A Computerized Hospital Management System: Case Study "Gitwe Hospital"

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Abstract:- A significant part of the operation of any hospital involves the acquisition, management, and timely retrieval of great volumes of information which usually involves patient medical records and medical history, staff information and schedules, rooms, operation theatre and ward scheduling, etc. The management of all of this information must be done in an efficient and cost-wise fashion so that the organizational resources are efficiently utilized. Unfortunately, most of the hospitals are still adopting the traditional way of manually keeping and recording data which is very hectic and takes up a lot of time and space. This results in a bad health care service and inefficient patient personal information management. Having a good Hospital Management System (HMS) provides various advantages such as exchanging health information electronically which then results in a high quality and safer care for patients and creates highly tangible managerial enhancements to the hospital. Every industry is now automating their functions; hospitals are also now adopting HMS to ease up their works. Gitwe Hospital Management System (GHMS) was designed for the Gitwe hospital to replace its existing manual record-keeping system. The new system controls the following information; patient information, room availability, staff and operating room schedules, patient invoices, etc. These services are provided in an efficient and cost-effective manner with the goal of reducing the time and resources currently required for such tasks. GHMS is an HMIS with great user interface designs, more performance enhancements, and a number of enriched modules. It works for a big deal to bring value to the words 'care' and 'comfort' in this hospital scenario. In addition, GHMS is endowed with an advanced feature of retrieving online WHO's ICD codes to properly note diseases on health records, to track epidemiological trends and to assist in medical reimbursement decision.

Keywords:- HMS (Hospital Management System); Java; MySQL Server; Windows Server.

I. INTRODUCTION

Previously when computerized Hospital Management System was not into practice, operations in the hospital such as rigorous recording of daily activities, patient-related information, and proper maintenance of the hospital equipment, funds allocation and usage were very difficult to manage.

Computers and data processing have improved the accuracy and reliability of information pertinent to the patients besides the improvement of the services provided to those; administrative and technical tasks have been improved too.

This has changed the workload of health professionals, allowing them to spend little time on the processing of patient information.

Management Information System (MIS) is typically a computer-based system which is used within an organization to improve its operations. It has been defined as the process comprising all the components that collect, process and disseminate data or information. Such components include hardware, software, users, communication systems such as telephone lines and the data itself. The technical functions and activities performed include entering data into the system, converting data into information, storing information and then producing relevant reports. Those predetermined objectives are accomplished by humans and other resources (Longest et al., 2000).

The introduction of computerized management information systems has changed the working practices in hospitals as patient information is stored on servers which is then retrieved and accessed by client computers. This is usually reliable, secure, faster, and more accurate than performing these tasks manually. Therefore, computerized systems are money-saving and reduce the workload of administrative and clerical staff. The provision of enhanced quality of health care and security of patient information are the common goals of all primary and secondary healthcare providers, so, various models and schemes for hospital interventions and development have been deployed (Friesner et al., 2009).

This research work is on the design and construction of a Hospital Management System, GHMS (Gitwe Hospital Management System). The software is very advantageous in this hospital as it improves the hospital administration by providing a superior patient care, streamline operations, strict cost-effectiveness and improved profitability.

The system uses JAVA as the front-end software which is an object-oriented programming language and has connectivity with the back-end software i.e MySQL. The patient data and other hospital information are kept in a central database server, and after proper authentication, individual workstations in different departments of the hospital access data from the main server. GHMS has been fully implemented, currently running in Gitwe hospital, and it is surely providing better and in-time health care services to patients.

The remaining part of this paper is organized as follows: Section II presents Related Work. A brief description of Problem Definition is provided in Section III. In section IV, the Proposed System is presented. The Methodology is

discussed in Section V while the Implementation is presented in Section VI. Results and Discussions are provided in Section VII and Featured Case Study in Section VIII. We conclude our work in section IX.

II.   LITERATURE REVIEW

Anderson (1993) stated that a research conducted by 2752 European hospital managers indicates that Information Technology can enhance the hospital overall activities and services provided to patients. The author again said that in the future, sophisticated patient and diagnosis classification will influence very much healthcare budgets and funding. On another hand, Smith and Gert van der Pijl (1999) stated that the use of Information Technology in both diagnostic and treatment processes will add to the development of networks of hospital, clinical and health care practices.

According to Lawrence and Dyer (1982), to ensure the proper operation of hospitals, these can be provided with high technology and intensive processing of patient information. The authors indicated that such type of organization is based on democratic control mechanisms where stakeholder inside the institution influences the decision-making processes.

Managing a healthcare organization is a daily growing career as various opportunities are available in both direct and non-direct health care settings. The former settings are those which provide direct care to patients, clients or resident who visit the healthcare organization for services. Non-direct care settings, on the other hand, do not provide direct services but rather support them through services and products made available to direct health care settings (Buchbinder and Thompson, 2010).

The design and implementation of an effective HMS is a prominent tool to improve healthcare organization's capability, its decision-making policies, and its operational efficiency. Currently, various hospital information services and management platform based on computerized medical records have been established, this has resulted in increasing the degree of patient satisfaction, enhancing hospital efficiency and quality, protecting the safety of healthcare organizations, and reducing relevant health care costs.

Computerized Hospital Management Information System is playing a major role in providing high-quality health care services worldwide. Such systems are equipped with computerized databases for storing highly sensitive patient data and other hospital information. HMS comprises different components which are implemented in Information Technology within a healthcare organization. Expectations and requirement from the system users reveal how they see and hear about the system, on how this will work for them in the future, therefore, various researches suggested that taking into account user expectations about the system being designed is a prominent element to ensure the successful implementation of the HMS (Farzandipour, Sadoughi and Meidani, 2010).

Ndira et al. (2008) stated that in hospitals and other healthcare organizations, different types of users such as nurses, doctors, administrators, managers, radiologists, pharmacists, etc. with a variety of backgrounds and conflicting interest exist. So, implementing an efficient hospital Management Information System cannot be successful without a prior effective analysis of the feelings and perceptions of relevant individuals who make use of it.

III.   PROBLEM DEFINITION

➢ *Problems with the Existing System*

Previously, Gitwe hospital was facing several challenges as it was using manual processes. Such problems include.

- Manually managing and maintaining critical information.
- Expensive data forms were always purchased.
- Manual data processing which often resulted in data inconsistency.
- Manual hospital billing and payment processes were complex and confusing.
- The manual drug management labor previously employed raised risks to patients and losses to the hospital.
- The manual system required numerous paper forms with data stores spread throughout the hospital management infrastructure.
- The information (on forms) was often incomplete or did not follow international rigorous management standards.
- Forms were often lost in transit between departments requiring a comprehensive auditing process to ensure that no vital information was lost.
- Information duplication existed in the hospital and often lead to data inconsistencies in various hospital departments.
- Accurate generation of reports and records was almost impossible, etc.

Considering the above, there was a need of designing and implementing a computerized hospital Management System to Gitwe hospital as it would help provide improved coordination of care and services, improved knowledge about services, reduced duplication of information, protection of patient confidentiality, etc.

IV.   THE PROPOSED SYSTEM

A. *Objectives of the New System*

The main goal of GHMS is to make a decent management tool aiming to:

- Automate the management of the hospital by making it more efficient and error-free. This is achieved by standardizing, consolidating, and ensuring data integrity, thus, reducing their inconsistencies.
- To improves patient-care by increasing the user's knowledge and reducing uncertainty allowing rational decisions to be made from the information provided.
- Provide automatic critical information management and maintenance.

- Simplify the knowledge of all the staffs, patients, treatment provided, and prescription, and also produce periodic reports for analysis.
- Cut back the time taken through the manual system so as to take care of all the records.
- Help in correct maintenance of patient and patient details.
- To cut off the usage of data forms which helps the hospital implement a cost-saving, paper reduction program?
- Provide data deduplication by eliminating duplicate copies of repeating data.
- Provide the drug management automation which is a new hospital model, much more advanced and highly efficient.
- Automate the billing and payment processes.
- Produce an accurate reporting. Since a single server does data maintenance, we can make the report maintenance easier and it provides high security.
- Offer a full collection of tools for various clinical operations, hospital and patient data administration.
- Provide a GUI that can facilitate users in storing, updating, and retrieving the information through varied user-friendly menu-driven modules.

B. How GHMS works

The working process of the whole system is shown in the following diagrams.

Fig 1:- Stations and interconnectivity-1

Fig 2:- Stations and interconnectivity-2
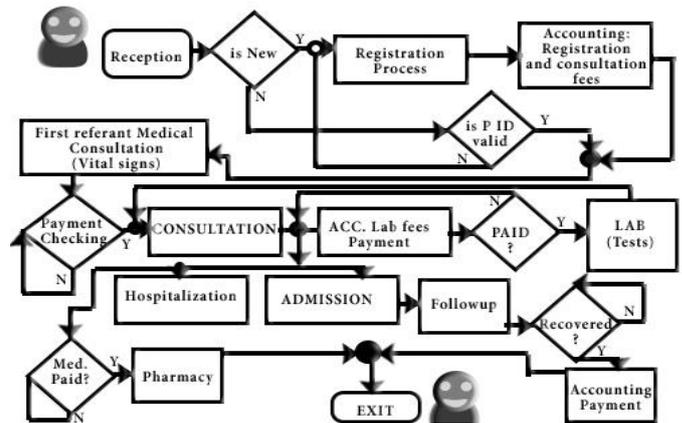
Fig 3:- Movement of patients & data flow

V. METHODOLOGY

GHMS is based on the database, object-oriented programming language, and networking techniques. This system uses JAVA as the front-end software which is an object-oriented programming technique and has connectivity with MySQL, the back-end software, used in areas where keeping the records in the database is necessary.

VI. IMPLEMENTATION

A. Hardware, LAN Configuration & Development Tools.

✓ *LAN Configuration (Main Building and Exterior Services Inter-connection)*
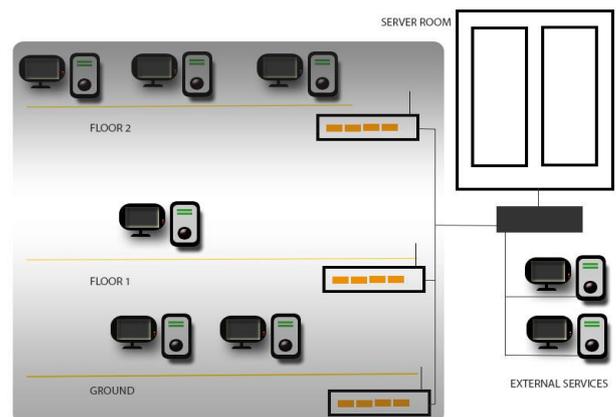

Fig 4:- LAN configuration
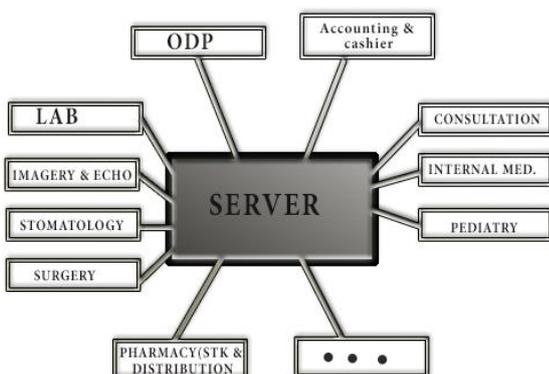
✓ *Hardware Used*

- A protected server room (datacenter).
- The main server.
- The backup server.
- A local client computer in the server room.
- A computer in each service.
- Two computers at reception.
- Cables, switches, routers, access point, clipping tool and cable meter.
- A webcam or camera connected to computers placed at reception.
- Stabilizer for the server computers.

- A power backup system for server room which can keep the power for 6 hours.
- A backup for each computer in the network (in each service) capable to save the power up to 2 hours.
- A printer in the server room.
- A printer at reception, cashier, and accountant rooms.
- Server cupboard.
- Switches cupboard in the server room.

✓ *Development tools*

GHMS is a web-based application with JAVA as the front-end software and MySQL Server as the back-end tool.

B. Operating System

Windows Server 2012 on a powerful server computer, client computers use client programs namely Windows 10, Windows 8 and Windows 7.

VII. RESULTS AND DISCUSSION

As seen on the following Figures, this research study shows that all user expectations were fully supported as GHMS meets user requirements relating to registering a new patient, displaying user and patient information, etc. The provided figures are simply samples as the system itself computerizes the management of the whole hospital.

As shown in Figure 5, a welcome screen is initially displayed to the user which then redirects her to the login interface (Figure 6). After a successful login, a global access-redirection screen (Figure 7) is displayed where the user has to select the service. The screen in Figure 8, provides basic information about the GHMS. Figure 9 provides basic information about the system's key features.

Operation about registering a new patient is provided in both Figure 10 and Figure 11. Figure 12 and Figure 13 provide the information regarding patient data editing. The system also records and initializes a patient visit and orients the patient to a particular service as shown in Figure 14. In Figure 15, the system also records the vital signs as long as those are furnished by the laboratory.

We can display user basic information by a search using various criteria such by NID (National Identification), PUID (Patient User ID), or E-mail (Fig. 16 and Fig.17), by names or by date of registering or visit (Fig.18).


Fig 6:- Login interface

Fig 7:- Global access-redirection screen

Fig 8:- About GHMS-screen

Fig 5:- GHMS-welcome screen
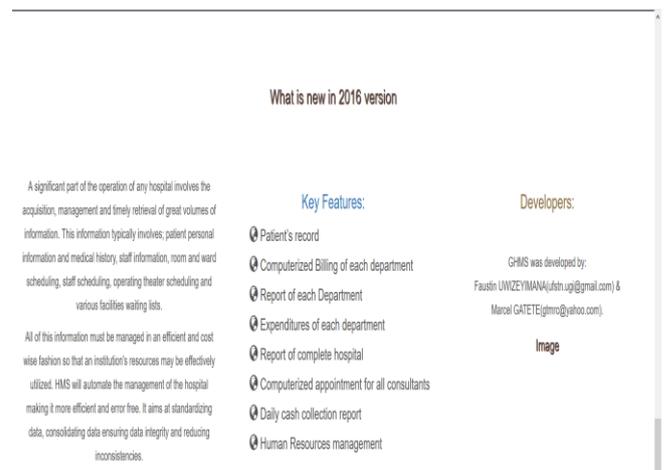

Fig 9:- GHMS-Key features

Fig 10:- Registering a new patient-1

Fig 11:- Registering a new patient – 2

Fig 12:- Updating patient details-1

Fig 13:- Updating patient details-2

Fig 14:- Initializing a visit

Fig 15:- Recording Vital signs
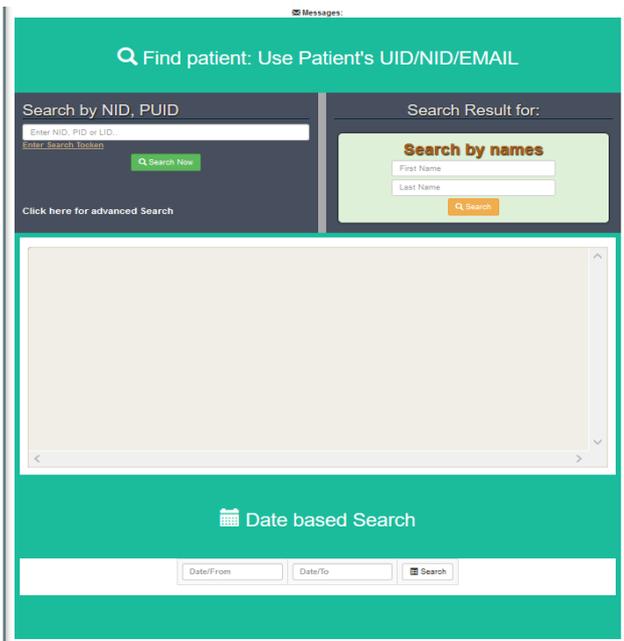
Fig 16:- Patient Searching
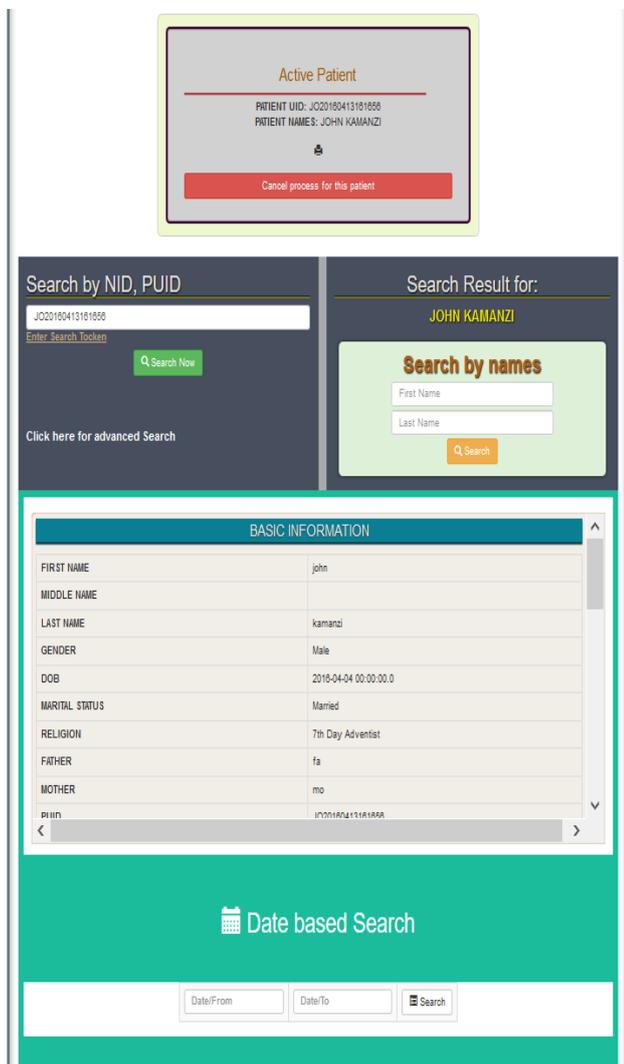
Fig 17:- NID/PUID Search result

Fig 18:- Searching result (Searching by dates)

VIII. FEATURED CASE STUDY

GHMS is currently running in Gitwe Hospital with.

- 242 Beds
- 40 Patients per day
- 43 Service Departments
- 289 Employees
- 500 Medical equipment
- 5 Surgeries per day
- 27052 Records
- Automation of processes: All
- 30 % of operational cost reduction
- 100% reduction in paperwork
- 90% improvement in patient care
- 90% reduction in information flow time
- Enhanced competitive advantages
- 100% timely & accurate information
- 100% of patient delights etc.

IX. CONCLUSION AND SUGGESTED FUTURE IMPLEMENTATION

The project GITWE Hospital Management System (GHMS) is for computerizing the working in the hospital. The software takes care of all the requirements of an average hospital and is capable to provide easy and effective storage of information related to patients, staff, etc.

We propose that a security system is also implemented as GITWE hospital facilities grow larger while providing around-the-clock care, they become more vulnerable to a wide array of security risks and vulnerabilities. Video security solutions are suggested to provide the healthcare facility with the peace of mind that comes with complete protection. With a suite of video management and network-based systems, providing video imaging/surveillance from a centralized, or even remote location would be more efficient. While physical safety is always a primary concern, the security system can also take great consideration in aspects of protecting tangible equipment and supplies as well as intellectual property and electronic data. We are looking forward to undertaking continuous maintenance of GHMS and keep long-term state-of-the-art, fully integrated hospital information system, offering a full suite of tools for clinical tasks, hospital management, and patient administration.

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