Design and Development a Mobile-Based Self-Care Application for Patient with Depression and Anxiety Disorders: An applied and developmental study

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Abstract

Background and Aim

Depression and anxiety can cause social, behavioral, occupational and functional impairments if not controlled and managed. Mobile-based self-care applications can be used as an important and effective factor in controlling and reducing the effects of anxiety disorders and depression. The aim of this study was to design and development a mobile-based self-care application for patient with depression and anxiety disorders.

Materials and methods

In this applied - developmental study we designed a mobile-based application for self -management of depression and anxiety disorders. In order to design this application, first the education- informational needs and capabilities were identified through a systematic review. Then, according to 20 patients with depression and anxiety, this education-informational needs and application capabilities were approved. In the next step, the application was designed.

Results

Of 80 education- informational needs and capabilities, 69 needs and capabilities with a mean greater than and equal to 3.75 (75%) were considered in application design. Disease control and management, drug management, nutrition and diet management, recording clinical records, communicating with physicians and other patients, reminding appointments, how to improve lifestyle, quitting smoking and reducing alcohol consumption, educational content, sedation instructions, introducing health care centers for depression and anxiety treatment and recording activities, personal goals and habits in a diary were the most important features of this application.

Conclusion

The designed application can improve self-care among people with depressive and stress disorders and help patients to access the information they need without search the Internet.

Background

Depressive and anxiety disorders are one of the important causes of disability in worldwide [1] and occur in up to 25% of general practice patients [2]. Normally, these disorders may not be as "brain disorders," but they do interfere with normal cognitive, emotional, and self-reflective functions [3]. In other words, depression and anxiety due to their nature always cause social, occupational and functional harm [4]. Studies have shown that if depression and anxiety are not treated, controlled and / or managed, they can

lead to poor quality of life [5], increased risk of suicide [6, 7], job loss due to frequent absences [8], and premature mortality, persistent fatigue, sad and angry mood, decreased self-esteem and ability to perform daily activities, and increased risk of hospitalization [9]. On the other hand, due to stigma associated with depressive and anxiety disorders, people are often reluctant to consultation and medication, so they may not be able to access effective psychological therapies [10]. One of the most effective ways to treat, control and / or manage these two disorders is self-care. Self-care as an independent factor can reduce the risk of disease complications [11].

Self-care processes help patients to control emotions, adhere to treatment, understand the treatment rationale, improve quality of life, reduce stress and anxiety, feel more secure, and increase life satisfaction. Also, these processes will ultimately maintain physical and mental health, reduce mortality, reduce health care costs, increase patient satisfaction and improve patients' quality of life [12]. Mobile - based applications can be used as a platform for self-care services [13, 14]. Mobile applications have become an all-encompassing tool for helping people to manage and control anxiety and depression symptoms [15], provide quick and easy access to health information, and improve interaction with therapists [16]. In other words, applications can help people manage their health, promote a healthy life, and have available correct information when and where they need. Hopeful findings have been reported on the effectiveness of mobile-based applications for depression and anxiety [17]. Lattie et al. [18] investigate the role of digital health interventions in improving depression and anxiety among students and concluded that applications are effective as computer, web, and virtual reality-based interventions in improving depression and anxiety. Almodovar et al.[19] also showed that mobile applications can increase self-confidence in coping skills and improve depressive and anxiety disorders. Therefore, considering the positive effect of mobile applications in the treatment, control and / or management of depressive and anxiety disorders, the aim of the present study was to design and development a mobile-based self-care application for patient with depression and anxiety disorders. This application can manage side effects, improve lifestyle, self-assessment, increase awareness and increase self-care in patients with depression and anxiety.

Method

The present study is a developmental-applied study that was conducted in the following three steps.

Step 1: Identify the capabilities and education- information needs of patients to design the application

In the first step, patients' information-educational needs and application capabilities were identified by literature review on January 1, 2022, from PubMed, Web of Science and Scopus databases. For this purpose, the following search strategy was used.

(Depression OR Anxiety) AND (Mobile-Based Self-Care Application OR Mobile-Based Self-Management Application)

Inclusion criteria included publishing the article in English, access to the full text, and reference to the required information-educational needs and capabilities to design the application. Exclusion criteria also included do not provide clear information about anxiety and depression disorders self-care by applications. The book and chapters of the book, the letter to the editor and the abstract of the conferences were excluded from the study.

Related articles were retrieved from the three introduced databases and entered into Endnote software. Thirty four articles were extracted from three databases: PubMed, Web of Science and Scopus. Fifteen studies from PubMed, 18 studies from Scopus and one study from Web of Science were retrieved. Four duplicate articles were excluded from the study. Then, 30 remaining sources were carefully examined and compared with inclusion and exclusion criteria. Then, the titles, abstracts and keywords of all articles were studied. Finally, 8 articles were included in the study [20–27]. The full text of these articles were studied, and finally the necessary data elements for designing and developing applications were extracted. At this stage, data collection was done by data extraction form. The validity of this form was confirmed according to the opinion of two medical informatics and two psychiatric specialists.

Step 2: Confirm the capabilities and education-informational needs to design the application

The data collection tool at this stage was a questionnaire. This questionnaire designed using the education informational needs and capabilities to design the application identified in the previous step. The questionnaire consisted of six parts: the first part: demographic information (4 questions). The second part: education-informational needs and capabilities in six parts: user profile (8 questions), clinical history (9 questions), lifestyle (14 questions), disease management and control (28 questions), sedation instructions (10 questions), and application capabilities (16 questions). Also, for each part of the questionnaire, an open-ended question was mentioned under the heading "Other cases". The validity of the questionnaire was confirmed according to the opinion of two medical informatics and two psychiatric specialists. Based on relevant suggestions, some synonymous and unrelated data elements were removed. Also, the reliability of the questionnaire was evaluated by Cronbach's alpha and was confirmed with a value of 0.902. Sampling was not performed at this stage and all patients with depression and anxiety (40 patients) referred to Hamzeh Medical Center affiliated to Fasa University of Medical Sciences (Fasa city, Iran) were included in the study. In order to participate, an invitation was sent to all of these patients. Thirty people accepted the invitation and finally 20 people entered the study according to the inclusion criteria. Inclusion criteria were:

- At least 18 years old
- Having a smart mobile phone literacy
- Declare informed consent to participate in the study
- Do not suffer from cognitive and mental disorders

The questionnaire was designed electronically and its link was sent to patients on January 12, 2022. All questionnaires were completed on January 20 and the results obtained from the questioner were analyzed by SPSS 23.0. The answers "very low", "low", "medium", "high" and "very high" with scores from 1 to 5 was given. Also, descriptive statistics (frequency, mean, and standard deviation (SD) were used. In accordance with the opinion of the research team and several psychiatrists, information-educational needs and application capabilities with a mean greater than and equal to 3.75 (75%) were considered to design and development the application [13].

Step 3: Design and development a prototype of the mobile-based application

At this stage, based on the education-informational needs and capabilities approved in the previous stage, the prototype was designed with Java programming language in Android Studio programming environment.

Ethical considerations

The code of ethics with the number IR.KMU.REC.1399.025 was obtained from the ethics committee of Kerman University of Medical Sciences. Patients' informed consent was obtained before participating in the study. The participation of physicians and patients in the study was also completely voluntary and it was possible for them to leave the study at any time.

Results

Stage one: Identify the education- informational needs and capabilities to design the application

Education- informational needs and capabilities were extracted from 8 articles [20–27] (Table 2). Table 1 shows the demographic information of patient's participant in stage two of the study. The majority of participants (60%) were female. Most age groups were 31–40 years old. Also, the majority of participants (80%) were suffering from anxiety and stress.

Table 1
Participants Demographic Information

Variable	Variable types	Frequency (Percent)
Gender	Men	8(40)
	Women	12(60)
Age	31 – 30	8(40)
	31–40	10(50)
	>=41	2(10)
Education level	Diploma	6(30)
	Bachelor	7(35)
	Master	6(30)
	PhD	1(5)
Disorders type	Depression	2(10)
	Anxiety	2(10)
	Depression and Anxiety	16(80)

Findings related to education-informational needs and capabilities required for application design included six categories include: user profiles, clinical records, lifestyle, disease management and control, relaxation instructions, and application capabilities (Table 2). The importance of each of these education-informational needs and capabilities is presented in Table 2. Of 80 education-informational needs and capabilities, 69 education-informational needs and capabilities with a larger mean and equal to 3.75 (75%) were considered for application design.

In the user profile, national code, age, weight, education, address and contact number with a mean of less than 3.75 were not included in the application design. In the lifestyle category, underlying diseases and in the application capabilities category, BMI calculation, lectures, Provide a biography, relaxing music and games and intellectual puzzles were excluded from the study and were not considered for designing the application.

Table 2
Information-educational needs and capabilities for application design

Category	Education-informational needs and capabilities	Mean(± SD)
User profile	First name & last name	3.81 (± 1.51)
	National code	3.40(± 0.14)
	Age	3.12 (± 1.08)
	Weight	3.75(± 1.32)
	Height	3.81(± 1.24)
	Education level	3.27(± 1.14)
	Address	3.31(± 1.11)
	Contact number	3.51(± 0.25)
Clinical history	Underlying disease	3.40(± 1.14)
	Family history of mental disorder and type of disorder	3.85(± 1.04)
	Duration of the disorder	3.80(± 1.15)
	Suicide history	3.95(± 0.75)
	Blood group	3.90(± 1.55)
	Hospital history	3.90(± 1.11)
	The first hospitalization	3.80(± 1.43)
	Number of hospitalization	3.75(± 1.43)
	History of smoking and alcohol	3.80(± 1.23)

Category	Education-informational needs and capabilities	Mean(± SD)
life style	Sport	4.25(± 1.33)
	Sleep management	4.20(± 1.15)
	Nutrition	4.15(± 0.93)
	Proper weight	3.75(± 0.91)
	Smoking and drinking alcohol	3.75(± 1.08)
	Stress and anxiety Management	4.20(± 1.43)
	Existence of bad habits	4.35(± 1.04)
	Overcoming to wrong beliefs	3.85(± 1.18)
	Overcome to failures	3.95(± 1.14)
	Personal hygiene	3.75(± 0.91)
	Physical activity	4.05(± 1.19)
	Strengthen the mind and body	3.95(± 1.14)
	Healthy sex	4.10(± 1.16)
	Social support and healthy relationships	4.25(± 1.07)
Disease management and control	Introduction of anxiety and depression disorders	4.10(± 1.02)
	Symptoms of anxiety and depression disorders	4.05(± 0.94)
	Complications of anxiety and depression disorders	4.10(± 1.37)
	Deep relaxation exercises	4.05(± 1.19)

Category	Education-informational needs and capabilities	Mean(± SD)
	Prevent the aggravation of the effects of anxiety and depression disorders	3.95(± 1.14)
	Overcoming stress and negative thoughts	4.10(± 1.16)
	Being Optimistic	4.05(± 0.94)
	Anger management	4.20(± 1.19)
	Dealing with worry	4.05(± 1.31)
	Manage conflict at work, school or in relationships	4.10(± 1.37)
	Smoking and drinking alcohol	4.05(± 1.31)
	Drug Use and Addiction	4.20(± 1.05)
	Proper communication with others	4.00(± 1.29)
	Anxiety and nervous attacks	4.10(± 1.21)
	How to get away from stressful relationships and environments	4.07(± 1.04)
	Health nutrition and diet	4.05(± 1.09)
	How to maintain mental health	3.95(± 1.29)
	Increasing the self confidence	4.10(± 1.21)
	Easing fear	4.05(± 1.43)
	High focus	3.95(± 1.27)
	Positive communication and social interactions	4.00(± 1.07)
	Make a better sense on yourself	3.95(± 1.19)

Category	Education-informational needs and capabilities	Mean(± SD)
	Motivation for more activity	4.00(± 1.17)
	Reduce restlessness	4.10(± 1.07)
	Self-care	4.00(± 1.29)
	Hopeful sentences	4.10(± 1.21)
	Daily programming	4.15(± 1.04)
Relaxation instructions	Slowly and regularly breathe	4.05(± 1.09)
	Strengthen muscles	3.90(± 1.21)
	Prayer	3.75(± 1.37)
	Music therapy	4.05(± 1.14)
	Aromatherapy	4.05(± 1.09)
	Mental imagery	3.75(± 1.16)
	Mindfulness	3.75(± 1.20)
	Meditation	3.85(± 1.13)
	Walking with mindfulness or yoga	3.80(± 1.39)
	Repeat soothing words	3.75(± 1.30)
Application capabilities	Calculate BMI	3.50(± 1.16)
	Lectures	3.30(± 0.92)
	Provide clinical history	3.70(± 1.38)

Category	Education-informational needs and capabilities	Mean(± SD)
	Introducing counseling centers to receive health services	3.85(± 1.30)
	Management of medications	3.85(± 1.34)
	Management of Nutrition and diet	4.10(± 1.21)
	Notebook	3.80(± 1.36)
	Communication with doctors, consultants and other patients	3.75(± 1.27)
	Appointment reminder	4.05(± 1.09)
	Relaxing music	3.75(± 1.31)
	Games and intellectual puzzles	3.65(± 1.38)
	Application settings (such as font, size and color of content)	3.60(± 3.25)

Step 2: Design a prototype of the mobile-based application

According to the results obtained in the needs assessment stage, a mobile-based self-care application for patients with anxiety and stress disorders was designed with the Java programming language in the Android Studio environment (Fig. 1). In the user profile section, the patient can register after entering the application and by entering a username and password enter the application.

In the clinical history category, the patients can save various information about blood group, family history of mental disorder and type of disorder, duration of the disorder, history of suicide, history of hospitalization, time of first hospitalization, number of hospitalizations and history of smoking and alcohol consumption on their mobile phone and send them to his/her doctor as a pdf file (Fig. 2).

In the lifestyle category, educational information in the form of videos and texts related to exercise, sleep, proper nutrition, proper weight, smoking and alcohol, stress and anxiety management, healthy bad habits, how to overcome wrong beliefs, how to overcome failures, personal health, physical activity, mind and body strengthening, healthy sex, social support and healthy relationships are provided.

In the category of relaxation instructions, different methods of relaxing the patient through slow and regular breathing, muscle strengthening, prayer, music therapy, aromatherapy, mental imagery,

mindfulness, meditation, walking with mindfulness or yoga and repetition of soothing words is taught. These trainings were provided to the patient in the form of text, videos and voice.

In the capabilities category, medical centers in Fars province (Iran country) were introduced to patients to receive remote counseling services. In the field of drug management, nutrition and diet management, patients could set a diet plan for themselves. For example, in the drug management section, patients could enter the drug name, dosage, drug allergies, and drug use date. According to the time and date of use, the necessary reminders were given to the patient (Fig. 3). In the notebook section, patients can write down information about their mental health, relationships, mood or feelings. Also, record her/his activities, personal goals or habits.

In the section of communication with doctors, consultants and other patients, a group was formed on WhatsApp and Telegram, patients could talk to doctors and consultants and other patients and share their experiences in this groups. Also, they could ask their questions. In the section of appointment reminder, patients could enter the time and date of appointment, doctor's name and office address. Different reminders were provided to the patient based on recorded time and date. In the application settings, the user can change settings such as font and size, font color and themes.

Discussion

In this study, a mobile-based self-care application was designed and developed for patients with depression and anxiety disorders. Analysis of education-informational needs and capabilities showed in the point of view of patients, most of the education- informational needs and capabilities are necessary for designing and implementing self-care applications. These education-informational needs and capabilities included six main parts include: user profile, clinical history, lifestyle, disease and control management, calm instructions, and application capabilities. Out of 80 information-educational needs and application capabilities, only 11 needs and capabilities (national code, age, education, and place of residence, contact number in user profile category, underlying diseases in clinical history category, calculate BMI, and lectures and provide clinical history in the category of application capabilities) were not considered in the design and development of the application. The designed application allows the patient to register and enter through a username and password and record their clinical history in PDF format and send it to the doctor. Also, this app can help to improve patients' lifestyles by providing educational information on reducing and controlling anxiety and depression in the form of videos, text and voice. Also, management of medications dose and time of use, the ability to record activities, personal goals and habits in a diary, the introduction of depression and anxiety treatment centers, communication with other patients and doctors were other features of this application.

Wasil R et al. [28] reviewed applications were designed for depressive and anxiety disorders in a review study. The most common features used in this applications included educational and self-assessment services to patients, how to gain calm, concentration and meditation. Also, in our study, educational services were provided to improve self-care processes and how to achieve relaxation, concentration and

meditation. Instructions for concentration and relaxation let person to get rid of internal and external factors that bother him/her. These instructions can help people to return to a normal state and perform daily routine activities in the present [29] and reduce stress and anxiety in people with depressive and anxiety disorders.[30–32] Fuller-Tyszkiewicz et al. [33] also designed a self-monitoring application with name BlueWatch to improve the well-being of adults with depressive symptoms. This app is organized based on the principles of Cognitive Behavioral Therapy (CBT) in six modules of psychological education about depression and an introduction to CBT, behavioral activation, cognitive reconstruction, problem-solving skills, assertiveness, and treatment methods to prevent Recurrence of disease. Blue Watch features also included short audio education activities, daily practice and self-monitoring functions (using daily mood recordings), short welcome video, training with the app and dashboard (to store patient activities and texts). The present study provides daily exercises in the form of relaxation instructions in the designed application. Patients by performing daily exercises such as calm and regular breathing, muscle strengthening, prayer, music therapy, aromatherapy, mental imagery, mindfulness, meditation, walking with mindfulness or yoga, repeating soothing words help themselves to reduce stress and anxiety .

Music therapy, meditation, relaxation breathing training, yoga, information about mental health care and healthy lifestyle (diet, exercise benefits and appropriate sleep) are other features of the application designed in our study and the application designed by Won Ju Hwang [34]. Several studies have shown that factors such as appropriate sleep hygiene and management [35], exercise and physical activity [36], meditation [37] can lead to a reduction in depressive and anxiety disorders, so it is necessary these factors consider in time of design self-care and self-management applications. Also Jamie M Kawadler et al. [38] who designed and developed BioBase, an application to reduce anxiety and increase the mental health of people in the workplace showed physical activity and sleep management were considered as part of the education-informational needs and capabilities of this application.

Management of smoking, shisha, alcohol and drugs was another feature of the application designed in our study. Deady et al. [39] also were considered a section for managing of smoking, hookahs, alcohol, and drugs in their application, along with other information-educational needs and capabilities such as training programs (prevention of exacerbation of effects of anxiety and depression disorders, overcoming stress and negative thoughts, how to get away from relationships and stressful environments) relaxation instruction, sleep management, physical activity and exercise, and daily programming. Other studies [40–42] have shown that there is a direct link between depression and anxiety and smoking. They can increase the severity of anxiety and depression in these patients over the time. So, in self-care applications for these patients, it is better to allocate a section for smoking, shisha, alcohol management.

Patient management of medications was another feature of the application designed in the present study. This feature can help patients to enter the name of the drug, dosage, drug allergies and drug use date. In order to take the medicine, the necessary warnings were given to the patient according to the time and date of use. Philip Kaare Løventoft et al. [43] designed an application called life management to

support patients with depression. This application has various capabilities for user registration, measuring the patient's depression based on the WHO Major Depression Inventory (MDI) questionnaire, Mood, appetite and sleep registration, calendar and event types, location tracking and mapping (providing data on patient movement patterns for Predicting phases of depression) and routine management (to help users with daily tasks such as getting out of bed, taking a shower, and daily programming). Also, it had capabilities to record a list of drugs that could be edited by the user, reminding the use of drugs in the Medication management section.

Patients' communication with doctors, consultants and other patient through social networks such as WhatsApp and Telegram was another feature of our application. Some studies have shown that social networks such as WhatsApp, Telegram, Facebook and Instagram are among the very helpful tools in promoting self-care processes [44]. Social networks create channels and discussion groups with the participation of patients and physicians, the exchange of educational and medical documents (e-books, articles, etc.), the exchange of multimedia files such as pictures or videos, video chat, access to counseling. Improved telecommunications and simplification of tasks reduce the consultation time, and promotion a participatory environment to improve the level of health care [45–48]. Ha Seung Wan et al. [49] designed a mobile-based application to address the problems posed by traditional and face-to-face counseling for people with depression. This application has different capabilities as well “semi-crowdsourced counseling, immediate intervention from multiple counselors, cognitive behavioral therapy (CBT)-based short comments and gasification”. These features help patients to receive counseling without visit a doctor.

In general, the application designed in this study, along with the introduced applications were includes information-educationalal content and various capabilities, such as: educational-therapeutic programs to overcome stress and anxiety, daily exercises (meditation, yoga), smoking and drinking alcohol, activities physical and exercise management, medication management, daily programming and sleep management. Depression and anxiety are the most common mental disorders. Disease management with self-care processes by using such applications will reduce the in-person visits, treatment costs and save time for patients. Immediate access to a physician to monitor patients' condition, communication with other patient, availability of scheduling are other benefits of these applications. It should be noted that these capabilities, will improve anxiety disorders and depression if properly used by patients [50].

Limitations

Patients' education-informational needs and application capabilities required to design the application were identified only in accordance with the opinions of patients referred to Hamzeh in Fasa speciality and sub-speciality clinics and were not used viewpoint of psychologists and psychiatrists. It is suggested that the opinions of psychologists and psychiatrists be used in future studies. Also, in this study, the usability of the designed application were not evaluated and its effects on improving and reducing anxiety and stress were not considered. In another study, the usability and effects of app on improving and reducing anxiety and stress will investigated.

Conclusion

In the present study, a mobile-based self-care application for patient with depression and anxiety disorders was designed and developed. The services provided in this application will be useful when access to psychologists and psychiatrists is not available. In addition, patients can actively and dynamically participate in self-care processes with the continuous use of this application, and help themselves to have healthy lifestyle and improve the quality of life with control and reduce their anxiety and stress. Also, this application can help patients to access to required information without search in the Internet.

Abbreviations

HIS: Hospital Information System; EPN: Electronic Progress Note

Declarations

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Author contributions

FD and KHM designed research. FD, EM and KB collected and analyzed data. FD, KHM and KB designed method. FD and KHM wrote the manuscript. KHM AND EM reviewed and edited the manuscript. All authors have read and approved the final manuscript.

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Availability of data and materials

The datasets used and/or analyzed during the current study are available from the corresponding author on reasonable request.

Ethics approval and consent to participate

This research was approved by the research ethics committee of Kerman University of Medical Sciences with the ethics code IR.KMU.REC.1400.607. To complete the questionnaires to comply with ethical standards, the first objectives of the research were explained to the participants at the beginning of the questionnaire and then informed and written consent was obtained from the participants. After completing the informed consent form, participants had access to the questionnaire questions and completed the research questionnaire. All processes follow relevant guidelines and regulations

Consent for publication

Not applicable.

Competing interests

None of the authors have a conflict of interest to report.

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Figures

Figure 1

Home page of Depression and Anxiety Self-Care Application

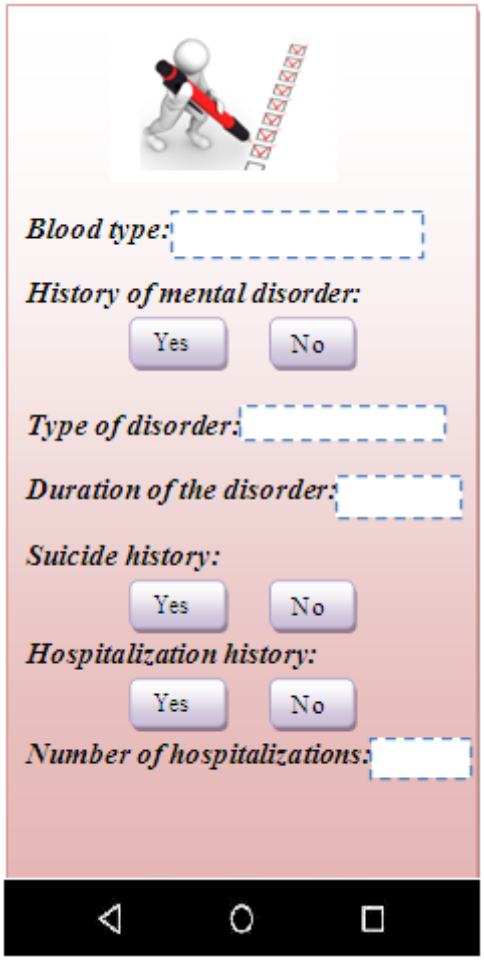

Figure 2

Recording of medical and clinical records

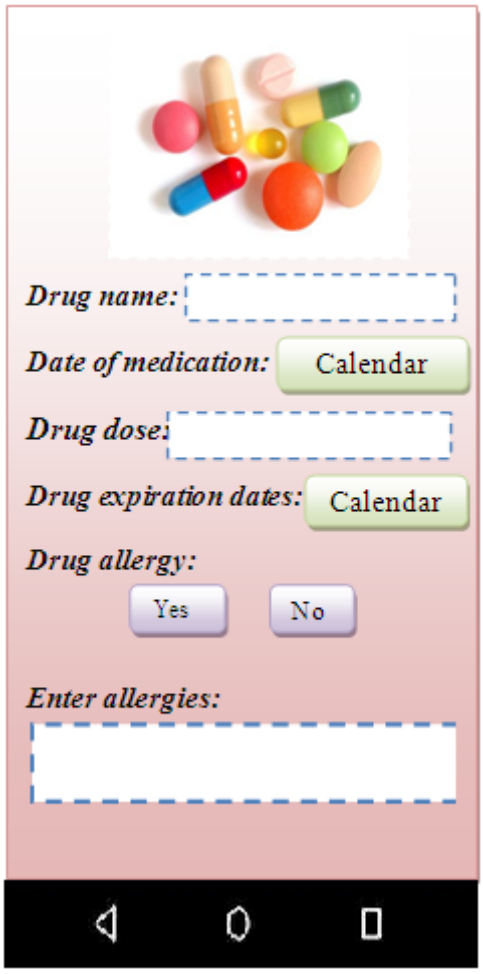

Figure 3

Drug management