Development of a Web Based Control System for Primary Health Care in Obowo Local Government Area of Imo State

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Abstract

The main aim of this research work is to implement a web based system to control the flow of patients and staff data in the primary health care center. It will proffer solutions to most of the problems encountered in the primary health care center using the manual system of medical record administration. The specific objectives of this study are to: design a web based system using html, php, JavaScript and MySQL and to develop a system capable of producing diagnostic reports. The methodology used for this study are spiral and Iterative Model. This has contributed much to the gain of organizations, individuals and the society at large. The benefits of integrating computer system into medical practices are endless as explained in the work. General health practice will be significantly modified by the use of computers for eliciting medical histories and maintaining patient data. The main purpose of this research work is to implement a web based system to control the flow of patients and staff data in the primary health care center.

Keywords: *Web Browser, Internet, System, Information Technology, Database*

1. Introduction

From pre-colonial times, the health system has attracted much attention in terms of structure and services. The primary health care model was declared as the appropriate strategy for ensuring health for all. However, up till now, very few studies have assessed the services provided by primary health centers in terms of its basic components. A primary health care center is described as a center that provides first contact, person focused, ongoing care over time that meets the health related needs of people [1].

Brief description of primary health care center activities includes: consultation and diagnoses of diseases by doctors, provision of treatment facilities, facility for admitting patients (providing beds, nursing, medicines etc.) and immunization of patients/children. These are the various jobs that are done in a primary health care center by the health workers.

Registration of patient information such as medical, personal, financial or recording of medical personnel information on paper is at risk of being stolen, affectedbyfire outbreaks, misplacement by employees and even petty things such as handwriting illegibility. Whenever the patient visits, his information is recorded again. Diagnosis information about patients is recorded on the document, which contains patient information. It is destroyed after some time to decrease the paper load in the office.

An automated primary health information system will be necessary because there are a lot of difficulties in maintaining a large amount of information on paper, especially as there is usually no backup for the information. Access to information can prove difficult and time consuming if it has to be searched for, and accuracy is needed in the recording of vital information. Also, chief medical personnel cannot oversee all that is written on the vast amount of paper to be used. Therefore, a system is needed that can perform all above said

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operations automatically. Moreover, the system should be user friendly, flexible, fast and highly secure. The merits of using this automated technology was summarized by [2] as the process of minimizing the documentation of patient incidents, improving communication of information to physicians, improving access to patient medical information, reduction of errors, forming a data repository for research and quality improvement and reduction of paper files.

The purpose of this research is therefore, to design and create a primary health care center information system that would enhance information integrity, reduce transcription errors by minimizing the chances of wrong documentation, reduce duplication of information entries, optimize report turnaround time, reduce the chances of pilferage as related data would be readily available electronically and maintain records of patients.

1.1 Review of Related Literature

1.1.1 The Importance of Healthcare Information Systems (HIS)

The importance of HIS emerges from their role in managing all patient data and information including key personal data about the patient and other comprehensive medical data. The importance is also shown in documenting all medical services that have been provided to the patient such as investigations, diagnoses, treatments, follow up reports and important medical decisions. In addition, it helps in improving quality, safety and reducing costs.

1.1.2 Development and Types of Hospital Information Management Systems

Information systems include all the expert workforce, computer networks, system models and system information required to perform various functions such as collection, processing, storage, access and distribution of information. It is possible to see information systems as systems that aim to provide accurate, up -to-date information where and when they are needed [3]. Data collected, stored and analyzed in information management systems are evaluated according to criteria such as certainty, up-to-dateness, reliability. As much as possible in the planning of information systems in public administration, the requirements of vertical and horizontal hierarchical levels in the public organizations should be estimated. Information management systems in the public sector are used to monitor the environment and to take into account the interaction of external factors with each other and with public authorities [4].

The Hospital Information Management System is a solution that hospitals use to process and collect information through computers about health care services and management. This information can be transferred between the units via the automation system in the electronic environment. It plays integrating role to different information that emerges in terms of medical, financial and management functions of the hospital [5].

The Hospital Information Management system is an institutional resource planning system that has been privatized and increased in quality according to the needs of the health sector [6].

Hospital Information Management Systems keep a lot of data because hospitals have so many functions. In this type of system, there is a wide variety of information available from the workforce used by the patient [7]. The system provides feedbacks on patient care processes for hospitals. It reveals the necessary tasks to perform and Helps in developing a diagnosis and treatment protocol that can be applied to a special patient [8].

First-generation hospital information management systems were first developed in the 1960s and ended in the 1970s. In 1972, the first hospital information management system was used in the El Camino Hospital in California. This system only provided request inputs and result reporting services. It did not provide emergency and outpatient services. In this process, computers have changed from single-tasking hosts to multi-tasking, user-

friendly computers. Besides, along with other factors such as economic developments, increased data manipulation have led to the development of hospital information management systems.

Information management systems developed during this period (1960' – 1970's) included some patient care topics and basically the automation of patient medical records. The second generation hospital management information systems emerged in the mid-1970s and ended in the late 1970s. In this period, hospitals are focused on the use of financial systems and financial problems. The main purpose of the system was to transfer information from the end user to financial systems. During this period, interest in patient care has increased.

By bringing together information from different clinics, integrated patient care information files have been transferred to computers [9]. Third generation hospital information management systems began in the late 1970s. This phase was under the influence of the introduced database technology at the beginning of the 1980's and focused on problems such as patient care planning, laboratory, and pharmacy issues. Fourth generation practices began at the beginning of the 1980s. An important feature of this period is that it integrates with third party systems, including financial and other departmental systems. Providing all the needs of a single firm is the basic feature of this phase. Hospitals have adopted the best practice or a software procurement strategy available in the market for private clinics. In 1990, investments in hospital information management systems projects increased, along with the prevalence of computers.

In 1991, the Institute of Medicine published the report "Computer-Based Patient Records: Essential Technologies in Health Care". This report describes the problems caused by paper-based records and encouraged the use of electronic patient records. In addition, the report pointed out the importance of the doctors in the system and stated that the focal point of the system should be patient [9]. After the 2000s, patient safety, reduction of medical errors and an increase in health care quality became the priority in the system. Broadband internet access, smaller and more portable devices, wireless technologies and radio frequency identification tools have been used as important technological tools in the healthcare industry [9]. Currently, electronic health record systems are among the most basic applications of the health sector. A patient index is registered at the base of the hospital management information system; all transactions are done using this index. The patient index consists of the patient's name and surname, date of birth, gender, address, second name, marital status, mother and father's name, allergic reaction information and name and phone information for emergency situations [10]. Once the patient successfully enters the system, he is transferred to the relevant section and comes out of the system as a discharged patient after the treatment period. These systems process different patient information in hospital management. It conducts out-of-hospital communication on issues such as procurement and finance. It functions as medical departments and services in patient care [11].

2. Methodology

The methodology adopted for this study wasthe Iterative Waterfall Model.The model combines the idea of iterative development with the systematic controlled aspects of the waterfall model. The Iterative Waterfall model is a combination of iterative development process model and sequential linear development model i.e. the waterfall model lays a great emphasis on risk analysis. It allows incremental releases of the product or incremental refinement through each iteration around the wheel.

2.1 Area of the study

This study was carried out for *Primary Health Care Center in Obowo Local Government Area of Imo State.* Imo State is in the south-eastern

part of Nigeria. In 1976 Imo State, called 'Eastern Heartland' was created. Imo State is bordered to the Northeast by Abia State and the Northwest by the Delta Region, to the North by Anambra Region, and to the South by Rivers State. The State lies within latitudes 4/45/N and 7/15N, and 6/50/E and 7/25E, respectively.

2.2 Methods of Data Collection

Data collection is the process of gathering and measuring information on variables of interest, in an established systematic fashion that enables one to answer queries, test hypothesis and evaluate outcomes. The methods of data collection employed in this project work is as follows;

2.2.1 Direct Observation

During this project work, some careful observations were employed to discover some problems encountered in the existing system.

2.2.2 Secondary Data Collection Methods

Secondary data is a type of data that has already being published in books, newspapers, journals, online portals etc. During this study, the internet was surfed in search of materials which aided to collect the necessary data.

2.3 Instrument for Health Information Systems Web App Development

A web-based software was developed in the course of this study as an attempt to proffer solution to Primary Health Information Systems of the health Centers in Imo State using Obowo Health center as a case study. Html, php and MySQL are used in the process of development of the application. Html is used for writing, structuring and presenting contents of the World Wide Web, MySQL is the database where the contents of the web pages are stored and finally php which is used for the connection.

2.4 The Proposed System Framework

A framework is a real or conceptual structure intended to serve as a support or guide for the building of something that expands the structure making it more useful.

3.0 Results and Discussions: Site Map of the System

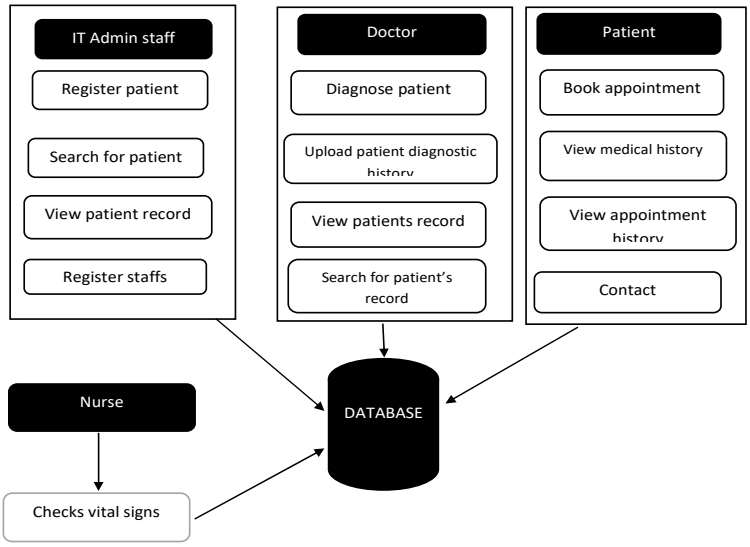

Figure 1: Framework of the Proposed System

3. Results and Discussion: Site Map of the System

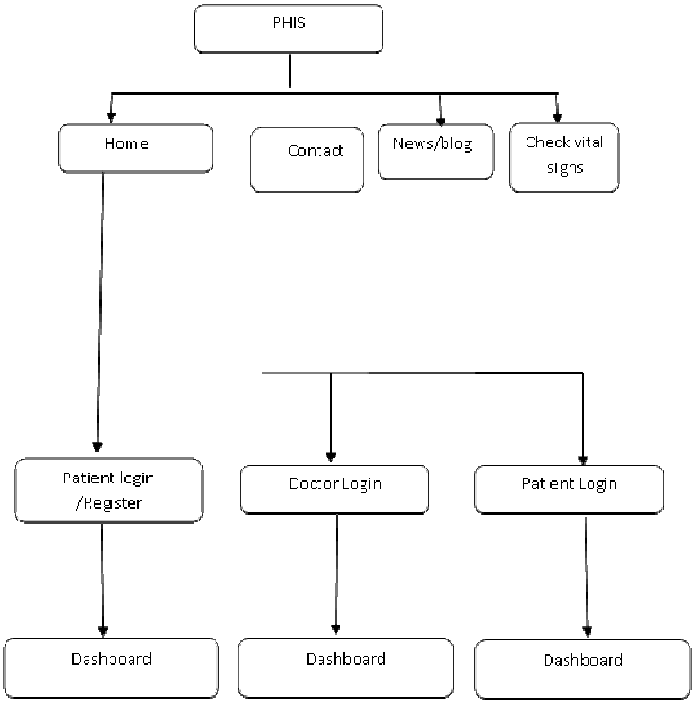

Figure 2: Site Map of the System

$$\varepsilon_{eq} = \frac{1}{1+\nu\sqrt{2}} [(\varepsilon_1 - \varepsilon_2)^- + (\varepsilon_2 - \varepsilon_3)^- + (\varepsilon_3 - \varepsilon_1$$

Table 1: Patient Registration Database

Field Name	Field Type	Field Size
ID	Big int	15
Full name	Varchar	25
Address	Varchar	40
City	Varchar	20
Gender	Varchar	10
Email	Varchar	25
Password	Varchar	6
Reg date	Date/time	8

Table 2: Doctor Registration Database

Field name	Field type	Size
ID	Big int	10
Specialization	Varchar	20
Name	Varchar	25
Address	Varchar	25
Fees	Big int	10
Contact no	Big int	12
Email	Varchar	25
Password	Varchar	10
Date added	Date /time	8

Table 3: Contact Us Database

Field name	Field type	Size
ID	Big int	10
Name	Varchar	25
Email	Varchar	20
Contact no	Big int	12
Message	Varchar	255

Table 4: Book Appointment Database

Field name	Field type	Field size
Specialization	varchar	20
Doctor name	Varchar	20
Fees	Big int	10
Date	Date /time	8
Time	Date /time	8

3.1 Program Design

The web application consists of the following modules:

1. The index page

This is the entry point to the application. It is the default page that loads when the application is called up. It contains link to the various section of the site.

2. Patient Registration/ Login Page

This is a page where the patient registers or login in order to access the primary health care information system.

3. Doctor Login Page

This is a page where the doctor logs in to perform his duties.

4. IT Admin Login Page

4. Conclusion and Recommendations

4.1 Conclusion

Computers are finding their way into every business, industry and research activity. The use of computers is diverse, such as in entertainment, education, problem solving, research, personal management, among others.

In primary health care centers, the process of maintaining the record of patients and employees requires processing and record keeping. Keeping in view a strong need for managing the various important information fast and efficiently, the proposed Primary Health care Information System (PHIS) when designed and developed will alleviate the problems encountered with the manual system of Health Centers Information Management. Proper analysis and assessment of the developed system indicates an efficient, usable and reliable records-management system, which adequately meets the minimum expectations that were set for it initially.

In designing the computerized system, a survey of the existing system was made. A complete design of a database application for searching and locating patient folders has been

carried out. Primary Health care Information System (PHIS) will provide better services for the ICT administrative staff, Patients, nurses and doctors such as reduction in time taken to find a folder, accuracy and timeliness of record preparation etc. In the implementation of this project, much has been done to eliminate data redundancy, inconsistency and improve on the integrity of the data stored in the system. The software model used is the dynamic system development model and iterative model. The security of the computerized system was also strengthened to avoid unauthorized person(s) having access to data.

4.2 Recommendations

Since data management is a vital part of the operations and survival of a hospital in the modern world, it must be well updated. The new system needs to run simultaneously with the existing system for a period of time so that if the new system disappoints, users revert back to the old system so as to correct the loopholes (parallel changeover).

Training and retraining of staff by the government is essential to allow all members of the primary healthcare team to benefit from investment in information technology. The computer skills of general practitioners and other primary care staff vary widely. Some general practitioners need little additional training to allow them explore the full value of the electronic medical records. However, many general practitioners will need considerable training to allow them to use these resources and help make the PHIS information technology strategy succeed. Medicine is an information based discipline, and giving doctors the information and skills they need to practice, medicine would remain essential in improving the quality of care the primary health care center provides.

The newly developed system is recommended for use in all the hospitals and primary health care centers in Nigeria who wish to automate their processes and streamline their general workflow.

4.3 Suggestion for Further Study

As the numbers of patients keep rising, managing a health facility can become increasingly difficult, but it can be made easy using an effective and efficient system. Proper Primary Health Care Information Management System are the mainstays for a patient's health care and thus good for handling rudimentary cases.

Further studies are recommended:

- On electronic health records.
- Healthcare interoperability
- Medical billing and electronic coding
- Application of hospital Interlinked software.

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