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# A Smartphone based Application to Improve the Health Care System of Bangladesh

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**Abstract**— Nowadays, smartphones have reached every hand and every home. As a result, people are making use of the beneficial mobile applications to make their everyday life easier. This paper focuses on development of a mobile application(app) to help providing an effective health care system. Using this app people can get numerous benefits like finding hospital information in the city, information about cabin, cabin booking with payment, intelligent suggestion on choosing suitable hospital, finding a doctor, emergency service calling, first aid informatin, alarm system for medication, Body Mass Index(BMI) calculator etc. This application will be a helping hand for people who find it difficult to select hospital, book cabin, contacting doctor for appointment or seeking help in emergency situation. Besides, it will help the masses in their everyday life by providing health care information, aid and medication information, medicine reminder system, etc.

**Keywords**—Health care; Emergency situation; Cabin booking; Doctor's appointment; Mobile application; Android.

## I. INTRODUCTION

Health care is a basic need of every human being. In Bangladesh the health care system is mainly provided by the government with little or no charge. But this comes with many complications. The huge number of patients makes it difficult for the government hospitals to provide them with a quality health care. As a result, thousands of private hospitals are established with a view to meet the growing need of the masses for a quality health care. But when one wish to take service from a hospital, he first tries to collect some information about that hospital. This information is not only hard to find but also difficult to understand in some cases. Especially when people from rural areas come to urban areas for better health care service, they find it very difficult to choose a suitable hospital. Besides, when comparing a number of hospitals for finding better alternatives, it poses some complexities. The cost and quality for various services in a hospital can be used as a metric for comparison with other hospitals which is not always possible.

In this paper, a mobile application to make health care more convenient for the masses is proposed. The reason for choosing android platform is that in Bangladesh, the cost of android phone is reasonable and even poor people can afford to have one. Besides, android phones are seen widespread and all ages and class of people are using it without hassle.

The application will provide:

- Online cabin booking system
- Intelligent suggestion of hospitals based on cost and quality

- Information about facilities of hospitals and their locations.
- Information about the doctor's chamber in a city, a way to make an appointment with the doctor
- Assistance to the user to make an emergency call for an ambulance or health care service
- Alert system to take medicines in a fixed time. The application will alert the user for taking medicine in proper time.
- Body Mass Index (BMI) calculator.

We discussed about some relevant papers in Section II. In Section III we described the system functionality with technical details. We showed a survey summary focusing the necessity of our implemented healthcare system in Section IV. Section V contains some challenges and scopes for future development of our work and finally, we conclude the paper.

## II. LITERATURE REVIEWS

There are several applications in the market that offer tracking system and anti-theft applications. Recently anti-theft applications have earned voluminous attention from the researcher and developers, where different types of features are offered.

The author in [2] proposed a mobile application which enables patients to manage their vital statistics information and transmit the medical information to health care providers. But there is no cabin booking feature, or hospital's statistical information for the user.

A mobile application based system in propounded in [3] to assist doctors in monitoring Alzheimer's patient medication give an alarm to the patient to consume the medicine. But this application only developed for Alzheimer's patient.

Another mobile application of personal health care system for patients with diabetes is presented in [4]. But the limitation of this work is that it can only push the blood glucose level to the Google sheet to receive services and cannot attain services from a particular doctor.

A web-based tele healthcare system proposed in [5] which was integrated with the mobile application for diet people. In order to comprehensively deal with the over-weight problem, the user interface with four important aspects on weight, diet, exercise and sleep records is implemented. In addition, online courses and knowledge of diet are provided in the system.

An integrated recommender framework for seeking doctors in accordance with the patient's demand characteristics, including their illness symptoms and their

preference is put forth in [6]. In the proposed method, a user's matching model is firstly suggested for finding the similarities between users' consultation and doctors' profiles. Second, to measure doctor's quality, doctor's experiences and dynamic user's opinions are considered.

A WAP-based telemedicine system described in [7] for patient-monitoring. It utilizes WAP devices as mobile access terminals for general inquiry and patient-monitoring services.

The authors in [8] provided various useful tools to the hospital's users such as personnel and structures finding, wayfinding and the possibility to access personal medical records collected on regional electronic health record.

In [9], the authors developed and tested the Berkeley Tricorder, a health monitoring device capable of measuring a subject's ECG, EMG, Blood Oxygenation, Respiration (via Bio-impedance), and motion.

Another electronic patient management system has been considered in [10]. They propounded a system which locates nearest available hospital, contacts its ambulance emergency system, accesses an Electronic Health Record of emergency patient that can critically assist in pre-hospital treatments. The system will identify the availability of the nearest available specialized hospital all through the EMS server, which provides continuous information about the incoming patient to the hospital.

A prototype of a wireless health monitoring system capable of sending SMS related to the health status of the patient is developed in [11]. The project can be divided into three stages of data acquisition, data processing and communication stages. The authors in [12] showed a web based system to book a train ticket in advance. But the system is less user friendly and not flexible to use.

Our main motivation is to develop a system integrated with a lot of features through which people would tackle different hard situation during disruption of health condition by saving time. For example, intelligent suggestion of hospitals, online cabin booking facility, allocate an appointment with a doctor, prescription displayer, medicine course reminder, emergency auto-call making to predefined important numbers, etc. features would help the user to make a quick decision and avoid unexpected situations. These features were not combinedly done in any previous works.

### III. IMPLEMENTATION OF OUR SYSTEM

#### A. System Architecture

The system consists of two major modules. One for administrators and one for the general users. The administrator section is for creating and updating information about hospitals and cabins. And the other section provides several prominent features for the general users that will enable them to get quick and effective health care. The app can be used offline, but it needs internet for updating and synchronization. The system architecture is visualized in Fig. 1 and the logic diagram of cabin booking is shown in Fig. 2.

#### B. Mobile Application

The application is developed in android OS. The startup page offers users a list of features. It has administrator section,

hospital information section, cabin booking in hospital section, section for appointment making with doctor, section for emergency health care, section for aid and medication information, BMI index calculation section, medicine reminder section and hospital suggestion section.

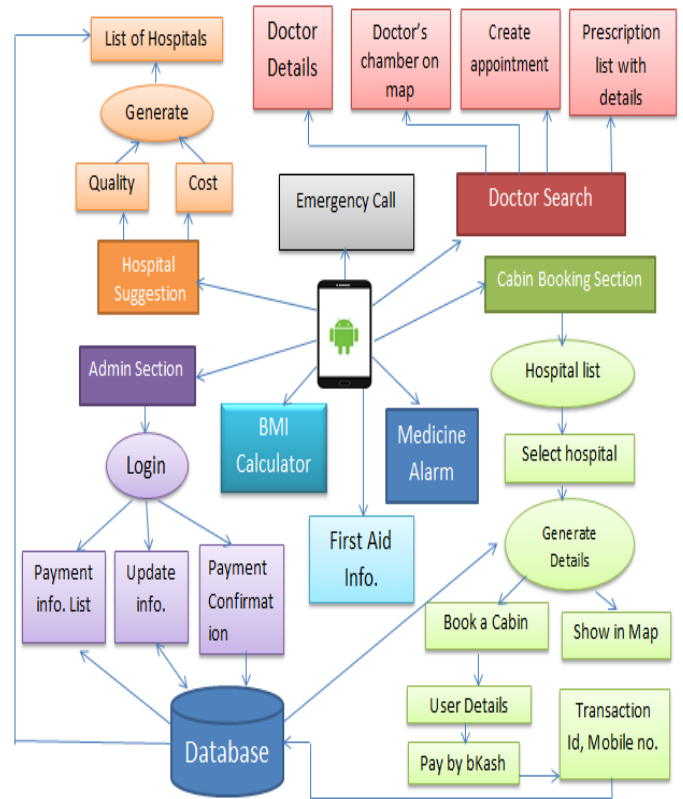


Fig. 1: System architecture

The admin section provides an easy way to create and update the hospital and cabin booking information. An administrator will be given a password to login to admin section. After successful login, admin can update hospital information such as list of specialist doctors, number of cabin, amount of charge for service, facilities provided by a hospital, information about Operation Theater etc. Furthermore, an admin can see who booked cabin with payment information. Admin will use the payment information to verify the identity of the one who booked cabin.

The cabin booking feature is one of the novel features of this application. Any user can find a suitable hospital and request for a cabin. If available the user can book it in advance by paying a specified fee. The fees and number of cabins available are updated by the hospital authority through this application. The user must provide his credentials when confirming a cabin booking. For example, we used bKash as payment method. After paying the required fees, the user gets a transaction message form the bKash system. This message has a unique transaction ID. This ID, along with phone number from which the payment was made, is uploaded to the server via this application by the user. The authority can anytime check and validate the patient's claim for a seat book by checking these information uploaded by the user. The system logic diagram is shown in Fig 2.

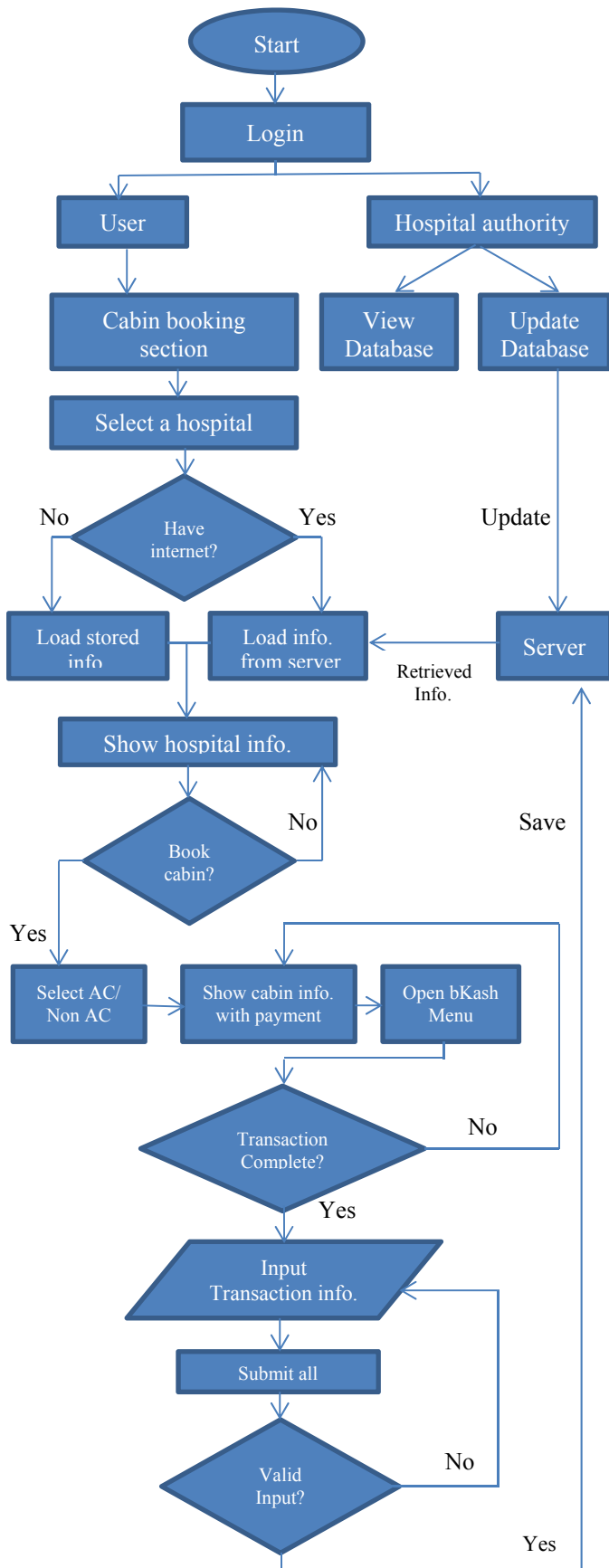


Fig. 2: Logic diagram of online cabin booking system

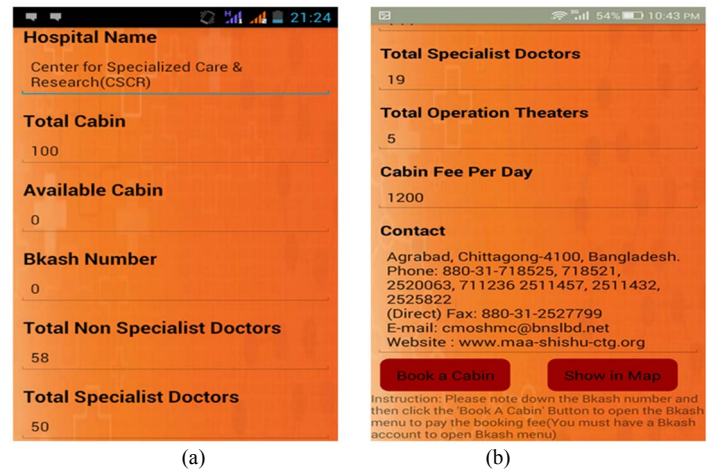


Fig. 3: Displaying details information with number of available cabins of a hospital

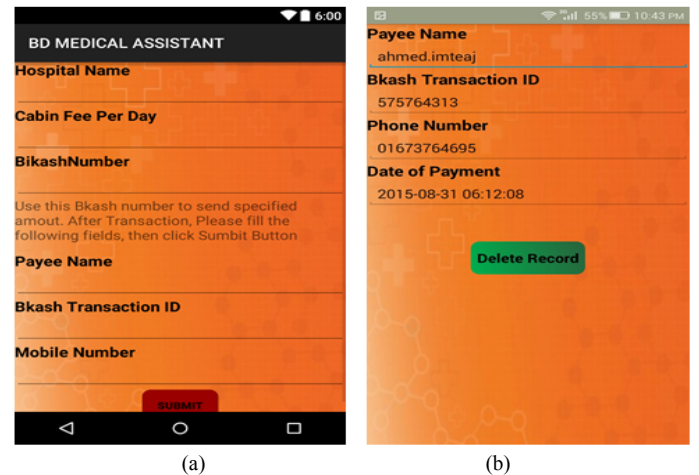


Fig. 4. (a) User input form for transaction (b) Displaying details information of a payee to authority



Fig. 5: (a) Choice options (b) List of hospitals according to quality (c) List of hospitals according to cost

In this application there is a unique feature called hospital suggestion. Here a comprehensive suggestion of hospitals can be obtained. It presents two categories of suggestion to the user. First is quality based, and second is cost based. The first option sorts the hospitals by the facilities they provide for example, the number of full time doctors, number of specialist doctors, number of operation theaters, number of cabins and user rating from online sites, such as google.com. In case of



cost based suggestion, the application sorts the hospital based on their cabin fee per day. This is demonstrated in Fig 5.

To help find hospital location, the app provides an option for getting hospital location. Users can easily find location of hospital with a single tap. The system will open up the google map application and mark the hospital’s location. (Fig. 6).

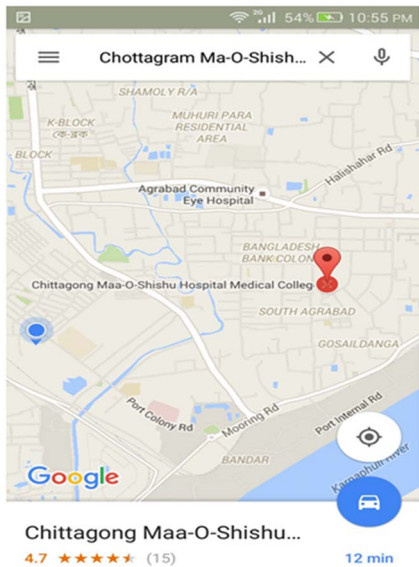


Fig. 6. Showing hospital location on the map

There is a prominent feature in this application for informing users of the available facilities of a hospital. By going through this section, a user will be able to know the details of a hospital, such as its doctors, its facilities, its cost for services etc.

The system also offers the users with a novel option to make an appointment with a doctor of his locality. A user can search for a doctor by mentioning his urgency. After finding a doctor, he can make an appointment with the doctor. The application will provide him the location of the chamber of the doctor.

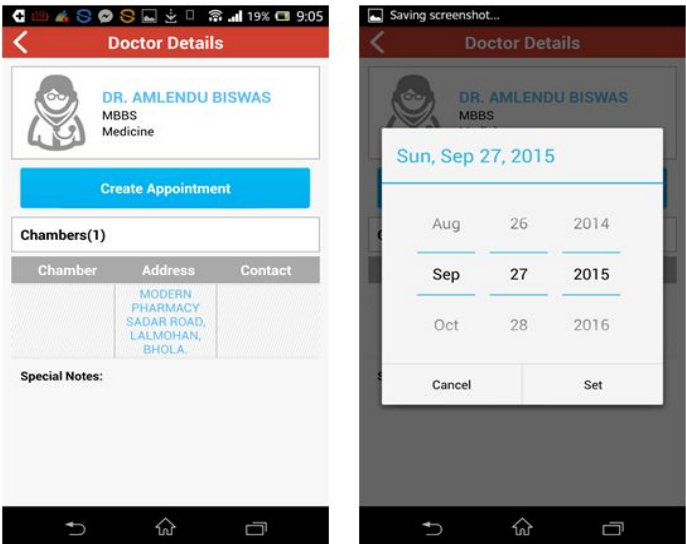


Fig. 7: (a) Details of a doctor and (b) setting an appointment

There is an option for the users to save their prescriptions provided by doctors. They can save in text format or can take photo and save them. This will help people keep record of their past illness and medication. Besides, it will prevent the prescription from being lost. (Fig. 7, 8).

In case of emergency when an ambulance or doctor is not at hand, this application can help by providing quick links for calling a doctor or an ambulance. There is an option for emergency calling in this app which takes just a tap to make a call to the desires service as shown in Fig. 9.

Moreover, using this application a user can find his body mass index (BMI) which is an indicator for obesity which is shown in (Fig. 10).

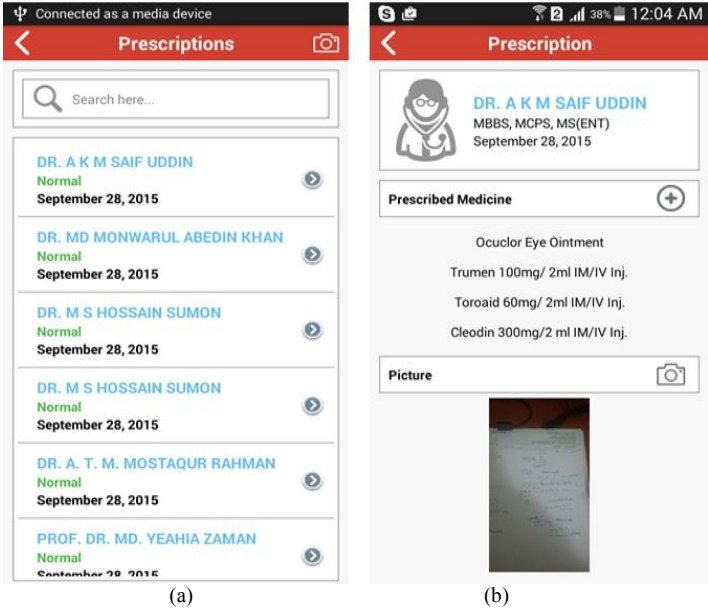


Fig. 8:(a) List of prescriptions (b) A prescription showing prescribed medicine along with image



Fig. 9: Emergency calling section

## IV. EXPERIMENTAL RESULTS

### A. Experimental Data

We have collected data from ten renowned hospitals of Chittagong city. To provide the user about the correct information of those hospitals, we went there and retrieve different information for the benefit of the users. We asked them about the information by which user can make a decision before choosing a hospital. That means, the application contains the data by which user can understand whether a hospital cabin is available or it is according to his budget, class, etc. or not. Using the information, we have given the user intelligent suggestion based on- quality and cost. We have considered the following criteria as input: Name of the hospital, Total cabin, bKash number, Unique password, Number of doctor, Number of specialist doctor, Operation theater, Cabin fee per day and Location.

### B. Measurement of Quality

We have rated each input out of 10 except map rating point. The Google map rating is rated out of 5. If the number of cabin, doctor and specialist doctor of a hospital is 100 or above, then they rated as 10 out of 10 in the input of their individual plot. We have used the following approach to generate the total rating point of different hospitals.

If No. of cabin, Doctor, specialist doctor  $\geq 100$

Then point = 10;

Else point = No. of cabin, doctor, specialist doctor / 10;

If OT  $\geq 10$  then point (OT) = 10;

Else point (OT) = OT;

Total point = Point (Cabin) + Point (No. of Doctor) + Point (Specialist Doctor) + Point (OT) + Map Rating Point

TABLE I. MEASUREMENT OF QUALITY

Name	Total Cabin, Point	No. of Doctor, Point	Specialist Doctor, Point	OT, Point	Map Rating point	Total points
CSCR	100, 10	58, 5.8	50, 5	5, 5	3.9	29.7
National Hospital	43, 4.3	45, 4.5	47, 4.7	4, 4	3.5	21
Metropolitan Hospital	130, 10	90, 9	55, 5.5	6, 6	3.3	33.8
Holy Crescent Hospital	90, 9	45, 4.5	38, 3.8	5, 5	4.3	26.6
Ma-O-Shishu Hospital	70, 7	144, 10	19, 1.9	5, 5	4.7	28.6
Halisahar General Hospital	26, 2.6	42, 4.2	13, 1.3	2, 2	2.5	12.6
South Point Hospital	25, 2.5	35, 3.5	15, 1.5	3, 3	2.8	13.3
Midpoint Hospital	35, 3.5	32, 3.2	18, 1.8	3, 3	3.1	14.6
Ekushey Hospital	38, 3.8	26, 2.6	8, 0.8	3, 3	1.3	11.5

### C. Survey Results













After implementing the application, we did a survey of 150 different level of users to attain their opinion in online and offline. We asked them several questions about problems they are facing and possible best solution according to their opinion. We recorded each of the answers, analyzed them and proclaimed our desired result. The list of questions is accorded in table 2 and user response is graphically shown in Fig. 11.

**Question 1:** Do you think the problems would be diminished through the application?

**Question 2:** Do you wish to have online cabin booking and payment system?

**Question 3:** What do you think about the usefulness of the application?

TABLE II. A LIST OF SURVEY QUESTIONS WITH OPTIONS

Questions	Options			
<b>Question 1</b>	Emergency Situation but no Available cabin(a)	Lack of knowledge about hospitals (b)	Unawareness about health related issues (c)	Forget to take medicine (d)
Percentage of total	68% 	12% 	3% 	17% 
<b>Question 2</b>	Yes (a)	No (b)	May be (c)	Not sure (d)
Percentage of total	85% 	5% 	7% 	3% 
<b>Question 3</b>	Very useful (a)	Helpful (b)	Need improvement (c)	Not sure (d)
Percentage of total	68% 	20% 	7% 	5% 

After contriving our system, we have craved to perceive user feedback and their persuasion. We have accumulated feedback from different male and female. We appraised them to rate this application, whether it is useful or not. 68% users rated this application as very useful. They suggested that this will be a prodigious opportunity to enunciate on community problems without any trouble. We have exhibited the feedback of the users regarding our system in graphically in Fig. 12.

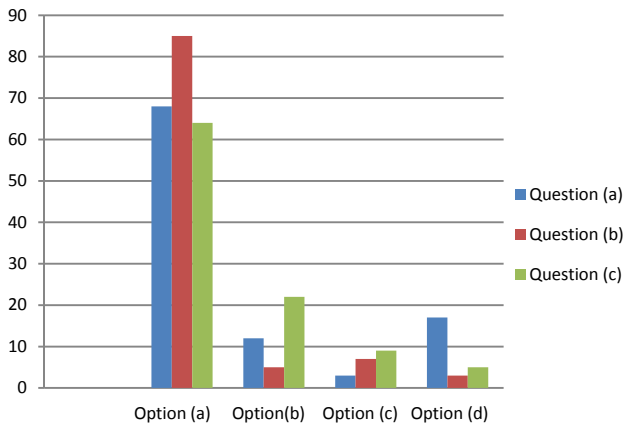


Fig. 11. User response to survey questions

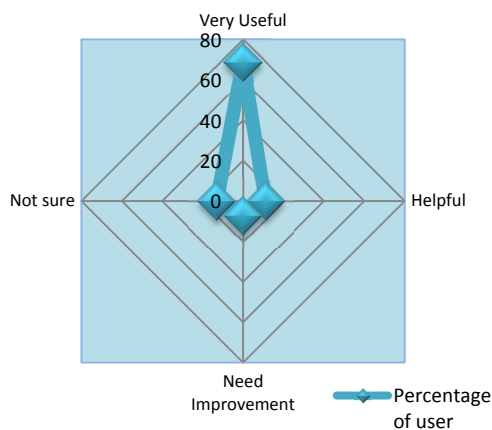


Fig. 12. User opinions about our system

## V. CONCLUSION

In this age of science and technology people are getting easier and convenient ways to solve their everyday problems. The health care is also getting attention of the scientist and researchers, and they are developing a helpful system to save life and care for life. This paper demonstrates a mobile application based health care tool that can be a friend like company for the masses. Using the app they can find many conveniences that can change the way people react in emergency situations. Instead of being panic, people may find

a quick and effective way to reach the solution with the help of this app. In future, we hope to work extensively on this to develop it to a new level for the betterment of people, especially the poor. We are also looking forward to use artificial intelligence in helping people detecting disease based on symptoms. This way, it is hoped that mobile based health care system will be a useful part and parcel of everyday life.

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