CHAPTER 1

1.0 BACKGROUND INFORMATION

A hospital is an institution for health care that provides patient treatment by specialized staff and equipment. Usually, hospitals are funded by the public sector, by health organizations (for profit or non-profit), health insurance companies or charities, including funds by direct charitable donations. Historically, however, hospitals were often founded and funded by religious orders or charitable individuals and leaders. Modern-day hospitals are largely staffed by professional physicians, surgeons, and nurses.

1.1 CLASSIFICATION OF HOSPITAL.

Hospitals are distinguished by their ownership, scope of services, and whether they are teaching hospitals with academic affiliations. Hospitals may be operated as proprietary (for-profit) businesses, owned either by corporations or individuals such as the physicians or they may be voluntary-owned by non-profit corporations, religious organizations, or operated by federal, state, or city governments. Voluntary and non-profit hospitals are usually governed by a board of trustees, selected from among community business and civic leaders, who serve without pay to oversee hospital operations.

1.1.1 COMMUNITY HOSPITALS

Most community hospitals offer emergency services as well as a range of inpatient and outpatient medical and surgical services. Community hospitals, where most people receive care, are typically small, with fifty to five hundred beds. These hospitals normally provide quality care for routine medical and surgical problems. Some community hospitals are nonprofit corporations, supported by local funding. These include hospitals supported by religious, cooperative, or osteopathic organizations. In the 1990s, increasing numbers of not-for-profit community hospitals have converted their ownership status, becoming proprietary hospitals that are owned and operated on a for-profit basis by corporations. These hospitals have joined investor-owned corporations because they need additional financial resources to maintain their existence in an increasingly competitive industry. Investor-owned corporations acquire not for profit hospitals to build market share, expand their provider networks, and penetrate new health care markets.

1.1.2 TEACHING HOSPITALS

Teaching hospitals are those community and tertiary hospitals affiliated with medical schools, nursing schools, or allied-health professions training programs. Teaching hospitals are the primary sites for training new physicians where interns and residents work under the supervision of experienced physicians. Non-teaching hospitals also may maintain affiliations with medical schools and some also serve as sites for nursing and allied-health professions students as well as physicians-in-training. Most teaching hospitals, which provide clinical training for medical students and other health care professionals, are affiliated with a medical school and may have several hundred beds. Many of the physicians on staff at the hospital also hold teaching positions at the university affiliated with the hospital, in addition to teaching physicians-in-training at the

bedsides of the patients. Patients in teaching hospitals understand that they may be examined by medical students and residents in addition to their primary "attending" physicians. One advantage of obtaining care at a university-affiliated teaching hospital is the opportunity to receive treatment from highly qualified physicians with access to the most advanced technology and equipment. A disadvantage is the inconvenience and invasion of privacy that may result from multiple examinations performed by residents and students. When compared with smaller community hospitals, some teaching hospitals have reputations for being very impersonal; however, patients with complex, unusual, or difficult diagnoses usually benefit from the presence of acknowledged medical experts and more comprehensive resources available at these facilities. A teaching hospital combines assistance to patients with teaching to medical students and nurses and often is linked to a medical school, nursing school or university.

1.1.3 PUBLIC HOSPITALS

Public hospitals are owned and operated by federal, state, or city governments. Many have a continuing tradition of caring for the poor. They are usually located in the inner cities and are often in precarious financial situations because many of their patients are unable to pay for services. The federal government matches the states' contribution to provide a certain minimal level of available coverage, and the states may offer additional services at their own expense.

1.1.4 GENERAL HOSPITAL

This is the best type of hospital, it is set up to deal with many kinds of diseases and injuries, and normally has an emergency department to deal with immediate and urgent threats to health.

1.1.5 DISTRICT HOSPITAL

This is the major health care facility in its region, with large numbers of beds for intensive care and long-term care; and specialized facilities for surgery, plastic surgery, childbirth, and bioassay laboratories.

1.1.6 SPECIALIZED HOSPITAL

This is a special type of hospital meant for a particular case like trauma centres, rehabilitation hospitals, children's hospitals, seniors' (geriatric) hospitals, and hospitals for dealing with specific medical needs such as psychiatric problems, certain disease categories such as cardiac, intensive care unit, neurology, cancer centre, and obstetrics and gynaecology, oncology, or orthopaedic problems.

1.1.7 CLINICS

A medical facility smaller than a hospital is generally called a clinic, and often is run by a government agency for health services or a private partnership of physicians (in nations where private practice is allowed). Clinics generally provide only outpatient services.

1.2 MANUAL WORKLOW OF THE HOSPITAL

In a hospital where patients are taken care of, when a patient visits the hospital, the patient is an inpatient if he/she is admitted while is an outpatient when he/she is not admitted. Or a patient is rushed in case of

emergency. Some patients go to a hospital just for diagnosis, treatment, or therapy and then leave as outpatients without staying overnight; while others are admitted and stay overnight or for several days or weeks or months as inpatients. Hospitals usually are distinguished from other types of medical facilities by their ability to admit and care for inpatients whilst the others often are described as clinics. When a patient enters the hospital the following sequence of operation is carried out.

First and foremost, the patient is registered in the card/registration room, and then the patient goes to the nurses workbench for examination (vital signs), the nurses then carries the patient folder to the doctors workbench for diagnosis.

After the diagnosis, the patient is then sent to the laboratory for test or the patient is sent to the pharmacy for collection of drugs; the pharmacy section checks the patients prescribed drugs and cost them before the folder is sent to the bill office for billing. After diagnosis the patient can also be referred to another clinic or to see a consultant in the same hospital. For example, he/she may be referred for radiology services (CT scan, MRI, and ultrasound) or to special services like dental care. There may also be possibilities for surgical services. The inpatient may recover fully and be discharged or die and will be given a death report.

The purpose of the hospital management system is to automate the system for storage and easy retrieval of data, flow of information and management of hospital.

1.3 BRIEF DESCRIPTION OF HOSPITAL ACTIVITIES

A Hospital is a place where patients visit to for medical check-up or diagnosis and treatment. Hospitals provide facilities like:-

→ Consultation and diagnoses of diseases by doctors.

→ Provision of treatment facilities.

→ Facility for admitting Patients (providing beds, nursing, medicines etc.)

→Immunization of patients/children.

Various operational works are done in a hospital; all these works are done manually using papers as follows:

→ Recording information about the patients that visit a hospital for treatment.

→ Generating bills.

→ Recording information related to diagnosis given to patients.

→ Keeping record of the Immunization provided to children/patients.

→ Keeping information about various diseases and medicines available to cure them.

These are the various jobs that are done in a hospital by the operational staff and doctors; information about patients is recorded manually by just writing the patients name, age and gender. Whenever the patient visits, his information is stored again;

- Bills are generated by recording price for each service provided to patient

on a separate sheet and at last they all are summed up.

- Diagnosis information to patients is generally recorded on the document, which contains patient information. It is destroyed after some time to decrease the paper load in the office.
- Immunization records of children are maintained in pre-formatted sheets, which are kept in a file.
- Information about various diseases is not kept as any document.

Doctors themselves do this job by remembering various medicines. All this work is done manually by the receptionist and other operational staff and lots of papers are needed to be handled and taken care of. Doctors have to remember various medicines available for diagnosis and sometimes miss better alternatives as they can't remember them at that time.

1.4 PROBLEMS OF THE MANUAL SYSTEM

Lack of immediate retrieval: -The information is very difficult to retrieve and to find particular information e.g. - To find out about the patient's history, the user has to go through various registers. This results in inconvenience and waste of time.

Lack of immediate information storage: - The information generated by various transactions takes time and efforts to store them.

Error prone manual calculation: - Manual calculations are error prone and takes a lot of time, this may result in incorrect information. For example, calculation of patient's bill based on various treatments.

Preparation of accurate and prompt reports: - This becomes a difficult task as business intelligence is difficult, this is due to lack of information collation (ability to put information together and analyse them).

1.5 NEED FOR AUTOMATED SYSTEM.

The need for an Automated Hospital Management System can be summarized as follows:-

Planned approach towards work: - The activities in the organization will be well planned and organized. The data will be stored properly in data stores, which will help in retrieval of information and in enforcing security.

Accuracy: - The level of accuracy in the proposed automated system will be higher. All operations would be done correctly and accurately. In practice, errors are not completely eliminated, they are reduced.

Reliability: - The reliability of the proposed system will be high as information is stored properly and securely.

No Redundancy: - In the proposed system utmost care would be taken to ensure that no information is repeated anywhere, in storage. This would assure economic use of storage space and consistency in the data stored.

Immediate retrieval of information: - The main objective of the proposed system is to provide for a quick and efficient retrieval of information. Any type of information would be available whenever users require them.

Immediate storage of information: - In manual system, lots of problems are encountered in trying to store large amount of information.

Easy to Operate: - The system should be easy to operate and should be such that it can be developed within a short period of time and fit the limited budget of the user.

1.6 PROJECT OBJECTIVES

The main aim of this project is to design an automated system for controlling the flow of patient's data in the hospital. The aim is to solve most of the problems encountered in the hospital using the old and manual system of medical administration. In the manual system, almost all the patient folders in the records have to be accessed by the staff for every folder request. The integrity and security of the data in database system are considered here from the point of view of freedom from risk. The risks are those events that threaten the data; threaten to destroy or corrupt it to prevent its use, threaten to access it illicitly or to steal it. The objectives of the project include:

ϖ Systematic data collection.

ϖ Efficient data storage

ϖ Accurate data communication and manipulation

ϖ Enhanced data security so that the hospital data and information are stored centrally in a secure fail safe database that has a secondary backup database.

ϖ Reduced system cost.

1.7 THE PROJECT SCOPE

The hospital management system is capable of supporting any number of staff of the hospital and each module of the package runs independently without affecting other modules. This means that all departments of the hospital work independently.

1.8 PROJECT ORGANISATION

Hospital management system deals with using computer to enter and retrieve data for management of information in the hospital. The project is made of 5 chapters:

CHAPTER 1 introduces the project. It gives the background information of the project and discusses the problems, scope and objective of the project. It states the solution to the manual system of record keeping.

CHAPTER 2 is the literature review of the project. It reviews the manual system of keeping record in the hospital. It states all the effort that has been made so far to computerize the existing system. The existing manual system has a lot of problems that are facing it like data redundancy, data manipulation, data collection, and data storage and data security.

CHAPTER 3 reviews the requirement elicitation, specification and Analysis and Design

CHAPTER 4 is the implementation and testing of the automated hospital management system. Active Server Pages .PHP is the programming language while the MySQL database is the server. Each unit of the project will be tested to ensure correctness, robustness and maintainability.

CHAPTER 5 is project evaluation and conclusion

CHAPTER 2

LITERATURE REVIEW

2.0 CONSIDERATIONS REGARDING PATIENT INFORMATION SYSTEM

The use of computers in medicine dates back to the 1950s with studies that attempted to expand the mental capacity of physicians (Stumpf and Freitas, 1997) or dealt with research on electrophysiology (Collen, 1986). With the evolution of this equipment, especially with the capacity to simultaneously execute various tasks beginning in the 1960s, computers began to be used in the processing of information in large hospitals, in both administrative and financial functions for the collection of statistics and the development of research projects (Stead, 2007; Stumpf and Freitas, 1997). The use of microcomputers, beginning in the 1970s, introduced the concept of distributed processing, increasing the number of systems in use in large hospitals (Stumpf and Freitas, 1997).

Because this diffusion did not always occur in an organized or homogeneous manner, the initial diffusion of computers in hospitals led to the emergence of islands of computerization, with isolated systems that lacked any form of interconnection and were developed by different teams. The redundancy and the lack of data integrity deterred health professionals, who saw these systems as developed by systems professionals for systems professionals (Stumpf and Freitas, 1997). This situation was also investigated by McDonald (1997), who analyzed the lack of interconnection of the different systems used by the hospitals, laboratories, and service providers in the healthcare field.

Collen (1986) described the development of approaches in the 1970s that sought to approximate the habitual processes of decision-making with the use of artificial intelligence in differential diagnoses. In the same decade, studies were undertaken in search of a better organization of the healthcare system (Kaihara, 1978). With the help of computer-processed simulations, the author established an ideal relationship between medical centers and population demands.

The distributed processing was expanded during the 1980s with the development and greater availability of microcomputers, and the possibility of network communication of such equipment increased in the 1990s (Stumpf and Freitas, 1997). This allowed for the emergence of hospital information systems (HIS), covering medical, administrative, and hospitality areas, although hospitality may be considered as integrated into the administrative area (Cortes, 2008). These three areas are interlinked by horizontal data and information flows, providing support to the developed

activities, In the proposed scheme, the information on the electronic records, which contain the procedures, prescriptions, laboratory examinations, professionals involved, and hospitalizations (when applicable), is fundamental for a HIS (Wakamiya and Yamauchib, 2009; Pinochet and Albertin, 2008).

2.1 ELECTRONIC RECORDS

A patient's medical record contains fundamental information for incorporation into a hospital information system, yet it is necessary to consider that not all hospitals adopt medical records, even though they may use administrative systems or even hospitality systems. While specific information is not available, professional practice shows that, in general, the administrative area benefits the most from information systems in hospitals. This use includes inventory management systems, accounts payable and receivable, financial services, and accounting services. In these cases, the traditional record (hand-written) should have part of its information inserted into administrative systems so that hospital bills can be processed. Similarly, hospital pharmacies use information systems to control stocks of prescriptions that are recorded in the medical records of patients.

This generates excess work that, in addition to consuming time and human resources, leaves the process susceptible to errors, delays, and failures, with repercussions that include the scheduling of exams, errors in forwarding requirements, and mistakes in billing that may lead to item disallowances, billing delays, or even missing charges for procedures or exams that have been performed.

Electronic records, when duly integrated with other systems, may reduce the occurrence of these problems, while also expediting the recovery of information for use by health professionals. This information can be used in statistical surveys, help with the analysis of procedures, be applied to preventative medicine, and be utilized for the control of hospital infections.

However, greater agility in the administrative processes and hospital procedures causes controversy, as one of the problems related to the use of HIS is that in order to deal with medical information, many systems end up demanding a change in the work methods of physicians who have always recorded their observations in structured and codified ways. Although some studies have considered this standardization and structuring to be necessary for the organization and increase in the quality of information (e.g., Setz and D'innocenzo, 2009; Hoff, 2009; Wakamiya and Yamauchib, 2009; Chaudhry *et al.*, 2006; Shekelle, Morton, and Keeler, 2006), other studies concluded that this could

harm the transmission of information among medical teams, imposing restrictions on the medical information that is input into the system (e.g., Warwick, 2009; Dawidowski *et al*., 2007; Stead, 2007; Walsh, 2004; Stumpf and Freitas, 1997).

Adler-Milstein (2009) stated that the potential benefits of using IT in the healthcare field, including efficiency and quality gains, will only be possible if the hospitals and clinics promote organizational changes, including greater autonomy for the individuals in the decision-making process and an increase in training programs. This situation is similar to that recommended by Goldzweig (2008), who concluded that the impact of the implementation of HIS depends on the context of the implementation and applications, as well as on the clinical problems and the patient population.

Another possibility presented by electronic records within HIS is the electronic prescription. Balfour III *et al.* (2009) concluded that this improves the level of care given to patients by eliminating the need to interpret handwritten prescriptions, reducing the possibility of errors regarding dosages and increasing communication speeds with hospital pharmacies. The presentation of the available drugs facilitates the indication of generic medications, potentially decreasing the costs for the patients (BALFOUR III *et al.*, 2009), reducing the dosages prescribed when associating the support systems with clinical decisions (Shekelle, Morton and Keeler, 2006) and permitting a more rapid renewal of prescriptions and dosage changes (Weingart *et al*., 2009).

Despite the abovementioned benefits, some problems were identified in studies focusing on electronic prescriptions. Physicians did not always check the prescription before its transmission (Hellström *et al.*, 2009) and also did not pay attention to the warnings regarding interactions among medications because many warnings referred to drugs that were no longer used (Weingart *et al*., 2009).

Another general benefit provided by HIS and especially by electronic records is the medical and nursing audits of the accounts presented to health insurance carriers. This analysis constitutes one of the main resources used by the carriers to better manage their costs with hospital care (Ribeiro *et al.*, 2008; FARIAS and Melamed, 2003). As a result, the auditor ends up adopting a financial approach and a vision of controllership, seeking the economic viability of the business and analyzing unauthorized charges for hospital costs. In this process, medical records will be able to reduce the number of errors, as they can set rules for the performance of procedures in addition to facilitating the investigation of conduct, inputs, and medical-hospital costs for the patients (Scarparo and Ferraz, 2008).

This action ends up impacting the price charged by the health insurance carrier, which is one of the items contemplated by consumers when choosing a health insurance plan. Along with medical care, structure of the operator, medical staff, communication, and convenience, price was one of the seven constructs identified in the research conducted by Milan and Trez (2005) that influenced the satisfaction levels of health insurance members.

Automated Patient Information Management System is a computerized medical information system that collects, stores and displays patient information. It deals with drug, equipment, human resources and other relevant information. They are a means to create legible and organized patient data and to access clinical information about individual patients. Automated Patient Information Management Systems are intended to complement existing (often paper based) medical records which are already familiar to practitioners. Patient records have been stored in paper form for centuries and, over this period of time; they have consumed increasing space and notably delayed access to efficient medical care. In contrast, automated Patient Information Management System stores individual patient clinical information electronically and enable instant availability of this information to all providers in the healthcare chain and so assist in providing coherent and consistent care.

The advantages of automated Patient Information Management System can be summarized according to (Yamamato 2006) as "optimizing the documentation of patient encounters, improving communication of information to physicians, improving access to patient medical information, reduction of errors, optimizing billing and improving reimbursement for services, forming a data repository for research and quality improvement, and reduction of paper".

The health care sector is an area of social and economic interest in several countries; therefore, there have been lots of efforts in the use of electronic health records. Nevertheless, there is evidence suggesting that these systems have not been adopted as expected, and although there are some proposals to support their adoption, the proposed support is not by means of information and communication technology which can provide automatic tools of support.

2.2 EVALUATION OF HEALTH CARE

In 1995 van der Loo conducted a literature review to classify evaluation studies of information systems in health care (van der loo et al 1995). The primary objective was to get an insight into the variety of evaluation methods applied. In all, 76 studies published between 1974 and 1995 were included in the review. Many different performance measures or success factors were applied in the studies reviewed. The review's main conclusion was that the evaluation methods and effect measures depended on the characteristics of the information system under evaluation. However, the range of identified evaluation methods and effect

variables was broad for every type of system. Among the effect variables were costs, changes in time spent by patients and health care personnel, changes in care process, database usage, performance of users of the system, patient outcomes, job satisfaction, and the number of medical tests ordered. Several authors have suggested approaches to evaluating information technology in health care (Anderson et al 1997). These approaches concerned assessment of technical, sociological, and organizational impacts. A literature review by Delone and McLean 1992 in the field of management information systems aimed at identifying determinants for system success. They presented a framework with six dimensions of success -:1) system quality, (2) information quality, (3) usage, (4) user satisfaction, (5) individual impact, and (6) organizational impact

The purpose of their review was to analyse evaluation studies of inpatient patient care information systems requiring data entry and data retrieval by health care professionals, published between 1991 and May 2001, to determine the attributes that were used to assess the success of these systems and to categorize these attributes according to the Delone and McLean framework. They also examined how the attributes were measured and what methodologies were used in the evaluation studies. Their review did not cover outpatient.

2.3 SYSTEM QUALITY

Delone and McLean 1992, proposed to subdivide success measures of management information systems into six distinct categories that define the five dimensions to measuring success of system deployment as follows: (1) system quality, (2) information quality, (3) usage, (4) user satisfaction, (5) individual impact, and (6) organizational impact. Within each category several attributes could contribute to success.

The information processing system itself is assessed with system quality attributes (e.g., usability, accessibility, ease of use). Information quality attributes (e.g., accuracy, completeness, legibility), concern the input and output of the system. Usage refers to system usage, information usage, or both. Examples of attributes of usage are number of entries and total data entry time. User satisfaction can concern the system itself or its information, although they are hard to disentangle. Delone and McLean included user satisfaction in addition to usage, because in cases of obligatory use, user satisfaction is an alternative measure of system value. Individual impact is a measure for the effects of the system or the information on users' behavior, and attributes can be information recall or frequency of data retrieval or data entry. Organizational impact, the last category, refers to the effects of the system on organizational performance. Thus, success measures vary from technical aspects of the system itself to effects of large-scale usage.

DeLone and McLean 1992- concluded that success was a multidimensional construct that should be measured as such. In addition, they argued that the focus of an evaluation depended on factors such as the objective of the study and the organizational context. Furthermore, they proposed an information system success model in which the interdependency—causal as well as temporal —of the six success factors was expressed. In their view, success was a dynamic process rather than a static state; a process in which the six different dimensions relate temporally and causally. System quality and information quality individually and jointly affect usage and user satisfaction. They influence each other and have a joint influence on user behavior.

A study was conducted in 2004 by Healthcare Informatics in collaboration with American Health Information Management Association (AHIMA) to measure the level of readiness of health information management (HIM) professionals and the extent of(Electronic Health Record) EHR implementation in their organization. The findings showed the industry is continuing to see more movement toward EHR. For example, when organizations were asked to describe their progress toward an EHR, 17 percent of respondents indicated they were extensively implemented; 26 percent indicated they were partially implemented; 27 percent said they were selecting, planning, or minimally implemented, and 21 percent indicated they were considering implementation and gathering information about it (Minal Thakkar and Diane. Davic August 14 2006).

In a study conducted during the summer of 2004 by the American Academy of Family Physicians (AAFP), nearly 40 percent of respondents, who were members of AAFP, indicated they either had completely converted to EHRs or were in the process of doing so. Twenty-four percent had purchased the EHR system within the first half of the year. Findings showed that cost remained a major barrier for physicians in small and medium practices in the move to EHR systems.

Previous research on risks of EHR systems identified privacy and security as major concerns. Other risks identified were financial risk (billing errors in software), software systems becoming obsolete, software vendors going out of business, computer crashes, data capture anomalies, programming errors, automated process issues, and populating invalid information in the decision support systems module of EHR systems.

Some of the main benefits of EHR systems that have been identified include reducing medical errors, improving quality of care, conserving physician time, sharing patient information among healthcare practitioners, and workflow efficiency.

2.4 RELIABILITY AND VALIDITY OF QUALITY MEASURES

Previous reviews of research on electronic health record (EHR) data quality have not focused on the needs of quality measurement. The authors Chan, Kitty S. et al, in 2010 reviewed empirical studies of EHR data quality, published from January 2004, with an emphasis on data attributes relevant to quality measurement. Many of the 35 studies reviewed examined multiple aspects of data quality. Sixty-six percent evaluated data accuracy, 57% data completeness, and 23% data comparability.

2.5 COST AND BENEFIT

The major barrier to adoption of an EHR system, as identified by some studies, was misalignment of cost and benefits or financial reimbursement (Bates, David 2005).. Brailer said that reimbursing physicians for using EHR systems and reducing their risk of investing in them should accelerate the adoption of EHR systems in physicians' offices.

Other barriers that have been identified are technical issues, system interoperability, concerns about privacy and confidentiality, lack of health information data standards, lack of a well-trained clinician informatics workforce to lead the process, the number of vendors in the marketplace, and the transience of vendors (Brailer david J et al 2003) .

These studies and other previous research conducted in the area of EHR systems determined the risks, benefits, and barriers as well as analyzed the relationship between the adoption of EHR systems and the size of the hospital or physician office. Moreno 2003 stated, "The evidence from our literature review suggests that large physician groups and hospitals are at the forefront of using EHRs; however, the extent to which small physician practices—those made up of eight or fewer physicians representing nearly 80 percent of all physicians in the US—have adopted EHRs nationally remains unclear.

The American Hospital Association (AHA) conducted a survey of all community hospitals in 2005 to measure the extent of information technology (IT) used among hospitals and better understand the barriers to further adoption. CEOs from 900 community hospitals (19.2 percent) participated in the study. The study found that 92 percent of the respondents were actively considering, testing, or using IT for clinical purposes. The remaining 8 percent that were not considering IT were primarily small, rural, non-teaching, and no system hospitals. The study reported that more than 50 percent of the respondents fully implemented the EHR functions results review—lab, order entry—lab, order entry—radiology, access to patient demographics, and results review—radiology report.

This study also reported that 50 percent of the rural hospitals specified they were just "getting started" on IT system implementation, whereas 48 percent of the urban hospitals indicated

"moderate" or "high" levels of implementation of IT systems. Cost was the number one barrier to the adoption of EHR systems; 59 percent of the hospitals found that initial cost was a significant barrier; 58 percent found acceptance by clinical staff as somewhat of a barrier. Among the smaller hospitals with bed size less than 300, more than 50 percent saw cost as a significant barrier.
Historically, test results have been among the earliest components of the information system to be automated and it is possible that not-for-profit hospitals, which constitute the more traditional form of hospital organization, may have more experience developing this component of their information systems. Though there has been significant attention placed on the promise of computerized order entry systems to reduce medical errors, starting with the IOM reports in the 1990s, fewer hospitals have successfully installed such systems. We found that hospitals with older age of plant (i.e., building) scored 8 points lower on the order entry sub-domain. One might suspect that newer hospital facilities would be more easily equipped with computerized order entry systems than hospitals with older physical facilities, as these results suggest. Perhaps more important than the age of the building is the newness of its technological infra-structure. The latter may not necessarily correlate with the building age, though it could be captured in the age of plant variable and may explain the findings we observe.

Historically, urban safety net hospitals in the United States are least able to meet the challenges associated with acquiring new medical technology. These hospitals balance multiple claims on their resources, perhaps reducing the capability to invest in the information technologies that support healthcare. Our analysis suggests, however, that urban safety net hospitals in Texas do not significantly trail their peers. Due to their size and scale, these hospitals may achieve IT parity because they can afford the fixed costs necessary for the IT infra-structure and have decided to pursue this course. In addition, all of the safety net hospitals in this sample are major teaching hospitals. Thus, it is difficult to differentiate between the effects of teaching status and safety net status.

According to recent estimates, adoption of clinical information technologies remains low but follows certain patterns. Our findings are consistent with these trends. Historically, the computerized display of lab results has been among the first aspects to be automated. In the last decade, digitization of radiological images has also increased. Both of these components fall under the test results sub-domain, which in our study showed the greatest degree of adoption. Though some hospitals may be experimenting with computerized order entry and decision support, these efforts have not yet translated into systems that physicians widely use, as indicated by the low scores in these areas. Electronic decision support is perhaps the most challenging component to implement since it requires all other components first. The nationwide health information network (NHIN) has been proposed

to securely link community and state health information exchange (HIE) entities to create a national, interoperable network for sharing healthcare data in the USA. Dixon BE et al, J Am Med Inform Assoc paper describes a framework for evaluating the costs, effort, and value of nationwide data exchange as the NHIN moves toward a production state. The paper further presents the results of an initial assessment of the framework by those engaged in HIE activities.

2.6 TIME EFFICIENCY

Abu Dagga A et al, 6th October 2010 Telemedicine and e-Health, searched five databases (PubMed, CINAHL, PsycINFO, EMBASE, and ProQuest) from 1995 to September 2009 to collect evidence on the impact of blood pressure (BP) telemonitoring on BP control and other outcomes in telemonitoring studies targeting patients with hypertension as a primary diagnosis. Fifteen articles met their review criteria. They found that BP telemonitoring resulted in reduction of BP in all but two studies; systolic BP declined by 3.9 to 13.0 mm Hg and diastolic BP declined by 2.0 to 8.0 mm Hg across these studies. These magnitudes of effect are comparable to those observed in efficacy trials of some antihypertensive drugs.

Poissant et al, J Am Med Inform Assoc, 25th September 2010 made a systematic review to examine the impact of electronic health records (EHRs) on documentation time of physicians and nurses and to identify factors that may explain efficiency differences across studies. In total, 23 papers their criteria; five were randomized controlled trials, six were post-test control studies, and 12 were one-group pre-test and post-test designs. Most studies (58%) collected data using a time and motion methodology in comparison to work sampling (33%) and self-report/survey methods (8%). A weighted average approach was used to combine results from the studies.

Verhoeven F et al, 2nd June 2010 Journal of Diabetes Science and Technology, 1994 to 2009, carried out a research to determine the effects of teleconsultation regarding clinical, behavioural, and care coordination outcomes of diabetes care compared to usual care. Two types of teleconsultation were distinguished: (1) asynchronous teleconsultation for monitoring and delivering feedback via email and cell phone, automated messaging systems, or other equipment without face-to-face contact; and (2) synchronous teleconsultation that involves real-time, face-to-face contact (image and voice) via videoconferencing equipment (television, digital camera, webcam, videophone, etc.) to connect caregivers and one or more patients simultaneously, e.g., for the purpose of education.

2.7 USABILITY

The Clinical Information Technology Assessment Tool (CITAT) examines information technology capabilities in the hospital within the context of the sociotechnical environment of the organization

(Wears RL and Berg M 2005). In exploring which hospital characteristics are most associated with highly automated and usable clinical information systems as measured by the CITAT, we found that hospitals with larger information technology staff, budgets, and capital expenses had statistically significantly higher scores on automation, test results, and order entry scores. Spending on these factors alone appears to be more relevant than other structural factors, such as bed size, ownership status, and total margin, and persisted after adjustment for these factors. In a separate sensitivity analysis, however, after we normalized each of these factors for hospital size the association diminished or disappeared. Although bed size, by itself, was not related to higher automation scores, these results suggest that larger hospitals may enjoy an economy of scale with respect to the high fixed costs associated with large IT projects. Achieving this level of cost-effectiveness with respect to IT spending may be more challenging for smaller hospitals. Likewise, teaching hospitals, perhaps because of their history of innovation and experimentation, appear to embrace information technologies sooner than other types of hospitals. These hospitals scored higher on the CIT score and on multiple automation and usability sub-domains. As with other innovations in medicine, it is possible that academic physicians advocate for newer information technologies, increasing the speed of its adoption in these organizations.

The CITAT assesses a system's automation and usability. Automation represents the degree to which clinical information processes in the hospital are fully computerized and is divided into four distinct sub-domains: test results, notes & records, order entry, and a set of other sub processes largely consisting of decision support. To score highly on a given automation sub-domain, the CITAT requires three factors of routine information practices:

- The practice must be available as a fully computerized process;
- The physician must know how to activate the computerized process;
- He or she must routinely choose the computerized process over other alternatives, such as writing an order or making a telephone call.

Usability represents the degree to which information management is effective and well supported from a physician standpoint, regardless of whether a system is automated or manual. An overall measure, called the CIT score, represents an average of the automation and usability scores (the survey items can be obtained from the corresponding author).

Usability items in the CITAT do not presuppose the use of technology. The usability domain is constructed to measure the ease, effectiveness, and support of the information system regardless of

the technologies in place (Amarasingham et al 2006). As an example of the types of questions in this domain, one of the survey items asks whether physicians are able to obtain adequate computer support in less than 2 minutes. As might be expected, we found that usability scores were generally higher than automation scores. It is feasible that thoughtfully planned paper-based systems could produce usability scores higher than, or equal to, systems which employ poorly designed electronic processes. However, consistent with two previous studies, we found that a higher automation score correlated with higher usability scores, suggesting that digitization may be necessary to produce usable information systems. Alternatively, these results may indicate that physicians' expectations are changing; electronic processes may be perceived to be more usable than nonelectronic processes, independent of overall merits, and therefore are rated more highly. Usability of the information system, an often elusive goal for hospital systems, was not specifically associated with any of the hospital characteristics we measured, with the exception of teaching status. In that case, hospitals with a teaching affiliation had higher user support scores than non-teaching hospitals. Our results suggest that usability may be more dependent on factors we did not measure as part of our set of hospital characteristics; these may include the quality and direction of leadership at the institution, the focus on quality improvement, and the concentration on human factors engineering in designing the information system.

The analysis explores a number of hospital characteristics, raising issues of multiple testing and increasing the probability of some false-positive relationships. As with all cross-sectional studies, positive associations will need to be confirmed in repeated studies. A Bonferroni correction for the number of tests performed would have eliminated many of the significant relationships we report. However, the Bonferroni method of correction for multiple testing is itself controversial and argued by some to be too severe a method for correction. The purpose of this study was to find potential relationships to explore further, given that the explanatory power of a cross-sectional study may be weak despite the construction of a well-validated instrument. Appropriate assessment of information technology requires multiple methods. Survey-based methods are one important method, but other methods such as electronic queries, time-motion studies, and qualitative analyses are needed to arrive at a complete portrait of an information system. Furthermore, this study attaches importance to higher scores on the CITAT, as a measure of the strength of the socio-technical environment at the hospital. However, we do not yet know whether, and to what degree, CITAT scores correlate with important clinical and financial outcomes. These relationships will need to be assessed in the future.

2.8 DATABASE

A Database Management System (DBMS) is a system in which related data is stored in an efficient and compact manner. It is a set of computer programs that control the creation, maintenance, and the use of the database of an organization and its end users. It allows organizations to place control of organization wide database development in the hands of database administrators (DBAs) and other specialists. A Database Management System is a system software package that helps the use of integrated collection of data records and files known as databases. It allows different user application programs to easily access the same databases. Database Management System may use any of the variety of database models, such as the network model or relational model. In large systems, a Database Management System allows users and other software to store and retrieve data in a structured way.

2.8.1 THE NEED FOR A DATABASE SYSTEM

Most organizations in this information age are faced with the problem of managing information effectively. Information can only be an asset if it is accurate and available when needed. Accuracy and availability are achieved if an organization purposefully organizes and manages its data. A database is the standard technique for structuring and managing data in most organizations today. This is because data is very useful for variety of purposes in organization. A database system is very important so as to avoid duplication of data, which introduces the problem of inconsistency in data.

2.8.2 TYPES OF DATABASE SYSTEM

2.8.2.1 INTEGRATED DATABASE SYSTEM

This is the kind of system whereby the database contains data for many users, not just one, which in turn connotes that any one user (batch or on-line) will be concerned with just a small portion of it. In addition, different user's portions may overlap in various ways (i.e. the data may be shared by several users).

An integrated system is based on the concept that there should be integration of data and processing. For an information processing system, this consists of all data that can be accessed by the system. In a computer-based Management Information System (MIS) the term database is usually reserved for data that can be readily accessed by the computer. Any application that uses a data item accesses the

same data item, which is stored, and made available to all applications. Also, a single updating of a data updates it for all users.

The use of an integrated database system provides the following advantages:

- Reduces cost of data collection and maintenance through sharing of data.
- Ensures enforcement of standard.
- Reduces data inconsistency
- Reduces data redundancy.
- Assures maintenance of data integrity.
- Simplifies handling of data security since the Database Administrator (DBA) usually applies security restrictions to protect data and privacy.

2.8.2.2 NON-INTEGRATED DATABASE SYSTEM

This is the type of system in which data files support individual application in various units that are also developed independently. This type of database poses a number of problems that affect the efficient utilization of data available in an organization. These problems include;

- Increased cost
- Data inconsistency
- Data redundancy
- Lack of data integrity.

2.8.3 APPLICATION OF DATABASE

Information stored in integrated database systems help government in areas like planning, modelling and forecasting. Integrated database helps the government in the following areas:

- **HEALTH CARE DELIVERY:** Accurate data got from census facilitate the provision of health facilities to the public. In hospitals, database systems can be used in recording data on patients, resource utilization and scheduling of medical personnel. These and other data recorded in other sections of the hospital (pharmacy, laboratory, and administration) help the hospital management in administration.
- **EDUCATION:** Here, stored data helps government in adequate planning and implementation of its educational programs.
- **FINANCE:** The availability of stored data on financial accounting makes good budgeting schemes possible. **TRAFFIC CONTROL AND PLANNING:** The provision of database for motor registration, analysis of road utilization and recording of accidents rates will make

it possible for government to plan and provide emergency services in combating traffic offenders.

- **CENSUS:** When accurate census data are stored, they help the government in policymaking, planning, projection and forecasting of development plans. Unreliable data frustrates the efforts of the government in making suitable projections for the plan of public utilities and facilities.
- **PUBLIC INFORMATION SERVICES:** Library inquiry system, recording proceeding, status and laws enacted in senate and parliament can be provided by a database. These provide necessary information needed by the public to contribute their own quota towards the development of the society.

2.9 HOSPITAL MANAGEMENT

Health Care services delivery especially in developing nations such as Nigeria are continually hampered by very weak information infrastructure to support data collection, collation, analysis and interpretation. This has led to a myriad of problems such as poor and inadequate information for clinical care of patients, education, research, and planning, budgeting and report generation amongst others. The burdens of poor information infrastructure are missing and misfiled patients records which are gradually becoming a norm while data reporting are either absent or delayed to the point of un-usefulness. Hospitals are still groaning with the burden of manual health records, absence of good health library and long patient waiting time for documentation. They are still struggling to benefit from the gains of information and communication technology, hence the need for Patient Information Management System.

Having considered the above and other problems besetting information management in our hospitals, this project aims at developing software for hospital management using oracle database system.

The goal is to satisfactorily integrate all efforts to ensure successful design and implementation of the Patient Information Management System, which must result to precision, cost cutting and efficient management. The product (Patient Information Management System) must be very accurate and suit all environments including large, medium or small-scale hospitals.

By implementing the Patient Information Management System, hospitals will enjoy the following benefits:

- Patient Information Management System will provide not only an opportunity to the hospital to enhance their patient care but also can increase the profitability of the organization.

- The hospital will require smaller staff to cater for more patients in the same time or even less.
- Patient Information Management System would enable the hospital to serve the rapidly growing number of health care consumers in a cost-effective manner.
- This software system will allow for development of additional modules including automation of more services as the resources and job tasks of the hospital grow in time.
- Upgrading of the software does not and will not require taking down of the existing running application modules.
- Hospital administrators would be able to significantly improve the operational control and thus streamline operations.
- Patient Information Management System would enable the hospital to improve the response time to the demands of patients care because it automates the process of collecting, collating and retrieving patient information.
- The Patient Information Management System software interface would also save a lot of time for doctors.
- Accounting sometimes becomes awfully pathetic and complex. This product will eliminate such complexity since the retrieval of information through its management information system will come virtually to their fingertips.

CHAPTER THREE

SYSTEM ANALYSIS AND DESIGN

3.1System Analysis

A system is a collection of interrelated components working together to achieve a specific goal. System analysis is the means studying and examine the operations of an existing system. The main goal of System analysis is examine the existing system and come out with a comprehensive and useful requirement specification for the proposed system.

System analysis is defined as the comprehensive study of an existing system to discover the areas of its functional limitation. It is a tool that helps in gaining an understanding of the existing the existing system and what is required of it.

It is a structural process that I used in collecting and analysing of data in respect to systems operation of integrated educational system and the procedures in order to get a full appreciation of the situation so that an effective web based computerized system may be designed and implemented.

3.1.1 ANALYSIS OF THE EXISTING SYSTEM

The existing system employed at Adeoyo Hospital Ibadan, involves tedious paperwork and rigour of going through various registers to find out patient's medical record. During the system investigation, the following problems were discovered:

- Information is very difficult to retrieve and to find particular information. For example, to find out about the patient's history, the user has to go through various registers. This results in inconvenience and wastage of time.
- The information generated by various transactions takes time and efforts to be stored at right place
- Various changes to information like patient details or immunization details of child are difficult to make as paper work is involved
- There is inaccurate and prompt report about patients' details because it becomes a difficult task as information is difficult to collect from various registers.

The main aim of the proposed system is to provide a quick and efficient retrieval of information. Any type of information pertaining to the patient will be available when needed and also to ensure

immediate storage of patients' details. Other benefits include: providing and prescribing drugs; precautions and dietary advice; providing and maintaining all kinds of tests for a patient.

3.2.1 Problem Associated with Old System

During my analysis of the manual way of managing patient record which was done by interview and observations, I observed some problems that were inherent in the manual ways of handling and manging patient records and there are listed below as follows:

- Lack of immediate retrievals
- Lack of immediate information storage
- Waste a lot of time and energy
- Requires much man power
- Time consuming
- Inadequate report generation
- Bulkiness of files and records etc.

3.2.1 The need for new System

Because of the problems inherent in the manual way of managing the patient records in Adeoyo Hospital, the need for computerization/automation becomes imperatives. They are listed below as follows:

- Saves time and man power
- Easy access to records
- Eradicate the manual ways of keeping staff and patient records
- Adequate and efficient report generation
- Monitor the productivity of the hospital
- Attending to patients without delay

3.2.2 Requirement Specification for the new System

Users of the Proposed System

The system will have the following types of users and privileges will be granted to all the users according to what each of the users can have access to.

- ICT Department

- Chief Medical Director
- Doctor
- Nurse
- Receptionist
- Health Assistant
- Laboratory Staff

3.3 System Design

This is the process of designing or building the new system after a detailed study of the manual way of marketing has been done. It is the stage in which the plans actually plan the life cycle of a system and all the work associated with the various stages of the system life cycle. The main aim of this design is to achieve a new system that is better and more productive than the manual system in terms of efficiency and services with the introduction of a managing staff and patient records system.

The design will make extensive use of the input validation approach, ensure that the user inputs are properly and correctly inputted

3.3.1 System Flow Chart

A flowchart is a type of diagram that represents an algorithm, workflow or process, showing the steps as boxes of various kinds, and their order by connecting them with arrows. This diagrammatic representation illustrates a solution model to a given problem. Flowcharts are used in analysing, designing, documenting or managing a process or program in various fields. The following are some of the commonly used shapes used in flowcharts, generally, flowcharts flow from top to bottom and left and right.

TABLE 3.1

SYMBOL	NAME	DESCRIPTION
	Flow Line	An arrow coming from one symbol and ending at another symbol represents that control passes to the symbol the arrow points to. The line for the arrow can be solid or dashed.
	Terminal	Represented as circles, ovals, stadiums or rounded (fillet) rectangles.

		They usually contain the word "Start" or "End".
	Process	Represented as rectangles. This shape is used to show that something is performed.
	Decision	Represented as a diamond (rhombus) showing where a decision is necessary, commonly a Yes/No question or True/False test.

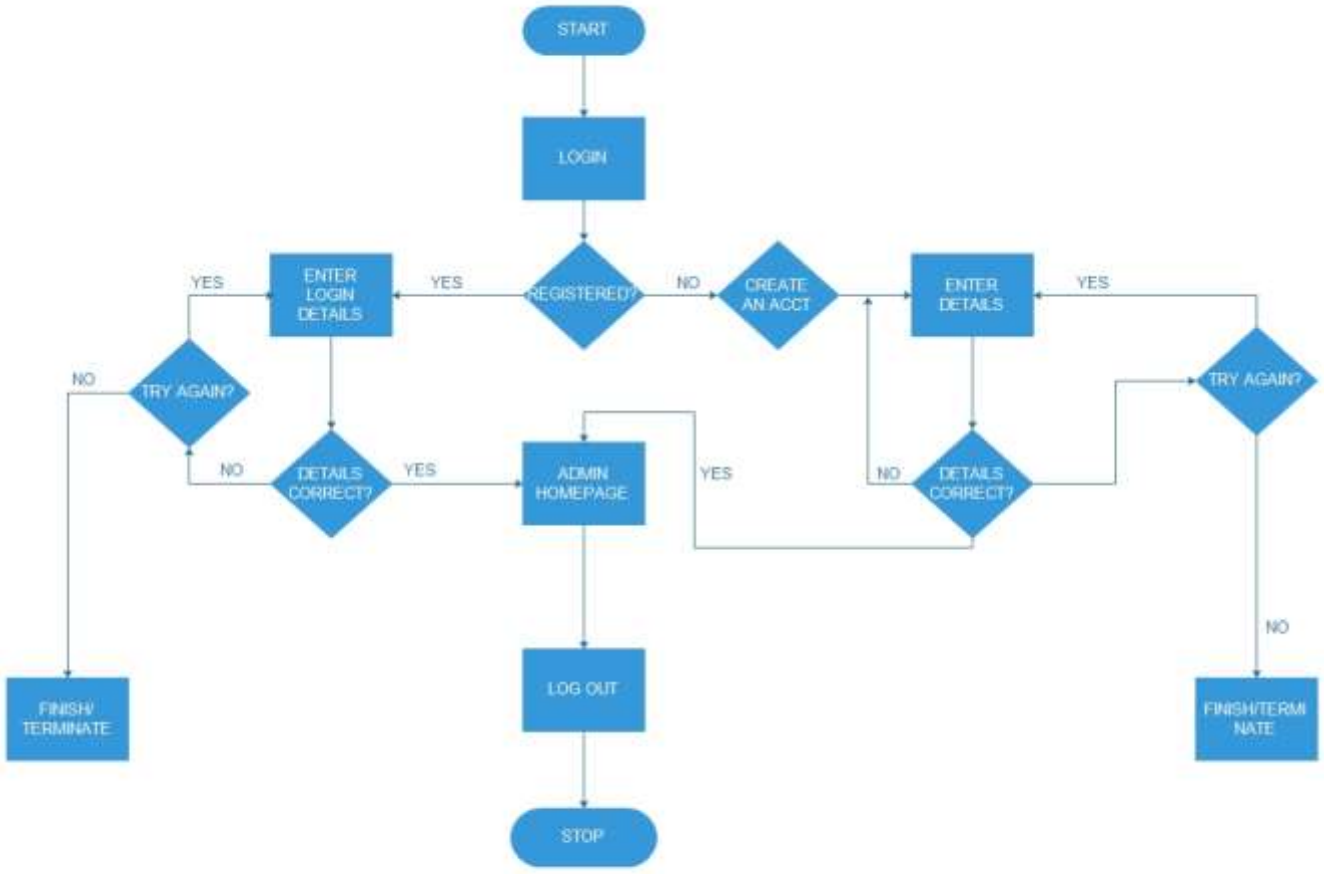


FIGURE 3.1 (ADMIN FLOW CHART)

Figure 3.1 shows the admin login flow chart. The admin log into the system with his/her user name and password. he/she enters his username and password and if the details are corrects the admin login to the admin panel to perform administrative duties but if the details are wrong it pops out an error message to tell the user to re-enter valid details or terminate the system.

3.3.2 Modelling Techniques

There are various types of modelling techniques used in system development, the techniques are used to show effective communications among the users of the system. The component of the system includes the environment and the boundaries.

The techniques to be used include: -

1. Use Case Model
2. ER Diagram
3. Data flow diagram

3.3.3 Use Case Model

The Use Case Model describes the proposed functionality of the new system. A Use Case represents a discrete unit of interaction between a user (human or machine) and the system. A Use Case is a single unit of meaningful work; for example, login to system, register with system and create order are all Use Cases. Each Use Case has a description which describes the functionality that will be built in the proposed system. A Use Case may 'include' another Use Case's functionality or 'extend' another Use Case with its own behaviour.

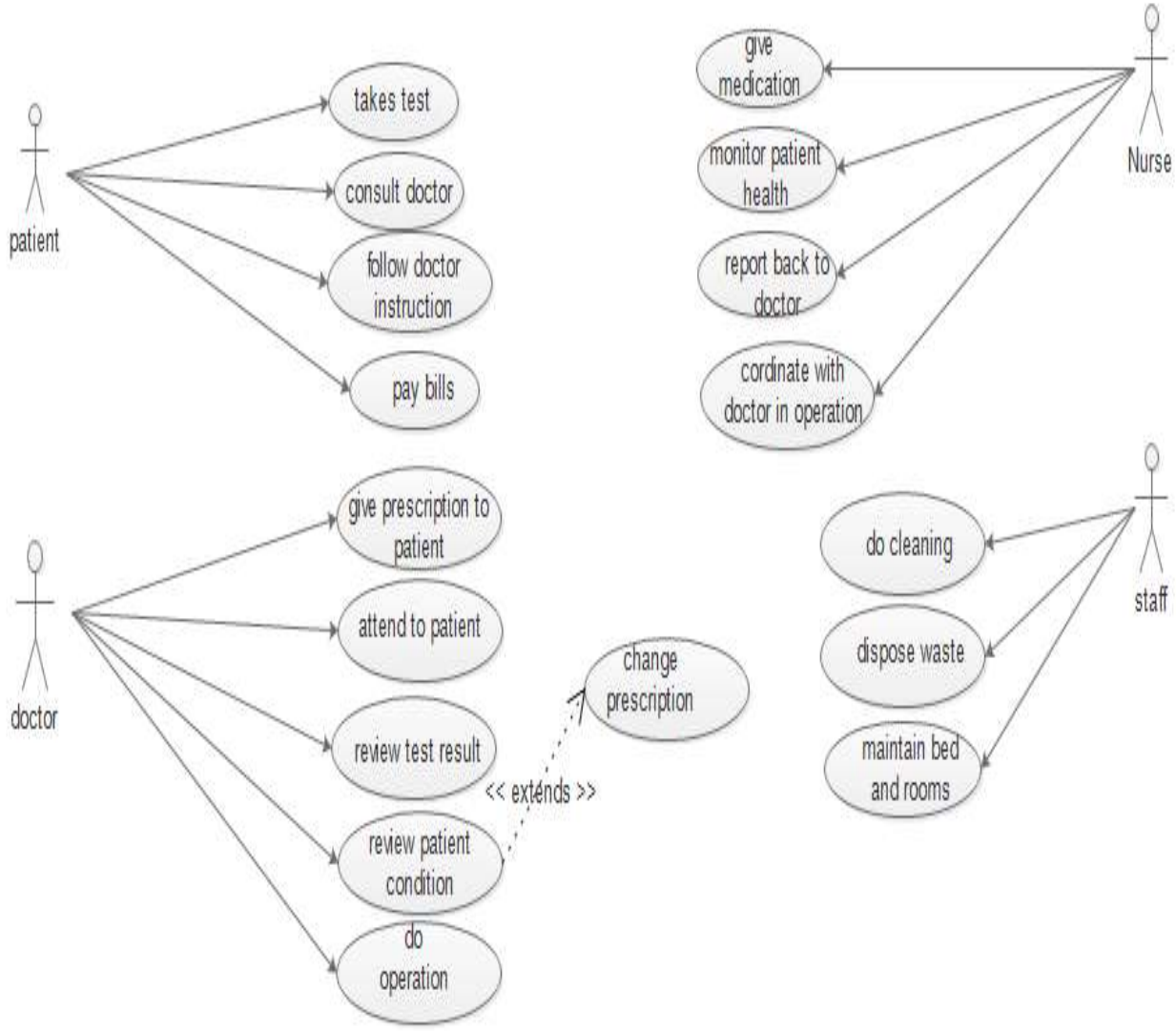
3.3.3.1 Elements of a Use Case Model

❖ **Actor:** The actor is often represented with a stick figure. It analyses the entity that will exchange information with the new system or the entity that will use the system.

❖ **Use Case:** it is basically used to show all the process or sub-process involved in the design of the new system. Usually represented with an oval.

❖ **Directional arrow:** The directional arrows shows the relationship between an entity and a process.

The below figure shows the system use case


patient
takes test
consult doctor
follow doctor instruction
pay bills
Nurse
give medication
monitor patient health
report back to doctor
cordinate with doctor in operation
doctor
give prescription to patient
attend to patient
review test result
review patient condition
do operation
<< extends >>
change prescription
staff
do cleaning
dispose waste
maintain bed and rooms

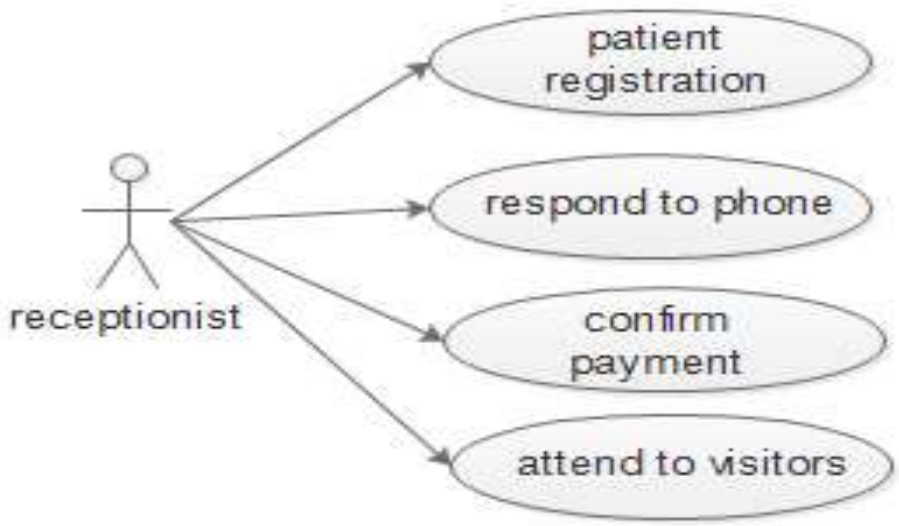


FIGURE 3.2 (USE CASE)

Figure 3.2 shows both the admin and user use case.

3.3.4 Process Modelling

The process model is a core diagram in structured analysis and design. Also called a data flow diagram (DFD), it shows the flow of information through a system. Each process transforms inputs into outputs. Flow lines represent data flowing between nodes including processes, external entities and data stores.

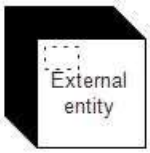
3.3.4.1 Data Flow Diagram (DFD)

A dataflow diagram (DFD) is the traditional visual representation of the information within a system. It shows how information enters and leave the system, what changes the information and where the information is stored. The purpose is to show the scope and system boundaries. It may be used as a communications tool between a systems analyst and any person who plays a part in the system that acts as the starting point for redesigning a system

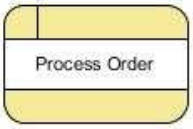
Diagram Notations

There are varieties of arrows that can be used but below are the most common used notations for designing a data flow diagram

1. **External entity: -** An external entity can represent a human, system or subsystem. It is where certain data comes from or goes to. It is external to the proposed system, in terms of the business process.



2. **Process: -** A process is a business activity or function where the manipulation and transformation of data takes place. A process can be decomposed to finer level of details, for representing how data is being processed within the process.



3. **Data Stores: -** A data store represents the storage of persistent data required and/or produced by the process.

4. **Data Flow: -** A data flow represents the flow of information, with its direction represented by an arrow head that shows at the end(s) of flow connector. Various types can be used ranging from Bent, flexible, line arrow, recycling and curved arrow etc. 

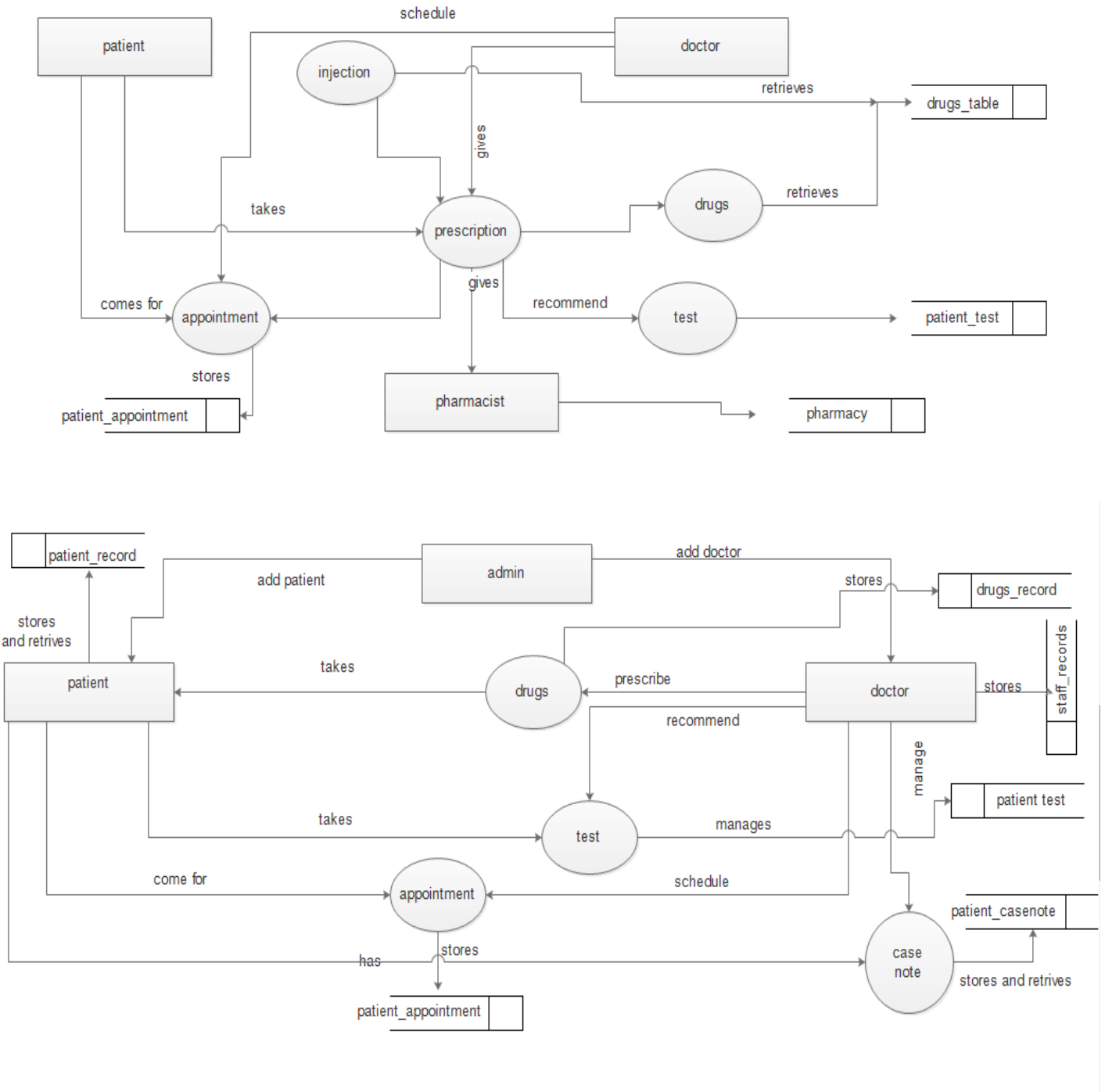


FIGURE 3.3 DATA FLOW DIAGRAM (DFD)

Figure 3.3 shows the DFD of the system. The customer/user and admin login into the system and the system verifies the details and role from the user table. If the details are correct the system logs in based on the user role and goes directly to its dashboard

3.3.4.2 CONTEXT DIAGRAM

A context diagram is a DFD that provides a general overview of a proposed system. In context diagram there is only one process and this represent the entire system.

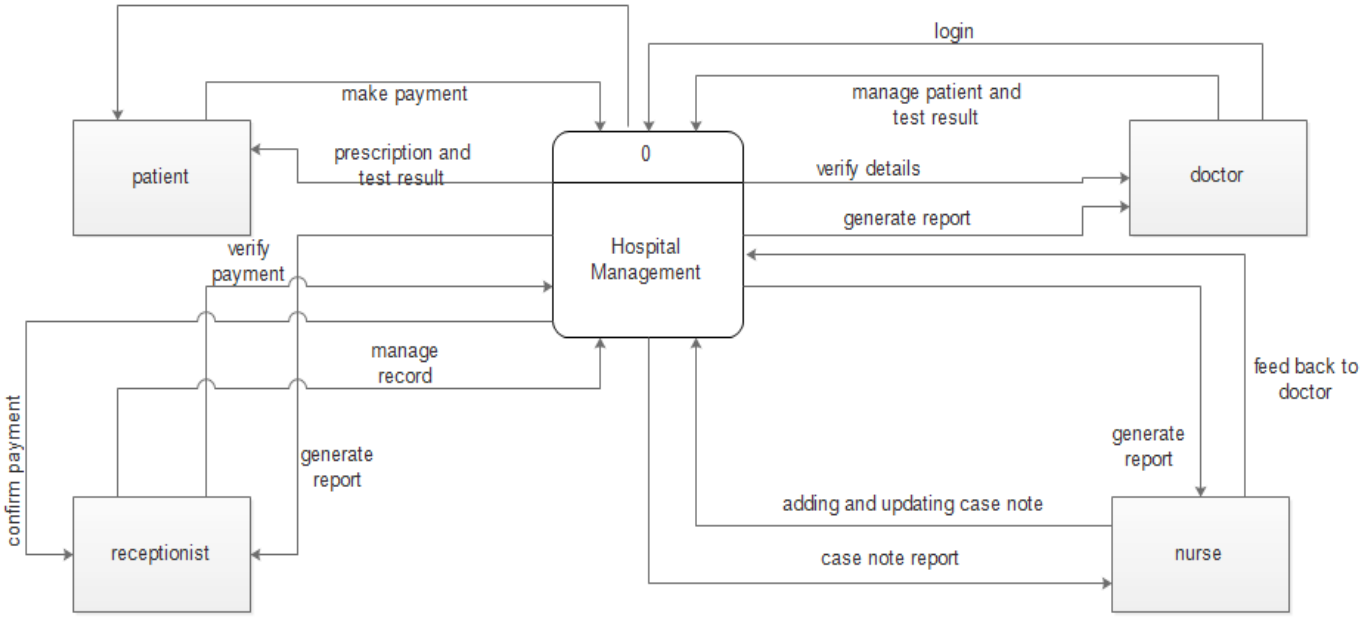


FIGURE 3.4 CONTEXT DIAGRAM

The staff login into the system with his/her registered email and the system checks the privilege given to the staff but if the details are not correct it returns him/her back to the login page to re-enter his/her login details.

If the staff is a working in ICT Department then the staff can do following operations

- ❖ Add, Edit, Update and Delete Staff Records
- ❖ Manage Staff Records
- ❖ Manage Staff Transfer
- ❖ Add, Edit, Update and Delete Hospital ward
- ❖ Add, Edit, Update and Delete Hospital Unit
- ❖ Add, Edit, Update and Delete drugs to Pharmacy
- ❖ Add, Edit, Update and Delete drugs categories and types to the pharmacy
- ❖ Add, Edit, Update and Delete Hospital equipment and facilities
- ❖ Add, Edit, Update and Delete Hospital test
- ❖ Manage Medical Reports, certificate and other Reports
- ❖ Disconnects and Reconnect staff account
- ❖ Add, Edit, Update and Delete Hospital Memo
- ❖ Generate Report etc.

If the staff is a doctor then the staff can do following operations

- Monitor the condition of the patient
- Prescribe drugs for patients
- Recommend test for patients
- View Test Results
- Schedule patient appointment
- Generate Report
- Manage patient case note
- See his/her activity log
- View, Edit and Update his/her details
- Transfer and Discharge Patient etc.

If the staff is a Nurse then the staff can do following operations

- Monitor the condition of the patient
- Manage Patient Case note
- Give feedback to doctor on patient condition
- Administer drugs to patient
- See his/her activity log
- View, Edit and Update his/her details
- View Patient Case Note etc.

If the staff is a Receptionist then the staff can do following operations

- Add, Edit, Update and Delete Patient Details
- Confirm and verify patient payments
- Attend to Visitors
- Give feedback to ICT Department on the payment made
- Check patient appointment List and send a reminder to doctors
- See his/her activity log
- View, Edit and Update his/her details
- View Patient Case Note

If the staff is a Laboratory, Blood bank or Radiology then the staff can do following operations

- Receive patient test prescription
- Update the patient case note
- Give feedback to the doctor on the payment test result

- See his/her activity log
- View, Edit and Update his/her details
- View Patient Case Note

If the staff is a Pharmacist then the staff can do following operations

- Add drugs to pharmacy
- Manage drugs in the pharmacy
- Attend to patient doctor's prescription
- Manage patient prescription
- Generate drugs reports
- See his/her activity log
- View, Edit and Update his/her details
- View Patient Case Note

3.4Conceptual Data Modelling

3.4.1 Database Design of the System

A database is a collection of information that is organized so that it can easily be accessed, managed, and updated and databases can be classified according to types of content and the kind of information they are holding. The main goal of DBMS is:

- Minimise redundancy
- Easy and fast access to record
- Easy and efficient way of upgrading record
- To manage records of information in a desired manner.

The following figure represent the design of the database.

FIGURE 3.5 (DATABASE TABLE)

3.4.2 Entity Relationship Diagram (ERD)

This shows the relationships of entity sets stored in a database. An entity in this context is a component of data. In other words, Entity related diagram illustrate the logical structure of databases. The figure below shows the entity related diagram (ERD) of the proposed system.

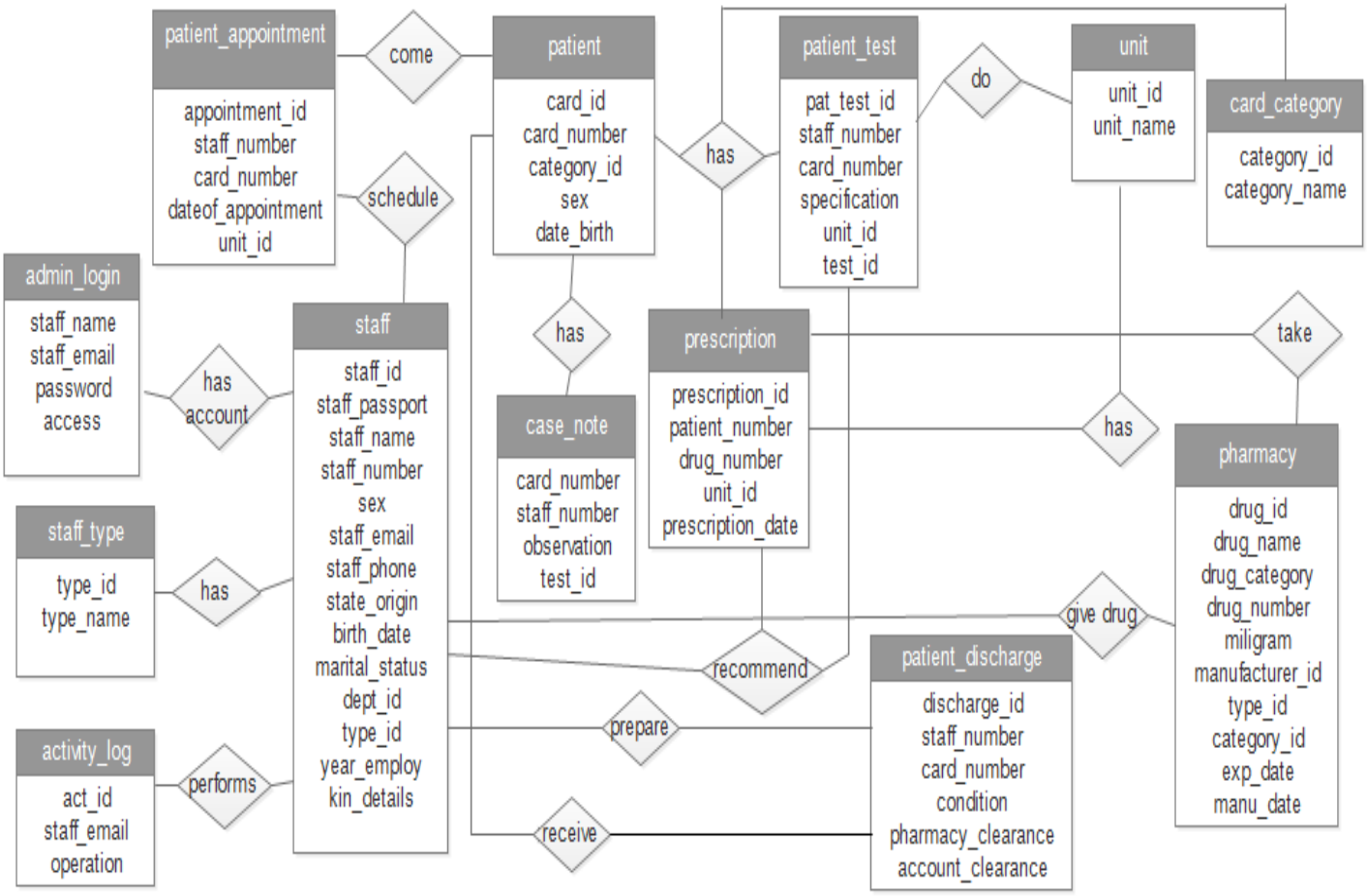


FIGURE 3.6 E-R DIAGRAM

Figure 3.6 above shows how the records are related to each other. The primary keys, foreign keys and shows the relationship between the database tables.

3.4.3 Database Tables

The table 3.2 shows the structure for card category table

Column	Type	**Description**
card_category_id	int (255)	Primary key to distinguish card category
card_category_name	varchar(30)	Category Name

numbers_of_users	int(255)	Numbers of card User
card_price	int(30)	Price of the card
time_added	timestamp	Shows date and time the category was added

TABLE 3.2

The table 3.3 shows the structure for hospital card table

Column	Type	Description
card_id	int (255)	Primary key to distinguish card
card_number	varchar (255)	used to identify the patient card
patient_name	varchar (255)	shows the patient name
sex	varchar (6)	shows the patient sex
date_birth	varchar (255)	shows the patient date of birth
address	text	shows the patient residential address
card_category_id	int (255)	Foreign key to reference the card category

TABLE 3.3

The table 3.4 shows the structure for hospital unit table

Column	Type	Description
unit_id	int (255)	Primary key to distinguish hospital unit
unit_name	varchar (30)	Shows the hospital name
time_added	timestamp	Shows date and time the unit was added

TABLE 3.4

The table 3.5 shows the structure for hospital ward table

Column	Type	Description
ward_id	int (255)	Primary key to distinguish hospital ward
ward_name	varchar (30)	Shows the ward name
bed_space	int (255)	Shows the numbers of the bed in the ward
unit_id	int (255)	Foreign key referencing the hospital units
time_added	timestamp	Shows date and time the ward was added

TABLE 3.5

The table 3.6 shows the structure for patient case note table

Column	Type	Description
case_note_id	int (255)	Primary key to distinguish case note
card_number	varchar (30)	Shows the patient hospital number
staff_number	int (255)	Foreign key referencing the hospital staff

content	int (255)	Foreign key referencing the hospital units
test_id	int (255)	Foreign key referencing the type of test
time_added	timestamp	Shows date and time the case was added

TABLE 3.6

The table 3.7 shows the structure for hospital drug table

Column	Type	Description
drug_id	int (255)	Primary key to distinguish test
drug_name	varchar (255)	Shows the drug name
nos_of_carton	int (255)	Shows the numbers of carton
nos_of_sachet	int (255)	Shows the nos of sachet in a carton
pack_price	int (255)	Shows date and time the test was added
sachet_price	int (255)	Shows the price per sachet
Drug_number	varchar (255)	Shows the drug number
manufacturer	varchar (255)	Shows the drug manufacturer
miligram	varchar (255)	Shows the drug milligram
type_id	int (255)	Foreign key referencing the drug type
category_id	int (255)	Foreign key referencing the drug category
manu_date	varchar (255)	Shows the manufacturing date
exp_date	varchar (255)	Shows the expiry date

TABLE 3.7

The table 3.8 shows the structure for drug category table

Column	Type	Description
drug_category_id	int (255)	Primary key to distinguish drug categories
drug_category_name	varchar (255)	Shows the drug category name
time_added	timestamp	Shows date and time the drug category was added

TABLE 3.8

The table 3.9 shows the structure for drug types table

Column	Type	Description
type_id	int (255)	Primary key to distinguish drug types
type_name	varchar (255)	Shows the drug category type name
time_added	timestamp	Shows date and time the drug type was added

TABLE 3.9

The table 4.0 shows the structure for drug stock table

Column	Type	Description
Stock_id	int (255)	Primary key to distinguish drug stock
drug_name	varchar (255)	Shows the drug category name
miligram	timestamp	Shows drug milligram
drug_cate_id	int (255)	Foreign key referencing the drug category
type_id	int (255)	Foreign key referencing the drug type
quantity	int (255)	Shows the numbers of quantity
carton	int (255)	Shows numbers of carton
total_sachet	int (255)	Shows the number of sachet

TABLE 4.0

The table 4.1 shows the structure for hospital test table

Column	Type	Description
test_id	int (255)	Primary key to distinguish test
test_name	varchar (255)	Shows the test name
unit_id	int (225)	Foreign key referencing the hospital unit
test_amount	varchar (255)	Shows the test amount

TABLE 4.1

The table 4.2 shows the structure for patient appointment table

Column	Type	Description
appointment_id	int (255)	Primary key to distinguish the appointment
staff_number	varchar (255)	Foreign key referencing the staff
card_number	varchar (255)	Foreign key referencing the card number
Dateof_appointment	varchar (255)	Shows the date of appointment
Unit_id	int (255)	Foreign key referencing the hospital unit

TABLE 4.2

The table 4.3 shows the structure for patient discharge table

Column	Type	Description
discharge_id	int (255)	Primary key to distinguish discharge
staff_number	varchar (255)	Foreign key referencing the staff
card_number	varchar (255)	Foreign key referencing the card number
discharge_condition	varchar (255)	Shows the discharge condition
pharmacy_clearance	int (255)	Shows the pharmacy department clearance
account_clearance	varchar (255)	Shows the account department clearance

time_discharged	timestamp	Shows the time discharged

TABLE 4.3

The table 4.4 shows the structure for patient discharge table

Column	Type	Description
payment_id	int (255)	Primary key to distinguish discharge
staff_number	varchar (255)	Foreign key referencing the staff
card_number	varchar (255)	Foreign key referencing the card number
payment_type	varchar (255)	Shows the payment type
amount	int (255)	Shows the amount paid
time_paid	timestamp	Shows the time paid

TABLE 4.4

The table 4.5 shows the structure for patient discharge table

Column	Type	Description
transfer_id	int (255)	Primary key to distinguish discharge
staff_number	varchar (255)	Foreign key referencing the staff
card_number	varchar (255)	Foreign key referencing the card number
previous_ward	varchar (255)	Shows the previous ward
previous_unit	varchar (255)	Shows the previous unit
previous_bed	varchar (255)	Shows the previous bed occupied
new_ward	varchar (255)	Shows the new ward
new_unit	varchar (255)	Shows the new unit
new_bed	varchar (255)	Shows the new bed
time_transferred	timestamp	Shows the time of trasnfer

TABLE 4.5

The table 4.6 shows the structure for the staff table

Column	Type	Description
staff_id	int (255)	Primary key to distinguish staff
passport	text	Shows the staff passport
staff_number	varchar (255)	Shows the staff number
staff_name	varchar (255)	Shows the staff name
sex	varchar (255)	Shows the staff sex
marital_status	varchar (255)	Shows the marital status

date_birth	varchar (255)	Shows the date of birth
staff_email	varchar (255)	Shows the staff email
address	text	Shows the staff address
type_id	varchar (255)	Foreign key referencing the staff type
dept_id	Int (255)	Foreign key referencing the staff department
year_employ	varchar (255)	Shows the staff year of employment
state_origin	varchar (255)	Shows the staff state of origin
qualification	text	Shows the staff qualification
kin_details	text	Shows the staff next of kin details
time_added	timestamp	Shows the time added

TABLE 4.6

The table 4.7 shows the structure for staff transfer table

Column	Type	Description
staff_transfer_id	int (255)	Primary key to distinguish the staff transfer
staff_number	varchar (255)	Foreign key referencing the staff
prev_unit	varchar (255)	Foreign key referencing the hospital unit
new_unit	varchar (255)	Foreign key referencing the hospital unit
transfer_time	timestamp	Shows the transfer time

TABLE 4.8

The table 4.9 shows the structure for staff type table

Column	Type	Description
type_id	int (255)	Primary key to distinguish the staff type
type_name	varchar (255)	Shows the staff type

TABLE 4.9

The table 5.0 shows the structure for staff login table

Column	Type	Description
user_id	int (255)	Primary key to distinguish the staff login
staff_name	varchar (255)	Foreign key referencing the staff name
staff_email	varchar (255)	Foreign key referencing the staff email
password	varchar (255)	Foreign key referencing the hospital unit
type_id	timestamp	Foreign key referencing the staff type

TABLE 5.0

The table 5.1 shows the structure for staff activities table

Column	Type	Description
act_id	int (255)	Primary key to distinguish the staff activities
action	varchar (255)	Shows the action performed
staff_email	varchar (255)	Foreign key referencing the staff email