iOS platforms.[18] Therefore, the development of a mobile-based system for compatible operating systems was the purpose of the aforementioned study, which is consistent with the purpose of our study, which was to develop a mobile phone application to increase the use of herbal medicine to treat some skin and hair conditions.

Plachkinova developed a comprehensive mobile-based system for alternative and complementary medicine. The main

function of this application was to provide a platform for sharing and providing medical consultations on Chinese and complementary medicine. In other words, this application was an effective way to improve the communication and interaction between those involved in traditional medicine.[16] This study also had an evaluation phase which was implemented through a researcher-made questionnaire, and the researchers tested all quality specifications of the developed application. Therefore, all steps involved in this study are somehow compatible with our study. The main purpose of the study, as mentioned earlier, was to improve the communication between the specialists in traditional medicine. Our study's main purpose is to develop a patient-centered application by which hair/skin patients can receive medical services and information on herbal medicine. In other words, our application allows patients to receive the best and high-priority treatment protocols based on their temperament to read about the symptoms and causes of related diseases and get familiar with them.[3,19]

Moreover, the use of mobile phone application will increase the knowledge of patients and also provides a system of knowledge management for healthcare organizations.[20,21]

The main limitations in application design include minimizing the displayed information, finding a way to provide all organized features, creating a visual interface with pleasant colors, minimizing the number of displayed pages, and displaying different parts for users in the shortest time. Despite numerous capabilities of the developed application in the present study, it also had other limitations. For instance, this application is developed for Android systems, and the findings of this study are limited to such systems only. In addition, the time available for the users to test the demo version was limited, and the users did not have enough time to experience all functions of the application.

CONCLUSION

The application of smartphone technology in health services can have a growing trend in the field of self-care and time management and reduce unnecessary referrals of skin and hair diseases. Also, mobile technology can be a helpful and effective tool for patients to educate and control the disease. The outcome of this research was the creation of a self-care application for skin and hair patients, which was made available to users as an Android-based application. By implementing a self-care program, patients can become familiar with the causes, symptoms, and treatment of the most common skin and hair diseases with an herbal treatment approach and use them to improve their awareness.

DECLARATIONS

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Ethics approval

Not applicable.

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Conflicts of interest

There are no conflicts of interest.

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