DESIGN AND IMPLEMENTATION OF PATIENT MANAGEMENT SYSTEM

BY

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APPROVAL

This project title was approved for Udofia Israel Udoh, and the research duly supervised

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CERTIFICATION

This is to certify that the project research design and implementation of patient management system was carried out by **UDOFIA ISRAEL UDOH** with registration number **CST/2009/347**

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(Student)

DEDICATION

I dedicate this project work to God Almighty for his protection, guidance, provision and sufficient grace. I also dedicate this to all those who contributed to my little success in life, especially my beloved parents, Mr. and Mrs. Sunday Udofia. And my Siblings.

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ABSTRACT

This study investigated online hospital management system as a tool to revolutionize medical profession. With many writers decrying how patients queue up for hours in order to receive medical treatment, and some end-up being attended to as ‘spillover’, the analyst investigated the manual system in detail with a view to finding out the need to automate the system. Subsequently, a computer-aided program was designed to bring about improvement in the care of individual patients, taking the advantage of computer speed, storage and retrieved facilities. The software designed will take care of patient’s registration, billing, treatment and payments.

The programming language employed in this work was Microsoft C#.

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CHAPTER ONE

INTRODUCTION

1.1 Background of the Study

The goal of any system development is to develop and implement the system cost effectively; user-friendly and most suited to the user's analysis is the heart of the process. Analysis is the study of the various operations performed by the system and their relationship within and outside of the system. During analysis, data collected on the files, decision points and transactions handled by the present system. Krishna medical center, luck now (K. M. C.) is a prestigious hospital situated in the heart of Hazrat Genj with a very large patient capacity. This number is increasing at a rapid pace with each passing day. The management of the hospital is concerned with the increasing effort in keeping records of the patient and recording their activities. Health is generally said to be wealth. It takes healthy people to generate the wealth the nation requires for the general well-being of its people. There is therefore the need for adequate Medicare especially in the area of diagnosis and treatment of diseases. Since there is a good relationship between the job output and health of the workers, a good Medicare is vital.

Unfortunately, in most developing nation (including Nigeria), this adequate Medicare is lacking due to how standard of technological know-how and manual handling of most medical problems. As observed by Lyiama H.C. and D.C. Chukwu, "very often, people in developing countries who are critically ill are rushed abroad for special treatment because it is felt that Medicare facilities at home are inadequate. This is partly because computer – aided Medicare has become a reality in many developed countries". It is also a known fact that the production of qualified medical doctors and other medical personnel and consultants in on the increase, but his is not enough to meet the health needs of the increasing population. The ratio of patients to a doctor is still high.

This situation creates problems, because proper and adequate medical attention of patients is far-fetched. Nowadays, the low-income class is mostly affected. Doctors hurry over their duties in order to attend to all the patients. At the end of the day, they are tired and over worked.

Considering the rate of population growth the medical care and facilities available, and the health needs of the people, computer-aided Medicare is in evitable for more accurate. Furthermore with the present shift to an information society, it is necessary to anticipate the future use of a sophisticated electronic machine the computer. This is necessary because the computer is rapidly finding its way into every field of human endeavor, including medicine. Its application includes patient care and protection, clinical administration, intensive monitoring during emergencies, surgical operations, diagnosis and automation of medical records. For instance, during a complex surgical operation as exemplified by Lyiama and Chukwu, "the computer monitors person being operated on, revealing all vital signs (pulse, blood pressure, breathing rate, etc) of interest to the doctors in the theatre, thus helping them to be more accurate and effective in what they are doing. Such a patient monitoring system can be with a video Display Unit (VDU), a keyboard for interactive inputs and an alarm". The wide range of the use of computer is due to its versatility as a data processing machine and its ability to do things including complicated tasks faster, better and more accurately than human beings would.

1.2 STATEMENT OF THE PROBLEM

It has been observed that to receive medical treatment in most of our hospitals, the patients queue up for several hours from one unit of the hospital to another starting from obtaining a new hospital folder, or retrieving an old one before consulting a doctor, to the laboratory unit for lab test then to the pharmacy to get the prescribed drugs and so on. With the manual processes involved in handling the patient most of them waste the whole day in the hospital. Very often, patients leave their homes very early in the morning in order to be among the first group to see the doctor. Otherwise, they may end up wasting the whole day without due attention.

This situation is discouraging to most patients and sometimes forces them to turn to non-professionals or even resort to self-medication for quick recovery.

Moreover, the volume of work for the hospital personnel is much. Patients outnumber the doctors, nurses and other medical personnel that too much are required from them. In this regard, to examine all his patients for the day the doctor hurries over his work without adequate attention and expertise to his clients. Still, at the end of the day he is exhausted.

In addition to this, the diagnosis and prescription depend on the doctor's memory and drug of choice. Their brains are often loaded with different diseases, signs and symptoms, complications and various drugs for their treatment and so on. Some of which are very similar. To remember and process these huge information in his clinical work is very tasking. For this reason accurate diagnosis and prescription may not always be obtained.

The keeping and retrieval of accurate records on patients are poorly carried out in most of our hospitals. Files may be misplaced; the record in them may be wrongly filled. Hence, it is not easy to obtain accurate and timely information or data.

This is also the case with obtaining other medical information and data especially when new folders and numbers are obtained each year.

Finally, the keeping of folder for each patient manually takes a lot of time and money and some of the information are redundant. All these have net effect of loss of lives and inefficiency on the part of management.

1.3 OBJECTIVES OF THE STUDY

This study is centered on the following objectives.

1. To examine the current procedures employed in our hospitals with regards to patients admission, diagnosis and treatment.

2. To examine the associated problem(s) or flaws in the current system

3. To improve on the already existing system by designing an efficient practical patient billing software, this is aimed at an accurate, faster and reliable patient's information system.

1.4 SCOPE OF THE STUDY

This research work is limited to patient's admission information system including treatments, bills and payments. The software developed will be carried out using Microsoft C# to manage the database.

1.5 LIMITATIONS

This project covers all aspect of Medical system with regards to patient's information. Due to time and financial constraint, the software developed excluded laboratory units.

1.6 SIGNIFICANCE OF THE STUDY

Several possible advantages to practical patient billing software System over paper records have been proposed which includes:

Reduction of cost

A vast amount of funds are allocated towards the health care industry. The computerized system is implemented, it will reduce the personnel cost.

Improve quality of care

The implementation of electronic health records (EHR) can help lessen patient sufferance due to medical errors and the inability of analysts to assess quality.

Promote evidence-based medicine

Computerized medical record provides access to unprecedented amounts of clinical data for research that can accelerate the level of knowledge of effective medical practices.

Realistically, these benefits may only be realized if the systems are interoperable and wide spread (for example, national or regional level) so that various systems can easily share information.

Record keeping and mobility

EHR systems have the advantages of being able to connect to many electronic medical record systems. In the current global medical environment, patients are shopping for their procedures.

1.7 DEFINITION OF TERMS

Electronic Health Record– An electronic health record (EHR) (also electronic patient record (EPR) or computerized patient record) is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations

INFORMATION – Information is data, or raw facts, shaped into useful form for human use.

SYSTEM – A *system* is a combination or arrangement of parts to form an integrated whole, working together to achieve specific tasks. A system includes an orderly arrangement according to some common principles or rules.

Subsystem – A complex system is difficult to comprehend when considered as a whole. Therefore, the system is decomposed or factored into subsystems. Subsystems constitute the entire system. They are complete systems on their own but exit in another system called the complex system. Subsystems can be further decomposed into smaller subsystems until the smallest subsystems are of manageable size. The subsystems resulting from this process generally form hierarchical structures. In the hierarchy, a subsystem is one of a supra-system (the system above it).

Expert system: is software that uses a knowledge base of human expertise for problem solving, or clarify uncertainties where normally one or more human experts would need to be consulted.

Hospital information system (**HIS**): variously also called clinical information system (**CIS**) is a comprehensive, integrated information system designed to manage the administrative, financial and clinical aspects of a hospital. This encompasses paper-based information processing as well as data processing machines.

MIS- Management Information System is the system that stores and retrieves information and data, process them, and present them to the management as information to be used in making decision. It can also be defined as an integrated machine system that provides information to support the planning and control functions of managers in all organizations. By these definitions, MIS must serve the basic functions of management, which include planning, organizing, staffing, directing and controlling. Information systems that only support operations and do not have managerial decision making significance is not part of MIS.

MCS- Management Control system is a form of Information System used by the management of an organization to analyze each application of information system in terms of input, storage, processing and output. The MCS has functional subsystems such as the hardware system, the operating system, the communication system and the database system. Management control systems are human artifacts. This means that MCS exits only because human beings design and build them.

CHAPTER TWO

LITERATURE REVIEW

2.1 ELECTRONIC HEALTH RECORD

According to Terry (2005), electronic health record (HER) is an evolving concept defined as a systematic collection of electronic health information about individual patients or populations. It is a record in digital format that is capable of being shared across different health care settings, by being embedded in network-connected enterprise-wide information systems. Such records may include a whole range of data in comprehensive or summary form, including demographics, medical history, medication and allergies, immunization status, laboratory test results, radiology images, vital signs, personal stats like age and weight, and billing information. Its purpose can be understood as a complete record of patient encounters that allows the automation and streamlining of the workflow in health care settings and increases safety through evidence-based decision support, quality management, and outcomes reporting, Swinglehurst D (2009).The terms EHR, EPR and EMR (electronic medical record) are often used interchangeably, although a difference between them can be defined. The EMR can be defined as the legal patient record created in hospitals and ambulatory environments that is the data source for the HER, Habib, (2010). It is important to note that an EHR is generated and maintained within an institution, such as a hospital, integrated delivery network, clinic, or physician office, to give patients, physicians and other health care providers, employers, and payers or insurers access to a patient's medical records across facilities.

A personal health record is, in modern parlance, generally defined as an EHR that the individual patient controls. Within a meta-narrative systematic review of research in the field, Prof. Trish Greenhalgh and colleagues defined a number of different philosophical approaches to the HER, Berg (1997). The health information systems literature has seen the EHR as a container holding information about the patient, and a tool for aggregating clinical data for secondary uses (billing, audit *etc.*). However, other research traditions seen the EHR as a contextualized artefact within a socio-technical system. For example, actor-network theory would see the EHR as an actant in a, while research in computer supported cooperative work (CSCW) sees the EHR as a tool supporting particular work. Prof. Barry Robson and OK Baek also reviewed these aspects and see the EHR as pivotal in human history, Baek, OK. (2009). In the United States, Great Britain, and Germany, the concept of a national centralized server model of healthcare data has been poorly received. Issues of privacy and security in such a model have been of concern. Privacy concerns in healthcare apply to both paper and electronic records. According to the *Los Angeles Times*, roughly 150 people (from doctors and nurses to technicians and billing clerks) have access to at least part of a patient's records during a hospitalization, and 600,000 payers, providers and other entities that handle providers' billing data have some access also Health & Medicine (2006-06-26). Recent revelations of "secure" data breaches at centralized data repositories, in banking and other financial institutions, in the retail industry, and from government databases, have caused concern about storing electronic medical records in a central location, CNN.com (May 23, 2006). Records that are exchanged over the Internet are subject to the same security concerns as any other type of data transaction over the Internet. The Health Insurance Portability and Accountability Act (HIPAA) was passed in the US in 1996 to establish rules for access, authentications, storage and auditing, and transmittal of electronic medical records. This standard made restrictions for electronic records more stringent than those for paper records. However, there are concerns as to the adequacy of these standards, Wafa (2010).

In the European Union (EU), several Directives of the European Parliament and of the Council protect the processing and free movement of personal data, including for purposes of health care, European Parliament and Council (24 October 1995).

Personal Information Protection and Electronic Documents Act (PIPEDA) was given Royal Assent in Canada on April 13, 2000 to establish rules on the use, disclosure and collection of personal information. The personal information includes both non-digital and electronic form. In 2002, PIPEDA extended to the health sector in Stage 2 of the law's implementation. There are four provinces where this law does not apply because its privacy law was considered similar to PIPEDA: Alberta, British Columbia, Ontario and Quebec. One major issue that has risen on the privacy of the U.S. network for electronic health records is the strategy to secure the privacy of patients. Former US president Bush called for the creation of networks, but federal investigators report that there is no clear strategy to protect the privacy of patients as the promotions of the electronic medical records expands throughout the United States. In 2007, the Government Accountability Office reports that there is a “jumble of studies and vague policy statements but no overall strategy to ensure that privacy protections would be built into computer networks linking insurers, doctors, hospitals and other health care providers.”Robert, (2007)

The privacy threat posed by the interoperability of a national network is a key concern. One of the most vocal critics of EMRs, New York University Professor Jacob M. Appel, has claimed that the number of people who will need to have access to such a truly interoperable national system, which he estimates to be 12 million, will inevitably lead to breaches of privacy on a massive scale. Appel has written that while "hospitals keep careful tabs on who accesses the charts of VIP patients," they are powerless to act against "a meddlesome pharmacist in Alaska" who "looks up the urine toxicology on his daughter's fiancé in Florida, to check if the fellow has a cocaine habit."Appel (2008). This is a significant barrier for the adoption of an EHR. Accountability among all the parties that are involved in the processing of electronic transactions including the patient, physician office staff, and insurance companies, is the key to successful advancement of the EHR in the U.S. Supporters of EHRs have argued that there needs to be a fundamental shift in "attitudes, awareness, habits, and capabilities in the areas of privacy and security" of individual's health records if adoption of an EHR is to occur, Nulan C (2001).

According to the *Wall Street Journal*, the DHHS takes no action on complaints under HIPAA, and medical records are disclosed under court orders in legal actions such as claims arising from automobile accidents. HIPAA has special restrictions on psychotherapy records, but psychotherapy records can also be disclosed without the client's knowledge or permission, according to the *Journal*. For example, Patricia Galvin, a lawyer in San Francisco, saw a psychologist at Stanford Hospital & Clinics after her fiancé committed suicide. Her therapist had assured her that her records would be confidential. But after she applied for disability benefits, Stanford gave the insurer her therapy notes, and the insurer denied her benefits based on what Galvin claims was a misinterpretation of the notes. Stanford had merged her notes with her general medical record, and the general medical record wasn't covered by HIPAA restrictions. Within the private sector, many companies are moving forward in the development, establishment and implementation of medical record banks and health information exchange. By law, companies are required to follow all HIPAA standards and adopt the same information-handling practices that have been in effect for the federal government for years. This includes two ideas, standardized formatting of data electronically exchanged and federalization of security and privacy practices among the private sector, Nulan C (2001). Private companies have promised to have “stringent privacy policies and procedures.” If protection and security are not part of the systems developed, people will not trust the technology nor will they participate in it, Robert (2007). So, the private sectors know the importance of privacy and the security of the systems and continue to advance well ahead of the federal government with electronic health records.

Legal liability in all aspects of healthcare was an increasing problem in the 1990s and 2000s. The surge in the per capita number of attorney sand changes in the tort system caused an increase in the cost of every aspect of healthcare, and healthcare technology was no exception.

Failure or damages caused during installation or utilization of an EHR system has been feared as a threat in lawsuits. Similarly, it's important to recognize that the implementation of electronic health records carries with it significant legal risks.

This liability concern was of special concern for small EHR system makers. Some smaller companies may be forced to abandon markets based on the regional liability climate.[40] Larger EHR providers (or government-sponsored providers of EHRs) are better able to withstand legal assaults.

In some communities, hospitals attempt to standardize EHR systems by providing discounted versions of the hospital's software to local healthcare providers. A challenge to this practice has been raised as being a violation of Stark rules that prohibit hospitals from preferentially assisting community healthcare providers, Dunlop (2007). In 2006, however, exceptions to the Stark rule were enacted to allow hospitals to furnish software and training to community providers, mostly removing this legal obstacle. An important consideration in the process of developing electronic health records is to plan for the long-term preservation and storage of these records. The field will need to come to consensus on the length of time to store EHRs, methods to ensure the future accessibility and compatibility of archived data with yet-to-be developed retrieval systems, and how to ensure the physical and virtual security of the archives·

Additionally, considerations about long-term storage of electronic health records are complicated by the possibility that the records might one day be used longitudinally and integrated across sites of care. Records have the potential to be created, used, edited, and viewed by multiple independent entities. These entities include, but are not limited to, primary care physicians, hospitals, insurance companies, and patients. Mandl et al. have noted that "choices about the structure and ownership of these records will have profound impact on the accessibility and privacy of patient information." Kohane, (2001).

The required length of storage of an individual electronic health record will depend on national and state regulations, which are subject to change over time. Ruotsalainen and Manning have found that the typical preservation time of patient data varies between 20 and 100 years. In one example of how an EHR archive might function, their research "describes a co-operative trusted notary archive (TNA) which receives health data from different EHR-systems, stores data together with associated meta-information for long periods and distributes EHR-data objects. TNA can store objects in XML-format and prove the integrity of stored data with the help of event records, timestamps and archive e-signatures.", Manning B (2007).

In addition to the TNA archive described by Ruotsalainen and Manning, other combinations of EHR systems and archive systems are possible. Again, overall requirements for the design and security of the system and its archive will vary and must function under ethical and legal principles specific to the time and place.

While it is currently unknown precisely how long EHRs will be preserved, it is certain that length of time will exceed the average shelf-life of paper records. The evolution of technology is such that the programs and systems used to input information will likely not be available to a user who desires to examine archived data. One proposed solution to the challenge of long-term accessibility and usability of data by future systems is to standardize information fields in a time-invariant way, such as with XML language. Olhede and Peterson report that “the basic XML-format has undergone preliminary testing in Europe by a Spri project and been found suitable for EU purposes. Spri has advised the Swedish National Board of Health and Welfare and the Swedish National Archive to issue directives concerning the use of XML as the archive-format for EHCR (Electronic Health Care Record) information.", Peterson HE (2000).

2.2 ELECTRONIC MEDICAL RECORD CONTRAST WITH PAPER-BASED RECORD

An electronic medical record (EMR) is a computerized medical record created in an organization that delivers care, such as a hospital and doctor's surgery, Perlin JB (2006). Electronic medical records tend to be a part of a local stand-alone health information system that allows storage, retrieval and modification of records.

Paper based records are still by far the preferred method of recording patient information for most hospitals and practices in the U.S. New England Journal of Medicine, (March 25, 2009). The majority of doctors still find their ease of data entry and low cost hard to part with. However, as easy as they are for the doctor to record medical data at the point of care, they require a significant amount of storage space compared to digital records. In the US, most states require physical records be held for a minimum of seven years. The costs of storage media, such as paper and film, per unit of information differ dramatically from that of electronic storage media. When paper records are stored in different locations, collating them to a single location for review by a health care provider is time consuming and complicated, whereas the process can be simplified with electronic records. This is particularly true in the case of person-centered records, which are impractical to maintain if not electronic (thus difficult to centralize or federate). When paper-based records are required in multiple locations, copying, faxing, and transporting costs are significant compared to duplication and transfer of digital records. Because of these many "after entry" benefits, federal and state governments, insurance companies and other large medical institutions are heavily promoting the adoption of electronic medical records. Congress included a formula of both incentives (up to $44K per physician under Medicare or up to $65K over 6 years, under Medicaid) and penalties (i.e. decreased Medicare/Medicaid reimbursements for covered patients to doctors who fail to use EMR's by 2015) for EMR/EHR adoption versus continued use of paper records as part of the American Recovery and Reinvestment Act of 2009.

One study estimates electronic medical records improve overall efficiency by 6% per year, and the monthly cost of an EMR may (depending on the cost of the EMR) be offset by the cost of only a few "unnecessary" tests or admissions, Perlin JB

(2006). Jerome Groopman disputed these results, publicly asking "how such dramatic claims of cost-saving and quality improvement could be true". Hartzband (2009).However, the increased portability and accessibility of electronic medical records may also increase the ease with which they can be accessed and stolen by unauthorized persons or unscrupulous users versus paper medical records as acknowledged by the increased security requirements for electronic medical records included in the Health Information and Accessibility Act and by recent large-scale breaches in confidential records reported by EMR users, Institute of Medicine (1999). Concerns about security contribute to the resistance shown to their widespread adoption. Handwritten paper medical records can be associated with poor legibility, which can contribute to medical errors. Pre-printed forms, the standardization of abbreviations, and standards for penmanship were encouraged to improve reliability of paper medical records. Electronic records help with the standardization of forms, terminology and abbreviations, and data input. Digitization of forms facilitates the collection of data for epidemiology and clinical studies. In contrast, EMRs can be continuously updated (within certain legal limitations). The ability to exchange records between different EMR systems ("interoperability") would facilitate the co-ordination of healthcare delivery in non-affiliated healthcare facilities. In addition, data from an electronic system can be used anonymously for statistical reporting in matters such as quality improvement, resource management and public health communicable disease surveillance, Judy (2006).

2.3 REVIEW OF HEALTH INFORMATICS IN MANY COUNTRIES

Health informatics (also called health care informatics, healthcare informatics, medical informatics, nursing informatics, or biomedical informatics) is a discipline at the intersection of information science, computer science, and health care. It deals with the resources, devices, and methods required to optimize the acquisition, storage, retrieval, and use of information in health and biomedicine. Health informatics tools include not only computers but also clinical guidelines, formal medical terminologies, and information and communication systems. It is applied to the areas of nursing, clinical care, dentistry, pharmacy, public health, occupational therapy, and (bio) medical research.

Informatics was a central part of the Nazi health care system, which included Nazi eugenics as one of its fundamental principles. New systems and technology, like electronic punch card tabulating and sorting machines, and the science of medical statistics, were used to gather, sort, and analyze personal information on a vast scale unseen before in human history. The information was used to help find and eliminate the 'genetically inferior' through sterilization or wholesale murder. Many of the architects of these systems would go on to play a role in the post-war medical informatics field, Baek, O. K. (2009).Worldwide use of technology in medicine began in the early 1950s with the rise of the computers. In 1949, Gustav Wager established the first professional organization for informatics in Germany. The prehistory, history, and future of medical information and health information technology are discussed in reference. Specialized university departments and Informatics training programs began during the 1960s in France, Germany, Belgium and The Netherlands. Medical informatics research units began to appear during the 1970s in Poland and in the U.S. Since then the development of high-quality health informatics research, education and infrastructure has been the goal of the U.S. and the European Union. Early names for health informatics included medical computing, medical computer science, computer medicine, medical electronic data processing, medical automatic data processing, medical information processing, medical information science, medical software engineering, and medical computer technology.

The health informatics community is still growing, it is by no means a mature profession, but work in the UK by the voluntary registration body, the UK Council of Health Informatics Professions has suggested eight key constituencies within the domain information project management, ICT, education and research, clinical informatics, health records(service and business-related), health informatics service management. These constituencies accommodate professionals in and for the NHS, in academia and commercial service and solution providers.

Since the 1970s the most prominent international coordinating body has been the International Medical Informatics Association (IMIA).

Even though the idea of using computers in medicine sprouted as technology advanced in the early twentieth century, it was not until the 1950s that informatics made a realistic impact in the United States.

The earliest use of computation for medicine was for dental projects in the 1950s at the United States National Bureau of Standards by Robert Ledley, Ledley RS (2006).The next step in the mid-1950s were the development of expert systems such as MYCIN and Internist-I. In 1965, the National Library of Medicine started to use MEDLINE and MEDLARS. At this time, Neil Pappalardo, Curtis Marble, and Robert Greenes developed MUMPS (Massachusetts General Hospital Utility Multi-Programming System) in Octo Barnett's Laboratory of Computer Science, Reilly (2003), at Massachusetts General Hospital in Boston, Reilly (2003). In the

1970s and 1980s it was the most commonly used programming language for clinical applications. The MUMPS operating system was used to support MUMPS language specifications. As of 2004, a descendent of this system is being used in the United States Veterans Affairs hospital system. The VA has the largest enterprise-wide health information system that includes an electronic medical record, known as the Veterans Health Information Systems and Technology Architecture (VistA). A graphical user interface known as the Computerized Patient Record System (CPRS) allows health care providers to review and update a patient's electronic medical record at any of the VA's over 1,000 health care facilities.

In the 1970s a growing number of commercial vendors began to market practice management and electronic medical records systems. Although many products exist, only a small number of health practitioners use fully featured electronic health care records systems. Homer R. Warner, one of the fathers of medical informatics, Gardner RM (1999), founded the Department of Medical Informatics at the University of Utah in 1968. The American Medical Informatics Association (AMIA) has an award named after him on application of informatics to medicine. Since 1997, the Buenos Aires Biomedical Informatics Group, a nonprofit group, represents the interests of a broad range of clinical and non-clinical professionals working within the Health Informatics sphere. Its purposes are:

- Promote the implementation of the computer tool in the healthcare activity, scientific research, and health administration and in all areas related to health sciences and biomedical research.

- Support, promote and disseminate content related activities with the management of health information and tools they used to do under the name of biomedical informatics.
- Promote cooperation and exchange of actions generated in the field of biomedical informatics, both in the public and private, national and international level.
- Interact with all scientists, recognized academic stimulating the creation of new instances that have the same goal and be inspired by the same purpose.
- To promote, organize, sponsor and participate in events and activities for training in computer and information and disseminating developments in this area that might be useful for team members and health related activities.

The Argentinian health system is very heterogeneous, because of that the informatics developments shows a heterogeneous stage. Lot of private Health Care center have developed systems, as the German Hospital of Buenos Aires who was one of the first in develop the electronic health records system. The first applications of computers to medicine and healthcare in Brazil started around 1968, with the installation of the first mainframes in public university hospitals, and the use of programmable calculators in scientific research applications. Minicomputers, such as the IBM 1130 were installed in several universities, and the first applications were developed for them, such as the hospital census in the School of Medicine of Ribeirão Preto and patient master files, in the Hospital das Clínicas da Universidade de São Paulo, respectively at the cities of Ribeirão Preto and São Paulo campi of the University of São Paulo. In the 1970s, several Digital Corporation and Hewlett Packard minicomputers were acquired for public and Armed Forces hospitals, and more intensively used for intensive-care unit, cardiology diagnostics, patient monitoring and other applications. In the early 1980s, with the arrival of cheaper microcomputers, a great upsurge of computer applications in health ensued, and in 1986 the Brazilian Society of Health Informatics was founded, the first Brazilian Congress of Health Informatics was held, and the first *Brazilian Journal of Health Informatics* was published. Health Informatics projects in Canada are implemented provincially, with different provinces creating different systems. A national, federally-funded, not-for-profit organization called Canada Health Info way was created in 2001 to foster the development and adoption of electronic health records across Canada. As of December 31, 2008 there were 276 EHR projects under way in Canadian hospitals, other health-care facilities, pharmacies and laboratories, with an investment value of $1.5-billion from Canada Health Info way.

Provincial and territorial programs include the following:

- eHealth Ontario was created as an Ontario provincial government agency in September 2008. It has been plagued by delays and its CEO was fired over a multimillion-dollar contracts scandal in 2009.[12]
- Alberta Netcare was created in 2003 by the Government of Alberta. Today the netCARE portal is used daily by thousands of clinicians. It provides access todemographicdata, prescribed/dispensed drugs, known allergies/intolerances, immunizations, laboratory test results, diagnostic imaging reports, the diabetes registry and other medical reports. netCARE interface capabilities are being included in electronic medical record products which are being funded by the provincial government.

In 2004 the U.S. Department of Health and Human Services (HHS) formed the Office of the National Coordinator for Health Information Technology (ONCHIT). The mission of this office is widespread adoption of interoperable electronic health records (EHRs) in the US within 10 years. See quality improvement organizations for more information on federal initiatives in this area.

The Certification Commission for Healthcare Information Technology (CCHIT), a private nonprofit group, was founded in 2005 by the U.S. Department of Health and Human Services to develop a set of standards for electronic health records (EHR) and supporting networks, and certify vendors who meet them. In July, 2006 CCHIT released its first list of 22 certified ambulatory EHR products, in two different announcements.

For more details on this topic, see European Federation for Medical Informatics.

The European Union's Member States are committed to sharing their best practices and experiences to create a European eHealth Area, thereby improving access to and quality health care at the same time as stimulating growth in a promising new industrial sector. The European eHealth Action Plan plays a fundamental role in the European Union's strategy. Work on this initiative involves a collaborative approach among several parts of the Commission services. The European Institute for Health Records is involved in the promotion of high quality electronic health record systems in the European Union.

The NHS in England has contracted out to several vendors for a national health informatics system 'NPFIT' that originally divided the country into five regions and is to be united by a central electronic medical record system nicknamed "the spine". The project, in 2010, is seriously behind schedule and its scope and design are being revised in real time. In 2010 a wide consultation was launched as part of a wider ‘Liberating the NHS’ plan. Many organizations and bodies (look on their own websites, as most have made their responses public in detail for information) responded to the consultation and a new strategy is expected in the second quarter of 2011. The degree of computerization in NHS secondary care was quite high before NPfIT and that programmed has had the unfortunate effect of largely stalling further development of the installed base. Almost all general practices in England and Wales are computerized and patients have relatively extensive computerized primary care clinical records. Computerizations are the responsibility of individual practices and there is no single, standardized GP system. Interoperation between primary and secondary care systems is rather primitive. A focus on interworking (for interfacing and integration) standards is hoped will stimulate synergy between primary and secondary care in sharing necessary information to support the care of individuals. Scotland has an approach to central connection under way which is more advanced than the English one in some ways. Scotland has the GPASS system whose source code is owned by the State, and controlled and developed by NHS Scotland. GPASS was accepted in 1984. It has been provided free to all GPs in Scotland but has developed poorly.[citation needed] Discussion of open sourcing it as a remedy is occurring. The broad history of health informatics has been captured in the book UK Health Computing: Recollections and reflections, Hayes G, Barnett D (Eds.), BCS (May 2008) by those active in the field, predominantly members of BCS Health and its constituent groups. The book describes the path taken as ‘early development of health informatics was unorganized and idiosyncratic’. In the early -1950s it was prompted by those involved in NHS finance and only in the early 1960s did solutions including those in pathology (1960), radiotherapy (1962), immunization (1963), and primary care (1968) emerge. Many of these solutions, even in the early 1970s were developed in-house by pioneers in the field to meet their own requirements. In part this was due to some areas of health services (for example the immunization and vaccination of children) still being provided by Local Authorities. Interesting, this is a situation which the coalition government propose broadly to return to in the 2010 strategy Equity and Excellence: Liberating the NHS (July 2010); stating:

"We will put patients at the heart of the NHS, through an information revolution and greater choice and control' with shared decision-making becoming the norm: 'no decision about me without me' and patients having access to the information they want, to make choices about their care. They will have increased control over their own care records."

These types of statements present a significant opportunity for health informaticians to come out of the back-office and take up a front-line role supporting clinical practice, and the business of care delivery. The UK health informatics community has long played a key role in international activity, joining TC4 of the International Federation of Information Processing (1969) which became IMIA (1979). Under the aegis of BCS Health, Cambridge was the host for the first EFMI Medical Informatics Europe (1974) conference and London was the location for IMIA's tenth global congress (MEDINFO2001). In 2002, the idea of a profession of health informatics across the UK was first mooted and by 2004 a voluntary open register was established. The UK Council for Health Informatics Professions (UKCHIP) now has a formal Code of Professional Conduct, standards for expressing competences which are used for entry, confirmation of fitness to practice, re-grading and personal development. Consistent standards express competences of health informatics professionals in both domain-specific and generic informatics professional areas. The consistency is intended to apply in operational care delivery organizations, academia and the commercial service and solution providers. In 2011, self-assessment tools were introduced for use by any interested party. In addition, the principles and UKCHIP model are being considered internationally (as at 2011). UKCHIP certification is being considered for regulatory purposes. In conjunction with workforce development tools such as the NHS HI Career Framework it is possible for individuals to compare their skills against typical job roles, determine their professional level, and for employers to carry out detailed workforce analysis to meet the emerging requirements of the informatics strategies of all the home countries.

The European Commission's preference, as exemplified in the 5th Framework as well as currently pursued pilot projects, is for Free/Libre and Open Source Software (FLOSS) for healthcare.

CHAPTER THREE

RESEARCH METHODOLOGY

3.1 SOURCE DATA

During the research work, data collection was carried out in many places. In gathering and collecting necessary data and information needed for system analysis, two major fact-finding techniques were used in this work and they are:

(a) Primary source

(b) Secondary source

Primary Source

Primary source refers to the sources of collecting original data in which the researcher made use of empirical approach such as personal interview and questionnaires.

Secondary Source

The need for the secondary sources of data for this kind of project cannot be over emphasized. The secondary data were obtained by the researcher from magazines, Journal, Newspapers, Library source

3.2 METHODS OF DATA COLLECTION

3.2.1 ORAL INTERVIEW

This was done between the researcher and the doctors in the hospital used for the studies, and the lab attendance was interviewed. Reliable facts were got based on the questions posed to the staff by the researcher.

3.2.2 Study of Manuals

Manuals and report based used by lab attendance were studied and a lot of information concerning the system in question was obtained.

3.2.3 Evaluation of Forms

Some forms that are necessary and available were assed. These include admission card, lab form, test result, bill card Etc. These forms help in the design of the new system.

3.3 THE EXISTING SYSTEM

System analysis is a structure process of collecting and analyzing facts in respect of existing operations procedures and system in order to obtain a full appreciation of the situation prevailing so that an effective computerized system may be designed and implemented when proved feasible. According to E.C and chapman R.J. “system analysis is defined as the method of determining how best to use computer with other resources to perform tasks which meet the information needs of an establishment. Before moving into the major system design building blocks of this new system we need to analyze the existing system and identify their weaknesses.

The existing system of medical system and drug prescription in Christ the King Hospital Enugu involves manual activities. It has been observed that to receive medical treatment in most of our hospitals the Patients queue according for several hours in the sequence of first come first serve (FCFS) though, a new patient usually register into the hospital by filling patients form which signifies that the person is an official patient of that hospital. Also, this gives the person access to own a hospital folder. Which is used to store the basic information about the diagnosis and drug prescribed to the patient.

In other hand, if it is an old patient, the staff retrieved his hospital folder using the patient's form which the doctor have a look at first, before examining the patient and carry out the appropriate therapy which is either he referred the patient to laboratory unit for lab test (if the need be) or to the pharmacy unit to obtain the prescribed drugs (if the matter is not too complex). But, any treatment offered to the patient by the doctor must be recorded on the patient's folder to avoid inappropriate therapy. Though, it sounds so easy but it has some stumbling blocks.

3.4 INPUT ANALYSIS

The input to the new system is derived from the patient's card. When a patient visits the hospital, he/she fills the patients form from where a card is issued to the patient. This forms the input to the new system designed. The information required for entry into the system includes:

1. Patients Name
2. Sex
3. Address
4. Age
5. Disease Symptoms
6. Date visited

3.5 PROCESS ANALYSIS

Based on the information collected from the patient, an analysis is carried out. The symptoms are processed to obtain the accurate diagnosis of the sickness. Also the diagnosis will help in the processing of the system to obtain the best emergency health care system to be administered to the patient.

3.6 OUTPUT ANALYSIS

The output is derived from the processing carried out on the input data. The output is presented in form of reports on a patient's diagnosis and possible treatment to the ailment. The reports are displayed on the screen and can also be printed out as a hard copy.

3.7 WEAKNESS OF THE EXISTING SYSTEM

The weaknesses of the existing system are highlighted below.

Lack of Accuracy: This situation crates problem in the sense that proper and adequate medical attention is far-fetched. Due to doctors usually hurries over their duties in order to attend to all the patient present in the hospital and along the line they may became exhausted, and the cases of traits and errors may be practiced.

In addition, the diagnosis, and prescription depends on the doctors memory so their brain are often loaded with different diseases, symptoms and various drugs for treatment, hence, to remember and process the hug information is his clinical work is very tasking. For this reason accurate diagnosis and prescription may not always be obtained.

Lack of speed of operations and effectiveness: It has been observed that to receive medical treatment in most of our hospitals, The patients queue up for several hours from one units of the hospital to another, Normally, the medical records system is based on the traditional file keeping system. Although, many patients are attended to with the method of information recording or retrieving an old file but above all, t wastes time. And at times many patients are as spillover. Moreover, the problem of redundancy may occur due to human brain is too complex and may not perform and may not perform effectively especially when new folders and card save obtain each year.

3.8 JUSTIFICATION FOR THE NEW SYSTEM

The new system among other things will have the following characteristics which will improvement the current system in use

1. The new system designed will help the management to use computer system to find patients information with regards to billing, treatments, etc.

2. Accuracy is maintained, as the computer information will yield an accurate result.

3. There will not be much congestion in hospitals, as the medical system developed will assist patients to be treated and the information stored.

4. The speed of operation of the medical system is high when compared to manual method.

CHAPTER FOUR

SYSTEM DESIGN

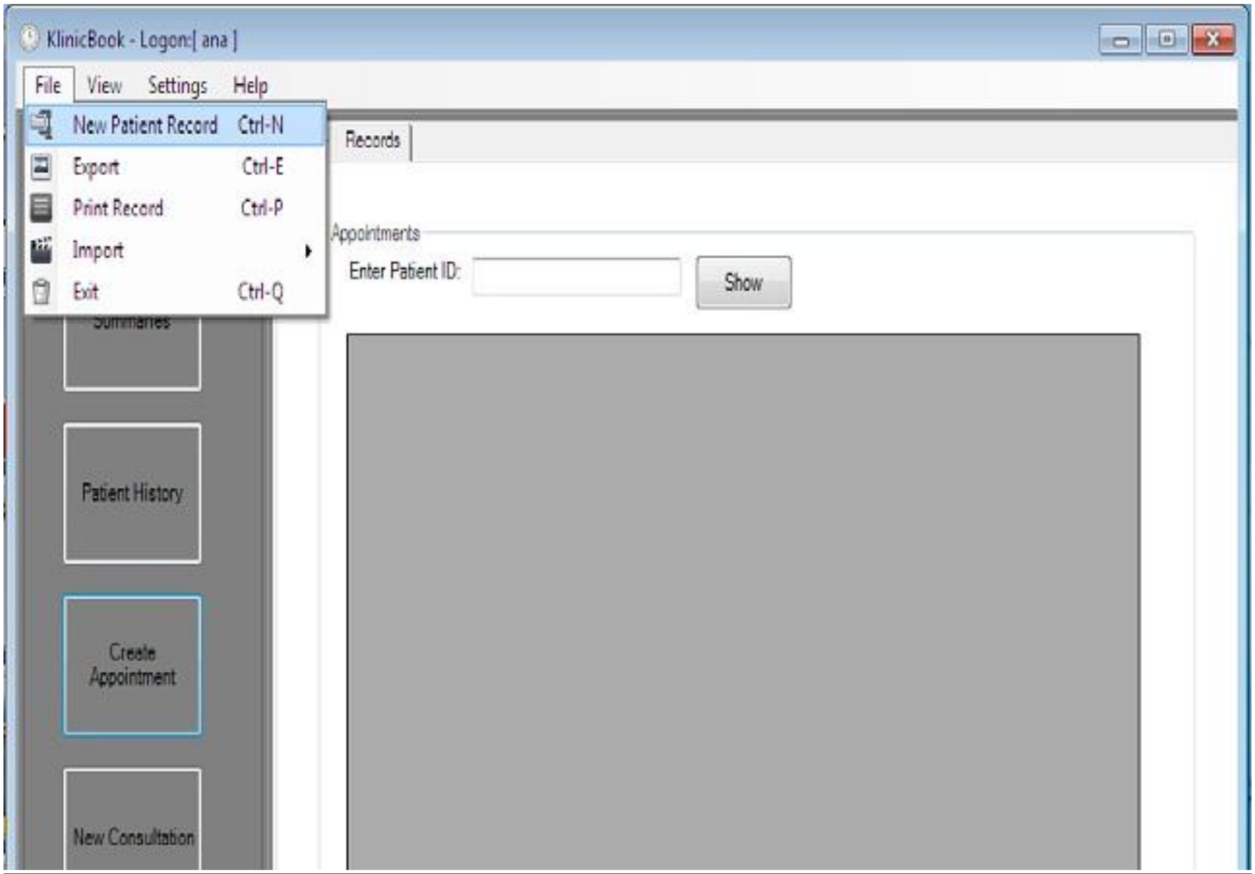
4.1 OUTPUT SPECIFICATION AND DESIGN

The output form is designed to generate printable reports from the database. The output is placed on a database grid and contains information on patient's records. The output produced can be printed on a hard copy or viewed on the screen. The output generated includes:

1. Patients File
2. Bill Record
3. Treatment Record.

4.2 INPUT SPECIFICATION AND DESIGN

The input to the new system is the patient's admission form, which is entered through the keyboard. The input form design takes the format bellow.



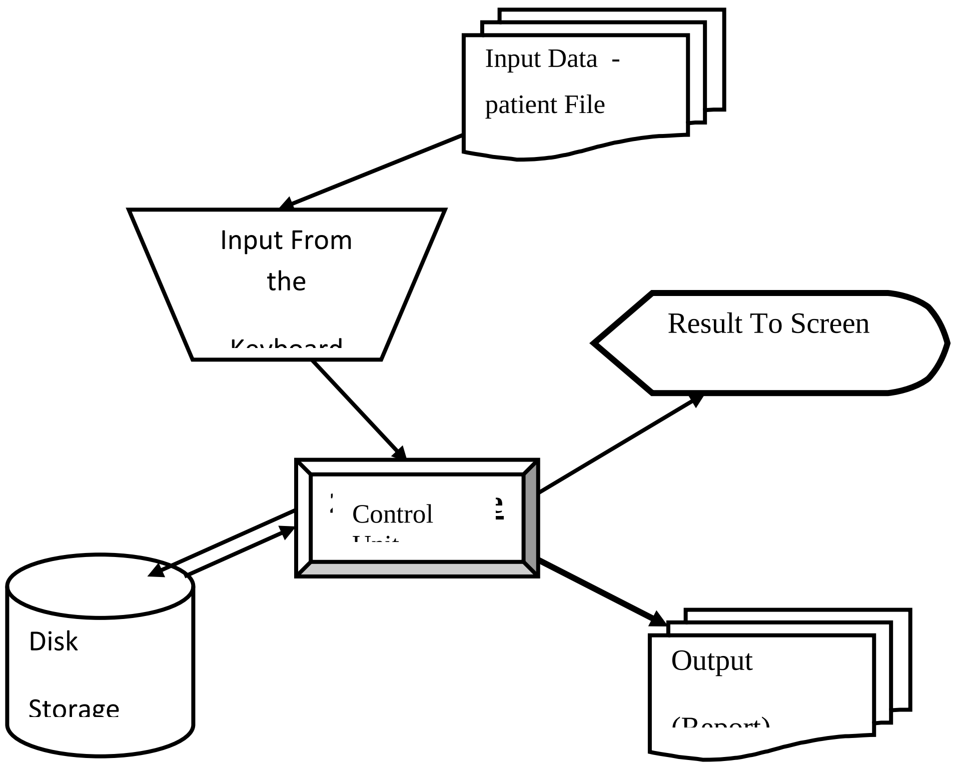
4.3 FILE DESIGN

In any good database design, effort should be made to remove completely or at worst reduce redundancy. The database design in the software is achieved using Microsoft access database. Bellow is the structure of the file designed in the database.

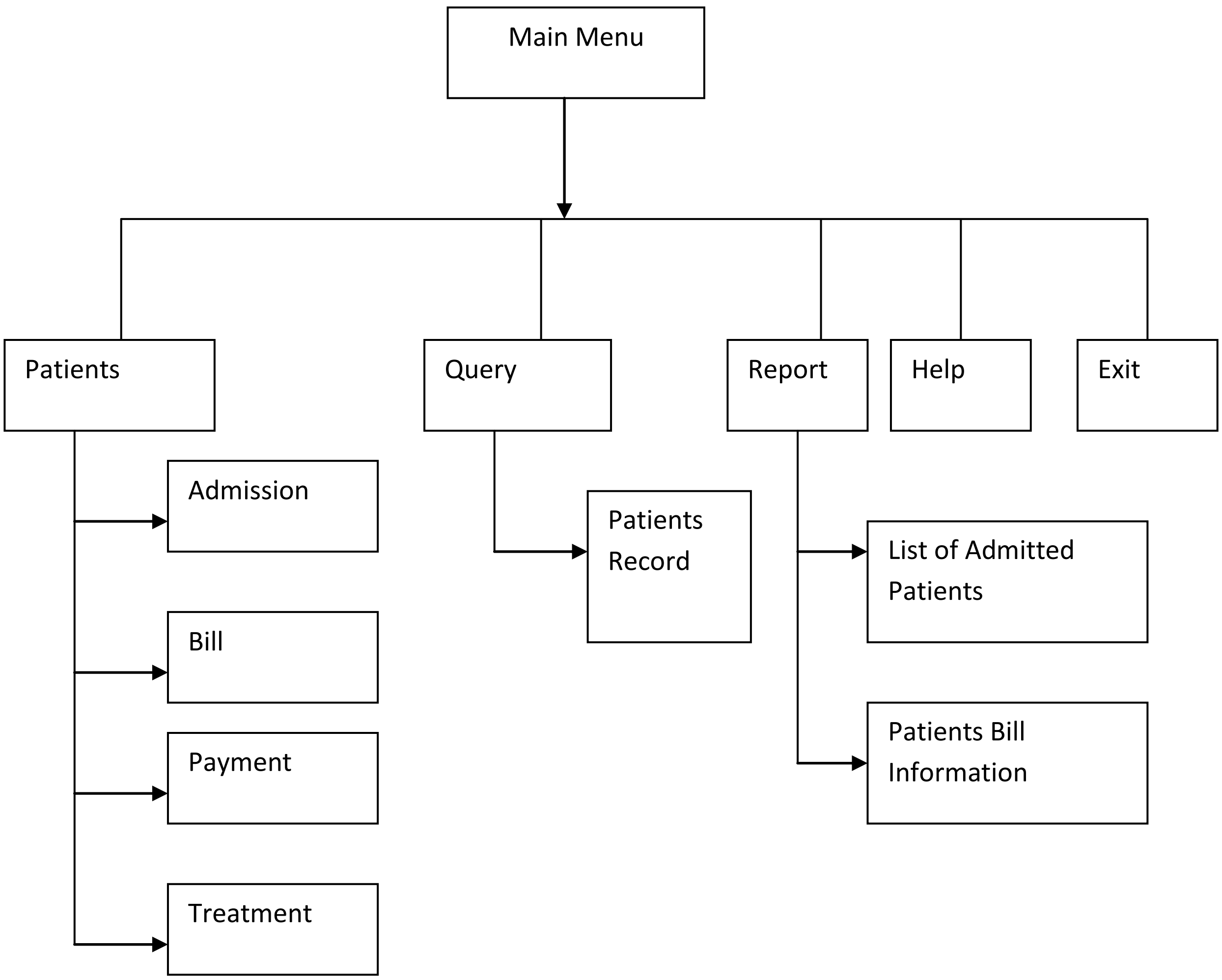
PATIENTS TABLE

FIELD	FIELD TYPE	FIELD SIZE
Card No	Text	15
Patients Name	Text	20
Address	Text	30
Age	Integer	2
Sex	Text	8
Ward	Text	20
Bill	Single	4
Date admitted	Date/time	8
Treatment	Text	100

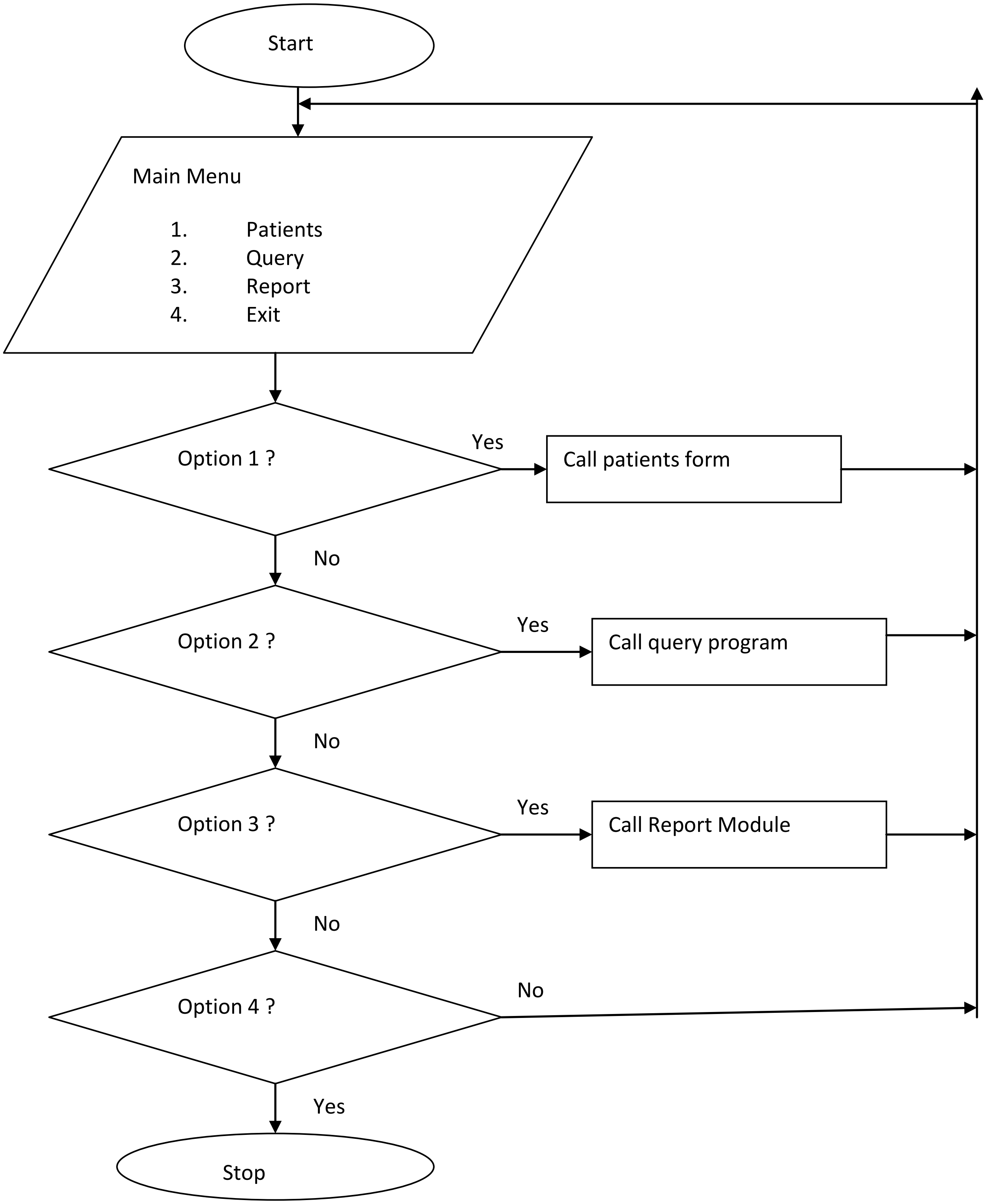
System Flowchart



4.5 Procedure Chart



4.6 Program Flowchart



4.7 Choice of Programming Language

The new system is implemented using Microsoft C#. This is because the programming language has the advantage of easy development. Flexibility and it has the ability of providing the developer/programmer with possible hints and it produces a graphical user interface.

4.8 HARDWARE AND OPERATING SYSTEM REQUIREMENT

Computer system is made up of units that are put together to the work as one to achieve a common goal. There are two parts of the computer system, namely.

- ❖ The Hardware
- ❖ The Software

Hardware Requirement

The program for this project is written in Visual Basic Programming Language. 6.0. it is designed to run on an IBM personal computer. The following minimum hardware specification is needed

Intel Pentium 1. MMX technology

14" VGA or SVGA Monitor

16 MB RAM

3.5 Floppy Drive

24 x CD ROM Drive

2.1 GB Hard Drive

Keyboard

Printer

Software Requirement

The following minimum software specification is needed:

Microsoft windows 98 or later versions

Microsoft Access 97

Microsoft C#

CHAPTER FIVE

SUMMARIES, RECOMMENDATION AND CONCLUSION

5.1 SUMMARY

Without the use of computerized system for medical system, I wonder what will be the stand of our economy today. Since, the implementation of this system does more good than harm in our country especially health sector. Hence not only does it provide good health with the help of the following factors, accuracy, flexibility, and speedy treatment. But, also it will be a big relief for medical doctors and nurses when attending to patients.

This project is well designed with reliability and efficiency as our mainstay, have come just in time to correct those weaknesses and anomalies, which exist in the existing manual method. The achievements made up this design can be summarized

a. Result of high processing speed of the computerize system

b. Patient's records can now be retrieved easily.

c. Billing system in the hospital will be more effective.

d. Similarly there is also an easy accesses to clinical reports for research purpose and decision making

5.2 Problems Encountered And Recommendations

During the processing of the project, I was faced with a lot of physical problems. These problems includes

I was seriously faced with the problem of data collection, which helps in building the manuscript. Because information they said is the tool of business so without solid data collection or material one finds it difficult to present a meaningful reports. So, inability to get materials on time really set my project back. Actually, it took me more than five months to gather enough information needed for this project.

Also for collection of data from my case study a lot of money is spent on transportation. Hence for one to be effective in this project, money must be involved.

Finally, the major limitations of this study were time, financial constraints and poor response by some medical doctors fearing that computers may take over the practice of medicine which in advance, they may lose their jobs. For this reason the researcher is recommending compulsory information technology training for all the medical practitioners to enable them cope with the current trend in information technology.

5.3 Conclusion

Based on the findings, the following conclusions were reached. The implementation of a patient billing software for a hospital will be a big relief for medical doctors and nurses when operational. The system can be a tremendous help to hospital management. It will also serve as a tool for quick operational decision making of the patient, thus enabling them to reach the solutions of their problem more quickly and more accurately than human being. Thus the overall effect of the use of computer in medical system is that patients acquire competence, accuracy, and effectiveness within the shortest time in their operations and can break into new ground with certainty.

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APPENDIX

PROGRAM SOURCE CODE

```
using System;

using System.Collections.Generic;

using System.Linq;

using System.Windows.Forms;

using Program;

namespace KlinicBookApplication{

public static class KlinicBook{

        // {XML Documentaion}

        /// <summary>

            /// this is the main entry point of the KlinicBook application

            /// </summary>

    [STAThread]

    //COMPILATION UNIT

    public static void Main(string[] args){

        AppInit kbook = new AppInit();
```

```
            Application.EnableVisualStyles();

            //Application.SetCompatibleTextRenderingDefault(false);

                Application.Run(kbook);

        }

    }

}
```

KLINICBOOK ENTRY POINT (MAIN METHOD)

```
/**

 * Generic AppName: CMHC-PMS-CDSS [Clinical/Medical Health Center - Patient Management System - Clinical Decision Support System]

 * Product AppName: KlinicBook™

 * Product Version: 1.0.0.0

 * Product Type: Prototype

 */

 ///<remark>

 /// <para>This is a main class file for the KlinicBook Application</para>

 ///</remark>
```

```
using Microsoft.Win32;
using System;
using System.Data;
using System.Collections.Generic;
using System.Text;
using System.Diagnostics;
using System.Drawing.Printing;
using System.Diagnostics.CodeAnalysis;
using System.ComponentModel;
using System.Drawing;
using System.Drawing.Drawing2D;
using System.Windows;
using System.Windows.Input;
using System.Threading;
using System.Runtime;
using System.Globalization;
using System.Windows.Forms;
```

```
using DBClass;
using FileClass;
using Helpers;
namespace Program{
///<summary>
/// This class is called by KlinicBook's {Main method} which is the class that conatins
/// the compilation unit for this application software.All initialisation is synchronous
///</summary>
public partial class AppInit : Form{
   /* MENUBAR */
   private MenuStrip kb_menu;
    /* MENUS */
    /* MENU ITEMS */
   private ToolStripMenuItem sub_file5;
   /* MAIN CONTROLS */
    private TableLayoutPanel tlp;
```

```
 private Panel kb_panel;

 private Button kb_ptnhistory;

private Button kb_new_staff;

 private Button kb_summaries;

 private Button kb_new_appmt;

 private Button kb_consult;

 private StatusStrip kb_strp;

 private System.Windows.Forms.Timer kb_timer;

 private ToolStripStatusLabel kb_stlbl;

 private ToolStripProgressBar kb_progb;

 private TabControl kb_tabc;

 private TabPage  kb_tbpg1 = null;

 private TabPage  kb_tbpg2 = null;

private PictureBox kb_pic;

 /* COMPONENT FORMS */

 private FormAppmt frmap = null;

 private FormLogon frml = null;
```

```
private FormSummaries frmsum = null;

private FormSetup frmset = null;

private FormPntRegister freg = null;

private FormPntConsult fconsl = null;

private FormUpdate frmupt = null;

private FormAdmissions frmadms;

private FormPntHistory frmphis;

/* TABCONTROL - {TABS CONTROLS} */

private Label kb_rep_lbl = new Label();

private TextBox kb_rep_pid = new TextBox();

private Label kb_bill_lbl = new Label();

private ComboBox kb_bill_cmb = new ComboBox();

private Button kb_rep_go = new Button();

private DataGridView kb_data_gd = new DataGridView();

private GroupBox kb_grbx = new GroupBox();

/// <summary>

/// This constructor creates an instance of the KlinicBook Application form.
```

```
/// This constructor has no arguments
/// </summary>
/// <param name=""></param>
/// <see cref=""></see>
/// <return>void</return>
//PUBLIC CONSTRUCTOR
public AppInit(){
  InitComponents();
}
private void kbookClosed(object o, EventArgs e){
   this.Dispose();
}
// CLASS METHODS
/**
 * FORM LOAD EVENT HANDLER
 */
private void kb_FormLoad(object o, EventArgs e){
```

```
/* CONFIGURATION */

string content = FileManager.ReadStringFromFile(@"lib\config.rtc");

if (!content.Contains("Database-Name:")){

frmset = new FormSetup();

DialogResult res = frmset.ShowForm();

switch(res){

case DialogResult.OK: /* If and only if success from [frmset] */

string[] confige = {"\n","{Network Database}","Database-ID:MHC-PMS-011E7i;","Database-Name:hospital;","Database-Path:Provider=Microsoft.ACE.OLEDB.12.0;Data Source="+frmset.getPath()+";","Database-Encode:"+frmset.getEncoding()+";","Database-Server:"+frmset.getServer()+";","Database-Type:"+frmset.getType()+";","\n","{Network Server}"};

FileManager.WriteStringToFile(@"lib\config.rtc","a",confige);

string conn = extractString();

//show login form

frml = new FormLogon(this, conn);

DialogResult ret1 = frml.ShowForm();
```

```
// check for success...
 if(ret1 == DialogResult.OK){
   // frml.Close(); // destroy the login form!!
break;
default:
break;
    }else{ /* If and only if [config.rtc] contains database config string  */
       // parse the file and retrieve the database connection string
string conn = extractString();
     //show login form
     frml = new FormLogon(this, conn);
     DialogResult ret2 = frml.ShowForm();
     // check for success...
      if(ret2 == DialogResult.OK){
        // write details of currently logged user to [users.rtc] and maintain state using this file.
   ///<summary>
```

```
///This is the initialisation method for KlinicBook Application

///</summary>

///<return>void [return nothing]</return>


private void InitComponents(){


 kb_menu = new MenuStrip(); // MENUBAR


 //============================================//

 tlp = new TableLayoutPanel();  // LAYOUT

 tlp.SuspendLayout();

 kb_panel = new Panel();

 kb_panel.Location = new Point(0,0);

 kb_panel.Size = new Size(200, 550);

 //============================================//


 //================================================//
```

```
kb_summaries = new Button(); // SUMMARIES OPTION

kb_new_staff = new Button(); // ADD STAFF USER OPTION

kb_ptnhistory = new Button(); // REPORTS OPTION

kb_new_appmt = new Button(); // CREATE APPOINTMENT OPTION

kb_consult = new Button(); // NEW CONSULTATION OPTON

//==============================================//

//==============================================//

kb_strp = new StatusStrip(); // STATUSBAR

kb_strp.SuspendLayout();

kb_stlbl = new ToolStripStatusLabel(); // DIGITAL CLOCK

kb_progb = new ToolStripProgressBar();

kb_timer = new System.Windows.Forms.Timer();      // TIMER

kb_timer.Enabled = true;

kb_pic = new PictureBox();  // AVATAR

//==============================================//

//====================== BEGIN MENUBAR DETAILS
====================//
```

```
ToolStripMenuItem file = new ToolStripMenuItem();

file.Text = "&File";

ToolStripMenuItem sub_file1 = new ToolStripMenuItem("New Patient Record");

sub_file1.Image = Image.FromFile(@"img\archive.png");

sub_file1.ImageAlign = System.Drawing.ContentAlignment.MiddleLeft;

sub_file1.TextAlign = System.Drawing.ContentAlignment.MiddleRight;

sub_file1.ShowShortcutKeys = true;

sub_file1.ShortcutKeyDisplayString = "Ctrl-N";

sub_file1.ShortcutKeys = Keys.Control | Keys.N;

file.DropDownItems.Add(sub_file1);
```