

# Android Based Patient's Healthcare Management System

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**Abstract:** An endeavor is made to advance the interaction between a general physician and a person via a smart phone application. This paper describes a tool with which we can improve the quality of treatment for patients using mobile application. The application, *MyCare*, runs on several Android based devices with Wi-Fi capability. This system allows users to conveniently record their measured health care data in their smart phones in a most convenient way and to track their long term health condition changes. Each time a person visits his or her physician, the data stored in his or her smart phone gets transferred to the health care service providers database wirelessly and enables the physician to easily get a clear picture of the patients health progress. Doctor's instructions, prescriptions, guidelines and appointment details all can be written to the application in the smart phone and transferred to the health care service provider's database wirelessly and the patient can review them leisurely. This system also enables users to check their wellness progress by representing their recorded data in the form of graphs and charts and can alert them on their prescription renewal dates. When patients record their daily health care data if the system notices any serious variation in the recorded data, it will automatically send a short message (SMS) briefly describing the abnormality in the data.

**Keywords:** Android, Wi-Fi, MyCare, SMS

## 1 Introduction

Today, people are very much concerned about monitoring and keeping track of their individual health information. Diabetes mellitus and blood pressure are the most widely spread chronic diseases and are especially common in the elderly people. It is suggested in a publication of the Department of Health and Human Services that in order to keep blood glucose and blood pressure at a healthy level, people with diabetes and blood pressure need to keep a balance between three important aspects: diet, exercise and the medicine in daily routine. Therefore, continuous self-monitoring of the blood glucose level (blood sugar) and blood pressure, daily diet, special symptoms, allergies and medicine is essential among these people.

There exist few gadgets that can measure these variations, but recording these variations regularly is a tedious and time consuming task. People often forget to record these information in their record books and often make mistakes while recording by hand. Even when visiting the medical practitioner they forget to bring the record books and they have to maintain few books to keep record of different health information. Therefore a handy tool that can assist needy patients to keep track of their health information is necessary.

Smart phones are widely used by people of all age groups and have many advanced features that enhance the user experience. These devices come from many popular vendors and have operating system platforms that are proprietary or are open source. These platforms enable users to develop different applications that can utilize all peripherals such as touch pad, sensors, camera etc., and provide various tools to check and validate application development.

Android operating system is an open source development platform which enables users to develop many different kinds of applications and many leading phone developers such as Samsung and HTC have adopted Android operating systems for their smart phones.

Android provides Software Development Kit (SDK) to develop application, test it on an emulator and finally run the application on a phone.

A smart phone based healthcare management system would be an ideal platform for developing an application and enable users to enhance their experience [1],[2]. So, Android operating system is chosen to develop the healthcare management system. Therefore many of the shortcomings mentioned in the above paragraphs can be eliminated.

In this project a smart phone based patient's health care management system, *MyCare* is designed, developed, implemented and validated the successful operation that can assist patients and health professionals in many ways.

This system enables storing of health information programmatically and people need not to worry about losses and inaccuracies. In addition, alarms can be included where the alarm system can remind the patient to take drugs on time, next checkup date and drugs levels. *MyCare* informs the doctor via a Short Message Service (SMS) about the patient's health status and also it includes alert system to alert the patient when the patient's reading differs from the normal stage. *MyCare* also enables users to check their wellness progress by representing their recorded data in the form of graphs and charts.

Doctor's will be able to have the patient's documentation of medical care, including patient's health status, their daily meals by transferring data via Bluetooth from a particular patient. This enables doctors to give suggestions on the patient's current health status and the appropriate solution to their problems. Doctors need not to write prescription renewals, appointment details and any notes manually.

## **2 Literature Review**

The Healthcare application is organized into two categories:

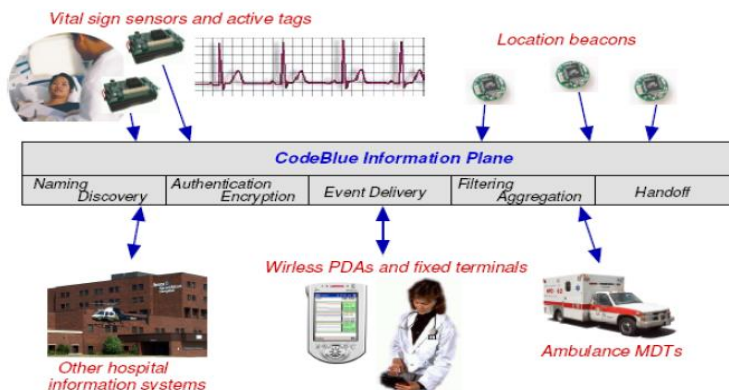
- 1) Health monitoring application which is designed for monitoring physical signs like blood glucose level, blood pressure level and ECG;
- 2) Health support application which is designed to manage the patient's daily activities like taking medicine on time, exercise and food.

### **2.1 Common architecture for health monitoring application**

Wireless sensor networks (WSNs) and smart phone technologies are used to create health monitoring applications. The integration of the existing medical technologies with smart phone and wireless sensor networks is a very promising application in home monitoring, medical care, emergency care and disaster response.

Light weight and no-intrusive biomedical sensors like pluse oximeter and electro cardiogram are easy to be deployed for continuously monitoring the vital signs of a patient

and deliver the data to the first responders[4][5][6]. For example, a wireless infrastructure for emergency response, CodeBlue is proposed and implemented as shown in Fig. 1.



**Fig. 1.** CodeBlue communication substrate.

CodeBlue is an efficient wireless communication substrate for medical devices used in an emergency care setting. It addresses ad hoc network formation, naming and discovery, security and authentication, as well as filtration and aggregation of vital sign data.

CodeBlue is based on a publish or subscribe model for data delivery, which allows sensing node to publish streams of vital signs, locations, and identities to PDAs or PCs used by caregivers.

## 2.2 Health support application: On-line personal health records management platform

There are two major on-line Personal Health Records (PHRs) management platforms in the market: Dossia [7] and Microsoft HealthVault [8]. These systems allow users to store and manage the health information in one central place. But the disadvantage is that they provide a limited health records formats. For example, only the test results like Glucose levels and blood pressures could be stored into them and the exercise data like heart rate, breathing rate, skin temperature could not be stored into them.

## 3 Methods and Design

### 3.1 Software

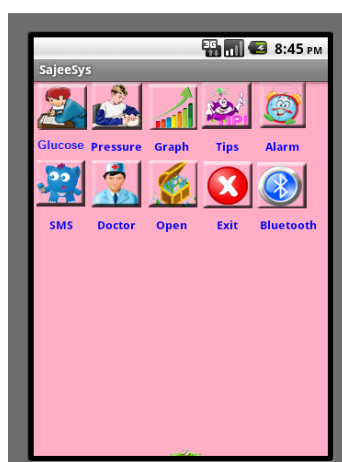
Android is a mobile operating system developed by Google and is based upon the Linux kernel and GNU software. Google releases the Android code as open-source, under the Apache License. As Android operating system is open-source it is used to develop *MyCare* for patient's system. Analysts points to the advantage for Android to be a multi-channel, multi-carrier OS. Android has been updated frequently since the original release of "Astro", with each fixing bugs and adding new features. It packages an operating system, middleware, and key programs. The Android SDK provides libraries needed to interface

with the hardware at a high level and make or deploy Android applications. Patient's interface of *MyCare* is designed by using Extensible Markup Language (XML) and Java Programming Language. SQLite database is used to store the data of a patient.

In *MyCare*, doctor's system requires large storage capacity. The size of the database depends on the number of the patients. *Mysql* is used for database creation. *MyCare* will enable patients to save, edit and delete data and also enable to receive data by wireless transmission. A database has been created with three tables to store data about recordings on Glucose, Pressure and Prescription. *My SQL* server is used for database and *NetBeans IDE* is for user interface design. User interface is designed using *Java* programming language.

### 3.2 *MyCare* application on Smart Phone

A Smart phone Based Patient's Health care Management System will store and display daily test results, diet and medicine taken, and get feedback from the doctor. And also it includes notification for drugs in taking times and next appointment details. Patient also can check their wellness with the help of graphs using this tool. Fig. 2 shows the front end of *MyCare* on smart phone.



**Fig. 2.** Front end of *MyCare*

There are ten buttons: glucose, pressure, graphs, tips, alarms, SMS, doctor, open, exit and Bluetooth. Each provides different functionalities.

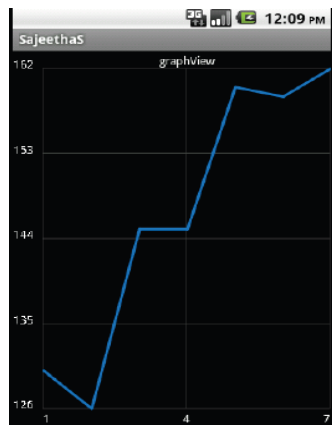
When the user click on "Glucose" icon, the tool will display the page to store the data. In that, user can store date, time, blood glucose level, food details, food time, special symptoms and allergies. Likewise in "Glucose" button user will be able to store blood pressure levels by clicking "Pressure" icon in Fig 2. In this also user can store date, time, blood pressure levels: systolic and diastolic, food details, food times, special symptoms and allergies. This page has two sliding bars to store blood pressure levels: One is for systolic pressure levels and the other one is for diastolic pressure levels. Here the data will be stored in the pressure database. Date picker and time picker is used for setting dates and time respectively.

*MyCare* included an Alert system for indicating abnormal variation of blood pressure and blood glucose as shown in Fig. 3.



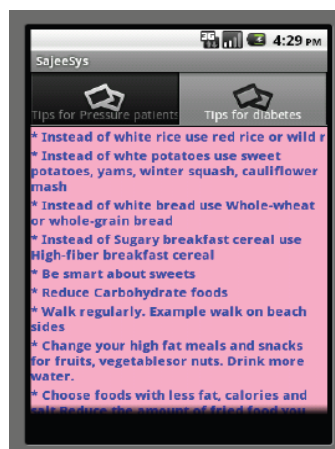
**Fig. 3.** Alert Message

There are two tabs for plotting graphs: One is for the blood glucose variations and the other one is for the blood pressure variations. User can select any of these two tabs and able to plot graphs. Sample graph is shown in Fig. 4.



**Fig. 4.** Graph

There are two tabs used for providing tips: one is for the blood pressure tips and the other one is for blood glucose tips. See Fig. 5.



**Fig. 5.** Tips

*MyCare* includes two alarms. First one is for setting alarms for drugs in taking times and next one is for next appointment date. User can set date and time by adjusting date picker and time picker. User can set repeat alarms by setting repeat time by seeking the seek bar. Normally user no needs to set the current time and current date.

Alarm service is introduced for reminding the patient about his or her drugs in taking times and next appointment details. Normally people forget these because of their work or elderly. It would be very helpful to the patients to maintain their health status healthy. The other important feature is, until the patient closes the message it will appear as wallpaper on his or her Smart phone.

Whenever patient needs medical advice from doctor he or she can be able to send Short Message Service (SMS) to the doctor including blood pressure and blood glucose data. Here patient need not to attach the reading manually. *MyCare* application automatically attaches the relevant data. In *MyCare* patient or user can store, delete or update the doctors' names and phone numbers.

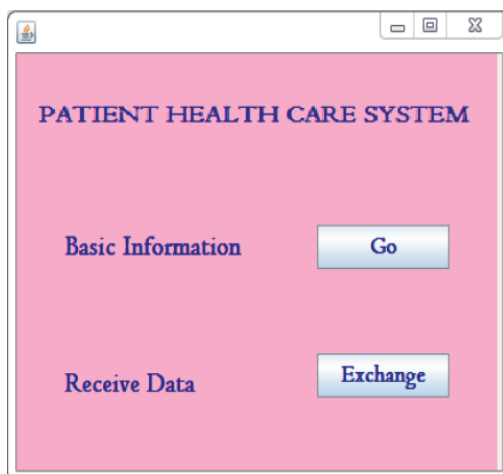
Patient or user can use this option to manage own records. That means can be able to open, delete or update all records or specific record. Close button is used to exit the application.

Whenever the patient meets the doctor he or she can able to transfer the data via Bluetooth to the doctor's system.

### 3.2 *MyCare* application on Desktop Computer

Doctor's system contains the main database for all patients. And also this system will contains the biography and health history of a particular patient up to date. Patients can be identified by their identity card number.

Fig. 6 shows the main interface of Doctors' system.

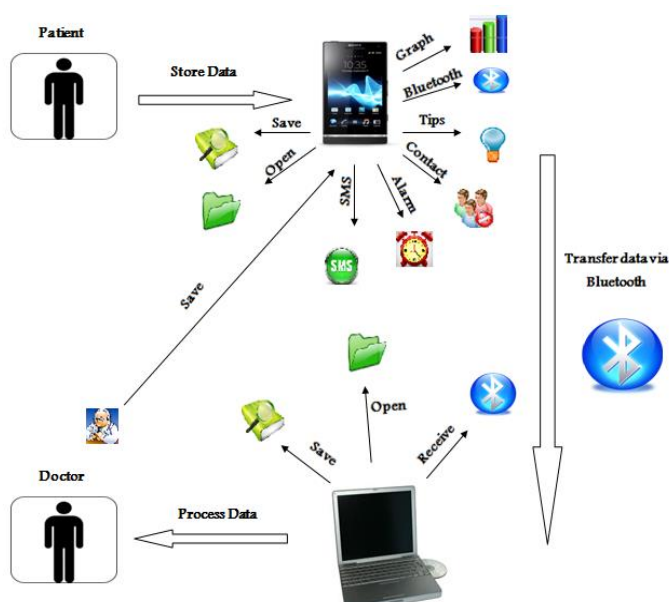


**Fig. 6.** Main interface

*MyCare* on desktop computer receives and updates the data in the corresponding database.

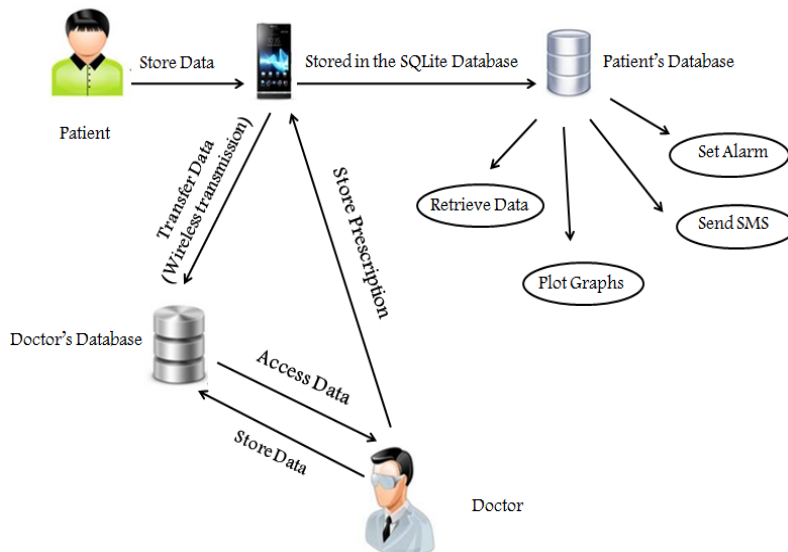
## 4 Flow Diagram

Fig. 7 shows the overall picture of the system architecture of *MyCare*, Smart Phone Based Patient's Health Care Management System for patients with diabetes and blood pressure. System architecture includes two components: *MyCare* on desktop computer with Bluetooth facility and *MyCare* on smart phone. For example, when the patient takes a blood glucose or blood pressure test result, he or she wants to store that data in his or her *MyCare* application on smart phone. And also patient needs to transfer the data to *MyCare* on desktop computer when he or she meets the practitioners for medical checkup. The smart phone will store this test result into the internal database in *SQLite*, and it will further push the test result to the doctor's database in *mysql*. The patient may also check his or her health status by plotting graphs using this application. Patient can send Short Message Service (SMS) to the doctor when he or she needs help. Patient can set alarm for next appointment date and drugs in taking results.



**Fig. 7.** System architecture of smart phone based patient health care system

Fig. 8 describes the System Actors Interaction of the Smart Phone Based Patient's HealthCare Management System. "SQLite" database is used to store the data of the patient. Patient can be able to retrieve data, can set alarms, can send Short Message Service (SMS) and also can plot graphs. And also patient can transfer data to *MyCare* application on Desktop computer via "Bluetooth" transmission. Doctor can receive patient's data and can be able store on his or her system. Doctor also can access and store data. *MyCare* enables the facilities to the Doctor to write prescription. Prescription details also can transfer to the *MyCare* application on Desktop computer.



**Fig. 8.** System Actors Interaction

## 5 Conclusion

The application *MyCare* works for the benefits of the society and acts as VIRTUAL DOCTOR for the patients. This application provides an interactive interface between the patient and the doctor. This paper proposed an Android based patient's health care management system (*MyCare*) that can be used to solve problems of too many patients seeking daily medical attention. This system will be helpful to many users to maintain their health related data and to review it efficiently. Main advantage of this *MyCare* system is doctors have the full history about the patient's health status. Patients will hold their data where ever they go. The proposed system will also help Medical Doctors to speed up diagnosis and treatment of patients through the advice and interaction with the patient.

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