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ABSTRACT

This research paper was motivated due to delays encountered in health care services, difficulty in locating health personnel's within a given location, issue of discrimination amongst various hospitals and poor medical attentions given to patients during treatment. The Objective of this research is to develop a web based patient's emergency medical support system (PEMSS) that could quickly locate nearby health-Paramedical personnel within a given location for faster administration of medical care services to patients. The methodology adopted was object oriented analysis design methodology (OOADM) and the top down design approach while the implementation was done using HTML, PHP, CSS and MySQL. The expected a web base Patient emergency medical system (PEMSS) that could allow patients to quick access to nearby health personnel within a geographical location.

KEYWORDS: Emergency Systems, Medical Care, Support Systems, Paramedical Personnel, Patients Emergency, healthcare systems.

1. INTRODUCTION

Provision of quick health amenities can never be over stressed, as people found it difficult to locate and access health Paramedical personnel when moved into a new location. Most times when this health care centers are shown to them, getting along with the way of life, and sometimes language barrier becomes an issue. Therefore, there are needs for innovations in health sector in Nigeria, in relative to prompt and efficient responses to more critical issues. Also an immediate need for the best teams equipped with current technology deployed in order to avoid waste of time and to be reached quickly or if they have no contact with the hospitals where patients are to be taken. Most of the world's population lives in areas where there is no telecommunications infrastructure, and this situation may not change significantly in the near future. In order to enable access for effective emergency and care interventions from various locations that already exist without waiting for traditional telephone lines to get to their rural homes, there are needs to enhance and improve the technology facilities through recent innovations. Conventionally, the radio communication is one solution that is found in such settings [1]. Therefore there are needs for innovation of the medical health systems on a web based platform where people could effectively use to alert or locate paramedical professionals with their localized region on time.

2. LITERATURE REVIEW

In the current dispensation, healthcare services provision within a regional or national health system can be itemized and analyzed into three main subsystems or sectors; which may includes: primary, secondary and tertiary care, as showed in Figure 1. Each of these sectors can be modeled and analyzed as subsystem of the whole industry, though in many countries restrictions between these sectors are often not clearly classified. Frequently there is a paradigm shift as the health services providers' moves from one of the sector to another. In clear term a patient journey should start with contact with primary care for an initial diagnostic consultation, and might then involve the patient being referred to secondary care for more specialized diseases or treatment, or a tertiary service for even more specialized follow-up. However, these sectors overlap and it is frequently true that an individual patient may receive services within more than one sector at the same [2].

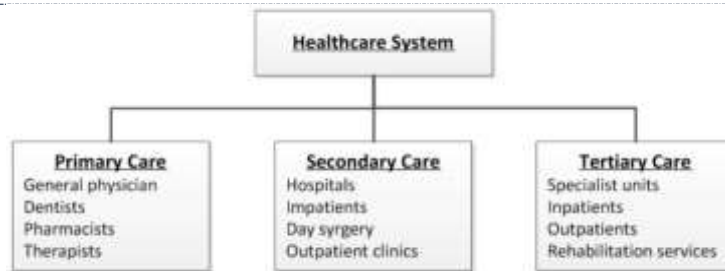


Figure 1: Sectors of Healthcare System [2].

A. Application of Patient Emergency Medical Support System (PEMSS)

Emergency Medical System (EMS) is a revolutionary approach to medical treatment in case of emergencies. This research looks at provision of a web based portal that could allow users to locate nearby paramedical personnel for quick access to health treatment and location of nearby hospital on a click. A user encountering or witnessing an accident can use this website to call, search for an emergency service team around that location. Or most times if traveling or relocating from one location to another, need might arise such that would require the services of a medical personnel to administer a drug or injection to the person (patient) based on the current location. Therefore below are some of the areas this PEMSS could be applied:

1. Homes: Patient emergency medical support system (PEMSS) could be used at homes when emergencies arises that require an expertise more especially when the person is new to the environment and needs a medical assistance to be attending to him/her at home.
2. Hospitals: Hospitals might also require the services of the register medical specialist registered with this platform for help within the hospital.
3. Place of Work: Various working places, there is no place emergency is not required and accident cannot occur and attention or service of medical personnel might be need instead of rushing the person to the hospital where more delays will be witnessed. The co-workers might decide to use this website to search for the services of the paramedical expert registered with the portal for quick medical treatment.
4. Schools: It is recorded that most incident and blood shared are witnessed in schools most especially in higher institutions and curt activities. If such are witnessed, taking the victim to hospital will take much delay and at the end might result to loss of life, therefore the services of this web based PEMSS application is the answer to the problem of quick health treatment.
5. Any Emergency situation: Fire outbreak, fighting, disasters like bush burning, accidents, electric shock etc are all required quick emergency assistance. Therefore the help of PEMSS goes a long way in addressing these emergencies as they arise.
6. Traveling: Transportation companies need the services of this PEMSS as it will give the presenters full confidence of quick treatment in case of accident on the way.
7. Industries: More emphasis are lead on chemical industries, because they deal more on corrosive chemicals that are harmful to the health. Therefore PEMSS could also assist them during emergency at the industry.

B. Emergency Medical Systems (EMS)

In most places, the Emergency Medical System can be summoned by members of the public (as well as medical facilities, other emergency services, businesses and authorities) through an emergency telephone number which puts them in contact with a control facility, which will then dispatch a suitable resource to deal with the situation. In research [3], defined ambulances as the primary vehicles for delivering EMS, though some also use cars, motorcycles, aircraft or boats. EMS agencies may also operate the nonemergency patient transportation services, and some have divisions for technical rescue operations such as extrication, water rescue, and search and rescue. This research strongly agreed with [4] stated that as a first health support, the EMS provides treatment on the scene to persons in need of urgent medical care. If it is deemed necessary, the patient will be tasked to the next point of care. This is most likely an emergency department of a hospital.

Historically, ambulances only transported patients to care, and this remains the case in parts of the developing world [5] The term "emergency medical service" was popularized when these services began to emphasize

diagnosis and treatment at the scene. In some countries, a substantial portion of EMS calls do not result in a patient being taken to hospital [6].

C. Impact of ICT in Patients Medical Emergency Systems

Introduction of information communication technology in managing patient health records can never be over emphasized as its impact and contributions has advance and improved medical practices. Taking a good look at the patient record management systems (PRMS) how the automation of patient records are stored and retrieved improving data integrity and removal of redundancy of records. In such means emergency systems cannot function fully well without the adoption of the information communication technology (ICT) where quick response of emergency calls to paramedical personnel's, emergency reports, alert of emergency situations via a network, android emergency support applications goes a long way in providing easy access to health treatments and assistance to people within a location.

Furthermore, [7] designed an android emergency medical system application with a push button that could allow patients in rural areas to effectively call to require for health treatment. According to them it was developed to reduce the time required for people in rural areas to reach emergency care services and prevent the tragedies like death due to lack immediate help and convenient transport. But the work [7] has a limitation, their system were not able to put into consideration of the case where there is no space in the hospital they are taking the patient to and also were not able to look at a situation where the patient cannot afford an android phone to make the call. Therefore that is why this PEMSS came in as this system could be accessed with or without android phone and also paramedical personals registered with the system start the treatment at the comfort of the patients must not take the patient to the hospital immediately. In summary, impact of ICT in patient emergency medical support system thoroughly helped in ensuring that medical assistance are provided as when due to patient form various location in Nigeria.

D. Types of Patients Emergency Medical Response System

1. Personal Emergency Response Systems

When many people hear the words personal emergency response system, the first thought that sometimes comes to mind is an older adult falling while alone and not being unable to get up.

2. Traditional Medical Alert Systems

The Senior Alert Medical noted the four types of systems that fall under this category which includes:

- a. Two-way personal emergency response system with 24/7 monitoring.
- b. Cellular personal emergency response systems, unmonitored, calls.
- c. Systems That Detect Falls
- d. Systems That Detect Smoke, Fire, or Elevated Carbon Monoxide Levels
- e. Systems That Monitor Medication Compliance
- f. Fitness and Activity (or Inactivity) Monitoring

E. Importance of Personal Emergency Response System

1. *A High Risk of fall for the Elderly*

According to the National Council on Aging (NCOA) Every 11 seconds, an older adult is treated in an emergency room (ER) for some type of injury related to a fall. Worse yet, every 19 minutes, one of the nation's seniors sustain a fall-related injury that ultimately causes people, making it the leading cause of fatal injuries for this demographic.

Moreover, if one look at the Centers for Disease Control and Prevention's (CDC) Health United States Report 2016, one could notice that falls are not only the number-one cause of emergency hospital visits for individuals aged 65 years and older, but other causes of injury cannot be related. Precisely, the Centers for Disease Control and Prevention's (CDC) report that there are roughly 645 fall-related ER visits for every 10,000 elderly persons.

2. *More affordable than other Emergency monitoring options*

The National Institute on Aging reports that falls by the elderly can occur due to poor eyesight or hearing, or by having slowed reflexes. Some health conditions contribute to falls as well, such as diabetes and heart disease, as can certain medications. In cases where the risk of falls is elevated without being to the point of the older person

needing around-the-clock care, it is more affordable to use a personal emergency response system than to pay for a quack nursing home, assisted living, or private in-home healthcare.

3. Provides an Immediate Response If A Problem Occurs, Anytime

Data provided by the World Health Organization (WHO) indicates that 20 percent of falls occur between 9 p.m. and 7 a.m., a timeframe which makes it likely that the fall occurred while going to use the restroom in the middle of the night. Even if the person doesn't live alone, it may be difficult to arouse others in the house if a fall occurs when they're asleep. Personal emergency response systems, on the other hand, provide 24-hour monitoring and an immediate response.

4. Offers Greater Peace of Mind

As loved ones start to age, it's not uncommon for family members and friends to worry about them more, especially if they live alone. Yet, one NCOA survey found that three out of four elderly persons have every intention of staying in their current homes for as long as they live. So, one way for everyone to have peace of mind in this type of situation is to use the services of an emergency response system.

5. Simple to use

Each system is a little different, but many offer easy-to-use wearable devices and an online platform that require nothing more than the push of a button or a search to connect with an emergency response representative or a search of paramedical personnel within the geographical location with the help of the Google map. In cases of falls or where movement is otherwise limited or even self-medication, this enables the older person to get help without having to try to crawl or otherwise find their way to the hospital

3. METHODOLOGY

The Object-oriented analysis and design (OOAD) was adopted for this design. It is a popular technical approach for analyzing and designing an application, system, or business by applying object-oriented programming, as well as using visual modeling throughout the development life cycles to foster better stakeholder communication and product quality. Web based patients emergency medical support system was designed following the OOADM stages /approach. Object-Oriented Analysis, Object-Oriented Design and Object-Oriented Implementation

Phase 1: Object-Oriented Analysis

In this stage, the problem is formulated, user requirements are identified, and then a model is built based upon real-world objects. The analysis produces models on how the desired system should function and how it must be developed. The requirement looked into includes:

User Functional Input Requirements:

Functional Requirement describes the use cases and actors that are found in the Web based patient's emergency medical support system. Each use case is described in details with diagrams and tables in their respective module section. These use case diagrams model the desired behavior of the system. The Functional requirement is categorized in five (5) main modules:

Patients User Requirement Module; Administrators User Requirement Module; Medical Professional User Requirement Module; Pharmacy (Drugs) User Requirement Module; Locate Paramedical Professionals User Requirement.

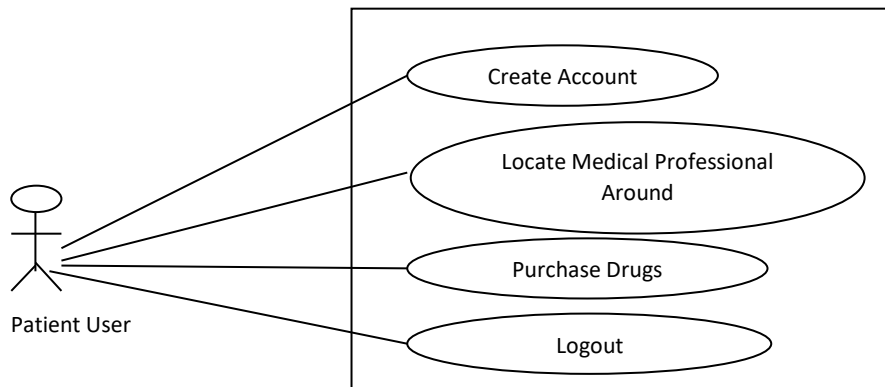


Figure 2: Patients Module Use Case Diagram

1. Patients User Requirement Module

As showed in figure 2; are some of the allowed modules for the patient so as to have effective healthcare within the comfort of his/her home.

- Create Account (Registration)
- Locate Medical Professional around
- Purchase Drugs

2. Administrators User Requirement Module

Administrator module is the module that enables administrators to configure and maintain various variables in the system.

1. Open New Account
2. Block or unblock account
3. Trace fraud
4. Grant Privilege to various user

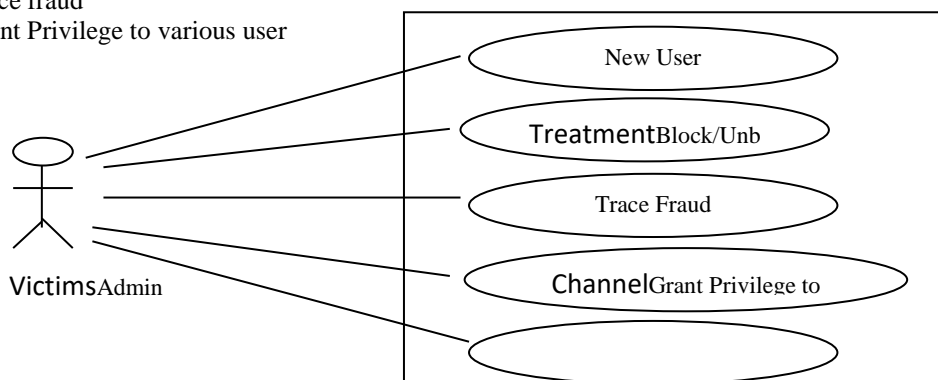


Figure 3: Administrator Module Use Case Diagram

3. Medical Professional User Requirement Module

The medical professionals registered with this platform will receive an alert anywhere they are ensuring that adequate healthcare is given to the client. The diagram below in figure 3 shows the various activities a paramedic must do before an access is given.

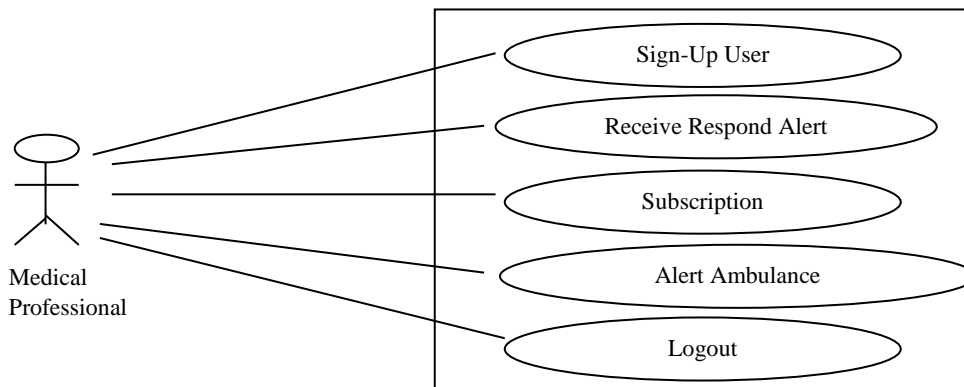


Figure 3: Medical Professional Module Use Case Diagram

4. Pharmacy (Drugs) User Requirement Module

This module allows the patients to either order or purchase for drugs on the platform. After the choice of drug is selected, patient must make payment before a receipt could be generated and a link sent to the email address which will serve as an evidence to clear or receive the drugs during delivery. Figure 4 shows the use case diagram listing the various functions and sub-sub-module in the system.

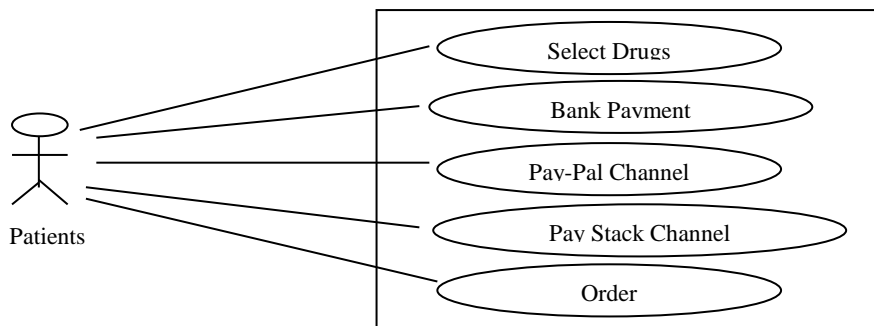


Figure 4: Use case diagram of Pharmacy (Drug) Module

5. Locate Paramedical Professionals User Requirement

This use case diagram shows how the system enables emergency victims in any location to search for any paramedical professional for quick response and treatment.

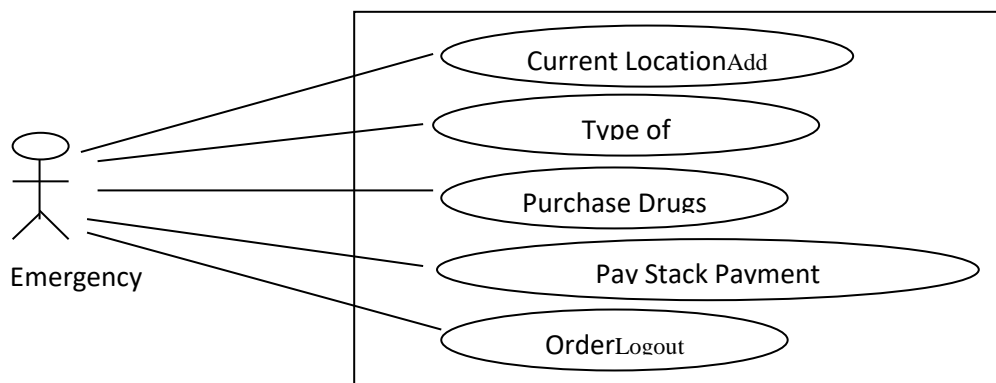


Figure 5: Locate Paramedical Professionals Use case Diagram

Phase 2: Object-Oriented Design

Object-oriented design includes two main stages, namely, system design and object design.

System Design

In this stage, the complete architecture of the desired system is designed. Figure 6 shows the complete architecture of the proposed PEMMS. It shows the high level model of the flow of data of the system. It shows the flows from the user browser to different departments in the hospital as well as the Admin login and user creation link to the application.

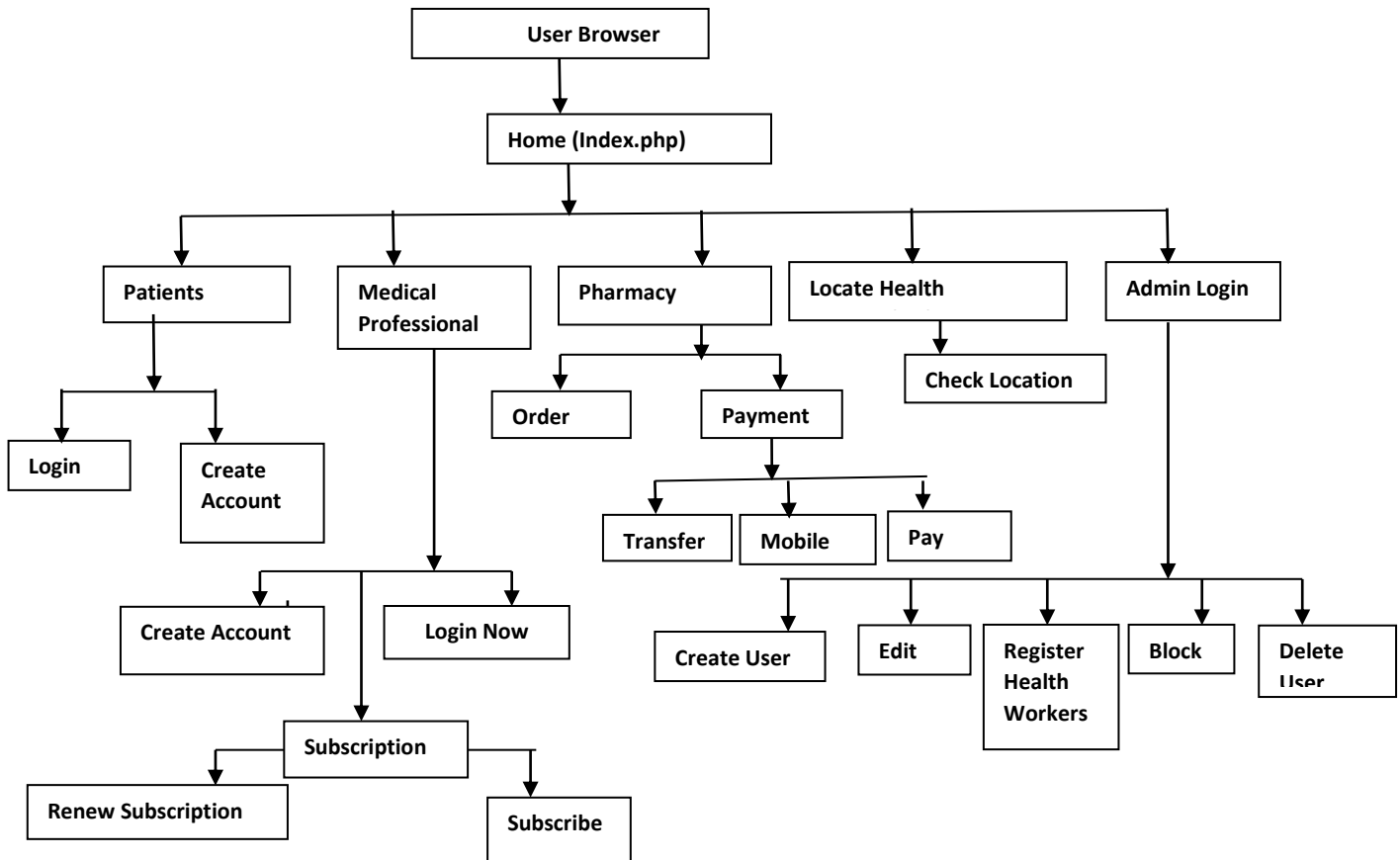


Figure 6: Architectural Design of Proposed System.

Object Design

At this phase, the data flow diagram of the proposed system was modeled ensuring that all new classes are created from scratch, incorporation of other classes (modules) in the existing system and means of information flow between the classes are covered. Figure 7 shows the data flow diagram between classes:

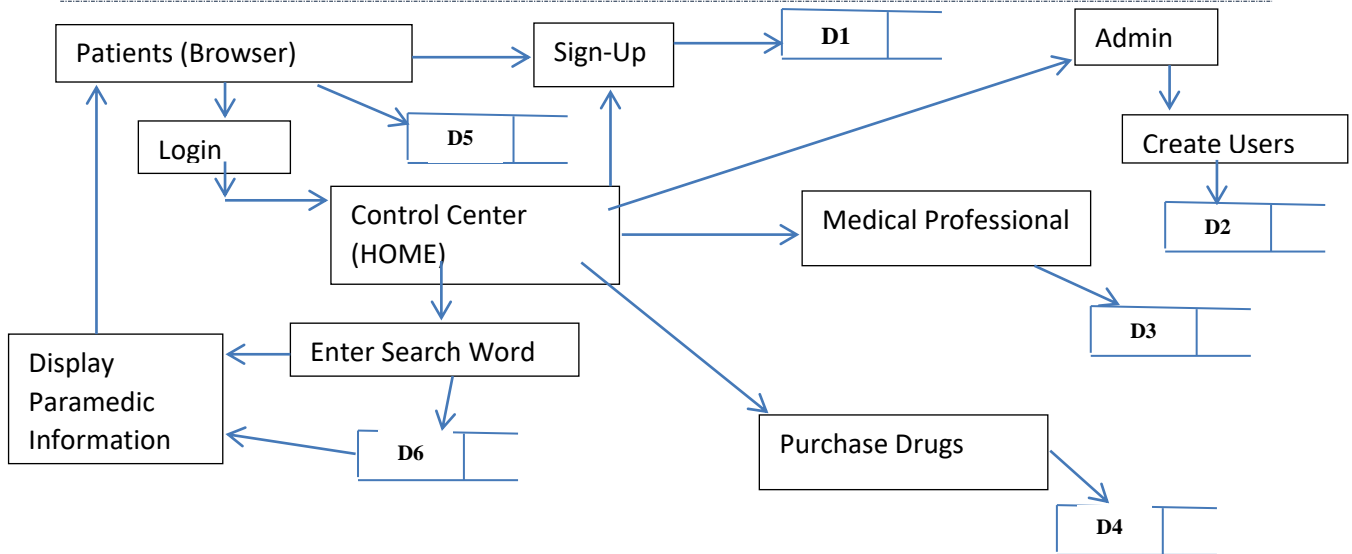


Figure 7: Data flow Diagram (DFD) of proposed System

Phase 3: Object-Oriented Implementation

In this stage, the design model developed in the object design is translated into code in an appropriate programming language or software tool. The databases are created and the specific hardware requirements are ascertained. Once the code is in shape, it is tested using specialized techniques to identify and remove the errors in the code.

Code Development

The front end development which was the link (interface) between the users of the system and the back-end of the application was done with the following programming languages:

- Hypertext Markup language (HTML)
- Cascading Style Sheet (CSS)
- Java-Script

The JavaScript language is used to enhance user and system interaction. It monitors events of action between the application and the end users. The back end development which ensures that any request made from the front-end was serviced accordingly as they come in. Languages used were:

- Hypertext Preprocessor (Php),
- My-Structural Query Language (MySQL).

MySQL was used to design and manage the Patients data in various databases.

6. System Description

The program was designed using Top – Down Approach. It makes use of the fundamental problem solving techniques. The software is structured in such a way that each subsystem is selected and executed independently. The task is divided into several modules, which come together to give the solution to the problem. The modules are as follows:

- Patients User Module:** This module enable users to create account and also login to manage their profile.
- Medical Professional Module:** This module allow medical professionals to subscribe in a way of payment and account sign up before they could be allowed to work with the system.
- Pharmacy Module:** The purchase of drugs could be done on this module by patients.
- Search Health Professional Module:** This module provides an interface for quick search of health workers within the geographical location.
- Subscription Module:** Renewal of monthly or yearly subscriptions by the paramedical personals is done on this module.
- Admin Dash-Board:** The admin uses this module to create new users, maintain the entire database and as well view other information. This module can also enable administrator to view patients account

reports, paramedical personnel' information, as well as delete or upload any relevant information concerning a patient or medical professional.

g) **Payment Module:** This module is use to make payment for any purchase

Figure 8-17 shows the output for the interfaces for the application of Patient Emergency Medical Support Systems that will assist both hospital administration and Patients to for prompt responses to Emergency Medical Services.



Figure 8: Introduction Page of the PEMSS



Figure 9: Home page of the PEMSS

The interface in figure 8: shows the front page of the application it captures the link to access into the PEMSS, while the figure contains the PEMSS Homepage, it contains the menu of patient Emergency Medical support System.

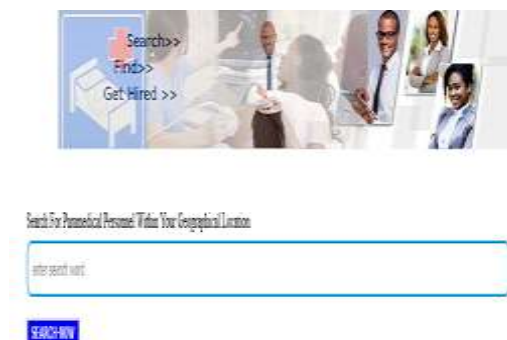


Figure 10: Paramedical Personnel Search Page.



Figure 11: Administrators Login Page

In the Paramedical Personal Search Page in figure 10: here patients could search for possible and nearest Medical centre that is closer to the location of emergency of any medical issues. Then figure 11: is the administrator login point that register potential clients and monitors the use of the PEMSS application.

Patients Dash Board

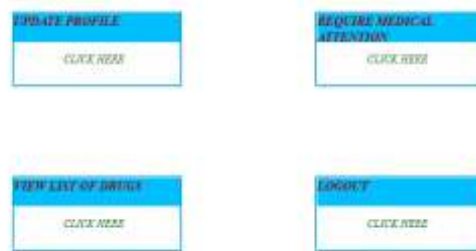


Figure 12: Patients Dash-Board



Figure 13: Patients Payment Page

In figure 12: the patient dash board shows the available services on the web based application of the PEMSS where patient could update profile, inquire for medical attentions, view the list of drugs. The web application has a gateway for payment channel as show in figure 13.


Figure 14: Patients Medical Help Page
Figure 15: Paramedical Registration Form

The PEMSS has medical help interface, this is to help patients to get attention in case were emergency centre could not be reach immediately, the patient into the details and get quick responses from the application as it is in figure 14. The patient can also fill in the paramedical registration form as showed in figure 15.





Please fill this form in order to register. Note that the fields with \ * \ are mandatory.

Patient registraion form

• SURNAME:	<input type="text" value="surname"/>
• MIDDLE NAME:	<input type="text" value="middle name"/>
• LAST NAME:	<input type="text" value="lastname"/>
• DATE OF BIRTH:	<input type="text" value="mm / dd / yyyy"/>
• GENDER:	MALE: <input type="radio"/> FEMALE: <input type="radio"/>
• PHONE	<input type="text" value="phone number"/>
• MARITAL STATUS:	<input type="text" value=""/> ▾
• GENOTYPE:	<input type="text" value=""/> ▾
• STATE:	<input type="text" value=""/> ▾
• L.G.A:	<input type="text" value=""/> ▾
• BLOOD GROUP:	<input type="text" value=""/> ▾
• USERNAME:	<input type="text" value="username"/>
• PASSWORD::	<input type="text" value="xxxxxxxxxxxxxxxx"/>
• CONFIRM PASSWORD:	<input type="text" value="xxxxxxxxxxxxxxxx"/>
• EMAIL:	<input type="text" value="joach@gmail.com"/>
	<input type="button" value="SUBMIT"/>

Figure 16: Patients Registration Page

As soon as the patients had a successfully login by the patients, it is requested by the patient to complete the biodata registration form as contained in figure 16. The PEMSS allows patients to also order for drugs and payment accordingly, figure 17 shows that interface.

PHARMACY

DRUG NAME:	<input type="text" value=""/>
QUANTITY:	<input type="text" value="drug quantity"/>
TOTAL AMOUNT:	<input type="text" value="amount"/>
	<input type="button" value="PAY-NOW"/>

Figure 17: Pharmacy (Drug Purchase) Page





4. CONCLUSION

Experiences from recent major health care cases have demonstrated that the greatest successes in health such as disaster and response are achieved through a coordinated effort of multiple types of agencies, including law enforcement, the military, search and rescue, fire, Emergency Medical Systems, hospitals, public health, and public utilities. The role of the EMS system and its providers in every phase of emergency management has grown from the traditional role and skill set of emergency patient care providers to specialized and highly trained positions in leadership, education, technological based and response. Emergency medical services providers and medical directors should be recognized as integral part to disaster preparedness and response. They should seek and afford opportunities to contribute in all phases of disaster management and other quick health activities through the use of web technology.

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