ICT as a Global Solution for Patients Information Security

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ABSTRACT

Security of data for patients is the most overriding obstacle in the healthcare sector when contemplating the implementation of HIS. The sharing of clinical data across Nigeria's health systems through a single IT platform seems to be a significant issue, perhaps owing to the country's poor technical progress. The current transfer of such data manually via the internet continues to mislead the supposedly private data of patients. The manual transfer as witnessed was terrible and violated the safety, delivery, confidentiality and ethical risk systems for the dissemination of health information. Electronic health record (EHR) containing patient information is considered extremely vulnerable in healthcare companies, in order to safe and protect unwanted access, sensitive patient care information has to be managed. Patients may get high-quality treatment if the appropriate information is provided at the correct time via health management system. Accessibility and availability are important elements of information security, and information that is available and accessible to users both inside and beyond organizational boundaries must be available. At the same time, patient safety must be protected from unauthorized access and an adequate degree of information security health care is required. The objective of this thesis is to examine current information security management with regard to Electronic Health Records and to examine ways in which sensitive information is exchanged between different health and cross-border players from potential threats to safety and health risks to the environment. Therefore, potential problems and possible recommendations and proposals were examined, with the aim of improving existing data security by preventing the required risks for health-sensitive information.

Keywords: Accessibility, access control, hand-to-hand transfer, and security specifications

1.1 Introduction

Security is an essential part of any information processing operations, especially in contexts with sensitive, private information, like in healthcare settings (Adlassnig, K. P., amd Information, E. F., 2020). Health Information Systems (HIS) have been claimed to provide economic advantages via efficiency, data management and care management. When shared health information between patient and healthcare practitioner is utilized to enhance diagnosis, boost patient training and encourage self-care, HIS may become more useful (Aldrawiesh and F. Siewe et al., 2019). In the 1960's and 1970's, the concept of computerized patient records was presented and many successful efforts were undertaken (Al-Muhtadi, J., 2017). The HIS paradigm of health information exchange has developed in recent years as patient-centric. Cloud computing may decrease the cost of hardware and energy use in such settings with fewer data centers and provide flexibility in updating software components Anderson, R., 2016) (Asabe, S. A., Oye, N., & Monday, G., 2013). Cloud computing allows healthcare to collaborate and to communicate with many players (healthcare professional, patient, manager, developer) in the area of healthcare (Bardram, J., 2014). When the public have cloud resources and services, they are known as an unknown cloud environment, such as Amazon AWS, Microsoft Azure and Google (Bass, D., 2019). With regard to security, we cannot use cloud computing with one technique, we need a lot of conventional new technologies and methods (Bennet, et al, 2019). The IT expert utilized IT to solve issues of HIS security, such as encryption, firewalls, access controls and backups (Berwick, D., 2017). According to the CSO editor, the 2018 HIS remains the preferred target of ransomware, crypto-mining and data theft (Bhatti, R., 2015). In HIPAA, the privacy and security rules as well as their infringement are two important criteria that may cause not only the exposure of sensitive information about patients (Blobel B., et al, 2014), but also a considerable loss and harm to reputation for medical professionals (Booth, H. et al, 2014). (Canada Health Infoway 2014). We must examine further how HIS security affects the entire field in a setting in which security is crucial to all IS systems and security elements are essential for HIS, on the other hand. Its objective is that HIS safety procedures be organized and described. Healthcare is an industry that is continuously evolving and confronts shifting circumstances and ever growing demand for healthcare services. Medical mistakes have been projected to cost about 37,6 billion dollars per year. The problems are also worsening with the growing human population density, which ultimately cost the healthcare sector a large amount and compel them to provide patients with improved services. In the growth of the medicine industry itself, the emergence of IT and its components will provide much more advantages. In the future, individuals doing medical research using electronic medical data, using more sophisticated and powerful apps, can readily generate useful results. EMRs are utilized extensively in various applications as well as these applications since we may get many benefits. Through EMR, patient information may be collected at any given location and medical and allergic interactions, prescriptions, and arrangements can be carried out automatically.

A model using different systems, operating systems and database applications in the healthcare system is designed for consumers to read, but because of the safety awareness the researcher cannot alter the data at any point. A user has to comply with the regulatory requirements of the resource access policy class, which are inconsistent with Nigerian Federal Ministry of Health Organizations, which regularize health policies (Anderson,2016). As the role and resource refrain is based on the goal of their limitations, the obligations policy to be carried out must be based on specified safety policies and regulations that have been established in this programme. Their purpose should be to allow users to delegate their access rights to others. The technique was therefore applied to restrict permissions to network resources based on each user's function.

1.2   Statement of Problem

Modern medicine faces a complicated environment, not because of technology but because of government restrictions and the sensitivity of information. The biggest danger is the growing security problems. Physical security is frequently poor, office staff are unaware of safety requirements and security of application and transmission protocols cannot be maintained consistently. The growing industry in medical identity theft was generated by health insurance requirements and general cash opportunities. Medical offices, including personal, credit, banks, health and insurance, have a perfect storm of information gathering. Thieves have understood the economic importance of medical facilities such as banks and safety is much simpler to break. Medical identity theft is a concealed crime mostly perpetrated by insiders. The devastating effect on the victims is unclear despite its hidden nature. In order to get health care services or to claim Medicare on behalf of patients, this information crime includes taking data from patients to personify them. In contrast to theft of financial identity, victim remediation is inadequate. Theft of medical identity damages health care information systems quality and ensures electronic record data security.

1.3   Aim and Objectives of the Study

The objectives of this study are:

i.   Identifying the safety issues in the health care system management system with respect to patient safety.

ii.   To develop safety concerns based on information security demands for the management system of electronic health records (EHR).

iii.   To adopt block chain security system for the safety of patient data in the medical system

<div align="center">**Literature Review**</div>

2.1 Introduction

Until recently, people had to visit a healthcare specialist in a traditional medical setting physically for excellent and effective healthcare services in Nigeria's health record. People living in regions lacking adequate health services, such as the Gumbe, Adamawa, Lanlate, Kofan Mazuga, Gusu and Gorunduse, require a long distance to go and to find various circumstances in order to get the necessary healthcare or less medical treatment at different levels (Adlassnig, 2020).

Those who want access to Nigerian medical literature and education are generally relied on to visit medical libraries, should they have access to these resources since health libraries and labs are insufficient in the nation. Patient data stored in primary care doctors' files because there was a lack of IT, resulting in lack of adequate national system networks, will not be readily available to specialists, pharmacies, hospitals or laboratories. As stated in ITU-T, 2018, the provision of the finest health services in Nigeria has physical, economic and knowledge impediments.

A health system is seen worldwide as an organization that provides health services to people, institutions and resources to fulfill the health requirements of the target population. There are broad ranges of health systems worldwide and in certain nations; planning of the health system among market players is dispersed. Health systems have numerous records and organization, because the 2013 National Demographic and Health Survey states exist. In other countries such as the USA and Europe, governments, syndicates, charities, churches or other coordinated organizations are working together to provide organized health services aimed at the people they serve. However, the health planning of the World Health Organization was often described as evolutionary rather than revolutionary (Asabe et al, 2013).

Public health initiatives have lately been acknowledged by the US and UK governments for the significance of decreasing the prevalence of diseases, disabilities, the impacts of ageing and health inequalities, and increased citizen awareness and knowledge. In a National Vaccine Scheduled for a Specific Period in 2015, 2012 and 2013, governments in the United Kingdom, United States and Nigeria cover all or part of the vaccine expenses. In some countries vaccinations are optional and in others compulsory, but most have a vaccines policy that promotes the provision of health vaccination programs for economic growth. public health programmes. The trend in IT in the

area of health care has changed greatly from conventional medical records on a work demanding basis to electronic records of health. The information distribution system in Nigeria is a medical electronic record containing vital information concerning people's mental, social and physical health for a long time to be accessed by the Internet or the Web anytime and anywhere, in the context of a data- and service-accessibility framework in the field of healthcare (Bardram, 2014).

2.3 Patient Security

Computing and safety for patients Information is a medical subcategory that is defined as the prevention, prevention and improvement of poor health outcomes or injuries. In 1999, in the subsequent "Quality Chiasm Crossing" report on the use of IT as an initial key step in transformation and transformation of the health care environment for better and safer care the Institute of Medicine report "I'm Human," called for the development and testing of new technologies for eliminating medical errors.

" In communication and decision-making the use of computer hardware and software for the storage, retrieval, sharing and application of the information, data and expertise of the medical sector" (HIT).

Health ICTs encompass a variety of technologies ranging from basic charting, to sophisticated decision making and medical integration. Health IT offers a wide variety of possibilities, including human error reduction, improved clinical results, coordination of healthcare, enhanced practical performance and time-controlling data. The purpose of this study is to synthesize the scientific data available on the effect on computerization and patient safety of various health information technology Information outcomes. Such a review may be helpful for doctors and health policymakers to decide to purchase and deploy these technologies on an evidence-based basis to enhance patient information computerization and security. The study included studies with electronic clinical orders (CDS), electronic registration, sign-out, hand-hold instruments; administration of barcode (BGCMA), smart pumps, Automated Pharmaceuticals Dispensing Schedules (AMDs); electronic sign-offs and hand-offs. studies in hospital and Community-built healthcare included the following procedures: (EMR). Patient Safety and computing. The primary findings of our interest were information, medical errors, adverse events, pharmaceutical errors, adverse events and mortality. The emphasis has been paid to systemic reviews, meta-analysis and RCS. In the case of non-randomized controlled studies, quasi-experimental, pre- and post-studies, prospective and retroactive studies, and case control, such studies have not been identified. Research has been discarded when any of those criteria have been met: high risk of biais, non-clinical trials, non-medical IT co-intervention, no computerization assessment and patient safety Information results, qualitative research or research.

To locate published and unpublished studies, the search technique was created. The study method included Medline, Embase and Cochrane Database. Studies published in this review were assessed through January 2020. Electronic medicine record (EMR), Electronic Physics Order were first utilized (CPOE). The initial buzzwords were electronic medical records, clinical decision entry (CDS), electronic sign-out & hand-off, code

administration (BCMA). Cochrane methodology for methodological validity and risk of bias before inclusion was analyzed, as were the methodology for Patient Electronic Portals, Telemedicine, Electronic Incident Reports, Smart Infusion Devices, Smart Pumps, Programmable Dispenser, Adverse Events of Medicinal Errors, Computerization and Security Studies have been done.

2.4 Impacts of Computerization And Security

The implications of computerization and patient security. The information is relevant to both a medical system and a healthcare system Organization relies on information. The widespread use of computers among healthcare professionals. Preventive care refers to keeping the patients in their facilities for treatments. Furthermore, patients' interest in pharmaceutical information and medical publications helps to safeguard and preserve their health. According to standard practice, it is generally anticipated that patients' personal diaries and personal information about patients be created, updated, transmitted, intercepted, and kept on a regular basis. Electronic health records, electronic patient records many healthcare organizations use electronic patient records (EPR) and patient electronic diaries, a human notion which may be kept in a repository.

The development of healthcare organization has been greatly supported by computerization and sensitive information and the structure of the information business. Service enhancement, cost reduction in spending, control system, advanced management system, supply chain management, management of electronic scheduling, improved information management (CDSS). In order to have a strong connection between stakeholders and their respective activities, in addition to using the available technology for varied purposes, the health care system employs a large number of stakeholders and their varied activities. However, utilizing a variety of different applications that allow interrelated stakeholders to collaborate may expedite and streamline interactions. Emotionally charged information It is important that information from journals and EHR, as well as information held by various stakeholders in the health care system, remain protected from unauthorized users. There are problems with the management system in identifying which communication distribution the retrieval information and actions of actors are acting on. This is a public organization, and within a specific time period, the Federal Ministry of Health of Nigeria has decided to execute certain significant health care services including the execution of Nigeria's National Information Technology program (NPIT). Electronic NHS has been provided with patient records (EPR), electronic scheduling, and e-pressure and internet communication.

2.5 Healthcare Information Security

The current health care system is very dependent on existing information, with existing information serving the important assets of the system. This is why the electronic newspapers of patients, the electronic health records (EHR) have a major health care effect and it is important that this data be secured from unauthorized users and appropriate security. A secure and secure communication mechanism must also be utilized to allow for specific health care activities. In order to provide optimum safety, a safety system should be able to optimize patient information confidentiality and gradually improve the overall safety level in the same system.

To fulfill the needs of health care about reducing risk and providing high quality treatment, healthcare provider organization uses risk management as their main strategy. This was PHI, and many health care providers have been given PHI to guarantee the safety of sensitive information flow, which puts management at risk for illegal access. This approach seeks, via several areas of surveillance, to detect all kinds of private data. All citizens get free care at the time of delivery, under this system. In this system, taxes are used to fund the delivery of services. In the countries with government healthcare, salaried doctors and other health professionals, such as nurses, offer both curative and preventative treatments. Socialist nations in Europe and Asia, such as Nigeria, China, North Korea, Cuba, and the former USSR, still use this technique (Terris, 2013).

2.6 The Nigerian Health Sector and Security

The Nigerian government's five-year Strategic Health Plan prioritizes health information systems to accomplish their goals by utilizing the six building components. The goal is to establish a national information management system (NHMIS) for managing and improving healthcare for all federal administrations. The Government recognized the necessity for a unified health information management system in support of the goal of the plan. The conference was planned on the basis of this concept and was held from November 2 to 4, 2019, as the first ever National Conference on HIT. It is one of the largest social sectors in Nigeria in terms of health. In order to attempt to better understand how the organizational structure and managerial dynamics of the Nigerian health sector influence on the delivery of its mission, it is essential to explore how these components interact. By learning how to better grasp the Nigerian health industry, the organization will be able to more effectively position it. Over the years, policy in the Nigerian health care delivery system have both been massive. Like other areas of the Nigerian economy, the health industry was extensively subsidized soon after the country's independence. As of 2012, when the Structural Adjustment Program (SAP) came into effect, the provision of health care was transferred to the private sector. This policy began in the years 2013 and 2014 and carried on till 2017.

2.7 Electronic-Clinic and Security

To experiment with a novel approach to healthcare delivery, Electronic-Clinic constructed a proof of concept in which the collaboration of patients, physicians, and other relevant parties could be executed. This may be seen in Figure 2.3. Current problems that impede the sharing of patient clinical data stem from the fact that centralization of patient data is not possible owing to the current distributed computing architecture.

Electronic NHMS gives users access to a wealth of health information via the internet and the World Wide Web, making it possible for stakeholders to reach people all over the world with up-to-date, accurate, and trustworthy information in real-time. A cutting-edge software development methodology is used to design the system, which allows for dynamic growth. By providing many client components, as well as individual users, the system becomes more user-friendly. The integrity and security of the system are of paramount importance because of the sensitive data it is handling. Consequently, the system is built with both integrity and security in mind, along with system development.

Figure 2.1: E-clinic high-level design

(Source: Smith, 2018)

2.7.1   Client / Server Technology

Clients may make advantage of distributed computing by using the Client-Server network technology to build massive systems from across the globe via the network. The biggest benefit is a significant delegation of work. A client is just the device at the end of the server's chain that takes use of the services offered by the server. Because the customers are anticipated to utilize the NHMS service housed on servers, client/server technology is very important to the NHMS system. In order to offer users with many advantages, including the ability to utilize the NHMS at any time, our system will allow you to get real-time, up-to-date data, updates, system upgrades, and modifications may be made without interrupting the users.

2.7.2   Web Service

The primary goal is to make the utilization of online services accessible for different groups of organizations (companies, people, or corporate groups) that do not have intimate knowledge of each capabilities such as the figure 2.2.

Following a thorough study of accessible literature on the information dissemination constraint-based access control model for Nigerian healthcare systems, the following facts were discovered: Blobel et al (2014) proposed a paradigm that focuses on describing policy, authentication, and certification as well as service delivery. To make sure that quality and speed improvements are brought to Nigeria's healthcare systems while at the same time addressing issues concerning interoperability, security, and confidentiality . To meet expectations, the primary focus here is ensuring that the system delivers. To log in to the system, everyone who uses it must have an account and must provide a username and password. It is anticipated that both patients and physicians would utilize the web client. Let's say, for example, patients use a web client to provide day-to-day updates on their condition, and physicians use the web client to see updates submitted by their patients. The purpose of the mobile client is to let you send changes instantaneously. Due to the mobile application's dependency on mobile devices or PDAs with low resources, some functionalities are constrained.

Figure 2.3 Web service architecture (Source: Smith, 2018)

Methodology

3.1 Clinical Diagnostic method

From the medical history and physical and mental exams, the physician narrows down the list of potential explanations of the illness to a set of differential diagnoses, which is known as the differential diagnosis. After making a list of the possible causes of the patient's symptoms, the physician next chooses which tests to order to narrow the list or to identify the particular illness causing the complaints. As a result, certain illnesses that may be present will be eliminated, and other ones will be added to be tested in order to either determine whether a particular disease is present or disprove it. Treatment is justified when the list has been narrowed till the physician thinks it's ready to go ahead. The first list of potential diagnoses may be modified after therapy has started, but a new condition may arise that was not included on the initial list.

Another key aspect of clinical decision making is maintaining a long-term connection with patients. Doctors who have had prolonged contact with their patients have a better understanding of the probability that a certain illness is present. The new doctor is more likely to identify symptoms related to emotion than a physician seeing the patient for the first time. Additionally, having a long and trustworthy relationship with a doctor can frequently help the patient's prognosis.

3.1.1 Methodology Procedures for 'Medical System'

Maintaining strict controls on users' access to apps and data. As soon as a user starts using the application, find out whether they have permissions to deal with apps and data.

3.1.2 Identification of the session user

```php
?>
<div id="add_user">
<p id="title">Add Doctor</p>
<?php
if(isset($_GET['error'])){
        echo '<div id="error">';
   echo $_GET['error'];
        echo '</div>';
}

if(isset($_GET['success'])){
        echo '<div id="success">';
   echo $_GET['success'];
        echo '</div>';
}
?>
```

Figure 3.1: Identification of the session user

3.1.3   Rules of procedure / permits

```php
?>
</div>
<form action="validate.php" method="post">
<label for="name">Doctor's Username</label><input type="text"
name="name"><br />
<label for="passwd">Password</label><input type="password"
name="pass"><br />
<label for="passwd">Re-type Password</label><input
type="password" name="cpass"><br />
<input type="submit"  name="add_doc" value='Grant Access'>
</form>
</div>

<?php
}if (isset($_GET['add_pat'])){

?>
<div id="add_user">
<p id="title">Add Patient</p>
<?php
If (isset($_GET['error'])){
        echo '<div id="error">';
   echo $_GET['error'];
        echo '</div>';
}
```

Figure 3.2: Rules of procedure / permits

Figure 3.3: Medical Information System

Any diagnostic actor (administrator, doctor or patient) may register with the media online platform if he or she is authenticated and administered. He or she may then see patients' particulars and transmit and get information from the front-end or online interface about his/her patients. Any column from the currently logged into user is supplied by the user method of the component. This technique has been used to add the data to the stored request details. Let's make sure we do not alter or delete other writers' postings via our program. The fundamental limitations of our program are that admin users have access to any URL, while ordinary users (the position of author) may access only permitted activities.

3.2 Authentication and Authorization

Authentication is a certification that a person or lot has used a user identification. Authorization checks that specific actions on an item may be performed by a user-id.

3.2.1 Authentication Process

The user/batch process asks user access from a server to <user-id>, verifies credential

– the authentication token is validated

– verifies that the associated user-id may execute the request

3.2.2 Methodology Design of RBAC in Medical system

In a business with diverse IT infrastructures and needs for dozens or hundreds of systems and applications, it is very difficult, without hierarchical development of role and privileges, to use RBAC to handle roles adequately and to assign appropriate role memberships. Roles are established inside an organization for different tasks. Certain operations are allowed to carry out certain responsibilities.

The Medical RBAC has three main rules:

Assignment of roles: The consent of the subject may apply only if the subject has been chosen or given a role.

Authorization of roles: The active role of the topic for the subject must be approved. This rule guarantees that users may assume the only roles that they are authorized for using Rule 1 above.

Authorization: A subject is only permitted to exercise if permission for the active involvement of an individual is approved. This rule guarantees that users may only execute authorizations under Rules 1 and 2.

There may be additional restrictions and roles integrated inside a hierarchy where higher-level roles contain authorizations that belong to sub-roles. RBAC may be controlled in order to establish or mimic gill-based access control using the notions of role hierarchy and limitations (LBAC). RBAC may thus be seen as an LBAC superset. The following conventions are helpful for creating an RBAC model:

S = Subject - A human or robotic agent

R = Role - Title or function that establishes a degree of authority

P = Permissions - Authorization of a resource access mode

SE = Session - A S, R and / or P mapping

SA = Assignment Subject

PA = Assignment Permission

RH = Partly structured was the role hierarchy. The text of RH may also include: [Note: x literally signifies y listed].

RH may be written as well:

There may be many roles for a topic.

Multiple topics may have a role.

A position may have several allowances

Allowance may be allocated to various functions

There are various permits for an operation

Authorization for various operations may be granted

A restriction puts a limiting regulation on the possible heritage of permits from conflicting roles so that the proper division of responsibilities may be achieved. For example, a login account and the establishment of an account should not be permitted to be both created by the same individual.

Using the notation of set theory:

$$PA \subseteq PXR$$

A many to many permissions for the role relationship assignment.

$$SA \subseteq S \times R$$

a many to many user to role relationship assignment.

$$RH \subseteq R \times R$$

A user may have many concurrent sessions with various permissions.

3.3 System Design

Extensibility is one of the system's main design concepts. Medi is required to satisfy all current market demands while being able to cope with changing needs, since the healthcare business is a constantly developing industry, introducing new things every day to the globe.

The major inputs and outputs are first examined since inputs and output are essential to manipulate any system. For Medi, both known and undiscovered inputs are diverse. As stated before, because extensibility is included, the system should be able to handle unexposed inputs as well as the future. In Table 3.1 below, identified inputs are presented

TABLE 3.1: INPUT METHODS DEFINED

Input	Type
Patient basic information	Text
Patient Records	Documents
Audio	Audio files / binary streams
Video	Video file/ binary streams
Imaging Inputs	Image files
Medications	Text
News	Text

3.4   The Research Tools

Tools to achieve the intended goals are:

3.4.1 Database Design

As the primary asset of the system, database may be regarded as the heart of the system. All media-related data should be maintained in the database. Database must be able to hold all the above-mentioned data types and is intended to efficiently store and retrieve data to accommodate for many users in one go. Competitive data

processing is essential since medical information may be changed from everywhere at the same time. Since the system is accessible via the web service from distant places, PL-SQL storage procedures are utilized to address the high usage traffic anticipated by reducing network traffic and by providing fast response data to users. The MS SQL server is utilized as one of the finest technology in the market for databases, supporting all of the above-mentioned technology.
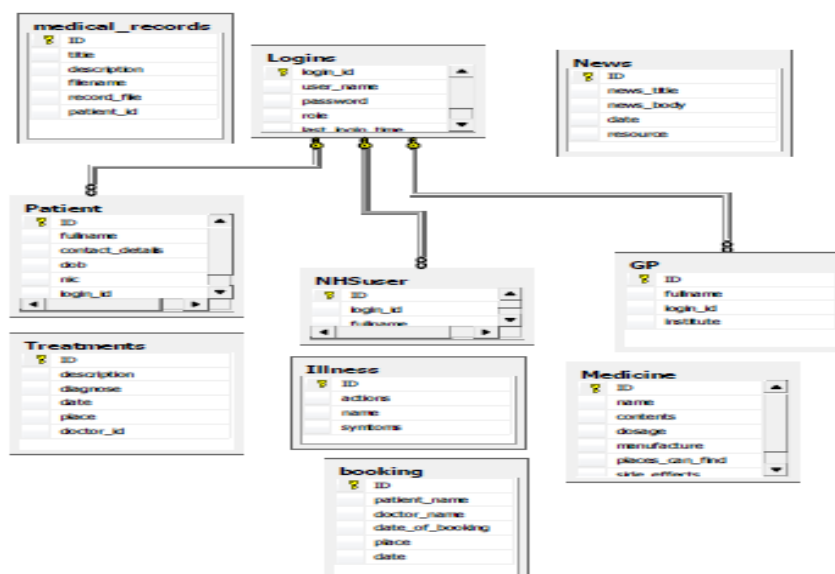

Figure 3.4: Diagram of the Entity Relation

3.5   Medical Client Applications

Medi is designed for a variety of people from various locations using existing connectivity technologies like ADSL, HSDPA, GPRS, WAP and Wi-Fi. Medi's main benefit is its capacity to cater to customers with any such technology. Medi offers three primary user terminals covering nearly all technologies to satisfy these requirements. The following describes the client interfaces.

3.5.1 Desktop Client

The client is a PC software application that offers consumers a user-friendly and interactive media service interface. It's designed for home or business usage by users. It is recommended to use desktop clients in hospitals, offices and other medical institutions.

3.5.2 Mobile Client

Mobile Client is a small device software program such as mobile devices, PDAs and mobile PCs.. During travel, you may access the media service through a mobile phone. The online service is a major component of the media. In the Internet service, all the Media services are deployed and the services are requested through all end user

interfaces. The web service's main component is the database. The essential characteristics of a health system are interoperability and extensibility. The web service enforces these. SOAP is the web service communication standard which enables users in various customer technologies to get media services. The system has a safety implementation to overcome these problems that helps to maintain the integration of the system. Although the interface is used and approved, the system may only be accessed by registered users. Notwithstanding the interface used, only logged-in users may access the system and each time they use the media system are permitted by a username and a password. For the communication with customers' web services, encryption methods are always used. The case diagram shows all users and their interactions in the system.

With the MySQL database management system, the user access history has been found to allow or restrict access to the health information system. which helps to update access history after every new transaction or after access history was retrieved, used the appropriate parameters of the database, and combined with the user transaction in order for constraints to be generated Once the restrictions are created, a user's fulfillment of the limitations will decide whether such users may use the health information system or not.

3.5.3 Structured Query Language (SQL):

Using the Structured Query Language (SQL) in which the user has tried illegal access to the health care information systems, all auditing trail records indicate compromising transactions, user pattern of abuse are generated by querying the audit trail part. After extracting these data, the patterns of user abuse will be examined extensively. The patterns of abuse generated are used to distinguish users' legitimate access requirements from requests that include users wishing to breach the access mechanism to the health information system and the health information system restrictions.

PHP uses a web-based solution package based on a cross platform: Access control activities will be managed using an architecture based on a distributed approach, a relational database management system (MySQL), the use of the SQL language, and PHP utilizing a multi-platform web-based server solution package. The established model determines which user actions are authorized by the system and which access level a user receives. The continuous connection between the doctor and the patient is an essential aspect of clinical decision making.. The database structure may provide policies as limitations on enabled and mandated activities in the environment for resources. When accessed by the local host, the table structure is shown as illustrated in Figure 3.5
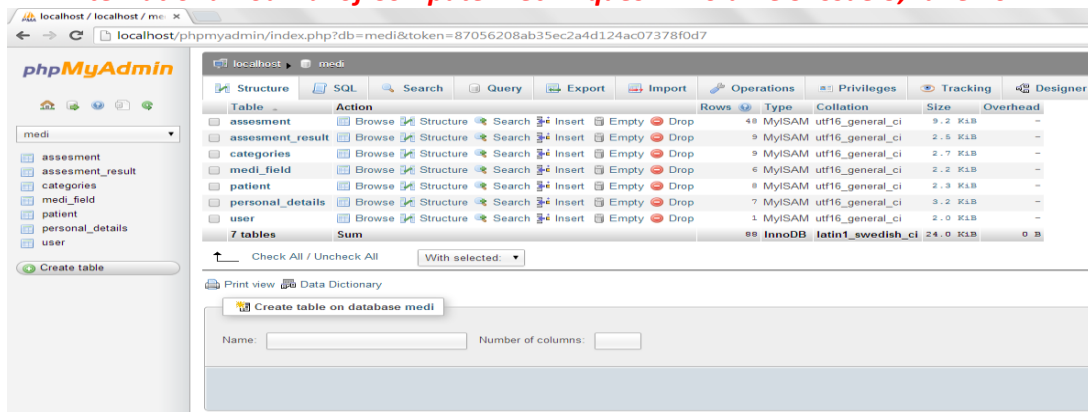
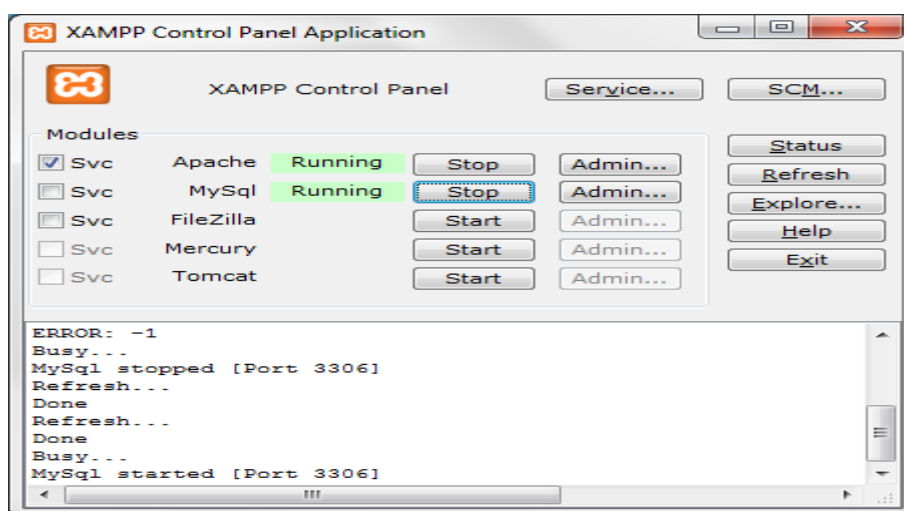Figure 3.5: [adaptive] Localhost.

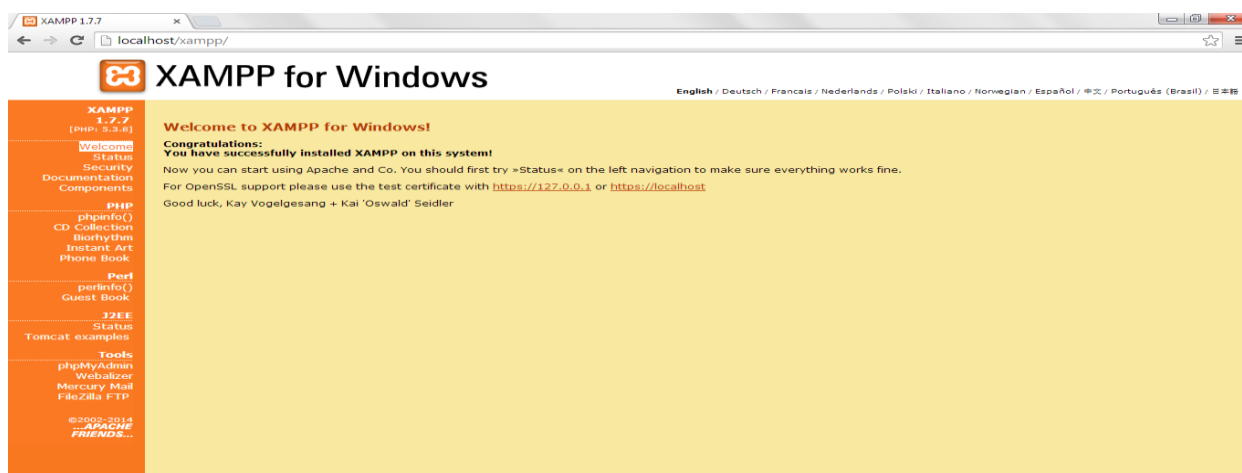Figure 3.6: Using the web browser to connect to the localhost

Figure 3.7: Windows XAMPP

3.6 Software Design

When developing software, the requirements are converted into a representation of the program, which is known as software design. Creating a representation or model, as well as providing information about the software data structure, architecture, interfaces, and components that are required to build a system, is the process of design. A block chain-based security solution for protecting patient-sensitive healthcare data is being developed.

Using a fog computing environment, the project develops a solution for health care data storage, in which users may store all information in one block chain without the need of a Trusted Third Party (TTP). In addition, the system ensured data integrity and confidentiality, as well as the elimination of inconsistency for the end user.

System architectures that are now in place function as centralized architectures in database systems.

i.   A large amount of data storage is needed for decentralized data storage as well as for information systems in general.

ii. The many types of attacks that may occur in centralized database designs.

iii. In central data architectures, there is no automated attack recovery mechanism.

iv. The decentralized design allows for the automated recovery of data from a variety of various assaults.

Following the study of this system, we proceed to the development of a decentralized system architecture, with fog computing serving to offer parallel processing in a distributed setting.
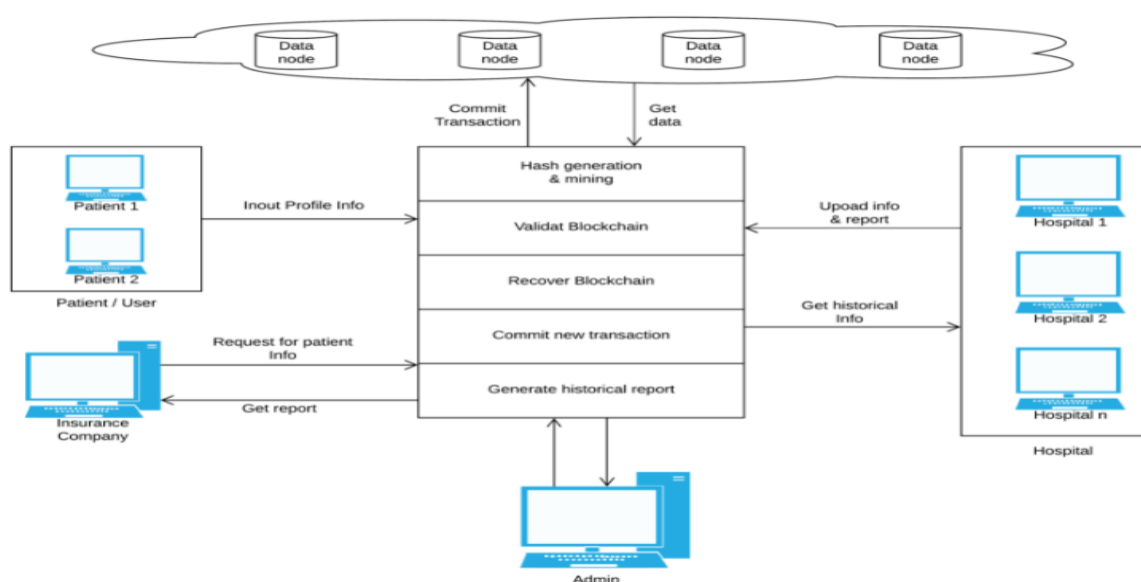

Figure 3.8: UML Diagram

A unified modeling language context diagram (UML) is a kind of unchanged structural scheme which defines a system structure using classes, properties and class connections. The diagram is the primary component in the object-oriented modeling process. They are utilized for the overall conceptual modeling of the application system

and for the specific modeling of the models translating into program codes. The classes in the graph indicate the primary objects or interactions and the objects to be coded in the application
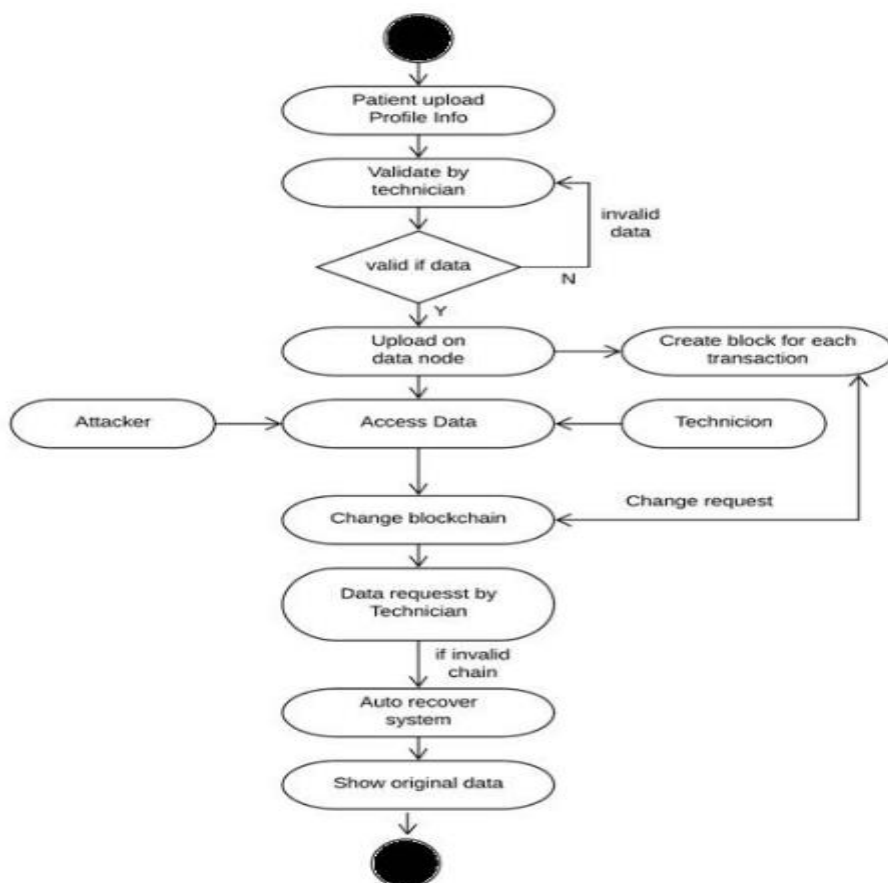
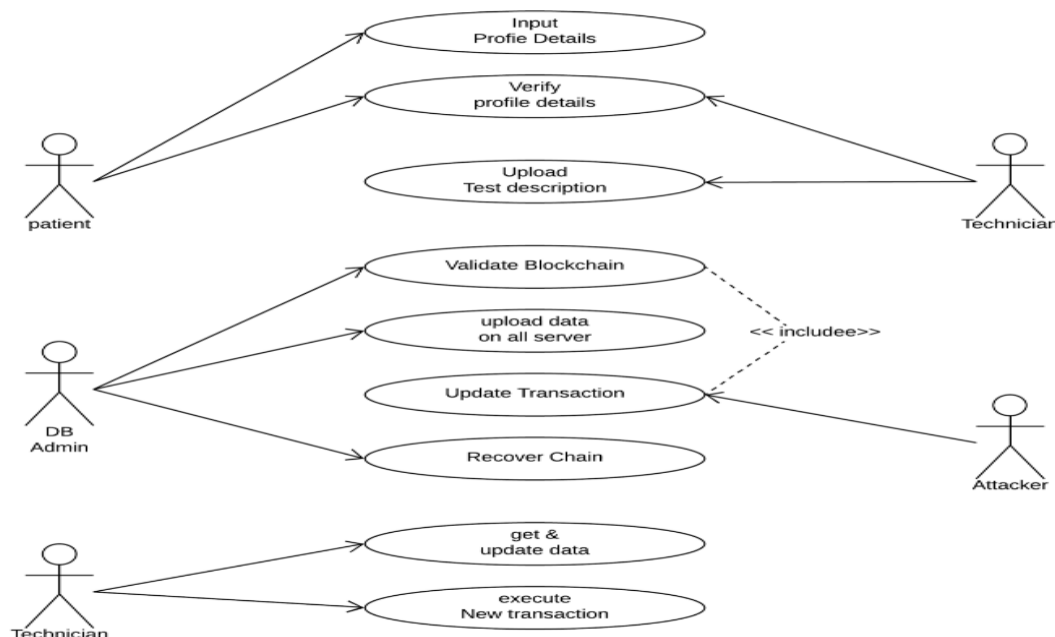Figure 3.9:Flow chart for Activity Diagram

Figure 3.10: User case Diagram

A use case sketch is a behavioral diagram type, defined by and produced from a case analysis in the Unified Modelling Language (UML). The purpose is to provide a graphical picture of the operation of the system in relation to players, their goals (represented as cases) and their dependency. The main objective of a case diagram is to show which system functions the actor performs for. Functions of the players in the system, such as administers, users, physicians and patients, may be described.

System Impementation

The health sector is a vast enterprise that includes both public and private entities, including the public at large. It means that Medi must be able to meet the necessary criteria for all of these parties. Media implementation is anticipated to take place in many stages since the implementation of such a big system is not feasible at once. Technically speaking, the effective deployment of media requires high-end technology and the infrastructure must be put in place first to execute the MediFirst of all, where physical safety exists, the servers must be positioned. A webserver and a MySQL database are needed. It uses the MS SQL server and the IIS server as the Web server for the database server. These servers are protected against unauthorized user's harmful intents by using advanced security features

4.1   Utilized Technologies:

The entire structure is built based on the Microsoft.Net technology, which provides the system with strong capabilities for easy development.

The IDE for creating the whole system is Visual Studio 2016, and the utilized database server is MS SQL Server. Integrated development environment is employed. The project solution was developed for the windows application as shown in Fig. 4 below. Medi has essentially been created as 5 components:

i. Software for Windows Desktop

ii. Web-based application

iii. Mobile applications.

iv. Web-based service

Conclusion and Recommendation

5.1 Conclusion

A new invention that ensures security, secrecy and ethical danger in the healthcare sector and enhances care quality, efficiency and effectiveness, the Control Access model in Nigeria's healthcare system via information sharing on its patients all over the globe.

This approach will reduce traveling costs enormously, particularly in view of the poverty and declining economies in these countries, for medical consultations that amount to billions of dollars from poor countries.

Collaborative and integrated healthcare systems are essential for the fast growth of technology and the health sector in the management and administration of information activities in healthcare services, and according to surveys, the majority of patients are ready for use in the field of health care services with new technology. Indeed, it contributes much more than increasing the capacity of the health system in the nation to execute these comprehensive medical systems, since many other factors are affected by implementation. In the educational sector, for example, students and instructors see the media as a useful tool for their teaching. And Medi will also offer real, statistical information for the scientific community. They may also utilize Medi to advertise their valued goods for the business sector. Bilingualism is important for the seamless development of media in different areas and should be used as a future improvement.

5.2 Recommendations

The following recommendations on the basis of the study are

1. For each state that collects and centralizes clinical information for Nigerian medical systems, a single Regulatory Agency for Healthcare Informatics should be created for ease of access, which will ultimately govern the standards in Nigeria for the healthcare sector.

2. Develop a core database to make a country globally available upon request by licensed clinicians/doctors from anywhere in the world is also an acceptable proposal for global accessibility

3. An Electronic Clinical Service Data Solution, like the MEDI System, enabling medical practitioners and other providers to obtain information from a range of trustworthy patient sources in an organized way.

4. Development of the system of neuro-fuzzy that can take smart decisions

5.3 Contribution To Knowledge

Some obstacles to sensitive information are addressed by the current data security framework in the health management system. The management planning should identify essential information security requirements and needs for improved health care based on a sound study of current backgrounds. Due to resources allocation, the health management system has various levels of safety to the stakeholders. Administrative and technical measures are two distinct measures, and various healthcare jobs are carried out. Sensitive healthcare information based on these two parameters. Successful Health Care Record (EHR) management in the system is by evaluating the suitable operation of the two measures together to achieve productivity on demand. On request, efficiency of health care resources via ICT applications causes management system security issues. The primary problem is the necessary job through the systematic interaction between users and the system resources. In addition, access monitoring was mainly a problem in order to ensure the authentication and authorization of end users to maintain the information safety of health assets. E-Health Records (EHR) or E-Health Journals are sensitive health-care information and a wide variety of sensible information-safety is necessary in order to ensure patient privacy and patient confidentiality. Under theoretical study, the information safety model defines the four features that guarantee the safety of health information in various security methods. If the management system respects the principles of information security, all potential security issues and risks to sensitive health information may be removed. In order to fulfill the security criteria, confidentiality, integrity and accessibility (CIA) is the idea of information protection. Health policies, procedures, laws and standards are mainly aimed at safeguarding the privacy and secrecy of electronic health data, as well as electronic health records (EHRs). While local politics and procedures are involved with the provision healthcare to protect sensitive information from non-authorized user rights under constitutional laws, the introduction of the International Standards Organization (ISO) and the Portability & Accountability Act on Health Insurance are open questions. Sensitive information is the duty of health care management and top managers and policy makers have the obligation of enabling security education and regular training infrastructure properly. Knowledge lack alone is a potential safety concern for sensitive health information. The creativity of performance in healthcare influences and generates barriers without an appropriate system for organizational awareness. The healthcare staff in Information Technology (IT) are very responsible and guarantee a high level of education in training and safety. Furthermore, the significance of safety education is due to the involvement of IT staff in many IT-related initiatives.

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