

## COMPUTER-BASED MANAGEMENT INFORMATION SYSTEM IN HEALTH-CARE DELIVERY INSTITUTIONS: COMPUTERIZATION OF UNAAB'S HEALTH CENTRE

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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 paper is to present a computer-based management information system that can be used in scheduling and managing information resources in health care delivery 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). The paper discussed the benefits which can be derived by the health institutions, medical staff and as well as their patients from computerized information system.

**Keywords:** computerization, health information systems, medical records.

### 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 (Adelanwa *et al* 2002). 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 (Whitehead, 1991).

The term, information system, refers to a computer-based system application designed to support the operations, management, and decision functions of an organization. Information systems in organizations thus provide information support for decision-makers. Information systems encompass transaction processing systems, management information system, decision support systems, and strategic information systems (Robinson, 1997).

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, and 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 (Dudley, 1968).

The main purpose of this study is to highlight the use of computer and its importance in scheduling and monitoring the various resources of the UNAAB's health-care; 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 computer-based documentation that will simplify the manual ways of recording data can be achieved by developing software, which can perform the above stated operations.

## Literature review

A management information system has been 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 (Awad, E., 1988). 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 (Dudley, 1968).

A health information management system is a computerized system designed 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.

## Statement of the problem

The design and implementation of computer-based management information systems in health-care institutions can be seen as a giant stride towards developing an advanced, efficient, and effective management information system, whereby most problems associated with manual information system can be completely eliminated.

The UNAAB Health Centre is an arm of the University of Agriculture of Agriculture, Abeokuta. It operates two clinics, one at the mini campus, Isale-Igbein, and the other at the permanent site, Alabata. The centre operates 24 hours daily. The Isale-Igbein clinic keep operates two shifts (morning and afternoon) while the permanent site clinic operates three shifts (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. The information system used at the centre is 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.

## Objectives of the study

This study sets out to solve the problems encountered with the use of manual systems of recording data in the Health Centre of University of Agriculture, Abeokuta.

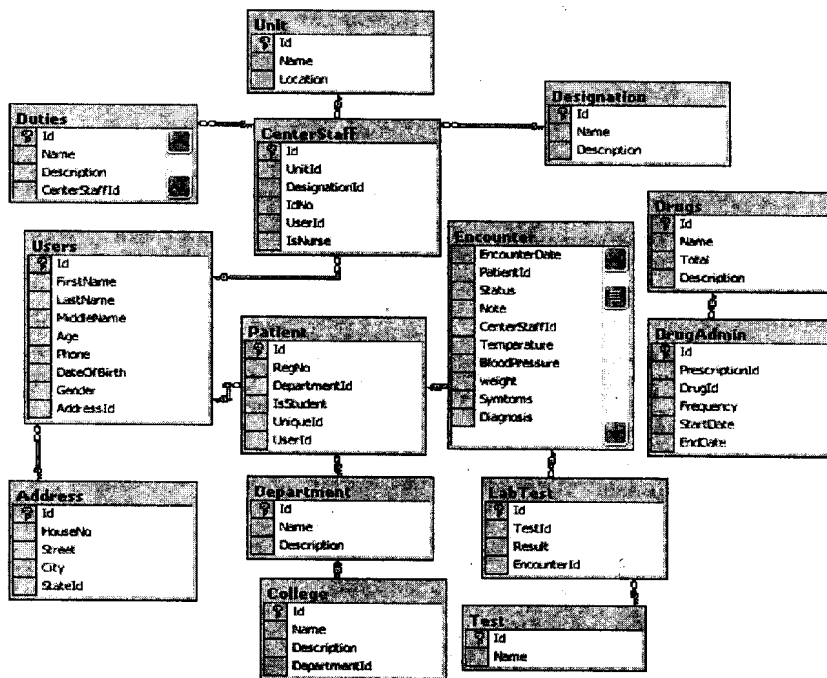
The system aims to provide efficient information to management at all levels for decision-making, planning, and budgeting; eliminate the number of unnecessary source documents; reduce time and effort needed for documentation; increase the quality of data; increase data reusability; reduce cost of duplicating data; and provide data security.

## Materials and methods

In order to have a detailed study of the existing system, a structured interview schedule was used to collect data. The information received by the staff is divided into 4 components, which are utilization and statistics, finance, medical information and inventory.

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. Microsoft C# (pronounced C sharp) 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 C# includes project templates, designers, property pages, code wizards, an object model, and other features of the development environment.

The systems for health-care institutions was designed based on the Entity-Relationship Model illustrated in the diagram below:



**Figure 1:** Entity-relationship model for UNAAB Health Centre Management Information System (MIS).

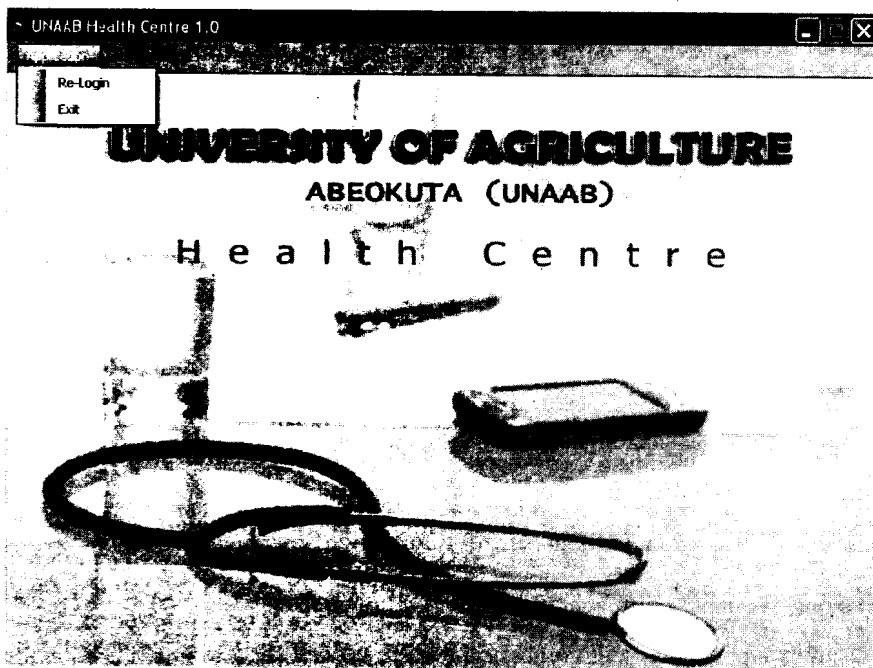
This E-R MIS model is structured into one database with seventeen tables as follows:

1. **THE USERS TABLE:** This table contains information about the users such as First Name, Last Name, Middle Name, Age, Phone, Date of Birth, and Gender.
2. **THE PATIENT TABLE:** This contains fields such as Registration Number, Department ID, Student ID, Unique ID, and User ID.
3. **THE LABTEST TABLE:** This contains information about medical test conducted (test name, result etc).
4. **THE UNIT TABLE:** This table contains the name of each unit, its id, location fields.
5. **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.
6. **THE ENCOUNTER TABLE:** This Table is used to keep records of patient encounter with the medical staff ,that is 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.

7. **THE DRUGADMIN TABLE:** The fields contained in this table are prescription id, drug id, frequency of usage, start date, and end date.
8. **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 UNAAB health centre. The center staff id field is the id of the staff assigned to a particular duty.
9. **THE DEPARTMENT TABLE:** The names of every department that can be found within the university environment are stored here.
10. **THE COLLEGE TABLE:** The list of each and every college operating in the University is stored here.
11. **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.
12. **THE CENTRESTAFF TABLE:** Fields such as unit-id, designation-id, id-no, user-ID found here. The list of all staff can be generated from this table.
13. **THE PRESCRIPTION TABLE:** This is specially for storing patients' prescription during each encounter at the center.
14. **THE TEST TABLE:** This stores the list of all medical tests that can be conducted by the medical laboratory unit of the health centre.

### Description of the computer-based health care management information system

The Health Care MIS as shown in Figure 2 is divided into two main modules namely the patient-care module and general module.



**Figure 2:** Main interface for the health-care MIS.

#### 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 (see Figure 3–7 in Appendix A). 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 health centre is also available here. The medical history of such patient is contained in this report.

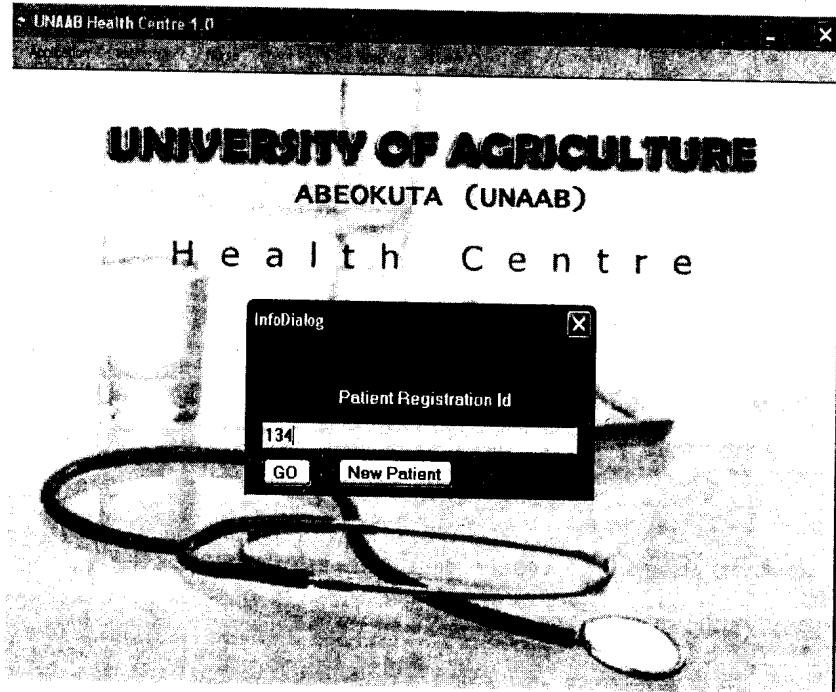


Figure 3: Staff nurse Access form on patient's record.

Patient File	
Patient Patient Encounter	
Patient No	134
First Name	ade
Last Name	yemi
Middle Name	ola
Department	computer
Phone	08034292166
Date Of Birth	08 August 1980
House #	34
Street	keoo
State	ogun
Gender	<input type="radio"/> Yes <input checked="" type="radio"/> No
Age	26
Matric No	976

Figure 4: Patient record.

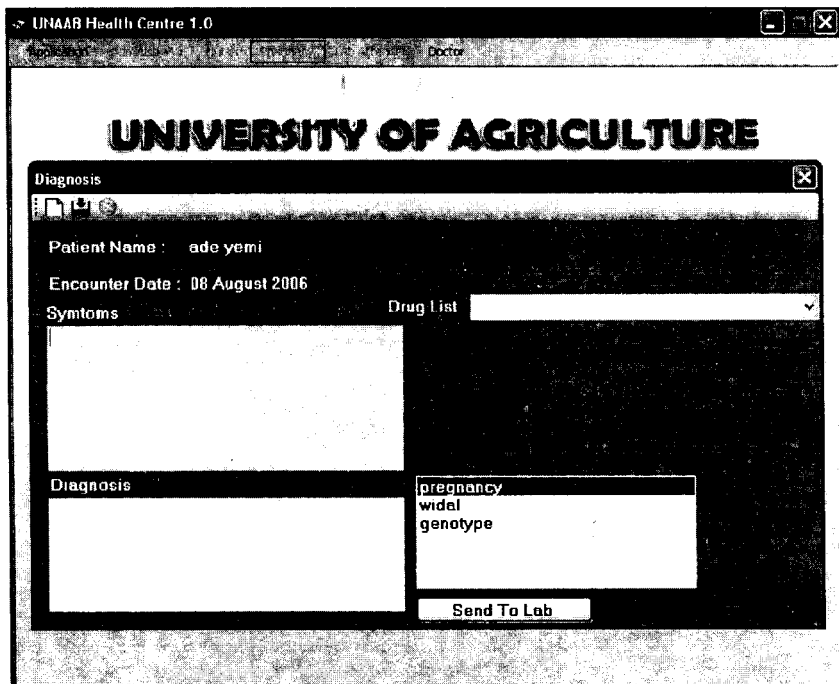


Figure 5: Doctor's diagnosis report.

- ii. 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.

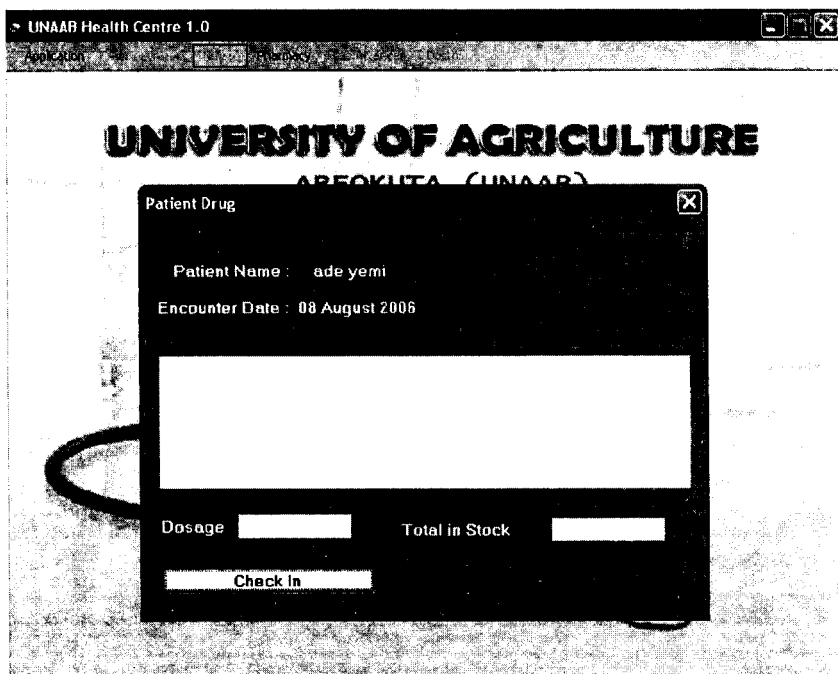


Figure 6: Pharmacy dispensing.

- iii. 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.

- iv. Medical Staff Record: This keeps the names, post and other relevant information about all the staff at the health centre.
- v. 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.

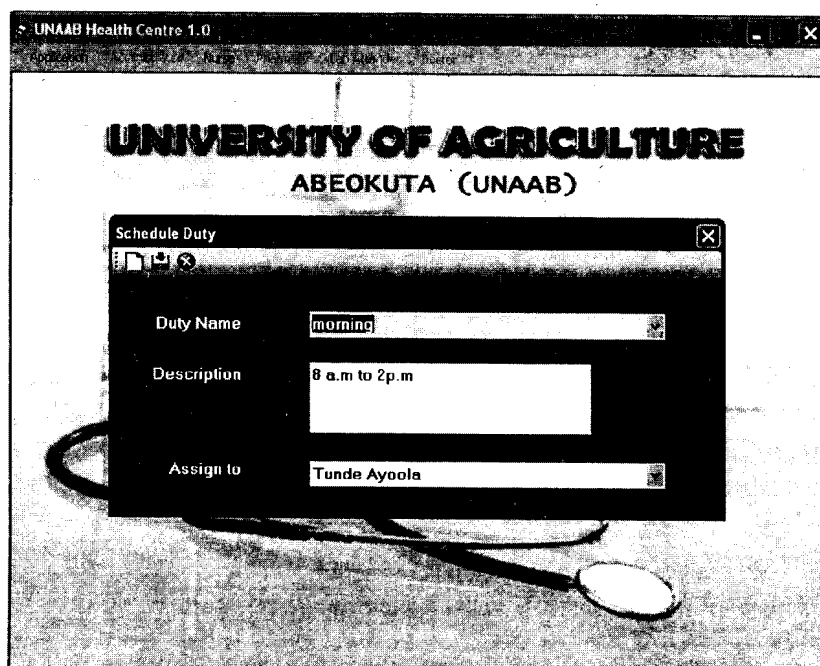


Figure 7: Nurses' duty schedule.

## Conclusion and recommendations

This study was carried out to introduce the use of computer in some units of the University of Agriculture Health Centre. 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 management information system was designed to ameliorate the observed inadequacies in the manual-based record keeping system currently being used. The Health Care MIS was designed using C# supported by Visual studio (.NET Framework) and Microsoft SQL server 2000 for the creation of the required database.

Arising from the observed benefits derivable from automated MIS; we 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. Finally, management must as a matter of necessity invest in information technology, due to its potential benefits in medical sciences, medical record keeping and administration.

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