Clinical Database Information System for Gbagada General Hospital

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ABSTRACT

Abstract: There is a need for the development of an efficient information system in our hospitals. Inefficient medical information systems, over time, have often resulted in manual operations, which in turn require more employees, and reduce the profitability of medical practices. Clinical Database Information System is not a new technology in the medical industry. In recent years, Clinical Database Information System has been implemented all around the world - Nigeria inclusive. Gbagada general hospital is a foremost hospital in Lagos. Some of processes in the hospital have been automated, but sophisticated features of the Clinical Database Information System need be included. In this paper, we have identified the need to develop Clinical Database Information System for Gbagada General Hospital. Some of the problems identified during our analysis were the issue of consultation report. This is a very vital feature that a system should provide. This makes it easier for another medical practitioner to evaluate medical condition of the patient. This system also allows for the tracking of patients' response to treatment. The primary information used for this research was obtained from Gbagada General Hospital. Secondary information was obtained from literature review of past researchers. The Water Fall methodology was adopted for the research. This is because Water Fall Model is suitable for the development and delivery of a high quality system at a relatively low investment cost. The front end of this system was developed using Portable Hypertext Programming (PHP) language. The back end was developed using Structured Query Language (SQL). Our major challenge in this research was access to information.

Keywords: Medical Information Systems, Clinical Database Information System, Water Fall Model, Structured Query Language, Portable Hypertext Programming language

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1. INTRODUCTION

In health care, as in other domains, the expectations surrounding new and as-yet-unproven technologies often are far more optimistic than is reasonable. These new technologies often are sold on the basis of their presumed positive human performance impacts. For example, clinical information systems have been advocated to reduce the risk of adverse drug events at each stage in the medication administration process. These systems, including computerized physician order entry (CPOE), automated dispensing systems and barcode technology, achieve this new level of "safety" through reduced reliance on memory, increased access to information, and increased compliance with "best practice" procedures [1]. But in addition to providing new capabilities, new technologies also impact the technical, social, organizational, economic, cultural, and political dimensions of work in new and different ways. Observations of new technology implementations have shown that a change in technology literally alters roles, strategies, and paths to failure.

In recognizing this, the Institute of Medicine report, To Err Is Human, recommends examining new technologies for "threats to safety and redesigning them before accidents occur." In order to minimize harm, we propose to anticipate the side effects of introducing clinical information systems in work practice, using proactive testing methods. The requirements for collecting information about patients and the process of their care have grown constantly since Florence Nightingale bemoaned the lack of adequate health records, through Larry Weed's promotion of the problem-oriented medical record, and into the age of documentation for prospective payment, utilization review, and healthcare report cards. Despite the corresponding increase in the use of computers to capture, store, and retrieve the information to meet these requirements, a great deal of redundancy exists in the process of the actual collection, while the goal

of reusing the data for multiple purposes remains elusive[2]. Clinical databases may contain a large variety of data from different domains, for example, patient visits, test results, laboratory reports, diagnoses, therapy, medication, and procedures. For example, clinicians dutifully record histories, physicals, impressions, and plans in their patients' medical records, but they must then take time to fill out additional forms to report medication lists, problem lists, and reasons for visits. Healthcare institutions employ entire departments devoted to abstracting records to provide documentation for reimbursement. Computers can best help us with reuse of data when data are represented in meaningful ways. The mere appearance of the word "pneumonia" in a health record does not tell us if the patient carries the diagnosis or has had the diagnosis excluded, and the absence of the word does not guarantee the absence of the diagnosis. Instead of relying on the textual portion of the record, computer systems make use of data coded with controlled terminologies, the International

Classification of Diseases, Ninth Revision, Clinical Modification (ICD-9-CM) [3] being the most widely used example. Clinical databases may have different purposes, for example, patient management, electronic patient records, clinical research, and quality control. Clinical databases usually have a large number of users with different requirements for views of the database. The administrator does not want to view data per patient, while the nurse must be able to lookup current medication for a specific patient. The researcher may want to do data mining on clinical information for thousands or millions of patients, and the clinician should be able to see his or her ambulatory schedule. Most clinical databases comprise only a part of these functionalities, but these examples illustrate the challenge that designers of clinical databases face. Furthermore, in contrast to schemas from many other domains (for example, finance and public administration) the logical data schemas of clinical data are always incomplete and developing. In databases, an entity is a single person, place, or thing (for example, patient or diagnostic test) about which data can be stored. In conventional relational database design, each entity is mapped to one or more tables using values of one or more rows to uniquely identify each record. That means that for each entity there exists at least one table. This strategy works well for most databases even if the number of concepts involved in a domain may be high. As long as the domain of interest remains relatively unchanged, the table layout (that is, the physical schema) should work well for many years. The domain of clinical science in particular (and biology in general) is, however, under constant development as new concepts appear and old concepts

are modified or deferred. In a conventional database (that is, in a conventional relational database) [4], new tables must be created to record new concepts. To give users access to the new tables, new forms must be designed and links to these forms must be provided in the user interface. If a table that is already in the database needs to be modified care must be taken not to destroy existing data and not to break any constraints. Accordingly, user-interface forms must be redesigned to reflect changes (for example, fields that have been added or removed) in existing tables.

2. METHODS

A review of the clinical research literature discussing data quality assessment methodology for Clinical Database Information system data was performed. Using an iterative process, the aspects of data quality being measured were abstracted and categorized, as well as the methods of assessment used.

2.1 Description of the Existing System

For a Hospital, like Gbagada General Hospital, Clinical Database Information System is critical to gathering and applying information effectively. It offers a wide selection of features to improve control of your medical information and save time spent on information retrieval. The existing system is still majorly paper based as most of the processes are manual. The hospital still does a manual processing of information, such as card information, drugs prescription, etc. The features listed here are all available in Gbagada General Hospital.

- Manual filing of patients' records
- Manual storage of laboratory records, drug description, and other related records.

2.1.1 Existing System

The problems, which are perceived by the customers/users in existing systems, are;

- Less Efficiency and accuracy due to lot of paper entries Increased expenditure for storage
- Lack of information while enquiring about a particular patient Increased Labor

2.2 Software Design

Any software development requires project management as importantly as having the right engineering team with coding expertise. This gets even more important when developing clinical software products – from patient management systems, to medical devices and to web-based medical information system etc. This software has been designed using PHP for the application program and MySQL for the database. The choice of the programming language is as a result of its robustness. PHP, over the years has been very useful in the development of web applications. This phase of the design illustrates the database used to store all data accepted and processed from the entry of the user.

Table1. Table Patients

Fields Name	Data Type	Null	Key	Description
Patient_ID	Int	No	Primary key	Identity, Store the Id of Patient
Patient_Name	nvarchar(50)	No		Store name of Patient
Tel	varchar(12)	No		Store contact phone of Patient
Address	nvarchar(50)	No		Store address of Patient
Gender	Bit	Yes		Store gender of Patient
City	nvarchar(20)	Yes		Store City of Patient
Country	Nvarchar(30)	Yes		Store Country of Patient

Table 2. Table Users

Fields Name	Data Type	Null	Key	Description
U_ID	varchar(5)	No	Primary key	Store Id of User
R_ID	Varchar(5)	No	Foreign key	Reference Roles table
UserName	varchar(30)	No		Store username of User
PassWord	Varchar(16)	No		Store password of User
Name	Nvarchar(50)	No		Store Name of User
Phone	varchar(12)	No		Store contact phone of User
Address	Nvarchar(50)	No		Store address of User

2.2.1 Input Design

Input from this system is majorly from the keyboard. The system user enters input data as related to the patients and staff information. Some of these data include:

- Username and password for login
- Patient number, names and details
- Bill number, amount paid, and balance
- Medicine details

2.2.2 Output Design

The output specification can be viewed from the receipt issued to patients, which contains the following:

Table 3. Output File Design

Drugs	Description	Data type
Patient ID	Patient Information	Int
Product	Name of the products	varchar(5)
Quantity	Quantity of each product bought	Int
Total	Total amount	Float
Receipt Num	Receipt ticket issued to customer	Int

2.2.3 Process Design

Potential medical information systems passed many phases the first of which is: collecting data and information on currently available medical systems; then the second phase comprised of making studies about such information; the third phase is converting such information into databases. The flowchart for this system is shown as fig 1.

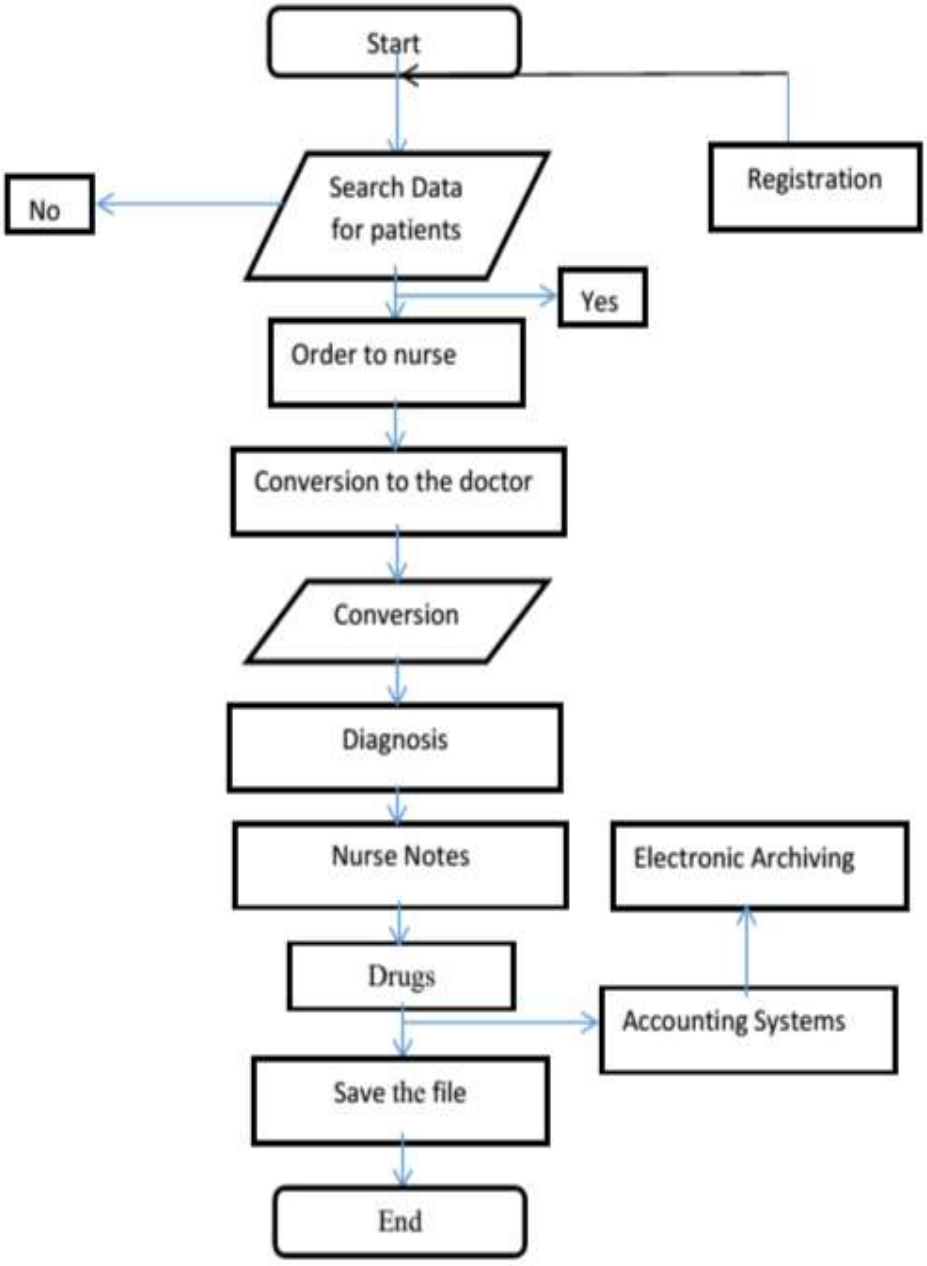

Fig 1. System Flowchart

2.2.4 Detailed Design

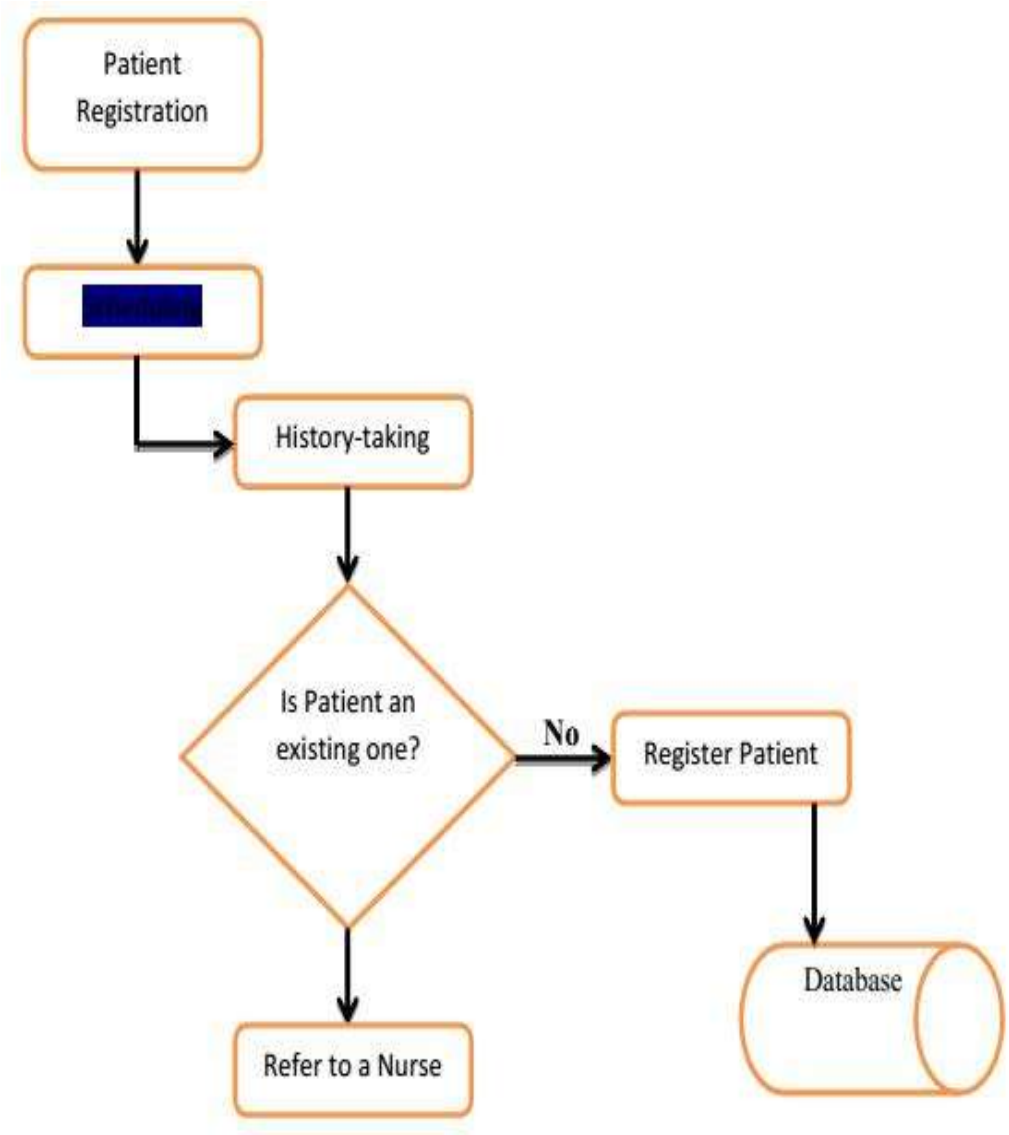

Fig 2. Patients Registration Module

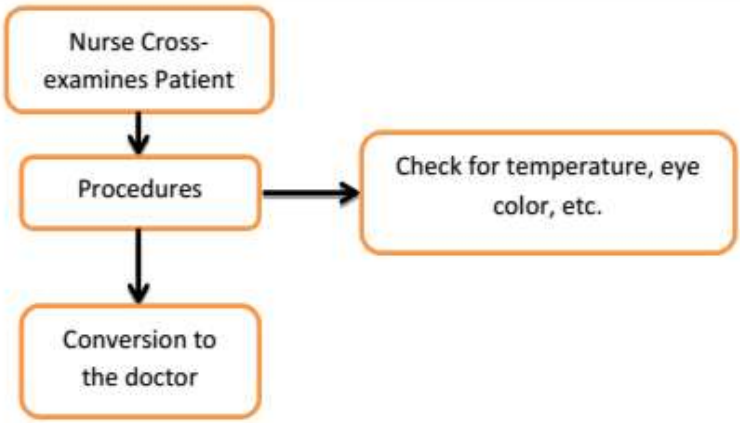

Fig 3. Patient Pre-examination Module

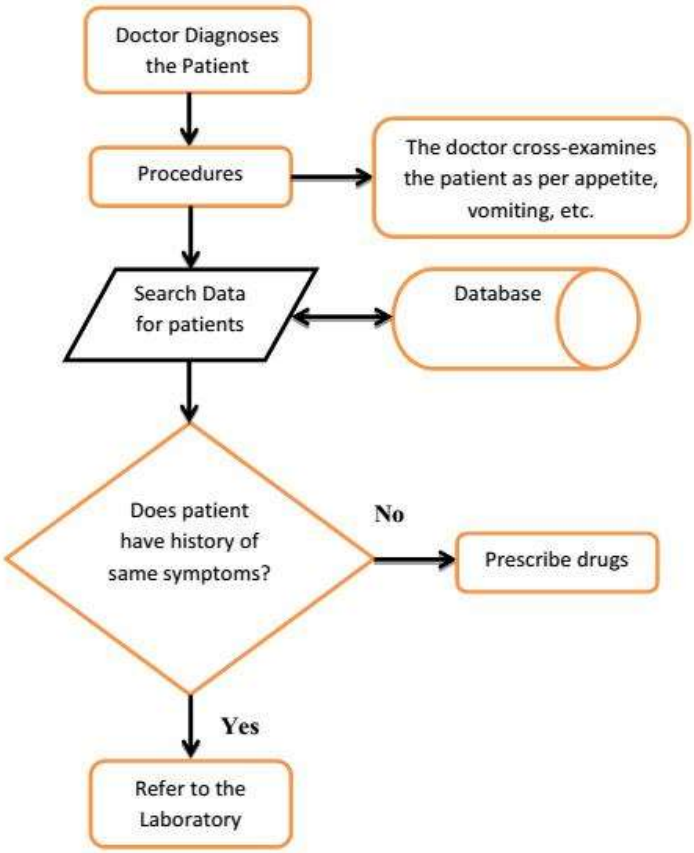

Fig 4. Diagnosis Module

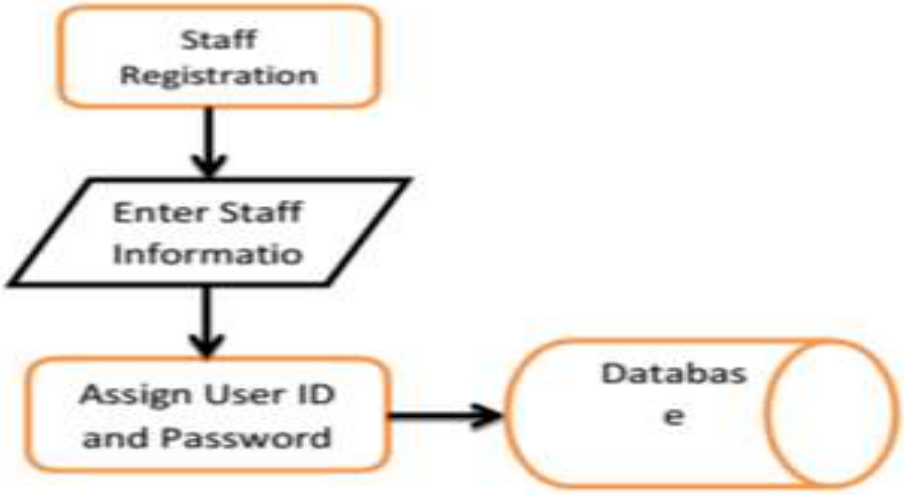

Fig 5. Staff Registration Module

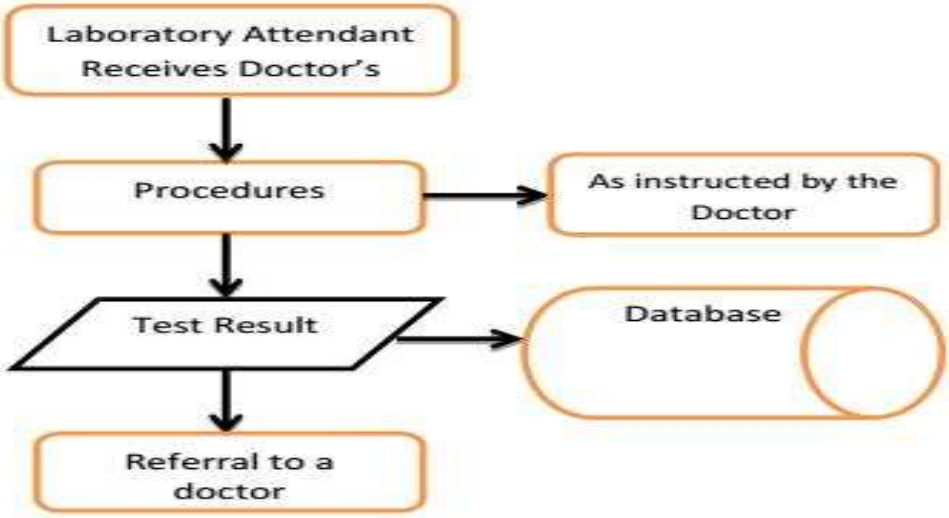

Fig 6. Laboratory Module

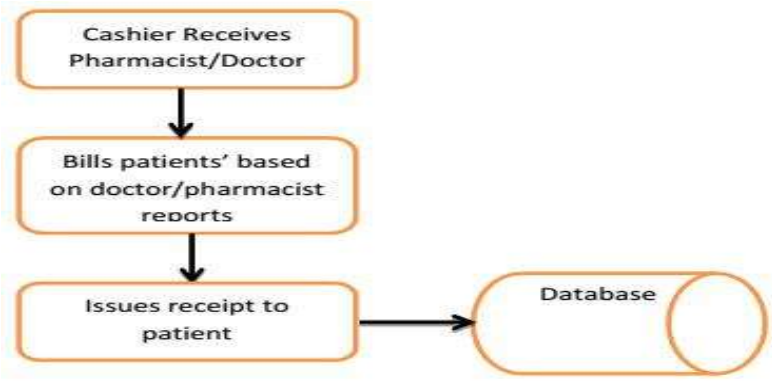

Fig 7. Accounting Module

3. RESULTS AND DISCUSSION

Five dimensions of data quality were identified, which are completeness, correctness, concordance, plausibility, and currency, and seven broad categories of data quality assessment methods: comparison with gold standards, data element agreement, data source agreement, distribution comparison, validity checks, log review, and element presence. Examination of the methods by which clinical researchers have investigated the quality and suitability of clinical data for research shows that there are fundamental features of data quality, which may be difficult to measure, as well as proxy dimensions. Researchers interested in the reuse of clinical data for clinical research are recommended to consider the adoption of a consistent taxonomy of clinical data quality, to remain aware of the task-dependence of data quality, to integrate work on data quality assessment from other fields, and to adopt systematic, empirically driven, statistically based methods of data quality assessment.

3.1 Program Screen Shots

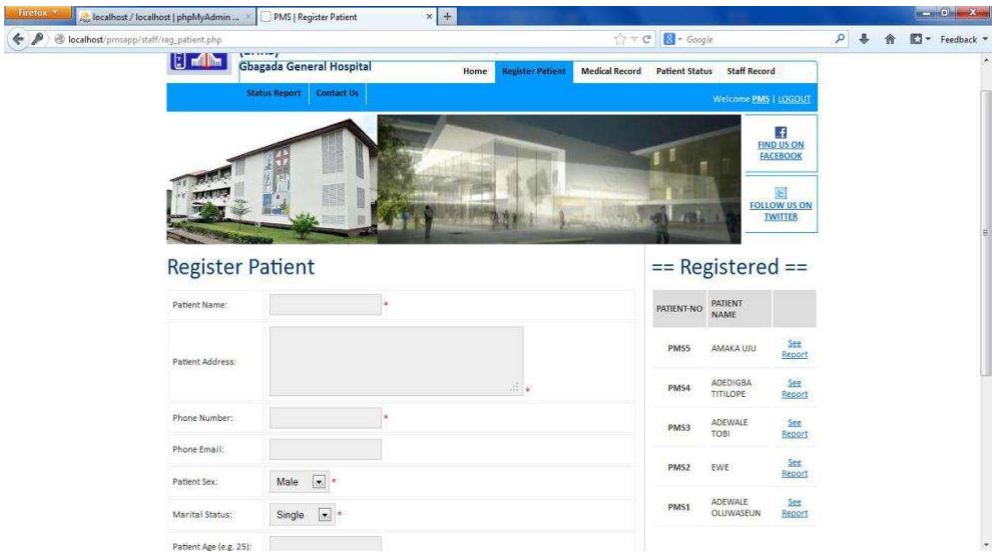

Fig 8. Patient Registration Page

Fig. 8 is the patient registration page. This allows the hospital attendant to collect the information of new patients in the hospital.

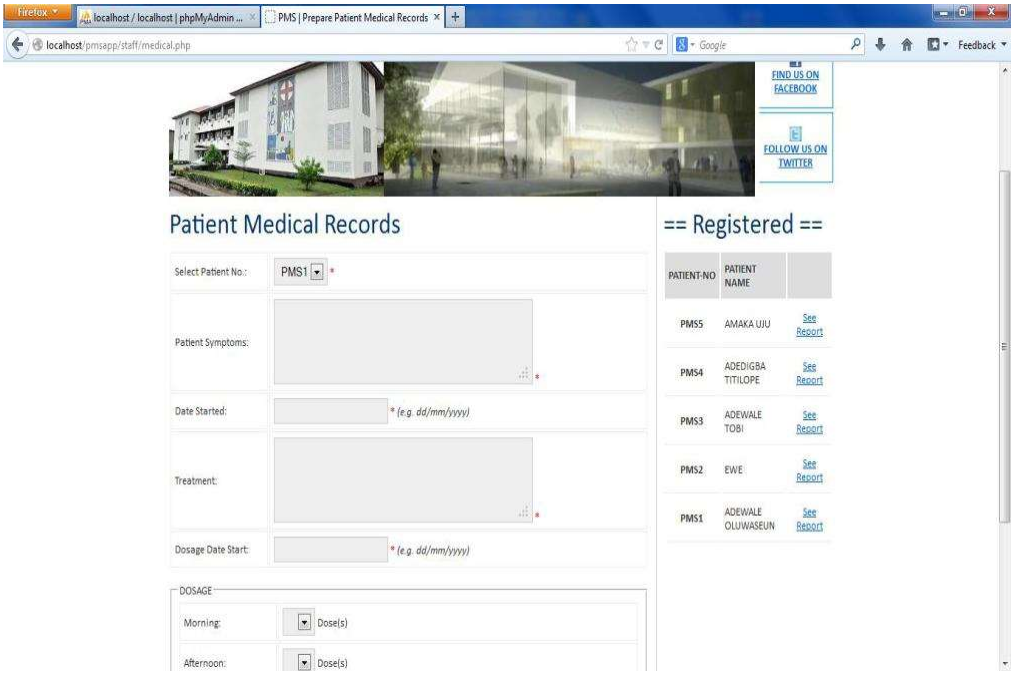

Fig 9. Patient Medical Records

Fig 9 is the Patients Medical Records page. This allows the hospital attendant to search for records of patients. This features the conventional card system being adopted in the automated system.

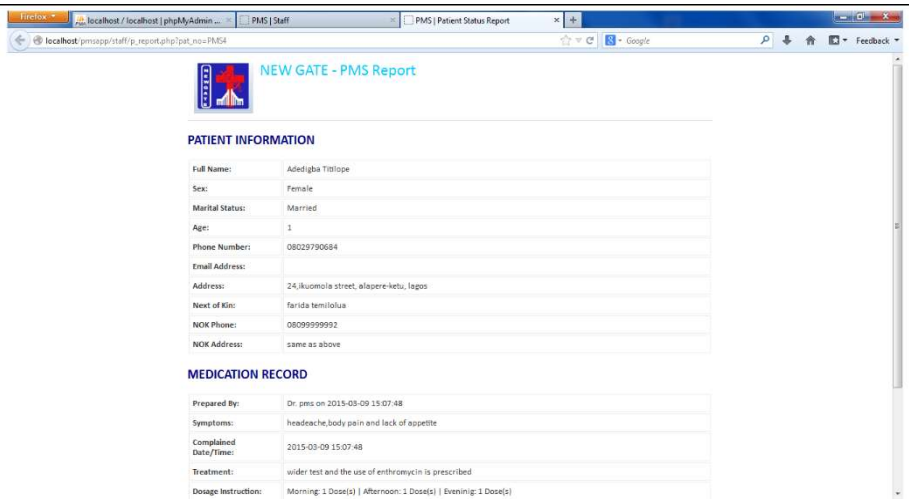

Fig 10. Report Generation module

The fig. 10 is the report generated for a patient. This feature allows for the generation of patients' report. This is much required so that the hospital can always keep tracks of her patients. More so, it will help when another nurse or doctor is following up on a particular patient's medical history.

4. CONCLUSION

Clinical Database Information System is a computerized system that would enable hospital staff carry out hospital operations electronically. This research has considered a foremost hospital, Gbagada General Hospital. It was observed that the hospital was still carrying out its processes manually in this 21st century, hence the need for a computerized system.

The software is developed using PHP as front end and MySQL as back end in Windows environment.

The goals that are achieved by the software are:

- Instant access.
- Improved productivity.
- Optimum utilization of resources
- Efficient management of records.
- Simplification of the operations.
- Less processing time and getting required information.
- User friendly.
- Portable and flexible for further enhancement.

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