

A Prototype of a Mobile-Based High Blood Pressure Patients' Self Management System

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Abstract— This paper proposed a prototype of a mobile high blood pressure patients' self management system. This is to leverage on the increasing Internet population coupled with the increasing population of people using mobile devices, and high speed broadband that will provide a better method to support the current approach to health care service delivery. The target groups are all individuals who have high blood pressure diagnosed and people that are prone to it but most importantly the younger generations who are not particularly oblivious of the health risk posed by high blood pressure. It is hoped that the management of patients with high blood pressure in developing countries of the world will achieve a better result by reducing mortality and increase awareness if the mobile technology with health information management applications that is fast gaining accessibility and availability is deployed and hence, the study.

Keywords— High Blood Pressure, Information Technology, Management, Mobile, Prototype, Systems, Health.

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INTRODUCTION

“Health is wealth” goes an adage that is many years old but still of relevance in our world today. The application of Information and Communications Technology (ICT) has proven to possess the ability towards enhancing the efficiency and performance of nearly all sectors including the health sector. ICT has been defined variously but in this paper, we define ICT as a technology and tool that has the capacity and capability of facilitating the processing of information and the communication of processed information with the help of telecommunication channels. In order to improve the quality and performance of healthcare services, ICT has become the most important technology in use in the developed countries. The application of computer technology had been applied for various purposes from clinical to special purpose and administration and in actual fact, the use of technology is important in a hospital [1] [2].

However, many developing countries like Nigeria are still lagging behind in the use and application of technology in healthcare delivery particularly, because they are either completely ignorant or unaware of their health and health issues, which may be due to illiteracy, personal, tribal or religious beliefs and the recent reliance on Herbal medicine and its propagation. Among the growing chronic diseases, the prevalence of high blood pressure is on the rise in Nigeria and this was echoed in some recent research carried out by [9] and [10], revealed that many Nigerians are at risk of having high blood pressure or worse still becoming hypertensive much earlier in life.

THE USE AND APPLICATION OF INFORMATION TECHNOLOGY IN HEALTH

In the National Strategic Health Development Plan Framework for Nigeria, Health Information System is defined as a set of components and procedures organized with the objective of generating information which will improve healthcare management decision at all levels of the health system [3]. In western countries, it was however observed that concerned efforts are taken to enhance the use of Information Technology in healthcare [4]. Generally, the public needs to be aware of their health regularly to prevent and avert health complicated issues, and because this is believed could be achieved with the aid of an awareness program which when created could be used by the public for general health related issues. [5] discussed that a 2012 e-Health patient survey by the public relations agency Ruder Finn found that 33% of patients want their physicians to have access to remote monitoring technologies and 40% of older patients want access to technology that can alert physicians and other caregivers if they are having a health emergency. Therefore, advantage can be taken through the use of mobile devices such as cell phones and tablets that are proliferating in the consumer market. [6] further highlighted the claim in a recent Forbes article [17] which concluded that more than 80% of Americans own and regularly use cell phones and that approximately 50% are smartphones running operating systems such as iOS or Android typically capable of browsing the Web and running downloadable applications. In addition to the general con-

sumer market, mobile technology is quickly becoming ubiquitous in healthcare. [7] discussed that the mobile network infrastructure powers the consumer use of wireless technology, the user access the network through a mobile device which is making people to connect seamlessly to each other around the globe. [6] provided more information to support the above whilst stating that an Information Week article published in 2011, that 80% of doctors use a smartphone or tablet at work, and also reported that an HIMSS report concluded that "93% of physicians use some form of mobile technology daily, and 80% use tablets or smartphones to directly influence patient care.

In a study carried out by [8] concluded that enhancing standard care with reminders, disease monitoring and management and education through cell phone voice and short messaging service can go a long way to help improve health outcomes and care processes which in turn have implications for both patients and providers. In essence, communication technologies can help to improve and provide great care and support for patients with high blood pressure and other chronic diseases.

However, all these underscore the importance of phone technology, which has evolved from basic wire communication for voice to a more sophisticated communication for digital data. The exploitation and integration of these technologies such as mobile phones, Health Information Systems or Health Information Technology for efficient healthcare delivery can only get better. Hence, this paper explores these components to arrive at the prototype for a mobile-based high blood pressure patients' self-management system.

STATEMENT OF PROBLEM

A recent research conducted by [9] and [10] revealed that there is a high prevalence of hypertension in Nigeria and that the overall awareness of raised blood pressure among hypertension cases is generally low in the country. Moreover, the Nigerian health sector has contributed little in the area of sensitization and programs on the dangers and risks of high blood pressure and how to prevent it [12]. Furthermore, many Nigerians are ignorant or completely unaware of their health and health issues. This may be due to lack of education (illiteracy), some personal or religious beliefs and recent reliance on traditional means of medication. It is therefore imperative to design systems that can help support,

manage and sensitize patients and individuals as far as High Blood Pressure (Hypertension) is concerned.

OBJECTIVE AND SCOPE OF THE STUDY

The main objective of this study is to develop a prototype of a Mobile-Based High Blood Pressure Patients' Self Management System in the Nigerian Health Care Institutions.

The scope of this study is to design a system that will assist health workers in monitoring patients (healthcare) with High Blood Pressure and also to provide support for non-patients in the prevention of Blood Pressure (self-management).

REVIEW OF EXISTING SYSTEMS

There are a few related systems which include:

- Glucose buddy-a diabetes monitoring tool (by Tom Xu : [www. Glucosebuddy.com](http://www.Glucosebuddy.com))
- MyRefill Rx (developed by Remedy Health Media in November 2012)
- Heartwise blood pressure tracker application (developed by SwEng. L.L.C)
- Patient engagement and blood pressure management for renal transplant recipients via home electronic monitoring and web-enabled collaboration care [11].

Glucose buddy (by Tom Xu)

A web site glucosebuddy.com helps people keep track of the sugar in their blood. The numbers are entered manually. The site works with an app for the iPhone to gather the blood glucose level and some information about when it was taken.

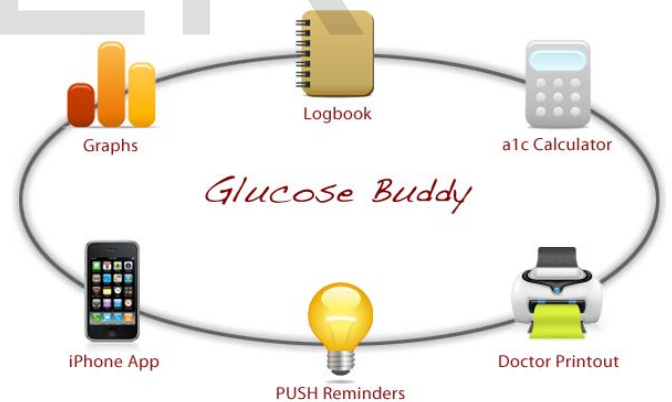


Figure 1: Glucose buddy framework. [www. Glucosebuddy.com](http://www.Glucosebuddy.com)

MyRefill Rx (developed by Remedy Health Media)

A mobile application that enable users to track their blood pressure, learn about high blood pressure, and order your medications directly from your device and get them delivered to your door. Website to download the application: <http://www.myrefillrxapp.com/>

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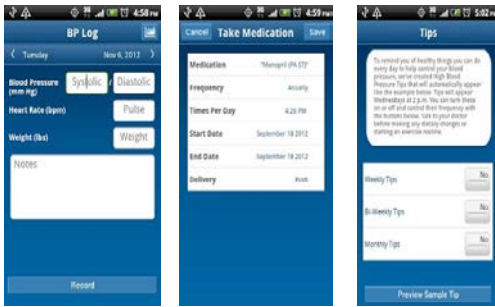


Figure 2: MyRefill RX . www.play.google.com

Heartwise blood pressure tracker application (Developed by SwEng. L.L.C)

Heartwise Blood Pressure Tracker allows users to log systolic and diastolic blood pressure. It also provides range and warning lines if the patient is at risk for hypertension or hypotension, combined with convenient sharing capabilities, it allows physicians and caregivers to monitor data closely.



Figure 3: Heartwise tracker showing how the application works. www.diabetescontrol.com

Enhancing Patient Engagement and Blood Pressure Management for Renal Transplant Recipients via home Electronic Monitoring and Web-enabled Collaboration [11].

The work is based on a “telehealth system” that incorporates home electronic blood pressure (BP) monitoring and uploading to a patient portal coupled with a Web-based dashboard that enables clinical pharmacist collaborative care in a renal transplant clinic.

ARCHITECTURE OF THE PROPOSED SYSTEM

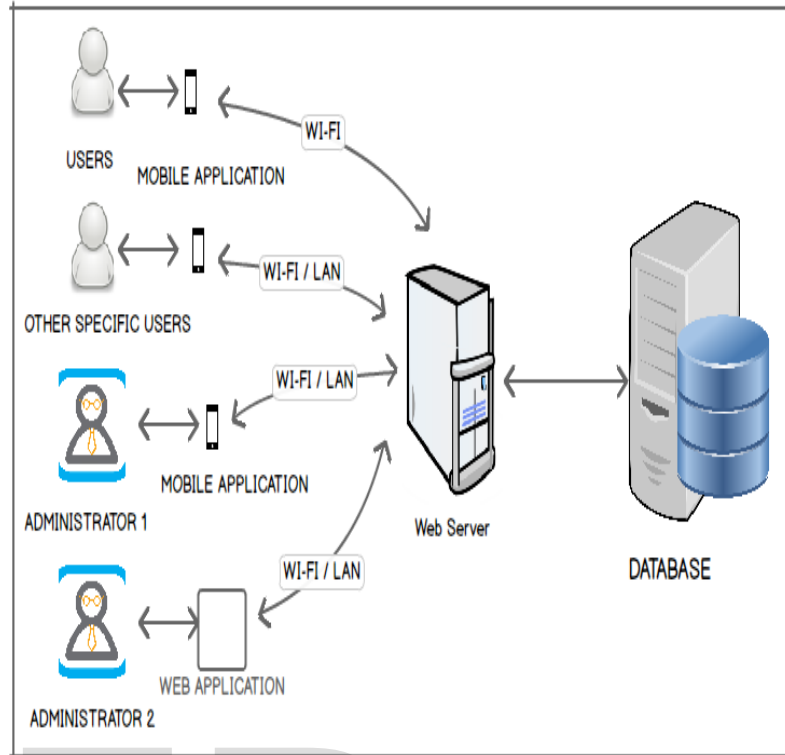


Figure 4 – Architecture of the proposed System

The Proposed User Specification

The user specification required for the system is stated as follows:

1. The mobile application should be able to provide adequate information about high blood pressure.
2. The mobile application must be easy to use and simple.
3. The system must be secure.
4. The system should provide help (frequently asked questions section).

The Proposed Functional Requirement

The proposed functional requirements describe the inputs, behaviours and outputs. A functional requirement defines a function of a system and its components. The functional requirement for the proposed system is as stated below:

- Ability to store blood pressure readings across time-lines
- Provision and classification of blood pressure categories
- Display graph of stored readings with appropriate information and implications respectively
- Messaging options
- Download options for new articles and information on blood pressure management

Non-Functional Requirement

The plan for implementing non-functional requirements is detailed in the system architecture. The non-functional requirement of the system should include:

- System Documentation should be provided
- The system should be efficient and effective in terms of cost, effort, task handling, etc..
- The system should give room for extension and expansion by considering the need for further development, upgrade and maintainability
- Response time should be optimized
- The mobile system should be relatively secure
- It should be user friendly.

System Flowchart of the Proposed System

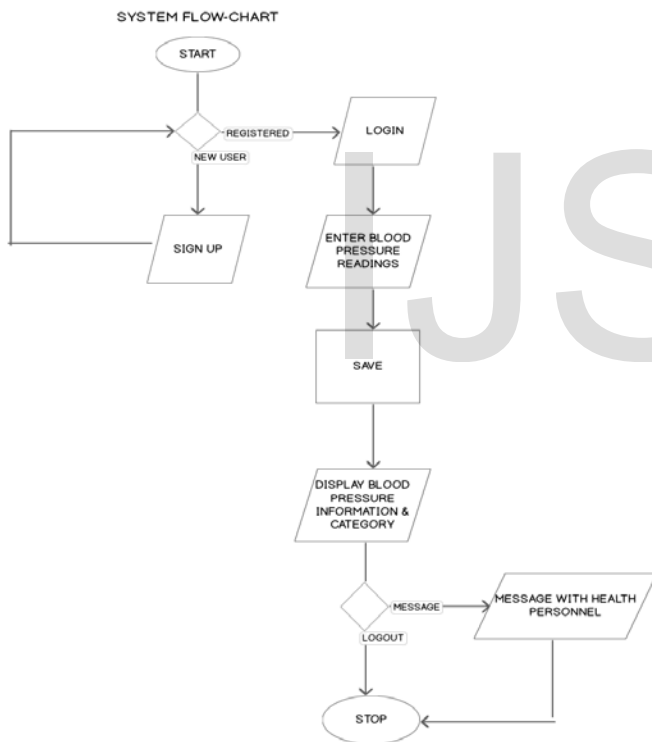


Figure 5: The System Flowchart of the Proposed System.

The Context Diagram of the Proposed System

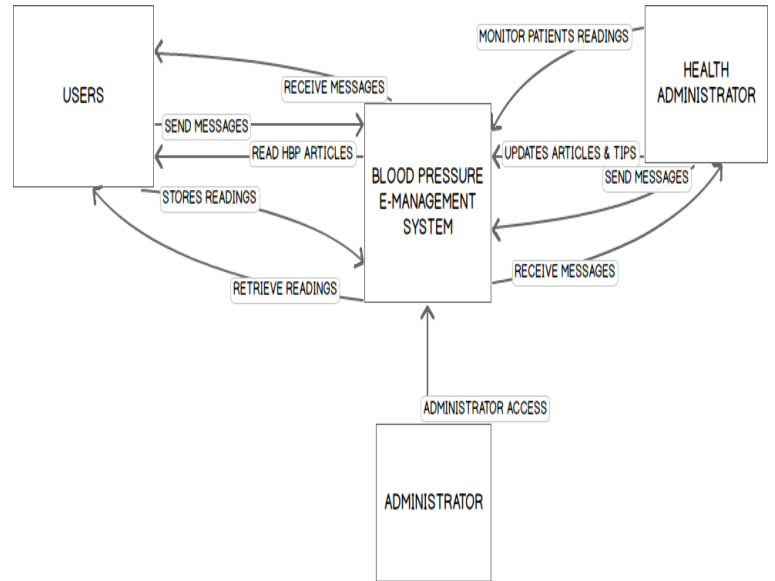


Figure 6: The context diagram of the proposed system.

Use Case Diagram of the Proposed System

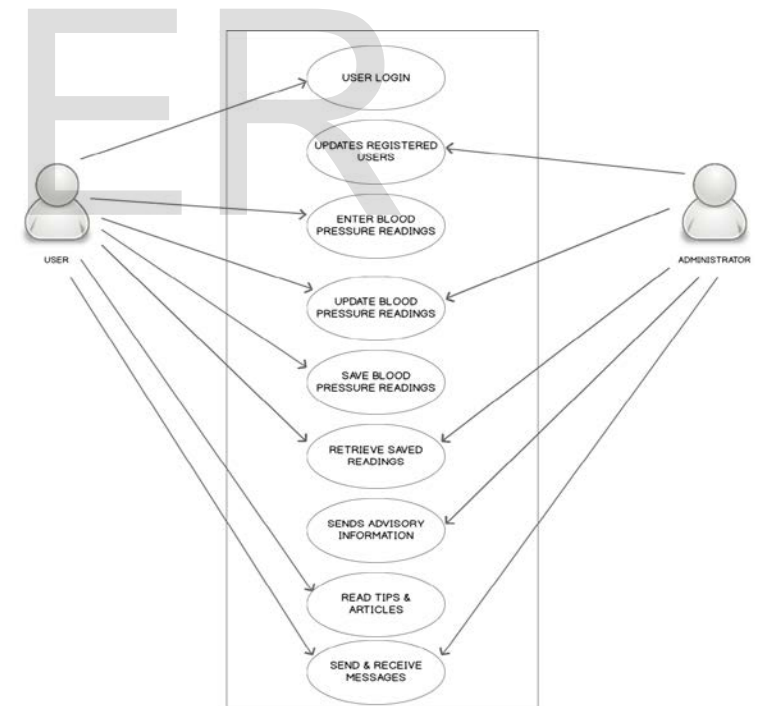


Figure 7: The Use case diagram of the proposed system

Sequence Diagram of the Proposed System

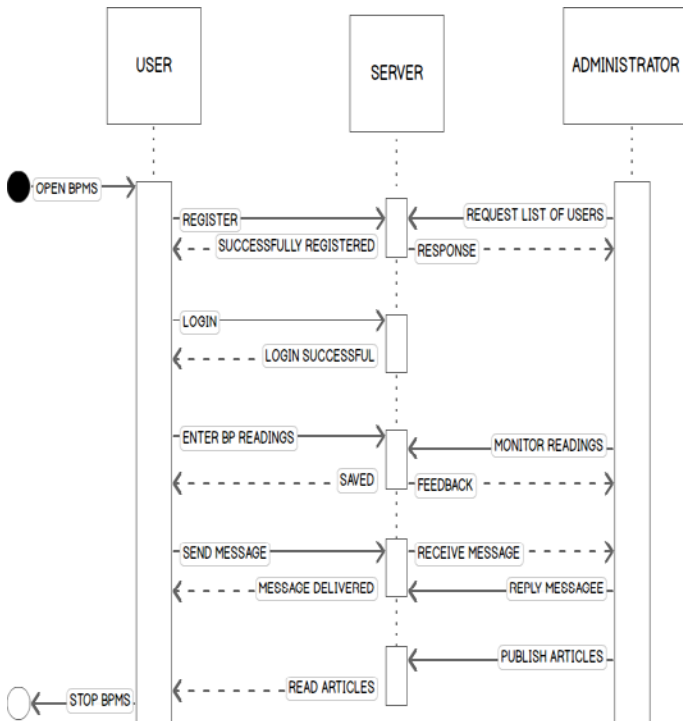


Figure 8: The Sequence diagram of the proposed system

CONCLUSION

The prototype system presented is a mobile-based high blood pressure patients' self-management system that will help patients with high blood pressure and other patients be aware, conscious of the need to manage and monitor their blood pressure readings with their respective doctors more effectively. The proposed system if implemented will minimize the amount of paper work used in hospitals, and help to facilitate better health care for high blood pressure patients and their regimes. Consequently, further research would focus on the implementation and testing of the proposed prototype.

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