DESIGN OF A COMPUTERIZED HEALTH-CARE INFORMATION SYSTEM

BY

SHEHU MUHAMMAD O.

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DEDICATION

To the man I respect and admire the most,

My father,

Mallam Muhammad Shehu Usman

Whose love, patience and scarifies have gone a long way to give me the beauty (knowledge) of world.

DECLARATION

I Shehu Muhammad O., declare that this work was done by me and has never been presented elsewhere for the award of degree. I also hereby relinquish the copyright to the Federal University of Technology, Minna.
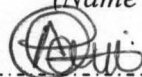

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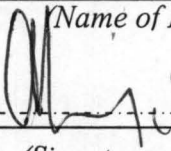
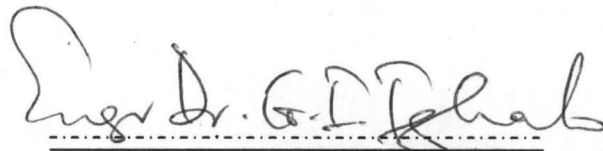
MR. ONUMANYI ADEIZA J.
(Name of Supervisor)
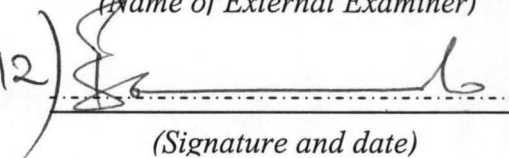
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(Signature and date)

ENGR. A. G. RAJI
(Name of H.O.D)

(March 15, 2012)

(Signature and date)

Engr Dr. G.I. Delab
(Name of External Examiner)

6/3/2012

(Signature and date)

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ABSTRACT

Information management is an essential task that must be effectively handled if health-care delivery institution is to achieve some measurable level of operational efficiency and success. The amount of information generated daily in an average health institution requires durable storage and fast retrieval techniques. There is growing demand by patrons of such institutions for timely and secured access to their personal and family health data. Automation of health information, which provides an efficient platform for attaining these goals, becomes handy. The objective of this project is to present a computerized record system that can be used in scheduling and managing information resources in health institutions. This information can be used to manage clinical data (such as patient name, address, medical history, laboratory results etc.) and administrative data (e.g. staff name and designation). Also discussed are the benefits which can be derived by the health institutions, medical staff and patients from computerized record system.

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CHAPTER ONE

GENERAL INTRODUCTION

1.1 Introduction

Information is a critical resource in the operation and management of organizations. Timely availability of relevant information is vital for effective performance of managerial functions such as planning, leading, organizing and control. An information system in an organization is like the nervous system in the human body, it is the link that connects all the organization's components together and provides for better operation and survival in a competitive environment [1]. An information system usually includes hardware, software, people communications systems such as telephone lines, and the data itself. The activities involved include inputting data, processing of data into information, storage of data and information, and the production of outputs such as management reports [2].

The term, information system, refers to a computer-based system application designed to support the operations, management, and decision functions of an organization. Thus information systems provide support for decision-makers. Information systems encompass transaction processing systems, management information system, decision support systems, and strategic information systems [3]. Every business must effectively utilize emerging technology. Information system is not only changing the way companies operate internally, but is also altering the relationship between companies, their suppliers, customers, and other business partners. The problems associated with the use of manual information system, such as notebooks, forms, and files in the administration, and management of organizations are numerous. The introduction of computerized management information system has effectively rendered all problems associated with manual information system negligible [4].

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The main purpose of this study is to highlight the use of computer and its importance in scheduling and monitoring the various resources of health institutions and also, in the recording of both clinical data (i.e. medical history, diagnosis, and therapy), and administrative data (patient name and address, staff name, address and designation). The computerized documentation that will simplify the manual ways of recording data can be achieved by developing software, which can perform the above stated operations.

1.2 Aims and Objective

This project is aimed at:

- ❖ To sets out system to solve the problems encountered in manual system of recording data.

- ❖ To provide information to management at all levels for decision-making, planning, and budgeting.

- ❖ To eliminate a number of unnecessary source documents.

- ❖ To reduce the time and effort needed for documentation.

- ❖ To increase data quality.

- ❖ To increase data reusability.

- ❖ To reduce cost of duplication.

- ❖ To provide data security.

1.3 Scope of Work

This project is focused and limited only to records keeping in health institutions. This contains the patient medical records such as patient's identification information, the patient's health history (what the patient tells the health care providers about his or her past and present health status), and the patient's medical examination findings (what the health care providers observe when the patient is examined). Other information included is lab test results, medications prescribed.

1.4 Methodology

In the design of this project, an extensive study was done on visual basic 6.0. Also on Microsoft access how it can be used as data base.

The information system is divided into five (5) component, which are Patient registration, Patient record, Patient diagnose, Patient medical history, and schedule of duty.

Upon login the following steps are followed:

- ❖ Register the patient by clicking on the patient registration command button. Next is to check
- ❖ Patient record,
- ❖ Patient diagnose,
- ❖ Patient medical history, and
- ❖ Schedule of duty.

1.5 Project Outline

This section shows the summary of various chapters in this project, which are as follows:

❖ **Chapter 1:** This is the introductory part of this project. It include why (objective), how (methodology), and a clearly define scope for the project.

❖ **Chapter 2:** This chapter gives the theoretical background and literature (history) review of previous works done as relates to this project.

❖ **Chapter 3:** This chapter contains the system analysis and design of the project. It gives a step by step analysis (description) and method carried in various sections of the design.

❖ **Chapter 4:** This covers testing, result and discussion of result. Also are conclusions and recommendations in chapter 5.

CHAPTER TWO

THEORETICAL BACKGROUND AND LITERATURE REVIEW

2.1 Theoretical Background

A medical record, health record, or medical chart is a systematic documentation of a patient's medical history and care [10]. The term 'Medical record' is used both for the physical folder for each individual patient and for the body of information which comprises the total of each patient's health history. Medical records are intensely personal documents and there are many ethical and legal issues surrounding them such as the degree of third-party access and appropriate storage and disposal. Although medical records are traditionally compiled and stored by health care providers, personal health records maintained by individual patients have become more popular in recent years.

A computerized medical record system is created in an organization that delivers care such as hospital or physician's office. Electronic medical record tends to be part of a local stand-alone health information system that allows storage, retrieval and modification of records [11]. Paper-based records have been in existence for centuries and are gradually replaced by computer-based records. Computerized information systems have not gained the same degree of penetration in healthcare as that seen in other sectors such as finance, transportation, manufacturing and retail industry. Further development has varied greatly from country to country and from specialty to specialty and in many cases as resolved around local system design for local use.

2.1.1 Contrast with Paper-Based Record

Paper –based records are still by far the most common method of recording patient information for most hospitals. 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 point of care, they require a significant amount of storage space compare to digital records [11].

In instance where physical record are to be kept for several years, the cost 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, collecting them to a single location for review by health care providers is time consuming and complicated, whereas the process can be simplified with electronic records. When paper-based records are required in multiple locations, coping, faxing, and transporting cost are significant compared to duplication and of digital record.

2.2   Literature Review

A management information system is called a method, a function, an approach, a process, an organization, a system, and a subsystem. It is a competitive tool that allows organizations to create and manage innovative products and services quickly, effectively and efficiently. Lucey (1991) opined that "Management information system is a system using formalized procedures to provide management at all level with appropriate information based on data from both internal and external sources to enable them to make timely and effective decisions for planning, directing, and controlling activities for which they are responsible". Management information

system is an integrated, computer-based, user-machine system that provides information for supporting operations and decision-making functions [5].

According to Kroenke (1989), management information system is the development and use of effective Information Systems in organizations. Thus, management information systems are designed to help managers plan and direct business and organizational operations. These systems output information in a form that is usable by all managers at all strategic, tactical, and operational levels of organization [6].

In the late 1960s, computer-based hospital information systems (HISs) began to emerge. These systems were intended primarily for communication. They collected orders from nursing stations, routed the orders to various parts of the hospital, and identified all chargeable services. They also gave clinicians electronic access to results of laboratory tests and other diagnostic procedures. Although they contained some clinical information (for example, test results, drug orders), their major purpose was to capture charges rather than to assist with clinical care. Many of the early HISs stored and presented much of their information as text, which is difficult to analyze. Moreover, these early systems rarely retained the content for more than a few days after a patient's discharge [7].

The Flexner report on medical education was the first formal statement made about the function and contents of the medical record [8]. In advocating a scientific approach to medical education, it also encouraged physicians to keep a patient-oriented medical record. The contents of medical records in hospitals became the object of scrutiny in the 1940s, when hospital accrediting bodies

began to insist on the availability of accurate, well-organized medical records as a condition for accreditation.

Morris Collen was an early pioneer in the use of hospital-based systems to store and present laboratory-test results as part of preventive care [9]. Use of computers to screen for early warning signs of illness was a basic tenet of health-maintenance organizations (HMOs). Other early university hospital-based systems provided feedback to physicians that affected clinical decisions and ultimately patient outcomes. A health information management system is computerized to meet the information needs of administrative staff, and patients of a hospital. For a hospital to achieve its ultimate objectives of better patient care, the hospital has to be managed on scientific lines. The complexity and potential impact of today's health need requires a comprehensive approach to problem analysis and innovative thinking in developing solution and strategies. Patient-care by its information-intensive nature involves extensive information processing for decision making and requires the support of an effective and efficient information system. It also requires an information system that helps match resource to need and demand ensures efficiency in delivery of services, planning, and implementation of priorities.

Information obtained from these kinds of analyses often is compared overtime. Health managers can then use such information to make predictions, e.g. to forecast cost of particular undertakings for budgeting purposes or as a basis for predicting results if a given change is made.

The design and implementation of computerized record systems in health-care institutions is a giant stride towards developing an advanced, efficient, and effective management information system. These helps to eliminate most problems associated with manual record system.

These institutions are meant to operate 24 hours daily on three shifts basics (morning, afternoon, night) as describe below:

- ❖ Morning   8 a.m. - 4 p.m.

- ❖ Afternoon   2 p.m. -7 p.m.

- ❖ Night   7 p.m. - 9 a.m.

There are 5 basic functional units namely, clinical/consultation, records, pharmacy, laboratory, and the environmental units. Each unit has a head that supervises the activities of his/her unit daily. Most information system been used are manual such as the use of notebooks to track records of daily visit to the centre, the use of patient small card to keep track of patients file, use of files and forms are operable. Such problems include high expenses of documentation, time consumption, low quality of data, loss of documents, duplication of data, limited user acceptance.

CHAPTER THREE

MATERIALS AND METHOD

3.1 Hardware Requirement

The following hardware resources need to be put in place in order to power the application:

- ❖ Pentium IV computer or higher is required

- ❖ 20G B of hard disk space to meet up the space requirement of the system.

- ❖ 128 MB of RAM

- ❖ Keyboard and mouse

- ❖ 15" screen monitor

- ❖ UPS (uninterrupted power supply)

- ❖ Printer

- ❖ Scanner and Power stabilizer.

3.2 Software Requirement

- ❖ Visual basic 6.0

- ❖ Microsoft access database

- ❖ Microsoft office 2000 or high

3.2.1 Programming Language Environment

Visual Basic 6.0 is an Object Oriented Programming Language like its counterparts; C++, Java etc. It can run effectively on Windows XP, Windows Vista and Window 7. Visual Basic programming language (Enterprise) provides forms and much more, tools to design

interface compare to the Visual Basic (Standard Version) [16]. The coding process is aided by

encapsulated objects which makes it much easier. The code in Visual Basic is simple to read

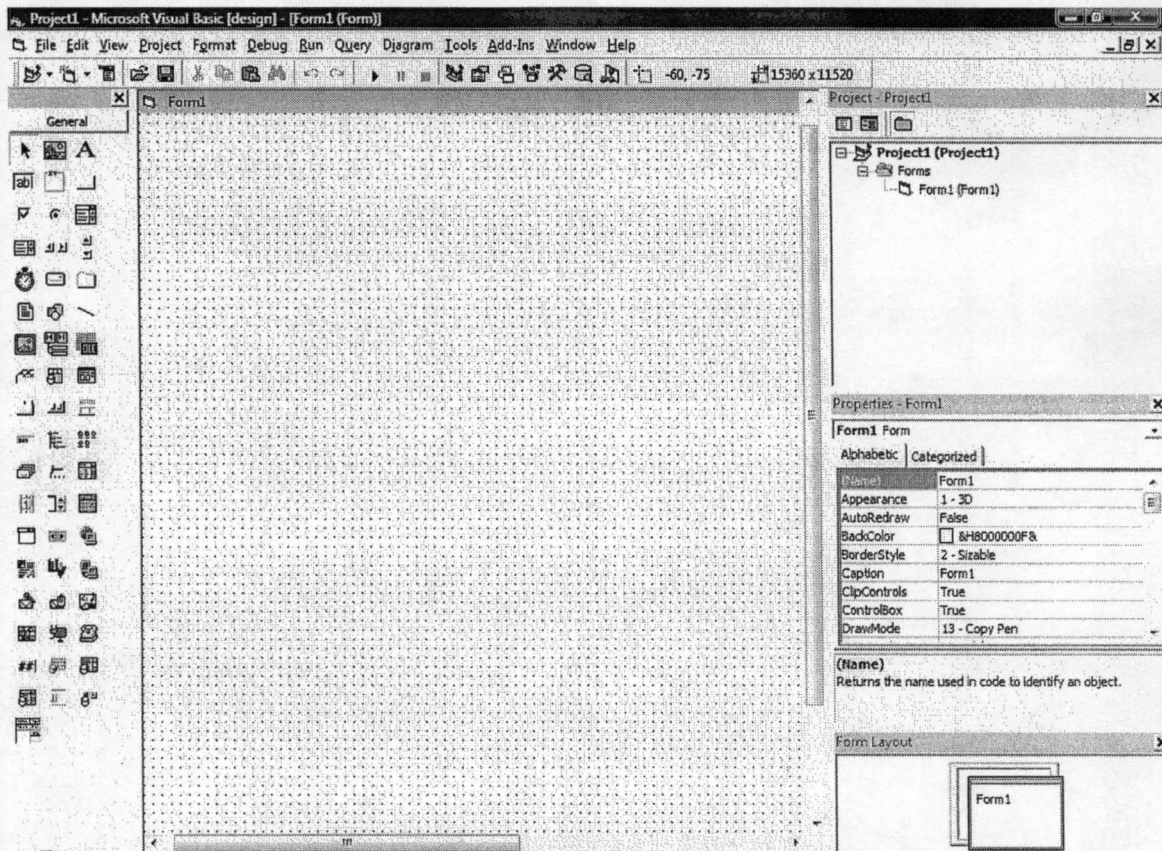because of the relativity to English Language.

Fig. 3.1: Visual Basic 6.0 working environment

3.2.2 Features of Programming Language Chosen

Visual basic was designed for ease of learning and design. The language not allows programmers

to create simple graphical user interface (GUI) applications but can also develop fairly complex

applications. Visual basic is a combination of visually arranged components or controls on forms specifying attributes and actions of the component and writing additional lines of codes for functionality. Default attributes and actions are defined for the components. A simple program can be created without the programmer writing too many codes.

Forms are created using drag and drop techniques. A tool is used to place control (textboxes, buttons etc) on the forms. Controls have attributes and event handlers associated with them. Default values are provided when control is created, but can be changed by the programmer. Many attribute values can be modified during runtime based on user actions. Visual basic can create executable files (.exe), active controls, DLL files, but is primarily used to develop windows application and to interface web database systems. Dialog boxes with less functionality can be used to provide pop-up capabilities. Control provides the basic function of the application, while programmer can insert additional logic within the appropriate event handler.

Visual basic main selling point is the ease with which it allows programmer to create nice looking graphics programs with little coding. Unlike many other languages that may take hundred of lines of programmers key code. As the programmer work in the graphical environment, most of the program codes are automatically generated by visual basic program. In order to understand how this happens, it is necessary to understand the major concepts of objects and tools used in visual basic. The main object in visual basic is called the FORM.

3.2.3   Database Design and Organization

Microsoft Access, a database management system, is the 'native' database environment designed

to effectively work with Visual Basic Programming Language. It is a relational database used to

cater for storage and retrieval of data in this project [15]. The access is Dynamic; this enables the

records to be accessed sequentially or randomly from the files. The structure of the database used

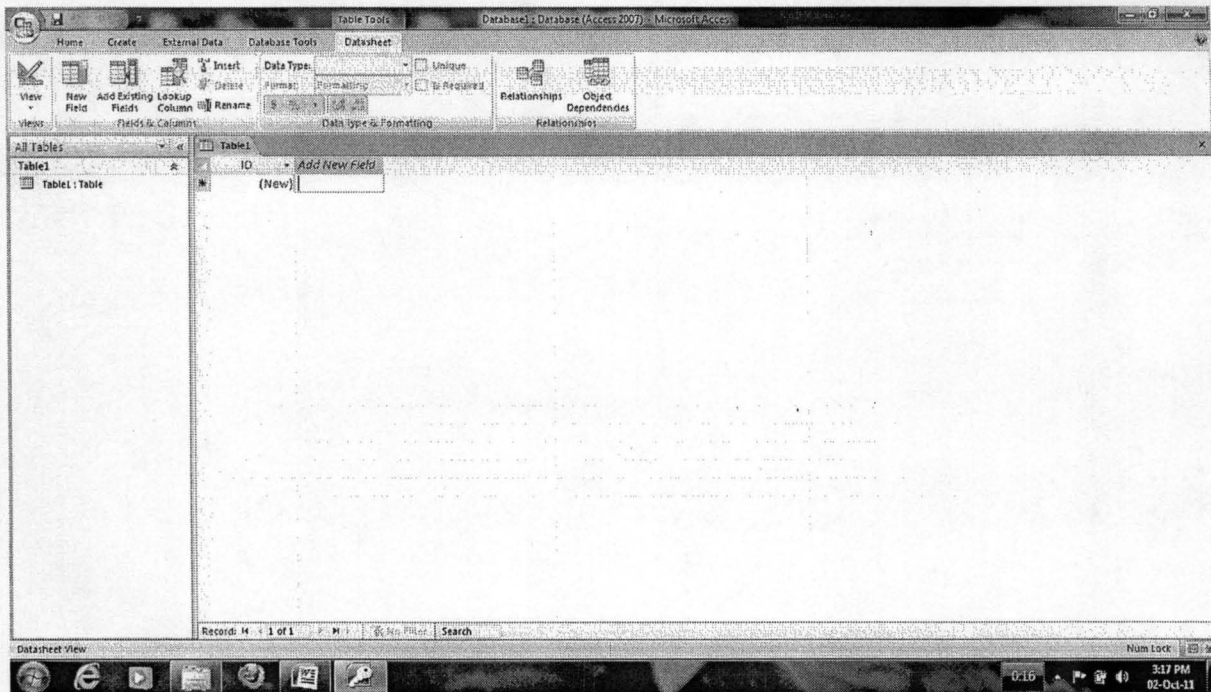in this project entails all field name, data type, and size.

Fig. 3.2: Microsoft access working environment

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3.3 Design

The proposed system is achieved by designing software. The system has user friendly interface that makes it easy for use to all users. The input forms are design to accept alphabets, numbers, as well as special characters. Visual basic 6.0 was used for designing the proposed system due to its features such as language interoperability, garbage collection, enhanced security, and improved versioning support. This programming language is used for building a wide range of enterprise applications that run on the .NET Framework. Support for VB includes project templates, designers, property pages, code wizards, an object model, and other features of the development environment. The systems for health-care institutions were designed based on the Entity-Relationship Model illustrated in the diagram below:
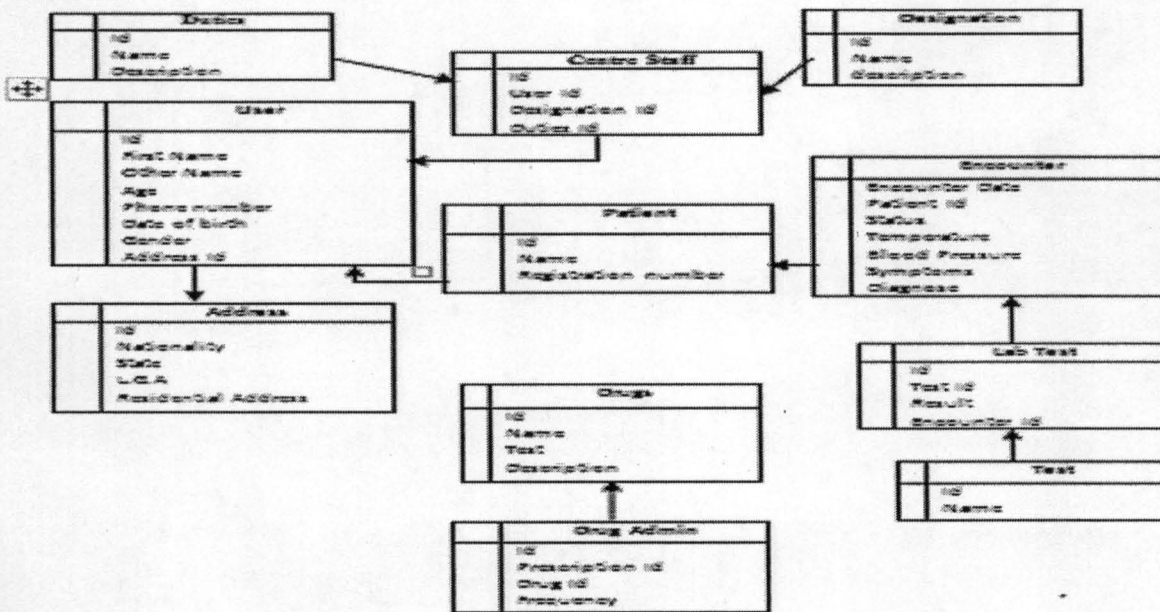

Fig.3.2: Entry relationship for health care information system

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This E-R model is structured into one database with fourteen tables as follows:

- ❖ THE USERS TABLE: This table contains information about the users such as First Name, Last Name, Middle Name, Age, Phone number, Date of Birth, and Gender.

- ❖ THE PATIENT TABLE: This contains fields such as Unique ID, and User ID.

- ❖ THE LABTEST TABLE: This contains information about medical test conducted (test name, result etc).

- ❖ THE DRUG TABLE: It contains fields such as the drug name, the total in stock, and the description of what the drug is used for.

- ❖ THE ENCOUNTER TABLE: This Table is used to keep records of patient encounter with the medical staff , nurse ,doctor ,etc. the fields available in this table are date of visit, patient identification number, patient's status, the name of the staff that attended to such patient, patient's temperature, blood pressure, weight ,symptoms, and diagnosis.

- ❖ THE DRUGADMIN TABLE: The fields contained in this table are prescription id, drug id, frequency of usage, start date, and end date.

- ❖ THE DUTIES TABLE: This is where duties are created by the chief nursing officer, and are assigned to nurses and other medical staff that operate on shifts. The name field contains the name of the three shifts operate at the health centre. The center staff id field is the id of the staff assigned to a particular duty.

- ❖ THE DESIGNATION TABLE: The names of possible positions that can be occupied by the health center staff are stored here. Also the description of what each personnel do is available here.

- ❖ THE PRESCRIPTION TABLE: This is specially for storing patients' prescription during each encounter at the center.

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❖ THE TEST TABLE: This stores the list of all medical tests that can be conducted by the medical laboratory unit of the health centre.

3.4 Description of the Computer-Based Health Care Management Information System

The Health Care information system shown in fig 4.1 is divided into two main modules namely the patient-care module and general module.

1. **Patient-care module**

   This module centers on enhancing the ability to track patient's record. It enhances the nurses, doctors, pharmacy, and laboratory integration towards improving patient's perception of care. This module takes care of patients encounter with the medical staff. It presents a tool for storing and retrieving patient information. Information that are available in the patient-care module are Basic patient information (name, address), diagnostic information. Physicians' orders, Medication data, Vital signs, intake/output, Diet information, Nursing notes, and Case management information.

2. **General module**

   This is concerned with management of data in respect of the staffing, supplies, inventory, pharmacy ordering, prescription handling, outcomes, and assessment control, etc of the health centre .Reports that can be generated by the proposed system are:

   I. Patient Medical Record: This shows the name, patient id, and other necessary information about a patient. The patients encounter (diagnosis, treatment received) at the

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health centre is also available here. The medical history of such patient is contained in this report (See fig 3.3, 3.4, 3.5 and 3.6).
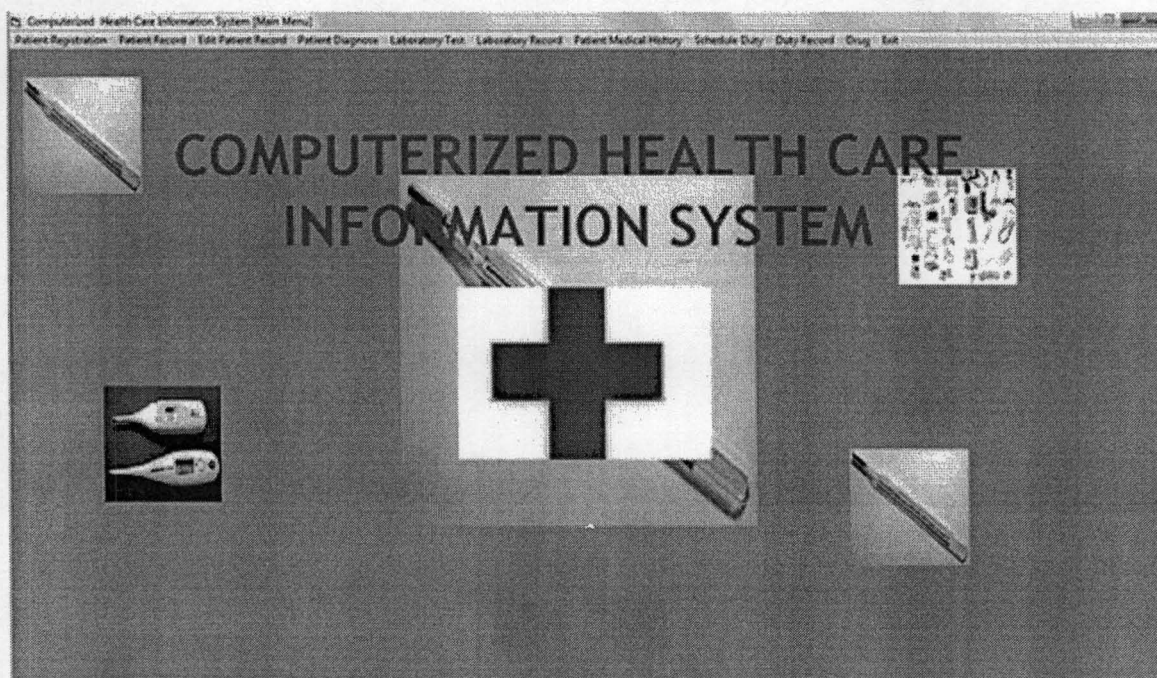

Fig 3.3: Main Interface for Record
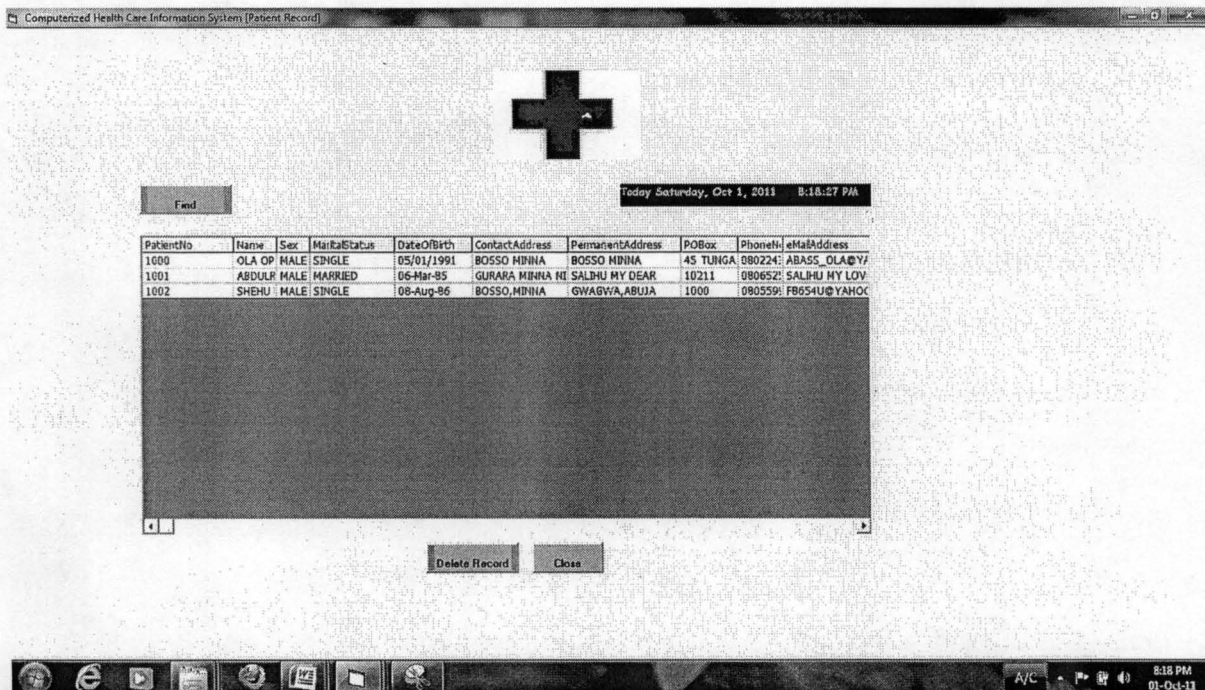
Fig 3.4: Patient registration
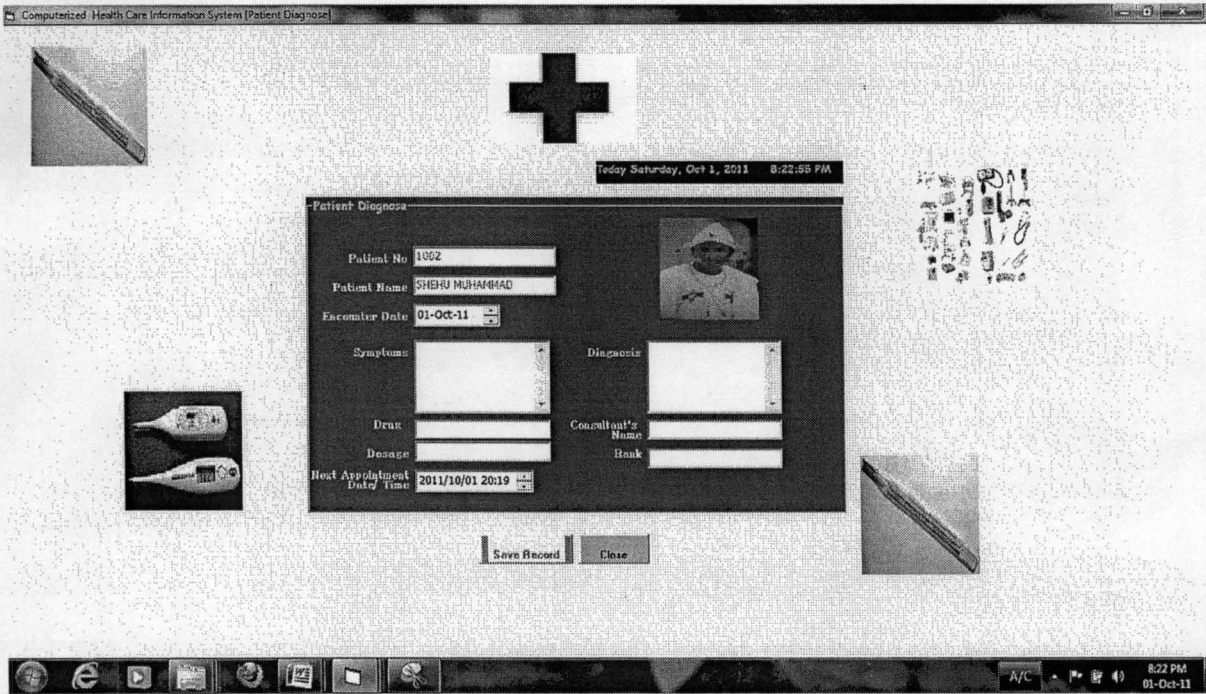

Fig 3.5: Patient Record

Fig 3.6: Patient Diagnose

II. Laboratory Stock: This shows the record of materials brought in, the quantity used, the quantity left, the number of tests conducted and the amount generated by the medical laboratory (See fig 3.7).
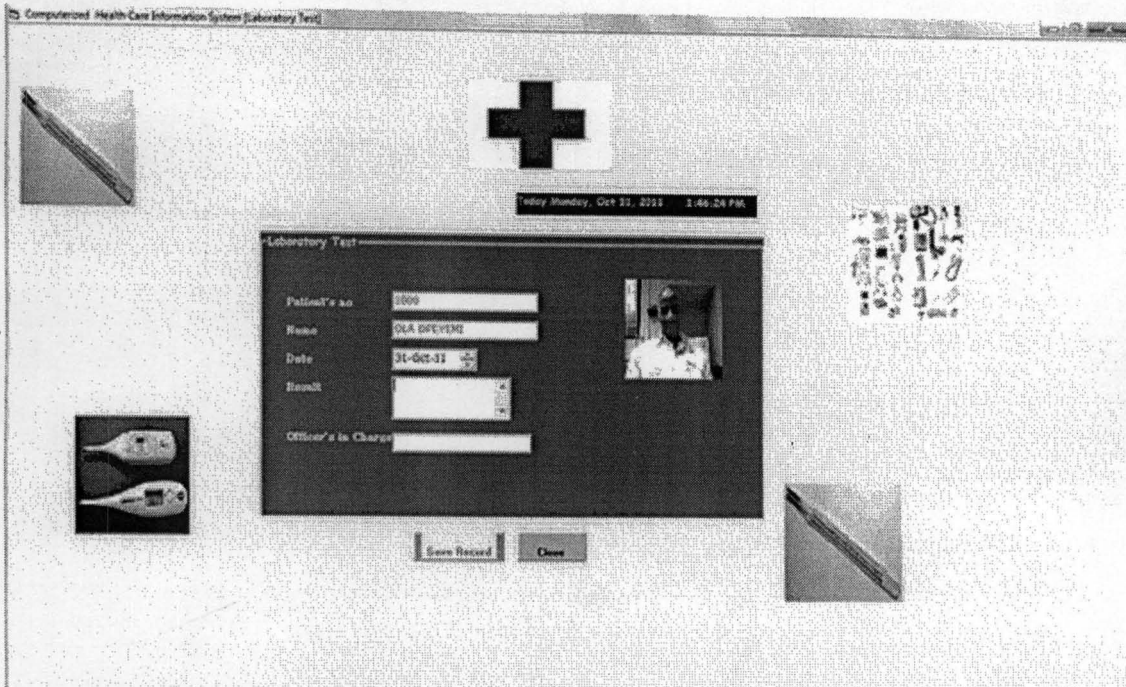
Fig 3.7: Laboratory Report

III. Pharmacy Stock Inventory: This report shows how resources (mostly drugs) have been allocated, administered and left in stock and also makes account of how drugs are dispensed (See fig 3.8).

Fig 3.8: Drug Table

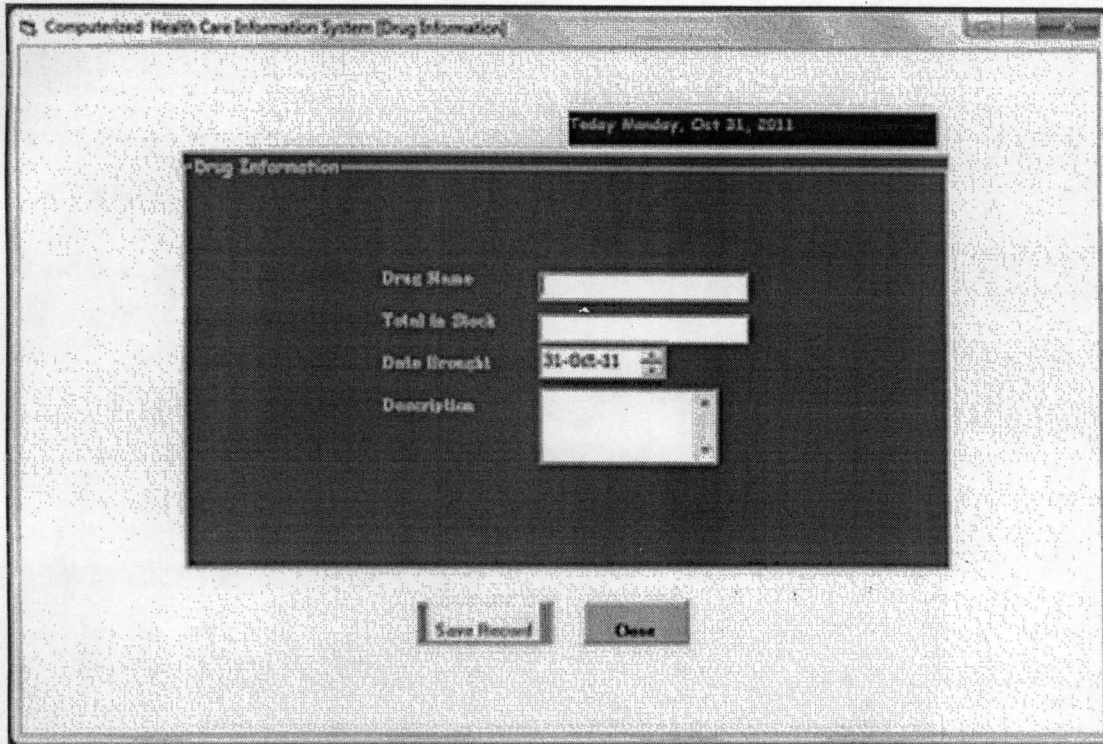IV.   Nursing Duties Schedule: This is the record showing how duties have been scheduled among nursing staff. The number of nurses on duty, date to work, and hour to start working, hour to end shift etc are presented in this report (See fig 3.9).
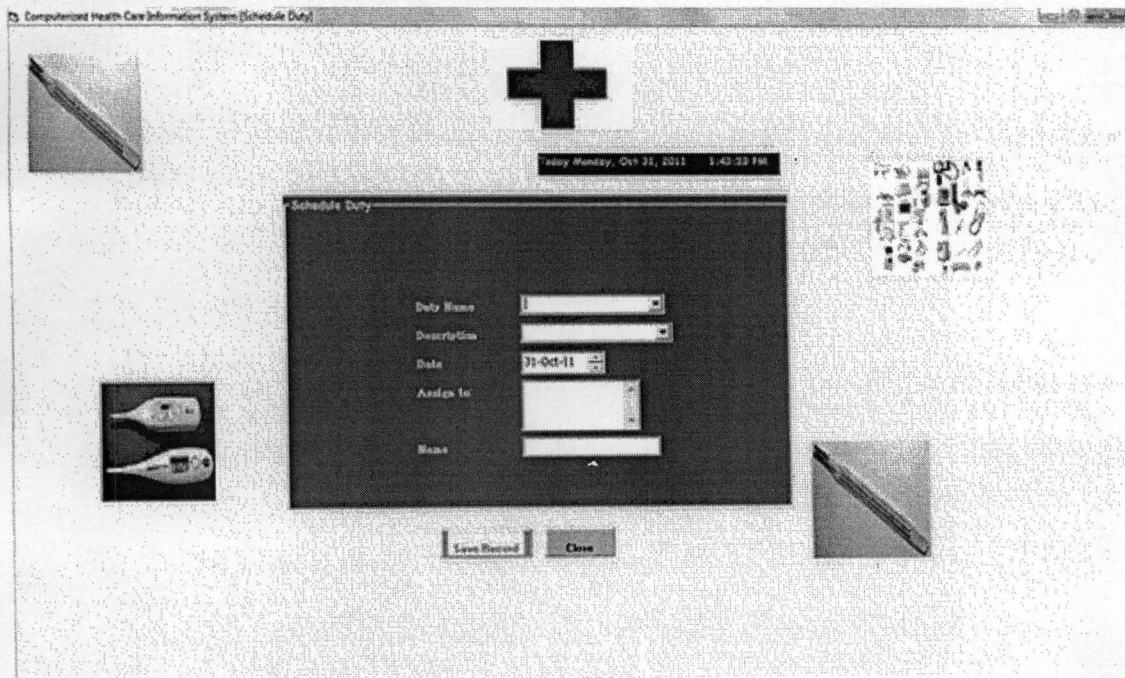
Monday, Oct 31, 2011   1:43:33 PM

Schedule Duty

Duty Name

Description

Date   31-Oct-11

Assign to

Name

Save Record   Close

Fig 3.9: Duty Schedules

CHAPTER FOUR

SYSTEM IMPLEMENTATION

4.1   Introduction

Software is set of program or instructions implemented on either hardware or firmware to make the computer useable. Hardware are the physical component of the machine, firmware are software routines stored in the read-only memory (ROM), programmable read-only memory (PROM).

4.2   Choice of Programming Language

The programming language used is visual basic 6.0. It is an event driven programming language and associated with development environment from Microsoft. Visual basic is derived from basic and enables the rapid application development (RAD) of graphical user interface (GUI) application [17].

Visual basic provides a unique and complete software architecture," Architecture" is the way computer programs such as windows and visual basic program work together. The major reason why visual basic has been successful is that it include everything necessary to write to windows, it also provide many set of tools to aid in building exiting applications. It enables programmers to fully utilize all the potentials of the language.

4.3   Installation and Testing

After compilation of the program was successful testing became the next step. The program has two main ways of operation namely; Running the software and installation the software.

Running the software:

> Insert the disk labeled "health information system".

> Open the containing folder.

> Copy the folder into Drive C of the computer to enable database connection.

> Copy the folder and double click on the .exe file "Health care".

> Enter the username "Admin" and password "admin1" to log in

> Follow the on screen steps for the installation

4.3.1   Input specification

The data to be inputted are as follows:

> Patient number

> Patient name

> Address

> Date of birth

> Gender

> Age

> Telephone number

> Marital status

> P. o. box

➢ Duty nurse

➢ Designation

4.3.2   Output Specification

This has to do with the output result of the system. Which are as follows:

➢ Running interface

➢ User account

➢ Main interface for health-care

➢ Patient registration

➢ Patient record

➢ Patient medical history

➢ Laboratory Report
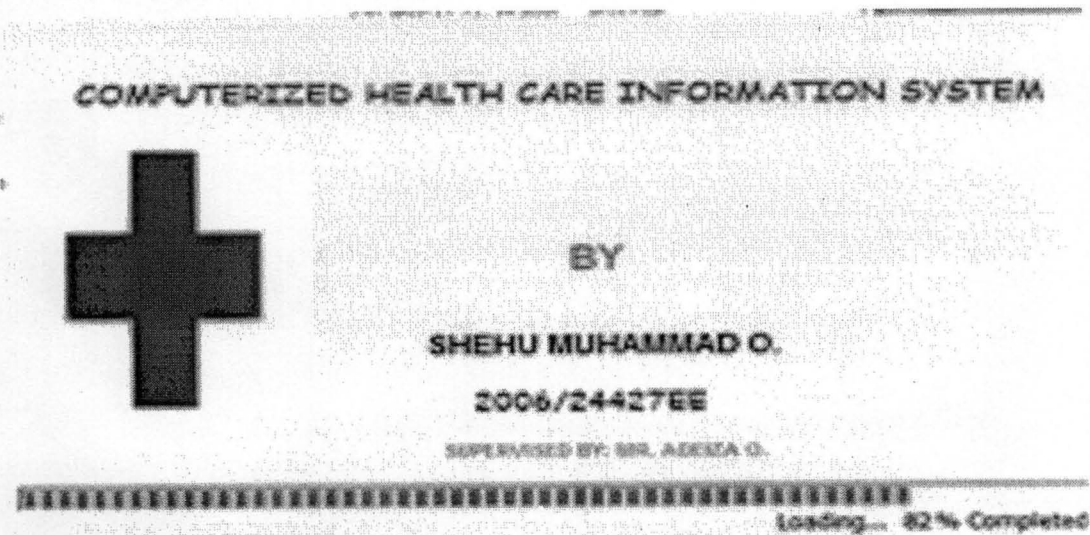
➢ Drug Table

➢ Schedule duty
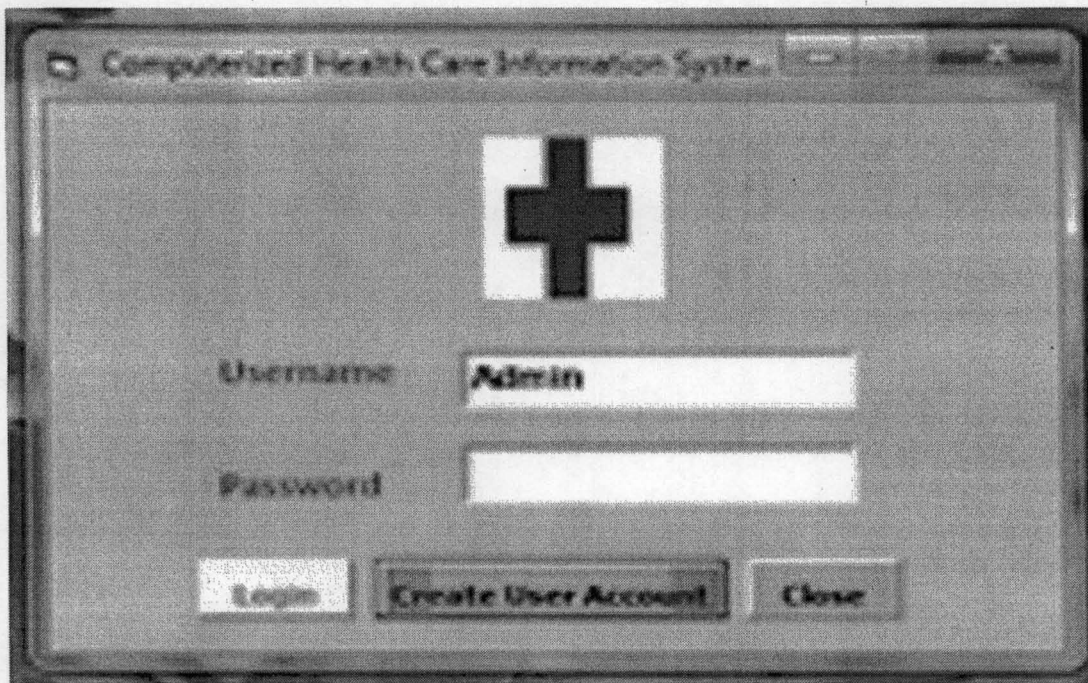
Fig.4.1 : Running interface

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Fig.4.2 : User Account Access

4.5   Training

Training is necessary so that users can understand the working principles of the system. Two group of will have to be trained, who are:

➢ The technical personnel who is responsible for operation and maintenance of the system.

➢ System users and managers.

Subsequent training can be scheduled to ensure these persons clearly the operating procedures.

4.5 System Maintenance

System maintenance adjusts and improves system by having system audit, user feedback, and periodic evaluations and by making changes based on new condition. Even with the conversion accomplished and the user trained, the system won't run itself. The system must be

monitored to ensure that operations are successful. Maintenance includes not only keeping the machine running but also updating and upgrading the system to keep pace with new products, services, regulations and other requirements.

Two tools are often required as part of the maintenance system. They are

- Auditing
- Evaluation.

Auditing: Auditing means an independent review of an organization's information system to see if all records and systems are as they should be, Often a system analyst will design an audit trail helps independent audit to trace the record of transaction from its output back through all processing and storage to its source.

Evaluation: This is done by user who is able to compare the work done by the system against some present criteria. Other evaluations may be done by the system analyst.

CHAPTER FIVE

CONCLUSION AND RECOMMENDATION

5.1   Conclusion

This study is carried out to introduce the use of computer in some units of Health-care Centre's. These units are those that are directly involved with the medical arm of the centre. It was observed that the mode of storing and retrieving patient information is time-taken and tedious. Consequently, an automated information system was designed to ameliorate the observed inadequacies in the manual-based record keeping system currently being used. More so it produces a more complete and higher quality record. The Health Care information system is designed using VB supported by Visual studio (.NET Framework) and Microsoft access as database.

5.3   Recommendation

From the observed benefits derivable from automated information system; I will like to suggest that:

- ❖ Health-care institutions should migrate from the manual record keeping method to the automated system.

- ❖ The present staff in the medical record units could be retrained to man the automated system being proposed.

- ❖ Management must as a matter of necessity invest in information technology, due to its potential benefits in medical sciences, medical record keeping and administration.

- ❖ Proper maintenance of the system.

- ❖ Management should ensure regular update of records.

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APPENDIX: SOURCE CODE

Program Codes

Private Sub Timer1_Timer()

Progload.Value = Progload.Value + 2

txtLoad.Text = Val(txtLoad.Text) + 2

If Progload.Value = 100 Then

Form1.Show

Unload Me

End If

End Sub

Private Sub cmdCancel_Click()

End

End Sub

Private Sub cmdLogin_Click()

Dim dbsstudent As Database

Dim rststudent As Recordset

Dim strregno, strpass As String

Dim rBookmark As Variant

strregno = Trim$(txtusername.Text)

strpass = Trim$(txtpassword.Text)

Set dbsstudent = OpenDatabase(App.Path & "\healthcare.mdb")

Set rststudent = dbsstudent.OpenRecordset(_

"SELECT username,password " & _

"FROM account ORDER BY username,password", _

dbOpenDynaset)

' Get user input and build search string.

```vb
If strregno = "" Then

MsgBox "Please your username", vbCritical + vbOKOnly, "User Login"

ElseIf strpass = "" Then

MsgBox "Please your password", vbCritical + vbOKOnly, "User Login"

Else

strregno = "username = '" & strregno & "'"

strpass = "password = '" & strpass & "'"


With rststudent

    ' Populate recordset.

    rBookmark = .Bookmark

    ' Find first record satisfying search string. Exit

    ' loop if no such record exists.

    .FindFirst strregno

    .FindFirst strpass


    If .NoMatch Then

        MsgBox "No records found with " & _

            strregno & "."


.Bookmark = rBookmark

Else

Form4.Show

txtpassword.Text = ""

cmdCancel.Caption = "Close"


    End If


    End With

End If

End Sub


Private Sub cmdSignUp_Click()
```

```vb
2.Show

        me.Text = ""

        rd.Text = ""


    Sub EnableAddButton()

        n(txtusername) > 0) And (Len(txtpassword) > 0) Then

        dLogin.Enabled = True


    cmdLogin.Enabled = False

    End If

End Sub


Private Sub txtpassword_Change()

    Call EnableAddButton

End Sub


Private Sub txtusername_Change()

    Call EnableAddButton

End Sub


Private Sub Form_Load()


With Data1

.DatabaseName = App.Path & "\healthcare.mdb"

.RecordSource = "account"

End With


End Sub
```