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CG4E: Design of A Caregiver Application for The Elderly

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ABSTRACT

The question of whether population ageing will be accompanied by a longer period of good health, a sustained sense of well-being and extended periods of productivity or illness-associated lifeline arises as both the proportion of older people and the length of life increases. Managing elder care will soon become one of the most pressing healthcare issues in the 21st century, especially for caregivers. This paper is focused on the design of an Android-based mobile caregiver application for the elderly (CG4E). Its functionalities include: The retrieval and update of home consultation by caregivers and the notification of the consulted elder's next of kin about any consultations. This paper is mainly focused on the use of the mHealth application for caregivers of ageing individuals and serves as a tool for caregivers of ageing individuals to offer intelligent reports in providing personalised health care services. This application was designed using Android IDE, and the back end was created using Mysql DB. PHP and JavaScript were used for scripting, while Phone Gap was used for carrying out tests on the local host. Angular JS was used in building the web app.

Keywords: caregiver, mobile application, android, mhealth

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1. INTRODUCTION

The number of people over the age of 60 is expected to grow from 810 million in 2012 to over a billion in less than 10 years with the figure expected to reach 2 billion by 2050 [1]. This rapidly expanding ageing population has placed considerable stress on families and the health systems in general.

This has required the need for more caregivers to care for these ageing individuals, but these caregivers still rely on the ubiquitous movement of health information ranging from drug prescriptions, diagnosis reports, current health status, pulse rate, body temperature etc. [1], [2]. A Caregiver is an individual such as a physician, nurse or social worker, who assists in the identification, prevention or treatment of an illness or disability [3].

According to the medical dictionary, Caregivers contribute to the benefits of medical or environmental resources to ill ageing. Caregivers are general terms as physicians or other health care practitioners who care for patients and provide treatment or support to sick, disabled patients.

Caregivers also assist other people who because of physical disability, chronic illness or cognitive impairment are unable to perform certain activities on their own. Informal care can be offered by family members or friends often in a home setting or volunteer professional care, formal care can be obtained at home, in the community or from institutions such as nursing facilities or government institutions. Caregiver application for the elderly (CG4E) is an effective way to deliver home care under certain circumstances since it is a rapidly developing field; it is difficult to define all CG4E applications.

It usually involves two-way electronic communication between the patient and the formal caregiver. This electronic home visit also requires some means for the care provider who might be hundreds of miles away to access the patient's vital signs and receive the patient's medical tests. The caregiver has been trained to use electronic monitoring or test equipment that sends the relevant snapshots or numeric data via phone line.

Rapid advances in medicine and technology are leading to marked increases in human longevity, combined with declining birthrates; societies around the world are now facing challenges associated with rapidly ageing populations [5]. It has been noticed in many rural communities that nearly a large percentage of senior citizens or the elderly have at least one chronic disease, while some other lesser percentage suffer from three or more chronic diseases [6]. These incapacitate them, making independent living nearly impossible and brimming about the demand for personalized care on the increase, these issues are raising broader concerns about the overall care and quality of life of the elderly.

2. OVERVIEW OF RELATED WORKS

What follows are literature on related works.

SmartNursing

A mobile application to improve communication in homecare, the system provides two user interfaces: one is for a Smartphone application and the other one is for web-based interaction with a server. The mobile interface is designed to be used by the nurses, whereas the web interface has administrative functionalities and can only be used by all chief nurses/matrons allowing them to create, replace, update and delete stored data [4]. The application uses MYSQL as a database to store the data on the server.

IAserv

An intelligent homecare web-services platform in a cloud for ageing-in-place. The IAserv can infer the appropriate care plan which defines the needed healthcare activities through the patient profile and relevant external web services. The caregivers administrate healthcare according to a pre-set medical goal, caregivers can also access contextually relevant information (e.g., the impact of recent weather changes for a person suffering from hypertension) through any mobile devices [5]. As shown in figure 1 below.

IAserv architecture comprises four main components

1. The knowledge-intensive layer
2. The cloud-based web services
3. The agent environment
4. The data repository

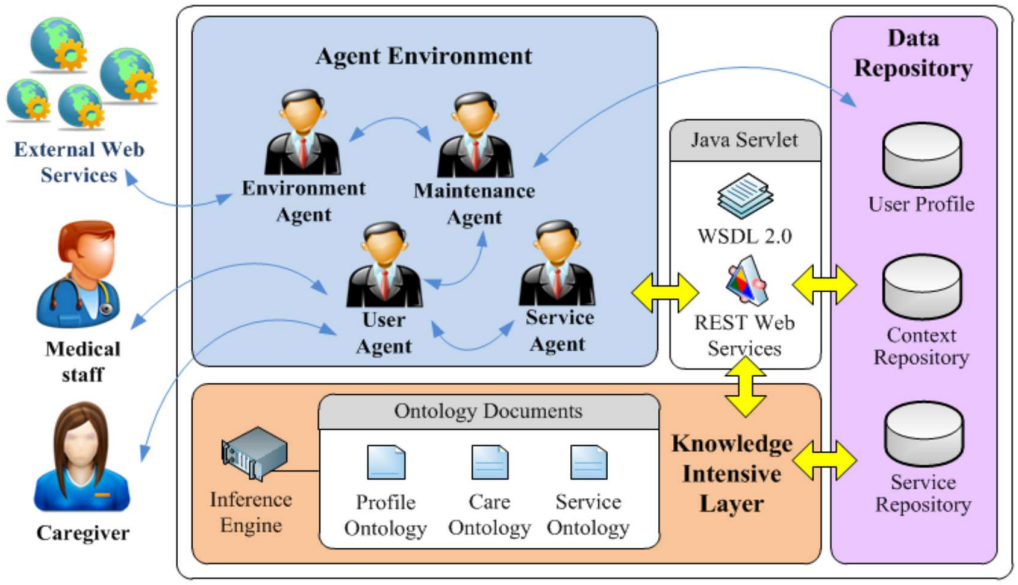

Figure 1 IAserv Architectural Diagram [5].

There is still a need for mobile solutions to create more intelligent personalized home care services. The applications mentioned above lack the generation of feedback for the next-of-kin of the patient being cared for. Also, some of their functionalities are customized for a particular region for use which makes them not useful in some locations. This paper focuses on building a mobile caregiver app that settles these challenges using smartphone capabilities and automation to improve caregiver services and daily nurses' work, especially through the use of notifications.

3. DESIGN

This section is focused on the developed CG4E application, a caregiver application for the elderly. It includes the system design, architecture, database structure, the different components and their functionalities. A whole lot of consideration is demonstrated for user experience with a suitable interface. The specification for the designed system is shown below:

1. Server Operating System Linux
2. Front and User End Operating System Android
3. Database MySQL DB
4. Storage HDD 10GB
5. RAM Requirements 1GB
6. API REST
7. Software Language PHP, JAVASCRIPT, PHONEGAP, ANGULAR JS

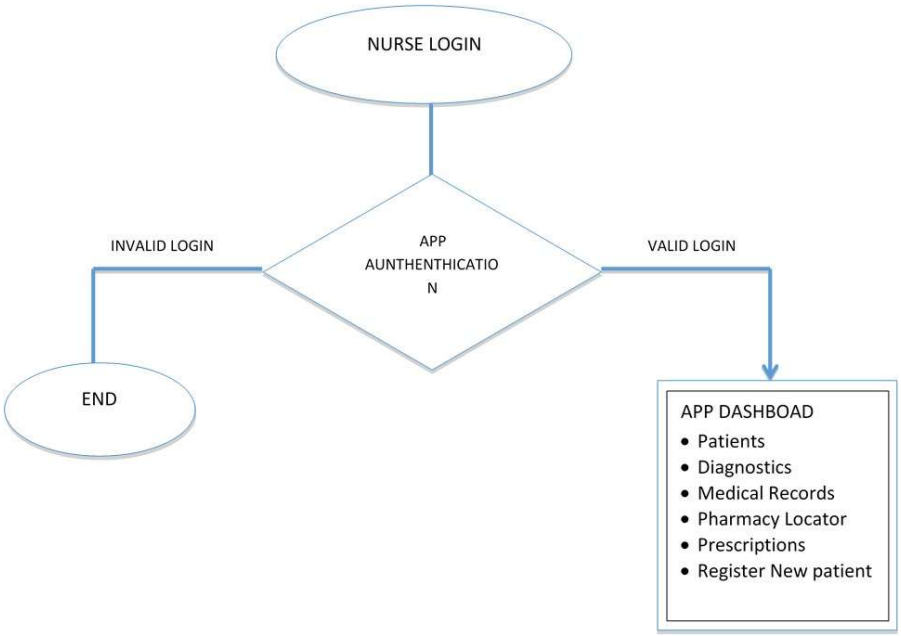

Figure 2: Application Workflow For the Designed Caregiver Application

Also, for the designed caregiver application, the type of data that is required from potential patients is listed below:

1. Patient's Biodata
2. Patient's Registration Data
3. Patient's Admission Information
4. Patient's next of kin data
5. Patients Medical History
6. Patients Prescription Records

The application workflow for CG4E is depicted in Figure 2 showing the authentication of the caregivers registered on the application platform to give care to patients.

Also, figure 3 depicts the database class structure for the designed application showing table representations for patient, appointment, examination, prescription, report and nurse with their respective parameters showing how the model relates.

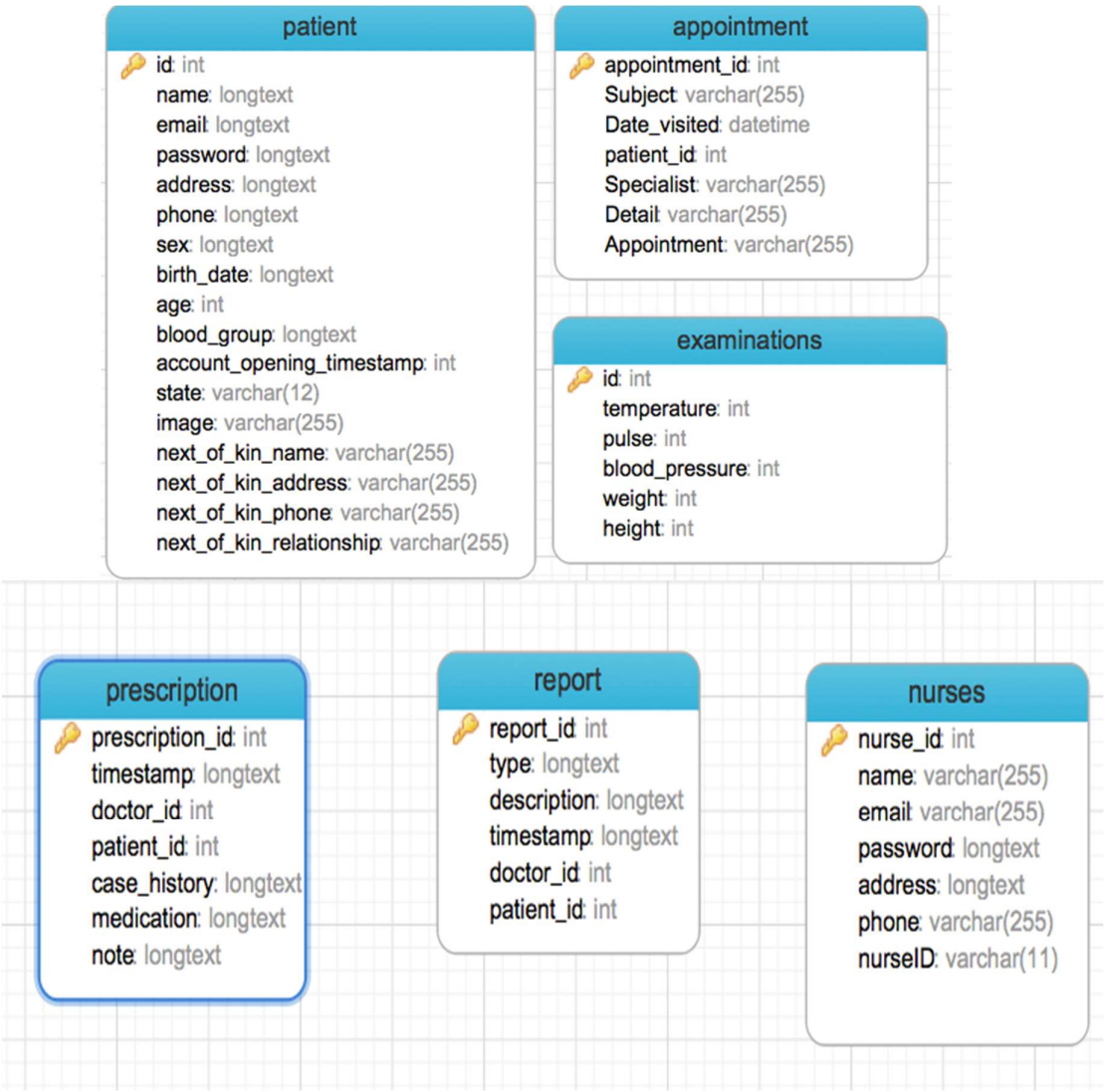

Figure 3: Database Structure for the Designed Caregiver Application

The System architecture diagram for the designed system is depicted in Figure 4. It shows a back end where registered caregivers' information is stored. From the architecture, the chief nurse/matron is the authorized personnel to register caregivers on the platform. The caregiver is assigned to a patient and in turn, registers the patients they have treated. This creates a file for the patient for updating and retrieval operations by the caregivers or the chief nurse/matron. The added functionalities include the ability of caregivers and the patient's next of kin to access the nearest pharmacies for drug purchases. Also, the patient's next of kin receives notifications anytime treatment is carried out. The caregiver's next of kin also receives notification for prescriptions, the name of the caregiver attending to their relation and appointment dates for the patient.

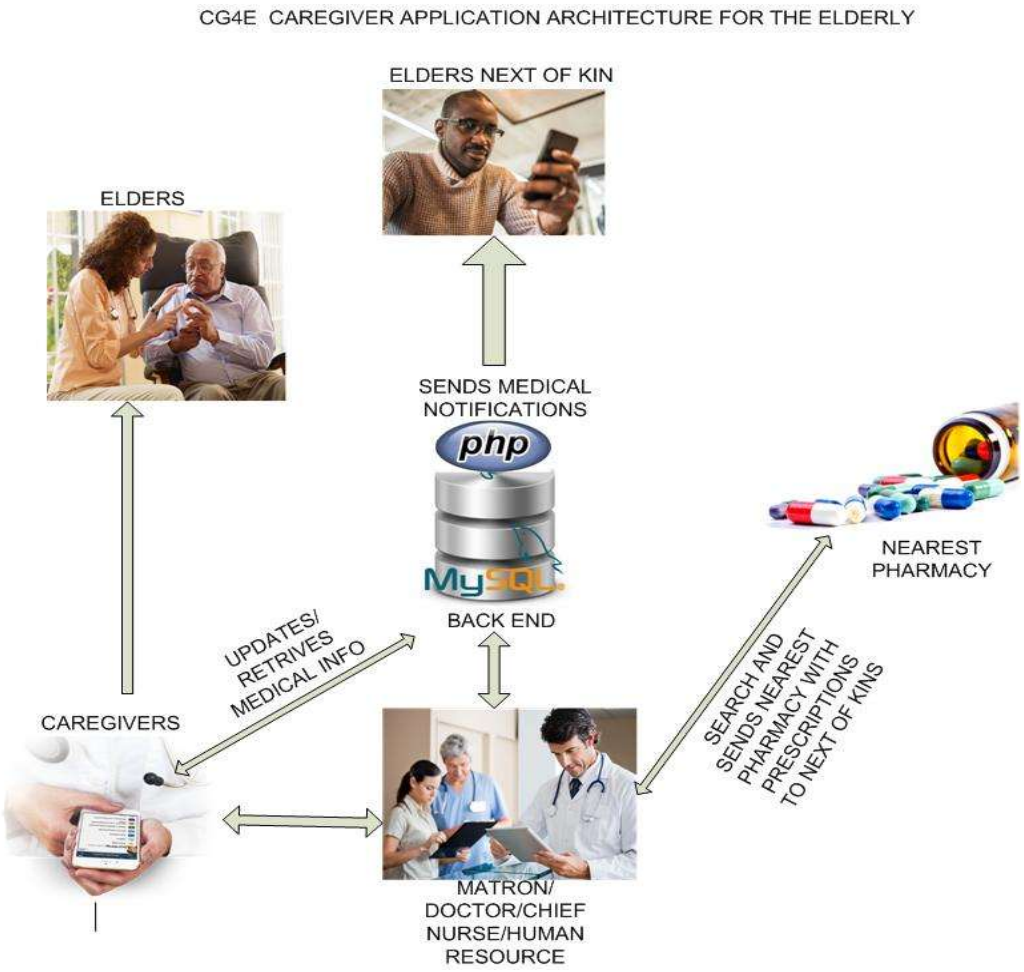

Figure 4: System Architecture Diagram For The Designed Caregiver Application

4. IMPLEMENTATION

When the application is installed and launched on Android, the login screen shown in Figure 5 appears, requiring the pre-registered caregiver to log in with their username and password for access to the application.

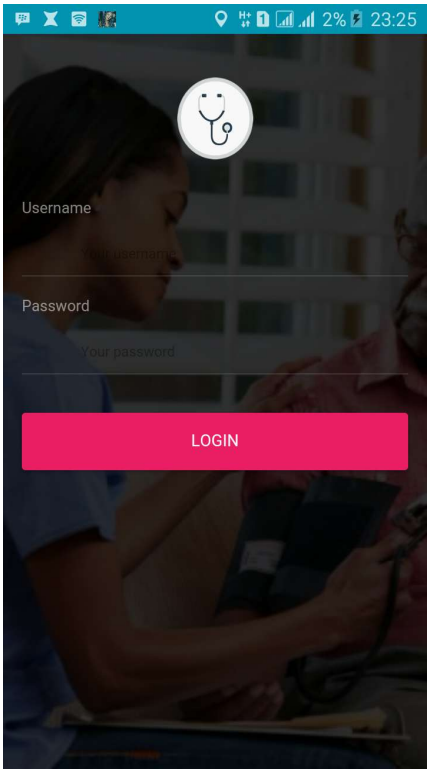

Fig 5: CG4E Login Screen

After the caregiver logs in, the home screen appears as shown in Figure 6. This appears immediately after a caregiver username and password is authenticated as valid. The home screen shows the caregiver all the patients appointed to her, and if any new patient has been assigned.

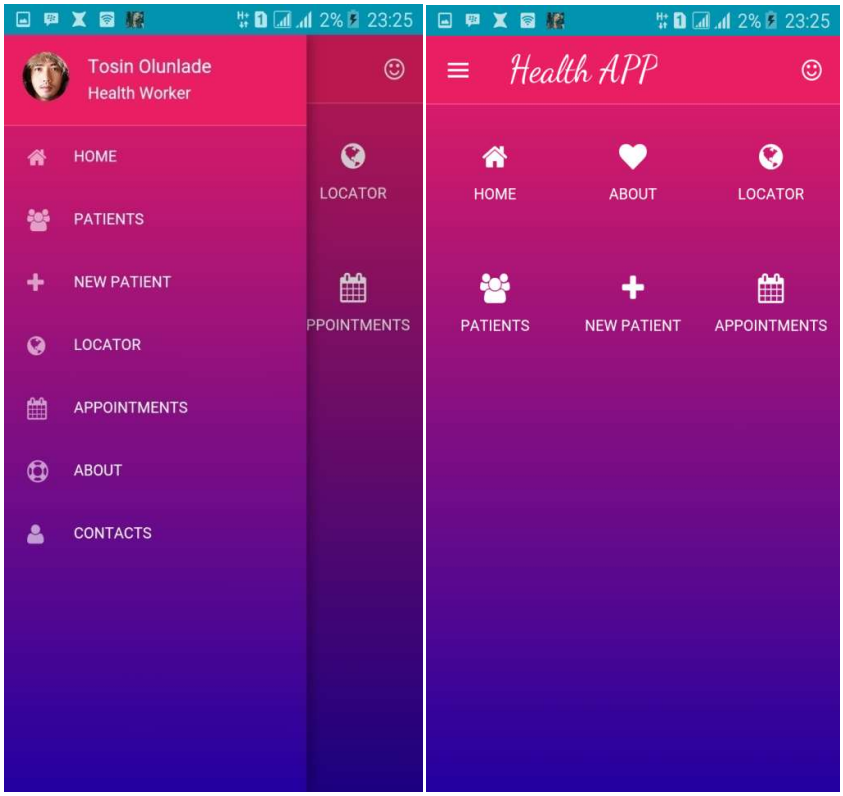

Fig 6: CG4E Home Screen

The caregiver also can add a patient using the new patient button or tab on the home screen. The new patient button or tab is identified with a medical plus (+) symbol in the CG4E app which allows the caregiver to add a new patient into the database with patient information including name, date of birth, age, gender, address, state, blood group, phone number, next of kin name, next of kin address, next of kin phone number, next of kin relationship and the caregiver adds a photo of the elderly patient as shown in figure 7.

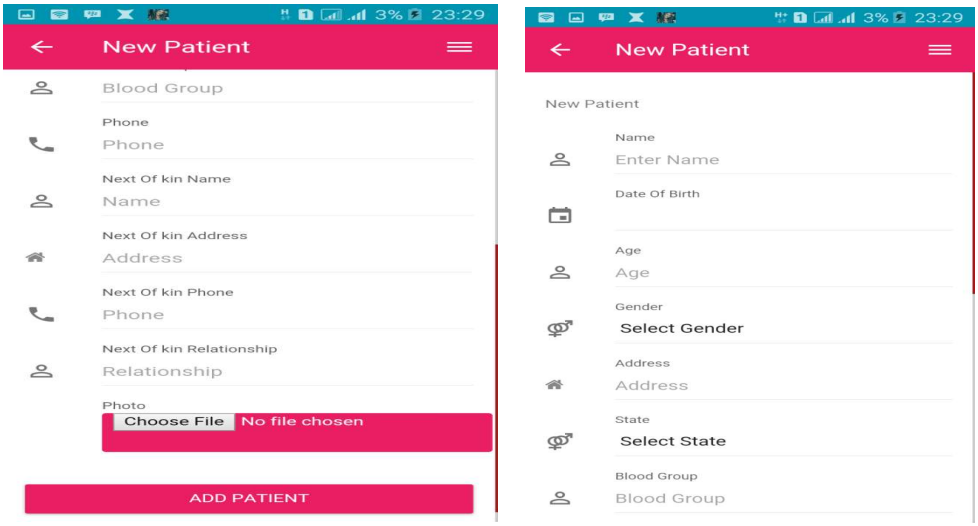

Figure 7: New Patient Form Page

Registered Patient's Data

The patient icon is seen on the home page with a user icon which data of all registered patients are being viewed by the caregiver and once clicked on any patient profile it displays the patient data e.g. examination, medications and bio data of the patient. (as shown in Fig 8).

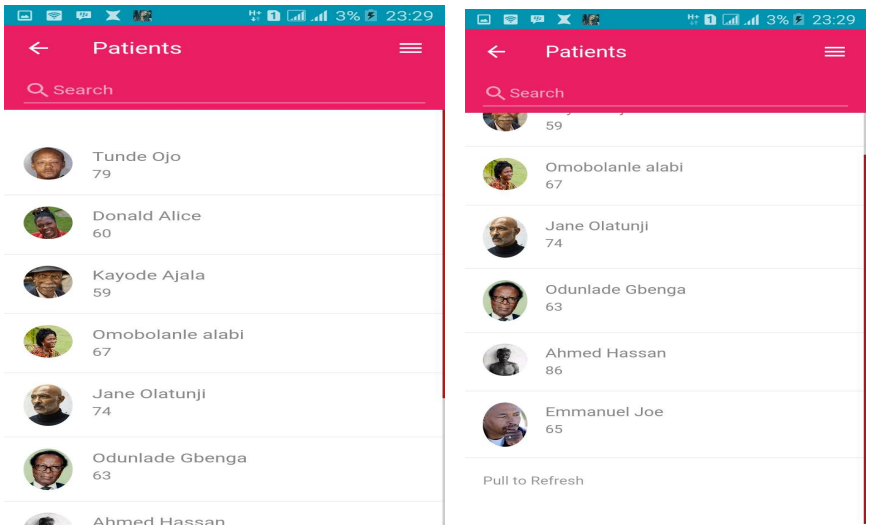

Fig 9: Patient Lists

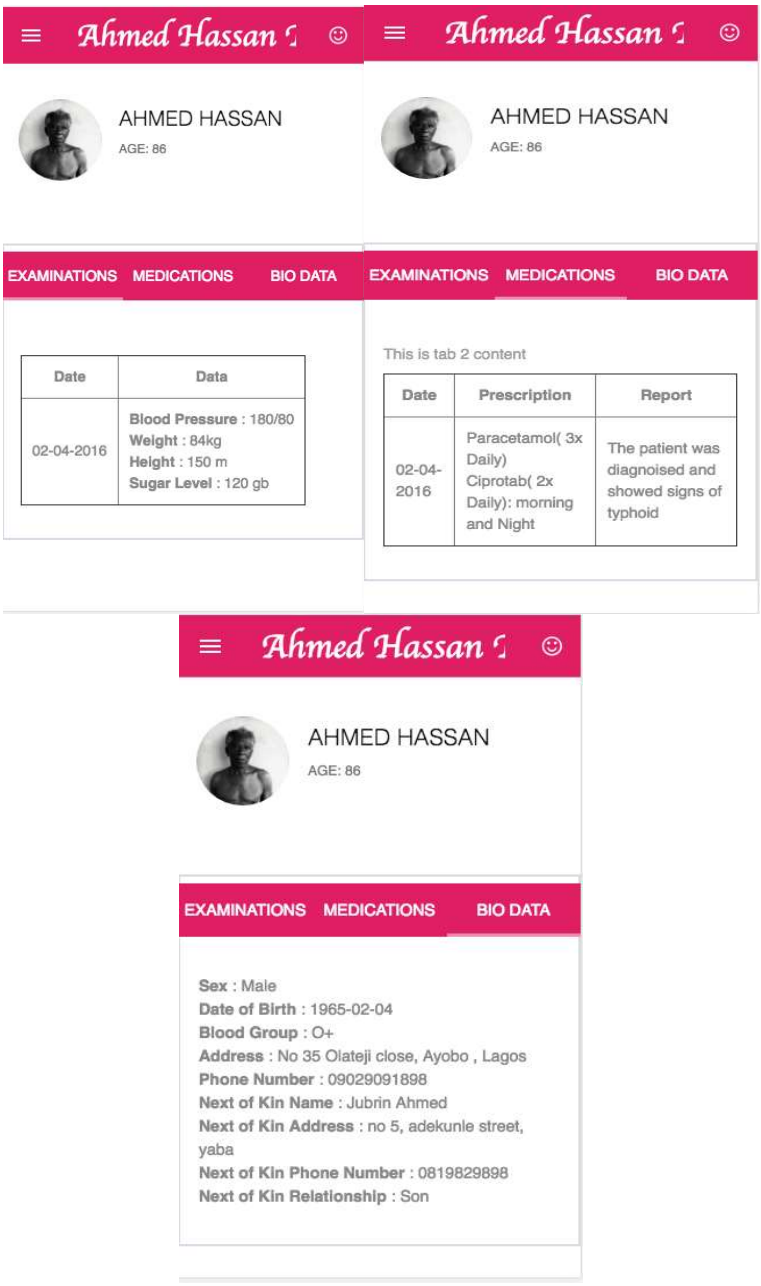

Fig 10: Examination Biodata

Examine Patient Page and Schedule Next Appointment Page

The examining patient page includes filling in the blood pressure, temperature, weight, height and sugar level of the patient and adding an examination of the patient into the database. The scheduled next appointment includes the subject of the appointment, the date and description and book appointment for the patient(as shown in Fig 4.5).

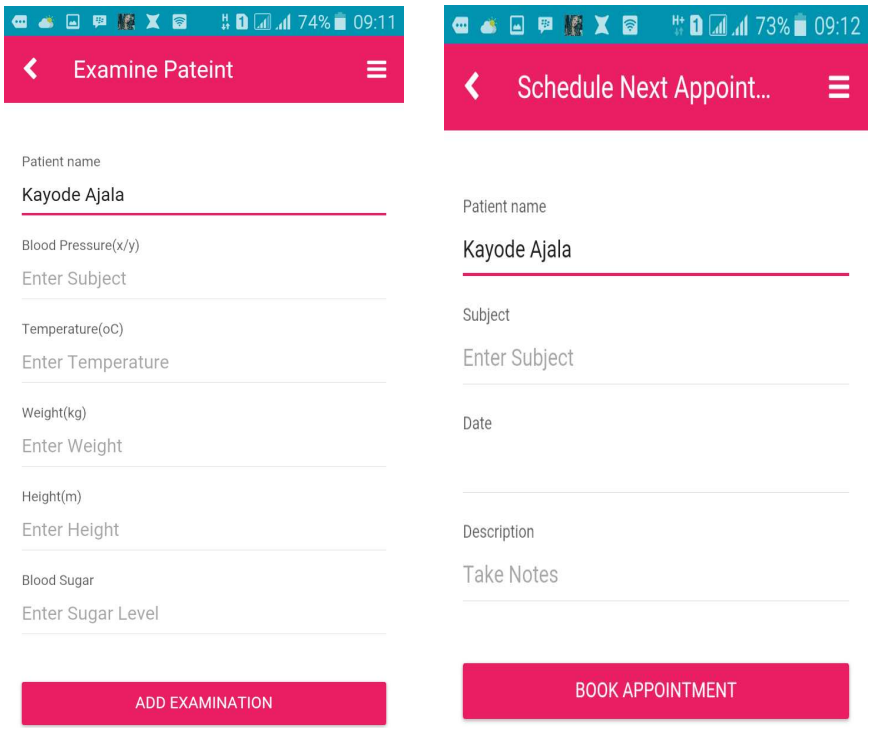

Fig 11: Patient Page and Schedule Next Appointment Page

5. SUMMARY, CONCLUSION AND FUTURE WORKS

5.1 Summary

The mobile caregiver application created in this project represents a significant advancement in m-health, a branch of telemedicine. Recent applications in telemedicine are increasingly helping to expand healthcare access to rural and underserved communities. By leveraging this technology, senior healthcare professionals such as matrons and doctors can more effectively delegate tasks to caregivers. It also enables them to monitor these activities in real-time, ensuring quality care and efficiency. This approach not only optimizes the workload for hospital staff but also enhances the delivery of healthcare services to remote areas, making critical medical support more accessible to those who need it most.

5.2 Conclusion/Future Work

This project explores how smartphones, particularly Android devices, can enhance the workflow of caregivers for the elderly. The implemented features leverage Android technology to simplify daily tasks, decrease the paperwork burden, allow for full concentration on caregiving tasks, and improve communication between caregivers and the elderly. In our future research, we plan to conduct a usability study of the developed application. This will involve testing the app's performance by distributing it to target users such as healthcare centres, hospitals, and home nurses, and gathering their feedback. Enhancements to the system could focus on improving user-friendliness and efficiency. Potential future functionalities may include patient tracking using wearable devices.

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