AN EFFICIENT MODEL FOR HEALTHCARE MANAGEMENT

A CASE STUDY OF ASOKORO GENERAL HOSPITAL, FCT, ABUJA.

BY

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NOVEMBER 2015

CERTIFICATION

This is to certify that this work "An Efficient Model for Healthcare Management" was carried out by **Garuba Oluwaseun**. Reg. Number: **20094771428** in partial fulfillment for the award of the degree of M.Sc in Information Management Technology in the Department of Information Management Technology at the Federal University of Technology, Owerri.

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ABSTRACT

An Efficient Model for the Healthcare Management is an element of health informatics that information platform that manages all aspects of operation in the environment. This study generates a model that seeks to integrate all aspects and major playing parts of the operation within the medical ecosystem using the Agile methodology.

Keywords: Management information system; Hospital management system and Agile

CHAPTER ONE

1.0 INTRODUCTION

1.1 Background of the Study

A significant part of the operation of any hospital involves the acquisition, management and timely retrieval of great volumes of information. This information typically involves: patient's personal information and medical history, staff information, room and ward scheduling, staff scheduling and various facilities waiting lists. All of this information must be managed in an efficient and coastwise fashion so that an institution's resources may be effectively utilized.

The aim of this study is to develop an efficient model for healthcare management for Asokoro General Hospital, FCT, Abuja that will computerize and automate the Hospital's administrative

optimum in tasks assigned to them. This is done effectively and efficiently at a required time at a click of a button.

This was done by looking at the existing system, analyzing its strong and weak points design and implementation of a new system. Interviews, observation and document reviews were tools used in data collection. SQL Server was used for the database management system, C# and ASP.Net were used for design.

Data flow diagram, relationship diagram and the data dictionary were results of the design and implementation saw different interfaces as seen in the last chapter of this project report.

Crescent, off Yakubu Gowon Crescent, Asokoro, Abuja. It offers specialist care in various aspects of medicine and was established by a decision reached by the federal government to establish at least one tertiary health institution in each state of the federation. Its mission statement in line with that of the federal government is to provide qualitative, affordable, specialized/tertiary level hospital care to its citizenry and to ultimately reduce the burden of diseases within the communities, through provision of prompt and emphatic preventive, curative and rehabilitative services.

1.2 Statement of the Problem

The Asokoro General Hospital, currently runs a semi-manual system for the management and maintenance of critical information. This current system generates a sizeable amount of paper work that is difficult to deal with, in terms of storage, retrieval, maintenance and sharing among the medical personnel. The personnel spend more time looking for information than they would spend on health care delivery. A major problem with the current system is that often information

billing time or after it has been rejected by say an insurance company thereby causing late/delayed or no payments.

Duplication of records resulting from multiple registration and misplacement of some of them allows for a potentially damaging misinformation of staff. This does not favor the generation of reports in terms of timeliness and accuracy.

Finally, staff scheduling for the wards is difficult and fraught with errors under the current

understaffed or overstaffed. Sometimes, staffs with the wrong skills are scheduled, or staffs are required to work too many consecutive hours.

Though the current manual system is functional, the hospital's human and capital resources are not being utilized in an efficient fashion and thus the need for an automated healthcare management system.

1.3 Objectives of the Study

The objective of this thesis is to design and implement an automated efficient model for healthcare management to replace their existing manual, paper-based system. The general objectives of the study are:

1. To automate the core system of the hospital i.e register patients for admission, records of consultancy and consultants, registry, record investigations done on patients from various investigation departments and the pre and post natal care of patients in the Obstetrics and Gynecology.
2. To integrate all functional parts of the hospital into one location thereby enhancing communication and a good network flow.
3. To make the system completely menu-driven and hence user-friendly. This is necessary to allow non-programmers use the system effectively and system could act as catalyst in achieving objective.
4. To ensure data integrity and security by protecting their data against non-authorized users or guiding against loss of patient's file or record.
5. This newly proposed system helps to eliminate swapping of patient's record and

6. To develop a reliable, understandable and cost effective system.

1.4Scope of theStudy

The Scope of this research work will focus on the .net framework to provide a rapid development and deployment of an application

1. An Efficient Model for Healthcare Management Solution which comprises of
    a. Registry/records management information system
    b. Consultancy/Diagnosis Management System
    c. Investigation management information system
    d. Obstetrics and Gyaenecology management system
    e. Nursing management information system
    f. Pharmaceuticals management system
2. The users management system which takes care of the account of users, roles, logs(which takes care of who and when one came on the system and what they did while on the system) and access or permissions.
3. Written report of the project
4. User manual

1.5 Significance of theStudy

The significance of this study is enormous in that it benefits the patient, staff and the general administrators of the system. The benefits that the hospital; would experience upon development/implementation of this model includes, but is not limited to the following:

1. Standardizing data, resulting in fewer corrections and significantly lowering the incidence of missing or incorrect data.

2. Consolidating data stores into one location ensuring data integrity and providing a database for future statistical and management reporting.

3. Reducing time spent by staff filling out forms, freeing resources for more critical tasks

4. Speeding up the billing process by having accurate, timely data, resulting in quicker payments and a better cash flow.

5. Increased error checking to reduce errors made in scheduling, making schedules more reliable, increasing staff morale, and reducing the amount of time spent by administration creating and publishing schedules.

6. Delivers multi-user support, which would provide simultaneous record retrieval access to as many users with necessary record locking.

7. It will provide a totally secure environment through the different levels of access and use, logging attempts to breach the security restrictions and disabling copying and printing of

8. The application will enable setting up a duplicate database server and updating it throughout the normal operations of the system. This is done in case of a failure of any of the two servers; the system will be able to continue without being interrupted.

1.6 **Limitations of Study**

The limitation of this work include modules like primary healthcare, human resources, operation theatre, utilities and store management systems because of the following constraints

1. Budgetary Constraints: The cost of gathering necessary materials useful of this project is enormous. This is because the hospitals runs over seventy per cent (70%) of its activities on paper.
2. Time Availability: The time available for this project will have an adverse effect on its outcomes as the project focus would be narrowed to ensure that the workload is achievable within the time specified. Taking into consideration the possibility of unforeseen circumstances.
3. Information Availability: Availability of staff members for interview is not encouraging as they were not readily available for questioning or are trying to hoard information possibly for security purposes.
4.

CHAPTER TWO

2.0LITERATURE REVIEW

2.1 AN EFFICIENT MODEL FOR HEALTH CARE SYSTEM

An Efficient Model for Health Care System refers to a computer system designed to manage all the hospital's medical and administrative information in order to enable health professionals to perform their jobs more effectively and efficiently. Moreover, HIS manages all the information

research. HIS consists of at least two of the following components: Clinical Information System (CIS), Financial Information System (FIS), Laboratory Information System(LIS), Nursing Information System (NIS), Pharmacy Information System (PIS), Picture Archiving and Communication System (PACS), and Radiology Information System (RIS). Each category has its own function, department and users in improving hospital services.

The application of information technology in health care is unceasingly evolving as the quality of patient care in contemporary times seems to depend on the timely acquisition and processing of clinical information related to the patient (Brailer, 2005).

Cholewka (2006) asserted that a significant paradigm shift has occurred in health care service delivery from an era of physician centeredness to emphasis on quality of patient care, from isolationist practices by caregivers to networking in a global world, and from competition to collaboration among practitioners. In tandem with this trend, improvement in technology and advancement in information systems has been adopted in the health care industry as a business

According to Paul R. Vegoda (1987), Hospital Information Management System (HIMS) is defined as, an integrated information system which improves patient care by increasing the user_s knowledge and reducing uncertainty allowing rational decisions to be made from the information provided.

Dujat, Haux, Schmücker and Winter(1996) view the hospital information system as the entire information processing and information storage subsystem of a hospital, whereby it is not just about computer systems and networks and the computer-based application systems that are installed on them, but it is about the information in a hospital as a whole. HIMS consist of different softwares that are integrated in order to capture data in specific sections of the hospital.

From the various definitions of HIMS which is a subset of an efficient model for health care management, it is understood that HIMS is a very broad area as it encompasses services catering to varied departments and personnel of any hospital and finally satisfying the patient care in its

and knowledge available to the right people, in the right place, at the right time and in the right form.

The use of computers in medicine dates back to the 1950s with studies that attempted to expand the mental capacity of physicians or dealt with research on electrophysiology. With the evolution

in the 1960s, computers began to be used in the processing of information in large hospitals, in both administrative and financial functions for the collection of statistics and the development of

The use of microcomputers, beginning in the 1970s, introduced the concept of distributed processing, increasing the number of systems in use in large hospitals

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

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

The distributed processing was expanded during the 1980s with the development and greater availability of microcomputers, and the possibility of network communication of such equipment increased in the 1990s. This allowed for the emergence of hospital information systems (HIS), covering medical, administrative, and hospitality areas, although hospitality may be considered as integrated into the administrative area (Cortes, 2008).

In studying an integrated system for the medical field some scientist identified problems such as disbursement rates that were 159% greater than those originally predicted and long time periods

A scientist upon analyzing the implementation of an integrated management system in a large hospital, found that its provided important benefits that outweighed potential difficulties, facilitating the execution and improving the quality of the services offered. The two cases demonstrated the influence of the chosen system supplier (especially with regard to care, training, and customization capacity) and of the way in which the implementation project was managed, resulting in the generation of different results for both projects.

A recent review of the literature on the computerization process in basic health care between 1980 and 1997 summarizes in its title the current situation, i.e. ―a descriptive feast but evaluative famine‖ (1). The authors pointed out the lack of research on the impact of IT on the health status of the population, and the methodological limitations in the design of the studies published so

far.

Kenney(l990) presented an overview of the health care industry's trend toward multihealth system and specific adaptive strategies for social work managers in health care are suggested. Doctors of social work departments in multihealth corporations will need to resolve issues of institutional versus corporate versus professional identity. The emergence of multi health systems possesses major challenges and unique opportunities to the social work profession. Awareness of managerial strategies and critical content areas can help social work leaders enhance the role and contribution of social work in these existing arid complex health care delivery systems.

Onwujekwe (2005) and Ofovwe and Ofili (2005), in separate studies conducted to assess patient and community satisfaction, found discontent with community members who decried the poorly

compared to hospitals in urban centers. Such demographic disparity in health care accessibility benefits from hospital information technologies and telemedicine to foster collaboration between clinicians in urban areas and those in rural settlements (Ouma & Herselman, 2008).

Electronic medical record systems help to improve access to health care in remote suburban areas and ensure improved maintenance of long-term care (Keenan, Nguyen, & Srinivasan, 2006).

Beneficial uses of information and associated technology as it relates to health care improvement in this model includes monitoring individual and organizational performance, facilitating information sharing among different health care organizations through a multi-agency approach, and empowering individuals by providing relevant information to consumers, thereby helping them to make informed choices (Gillies & Howard, 2005).

Sisniega (2009) asserted that the applications of information and communication technologies (ICT) facilitate ubiquitous and instantaneous communication between organizations and their stakeholders. Information communication technology enables people and organizations to achieve a seamless workflow and effective processes through improved interactions.

Wilcke(2008) defined information literacy that affects medical practice as the ability to identify the need for information and seek, evaluate, and use information in any presented format.

According to Svensson (2002), consumer informatics helps to create virtual communities for

A study on electronic medical records by Keenan et al. (2006) found improvement in daily work and enhanced patient care: (a) medication turn-around times fell from 5:28 hours to 1:51 hours; (b) radiology procedure completion times fell from 7:37 hours to 4:21 hours; and (c) lab results reporting times fell from31:3 minutes to 23:4 minutes. In the same study, transcribing errors for orders declined, and length of hospital stay decreased.

Sammon, et al. (2009) associated patient data analysis systems (PDAs) with enhanced storage and analysis of patient data enabling physicians to reach improved clinical decisions on patient care.

Stone, Patrick, and Brown (2005) opined that effective organization creates specific and strategic objectives, including objectives related to the clinical and operational strategies. Failing to address the interrelationships that exist between the strategies can result in unforeseen negative consequences.

Morath and Turnbull (2005) recommended creating a culture of safety in health care organizations by recognizing and accommodating the multiple complexities of those organizations. A laudable approach would be to take advantage of the ability of large-scale data systems to amass information as means of identifying significant trends, and enable creation of blame-free sanctuaries in which care errors and observations of incompetence receive prompt solutions. Data production and collection requires knowledge to facilitate this undertaking. Various forms of knowledge are essential business asset used for development of new products and services, thereby useful in developing a competitive advantage in the marketplace (Rennolls

Cohan (2005) expressed a contrary view that investment in information technology does not necessarily transcend to improvement in productivity. Cohan stressed that shortfall in productivity expectations have made industrial leaders more cautious in adopting information technology in their organizational processes. Presenting a balanced view, Farquharson (2009) asserted that adoption of information technology increases productivity but falls short of expectation in improvement of productivity considering the high capital investment required for implementation. Farquharson surmised that industry productivity paradox exists to some extent with implementation of ICT. Furukawa, Raghu, Spaulding, and Vinze (2006) argue that hospital information systems enhance quality of health care delivery and safety.

Fuji and Galt surmised that some elements of hospital information systems increase patient participation in care process, thereby reducing unwanted outcome of treatment.

Harrison and McDowell (2008) linked the evolution of the LIS technology to advancements in information technology solutions, stressing that LIS has led to an increased awareness in the development of technological solutions designed to minimize medical errors.

Woodside (2007) concur that health care organizations use electronic data interchange to share history in an exchange facilitates initiation of care and decreases the chances of errors. Data interchanges that involve physician's orders and pharmacies can protect the patient by detecting prescriptions of incompatible drug combinations, and highlighting potential allergens to patients.

Many providers do not run tests, ship supplies, or provide care without assurance that the patient has insurance coverage and that the insurance company has authorized the expenditures. Electronic interchange between entities helps avoid delays in the approval process and decrease the possibility of poor outcome because of a delay in treatment.

Crane and Crane (2006) reported that numerous solutions for the medication error problem in hospital settings might be averted with the use of an integrated systems approach. However, execution of an organization's integrated electronic medical record without use of communication billing software may escalate process breakdowns.

Phillips (2009) stated that the use of an integrated system offers considerable conceptual flexibility and data integration capabilities instead of using one module for electronic records. An integrated records system promotes a user-interface with e-records repository to facilitate storage and eventual retrieval of records

Keenan et al. (2006) opined that electronic medical records system provide an effective educational tool for training of resident doctors and medical students. Health care information technology and e-health offer strong potential in research and development of clinical protocols. Future studies in this area may provide broader implications of health care information technologies applications (Keenan et al., 2006).

As a result of decades of neglect, there is a serious shortage of modern health care facilities. The

in the villages, but concerns abound about serious lack of specialized health care facilities (Ouma & Herselman, 2008).

A gap in knowledge exists about the exact number of hospital information systems functionally available in Nigeria, but the subjective data project less than 5% implementation of any form of hospital information technology in a country of more than 150 million people (Idowu et al.,

disparities exist in the implementation of hospital information systems in developing and developed countries (Grimm & Shaw,2007; Williams & Boren, 2008). Speculated reasons include poor technological and funding support in developing nations, poor management capacity at all levels that ensures seamless workflow, and a complex milieu of health care service delivery. Other possible factors for low implementation include the continual evolution of technology, confidentiality problems with use of hospital information systems, and the poor technological background of the Nigerian society (Herbst et al., 1999; Grimm & Shaw 2007;Krishna et al., 2007).

Hern-Underwood M. J. and Workman(1993) saw that in today's technical and demanding patient care system within the hospital organisation, there is a need for head nurses as nurse managers to be ever more attuned to the climate of their staff. In this study of 34 nurse managers in seven pediatric hospital organizations across a Midwestern portion of the United States, an analysis of fielder leader match scales showed the significance of group climate on retention.

Fallon says that organisation is technology in the broadest sense: processes, procedures, policies, controls, formal authority structures and techniques. Among groups or organisations, it is

and structure must be changed first. The components of each organisational theory and structure

effective manager understands the organisational forces that exist in the work place. A willingness to listen, communicate, innovate. And lead should result in both effectiveness and rewarding experiences for a manager in the hospital too.

Pineault, Raynald et al(1989) examined the extent to which health counseling practices in 3 hospitals were influenced by patient characteristics, medical care processes and organisational factors. It was seen organisational factors were more important than the patient characteristics in determining health counseling.

Seim, Lerner (1988) presented a useful overview of the planning , design and construction process, emphasizing the importance of the practical application of management skills in the hospital.

In other developing countries, structural deficiencies due to the current economic situation have led to considerable deficits in social policies — including those related to public health care.
Changes in demographic and epidemiological profiles, in urbanization and in the level of industrialization have created a need for new models of health care. Such models attribute an increasing level of importance to primary health care, the strengthening of which is considered

CHAPTER THREE

3.0METHODOLOGY AND SYSTEM ANALYSIS

3.1 METHODOLOGY

There are various methodologies some of which are listed below

1. SSADM,
2. OOADM,
3. Prototyping,
4. Expert and
5. Agile Methodology.

The Agile Methodology was employed in this project and below is an expose on the Agile Methodology and how I employed its use in this research.

3.1.1 Agile Methodology

Agile methods are a subset of iterative and evolutionary methods and are based on iterative enhancement and opportunistic development processes. The purpose of having short iterations is so that feedback from iterations N and earlier, and any other new information, can lead to refinement and requirements adaptation for iteration N + 1. The customer adaptively specifies his or her requirements for the next release based on observation of the evolving product, rather than speculation at the start of the project. There is quantitative evidence that frequent deadlines reduce the variance of a software process and, thus, may increase its predictability and efficiency.

The pre-determined iteration length serves as a time-box for the team. Scope is chosen for each iteration to fill the iteration length. Rather than increase the iteration length to fit the chosen

and past iterative methods is the length of each iteration. In the past, iterations might have been three or six months long. With agile methods, iteration lengths vary between one to four weeks, and intentionally do not exceed 30 days. Research has shown that shorter iterations have lower complexity and risk, better feedback, and higher productivity and success rates.

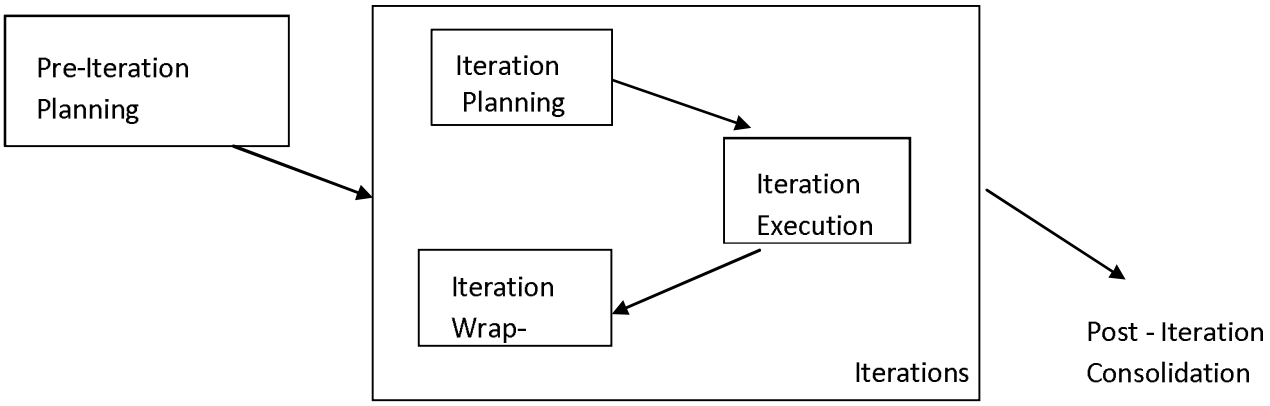


Fig 3.1: A diagram showing the agile development process (Source: Serena, 2007. Pg 6. An Introduction to Agile Software Development)

Why the Agile Methodology?

The agile methodology is preferred to other methodologies because:

1. Formalization of the software process hinders the human and practical component of software development, and thus reduces the chance for success.
2. This method welcomes changing requirements, even late in development. Agile processes harness change for the customer‘s competitive advantage.
3. Agile processes promote sustainable development.
4. The sponsors, developers, and users are able to maintain a constant pace indefinitely.
5. Continuous attention to technical excellence and good design is the watch-word.
6. Simplicity – the art of maximizing the amount of work not done – is essential.

7. At regular intervals, there are reflections on how to become more effective, then tunes and adjusts its behavior accordingly.

How Agile Methodology was employed

In the analysis of the existing system of the Asokoro General Hospital, the users who are key players in various departments relevant to the development write ―user stories‖ to describe the need the software should fulfill as it concerns their individual departments. User stories help the team to estimate the time and resources necessary to build the release and to define user acceptance tests. A user or a representative is part of the team, so he or she can add detail to requirements as the software is being built. This allows requirements to evolve as both users and developers define what the product will look like. This takes us to the next stage which is the release plan.

To create a release plan, the team breaks up the development tasks into iterations. The release plan defines each iteration plan, which drives the development for that iteration. At the end of an iteration, users perform acceptance tests against the user stories. Iterative user acceptance testing, in theory, can result in release of the software. When the users decide that enough user stories have been delivered, the team can then choose to terminate the project before all of the originally planned user stories have been implemented.

3.1.2 THE ORGANIZATION AND ITS ENVIRONMENT

The Asokoro General Hospital, FCT, Abuja is a public health sector designed to provide health care services to Nigerians and especially the people of the Federal Capital Territory – Abuja to

Hospital, is a health care providing body with perpetual succession established under the Nigerian Act, to provide social health care services in Nigeria with an aim to achieve qualitative and efficient health Care delivery at affordable prices within the public health sector.

3.1.3 DEMOGRAPHIC VARIABLE

Demographic variables examined for the Asokoro General Hospital, FCT, Abuja included: sex of the patient, age, patient‘s ethnic group, annual family income, patient's education level, mother's age at the time of the child's birth (19 years or younger, 20 to 29 years, or 30 years or older); number of siblings in the family (one, two, three, or four or more); whether any family member was employed during the preceding month; and mother's marital status. Other demographic variables examined in the Asokoro General Hospital, FCT includes ethnic group of patient, sex of patient, annual family income, highest education of adult patient, poverty index (at or above poverty threshold or below it) and size of the family.

The list below shows the different types of identifying information that will be found in patient‘s table in the database. The use of first and last names, sex, date of birth, and an additional one or more physical characteristic was used.

Patients Having different Kinds of Identifying Information recorded in the Unit Database

a. First and last names
b. Sex
c. Physical attribute (e.g., skin color) (at least one)
d. Date of birth
e.

f. Annual family income

g. Education level

h. Alias

3.2 SYSTEM ANALYSIS

3.2.1 Analysis of the Present System

The records and registry department is the first to be visited upon entry into the hospital, in this department a patient's record details are captured, registrations of in/out patient, new born etc are done and they also manage repeated visits and appointment scheduling.

The nursing station is the next station to be visited upon entry into the hospital. In this department, the patient's vital signs are captured, the patient is directed to the appropriate clinic or consultant, and if investigations are needed they direct the patient to the investigation

management of both nurses and doctors are taken care of, report on everything that happened during the shift e.g the state of the fan, the number of vacant beds etc as at time of handover. Also in this department, in-patients are divided into medical or surgical patients.

The diagnosis/consultancy section, this is the next department a patient visits. In this section a consultant is met who examines the patient and determines if he/she is an in/out patient, they also determine if the patient is a medical or surgical patient. They treat and prescribe drugs to patient

The Pharmaceuticals department handles all the drugs and medical items available in the hospital, they administer drugs as prescribed by the consultant to the patient, and they take stock of the drugs available.

The investigation department handles clinical investigations done in the hospital e.g hormonal assay, hematology, they keep record of blood bank data and maintain the status of various investigations done in the hospital.

3.3 Information flows

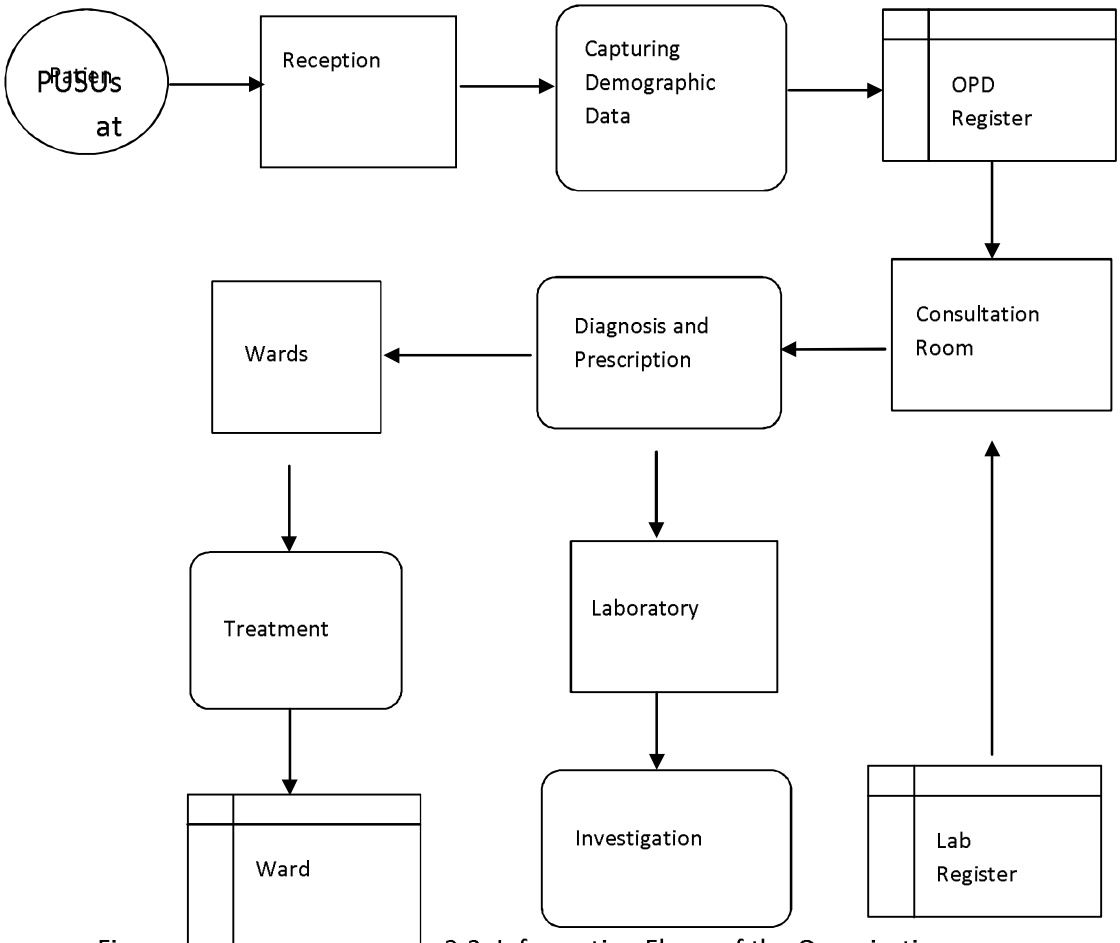


Fig 3.2: Information Flows of the Organization

Pharmacy Data Flow Diagram

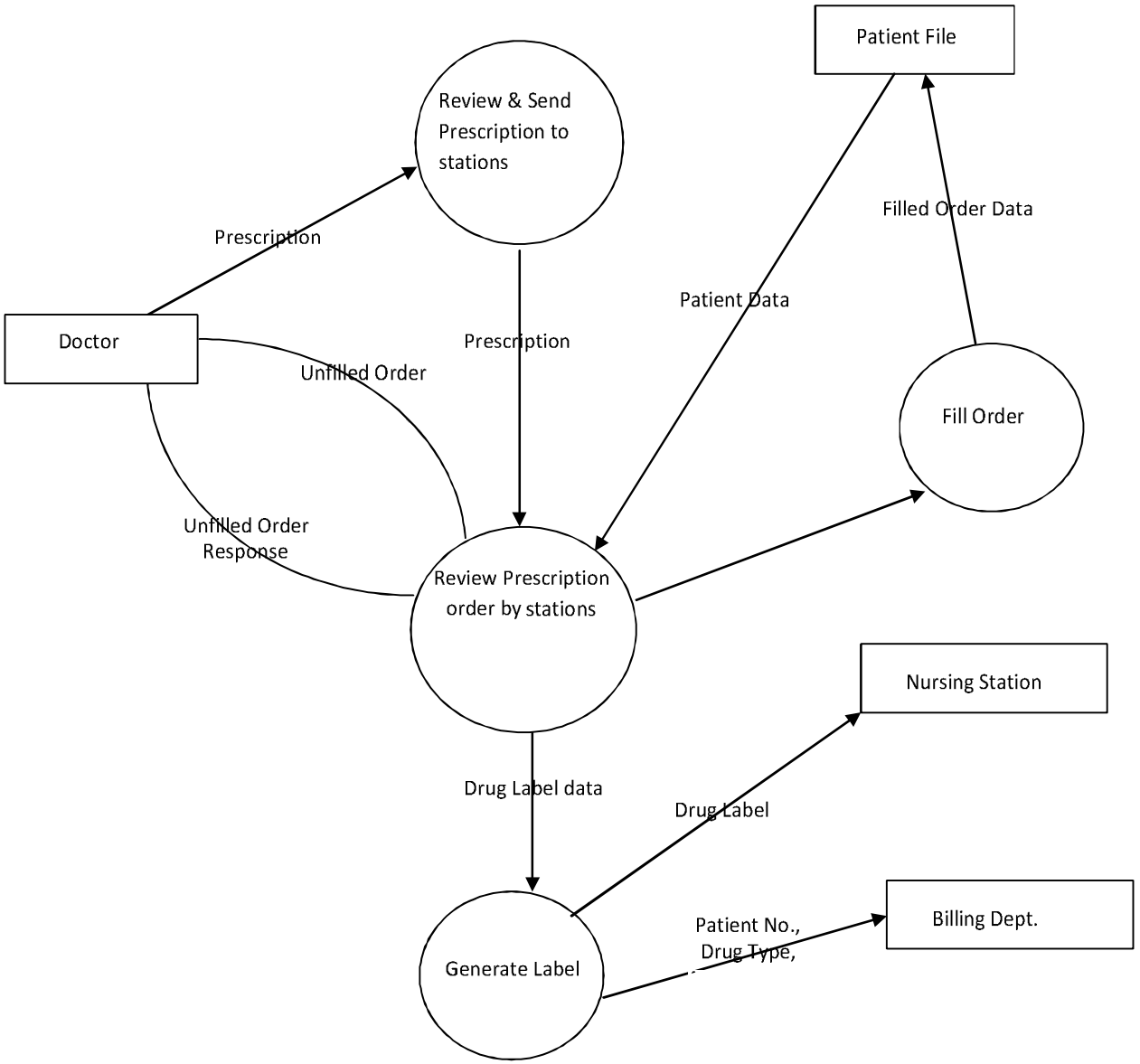


Fig 3.1 Pharmacy Data Flow Diagram

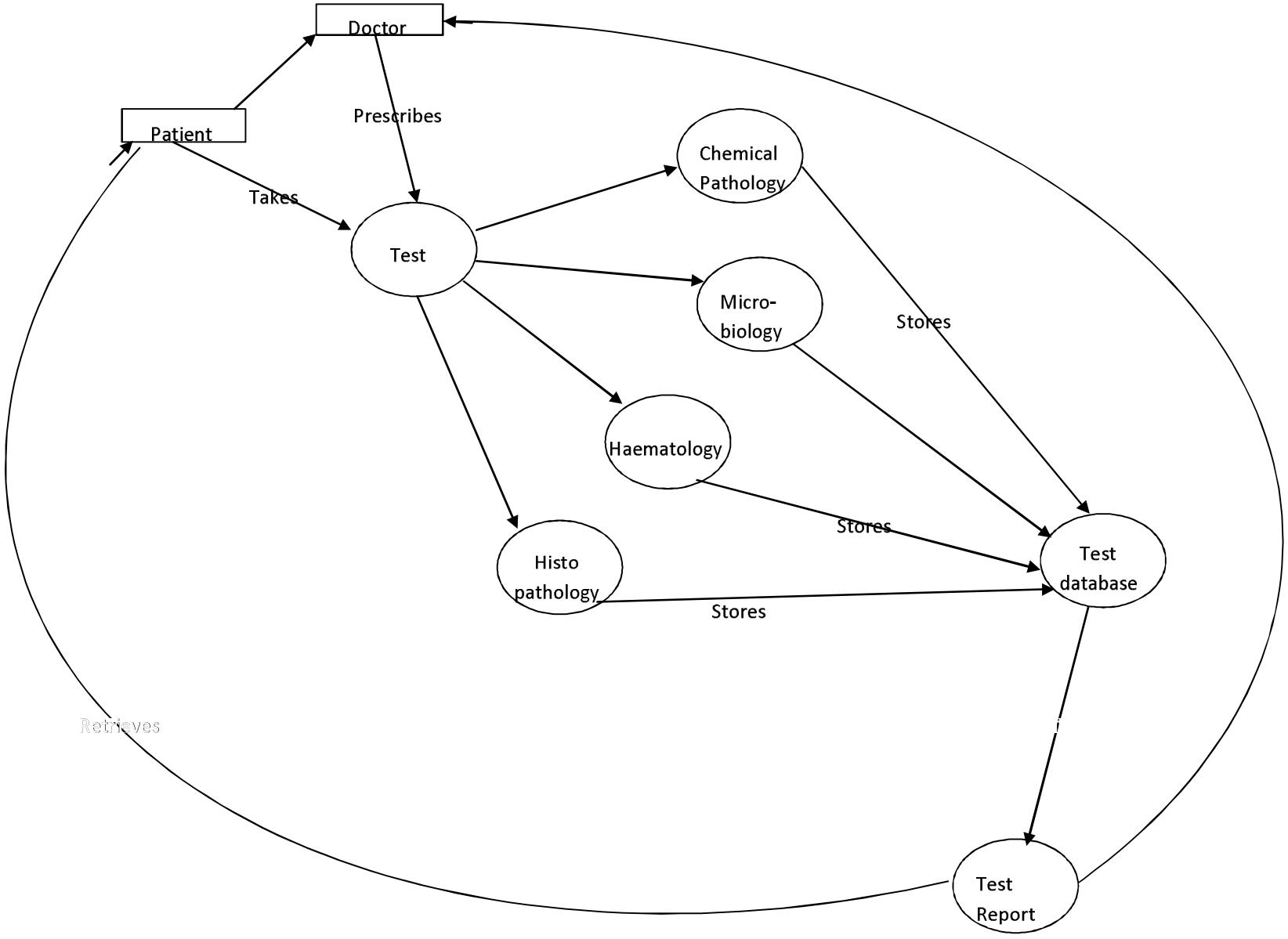


Fig 3.2: Investigation Data Flow Diagram

Obstetrics and Gynecology Data Flow Diagram

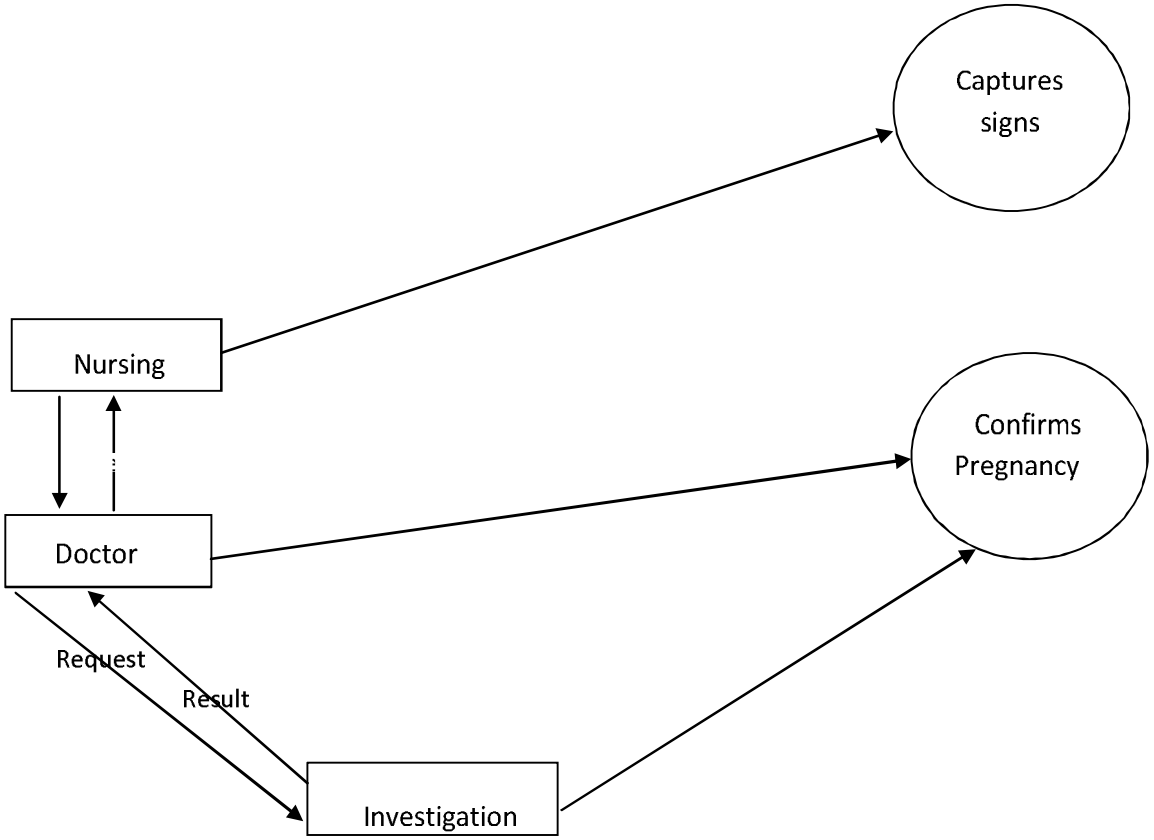


Fig 3.3: Obstetrics and Gynaecology Data Flow Diagram

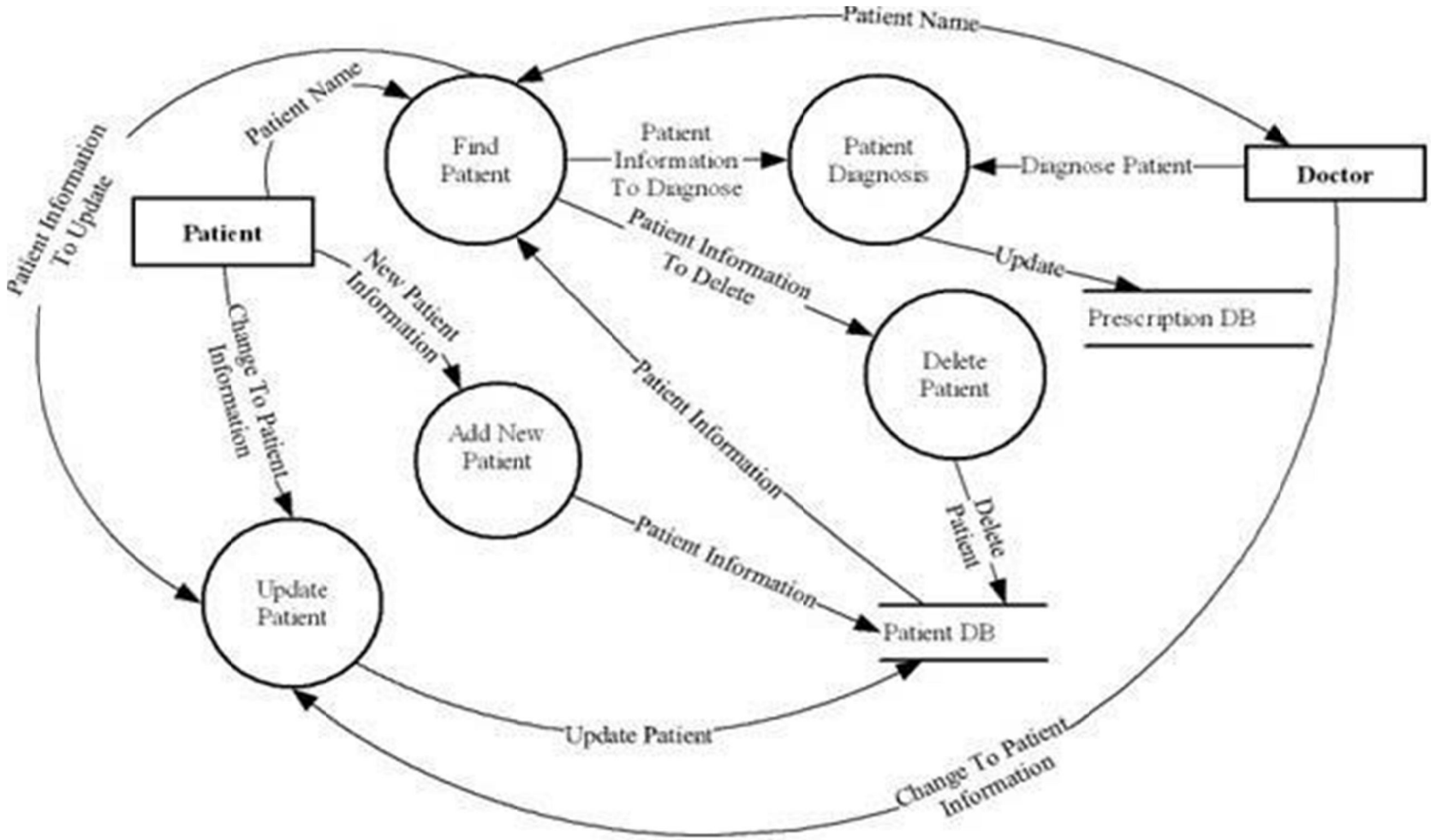
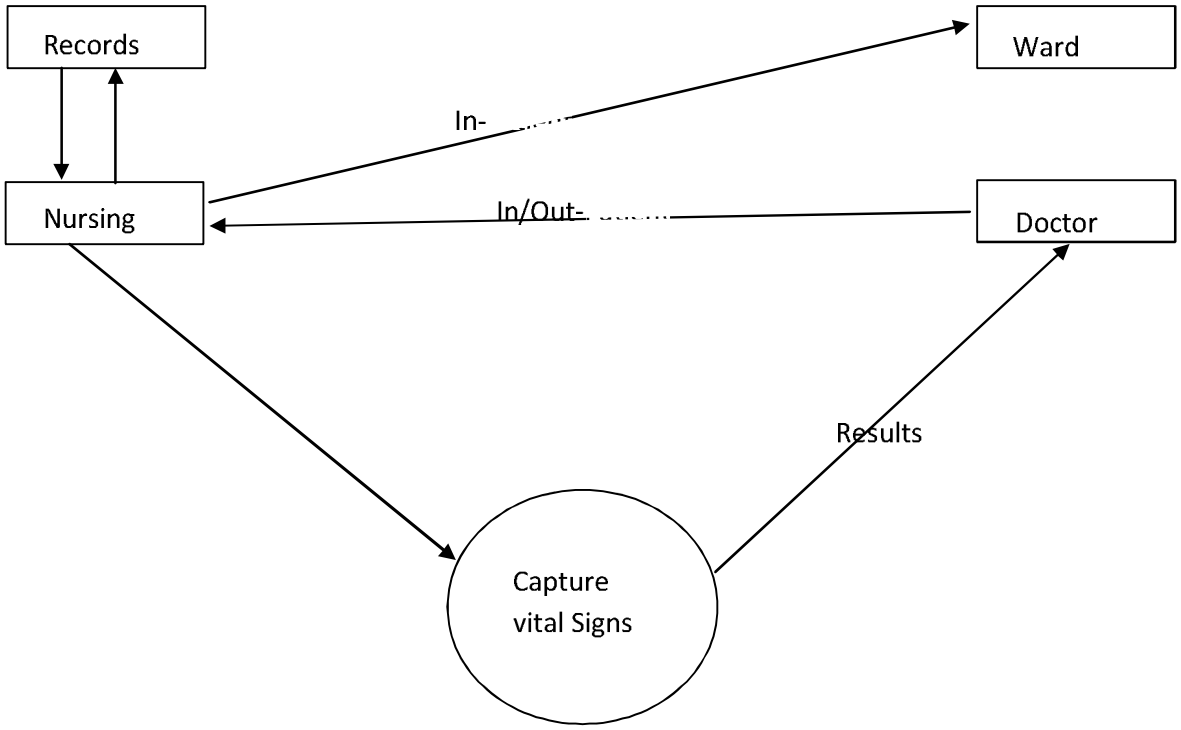
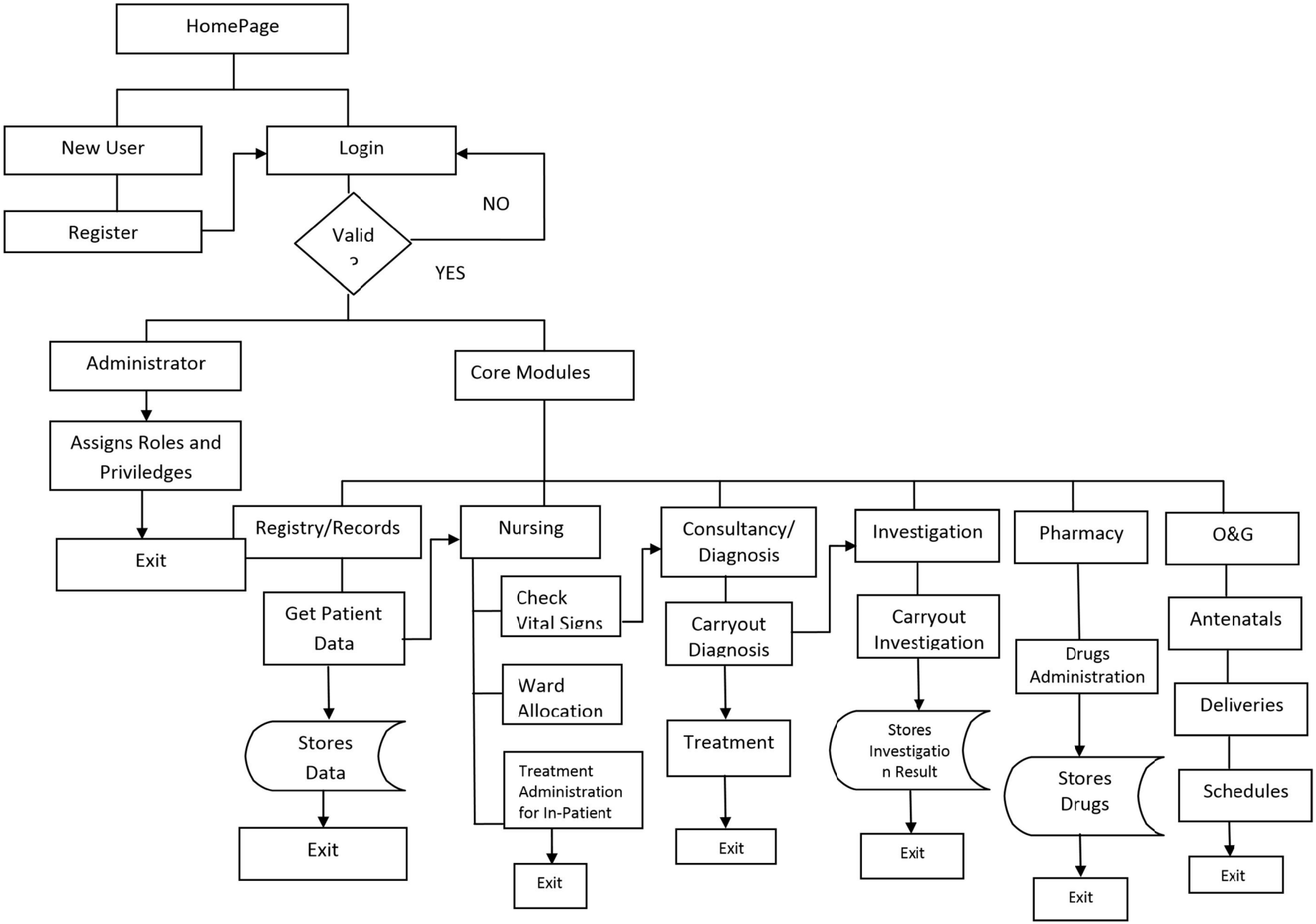


Fig 3.4: Patient Information

Nursing Data Flow Diagram




HomePage
New User
Login
Register
Valid
NO
YES
Administrator
Core Modules
Assigns Roles and Priviledges
Exit
Registry/Records
Nursing
Consultancy/ Diagnosis
Investigation
Pharmacy
O&G
Get Patient Data
Check Vital Signs
Carryout Diagnosis
Carryout Investigation
Drugs Administration
Antenatals
Ward Allocation
Deliveries
Stores Data
Treatment
Stores Investigation Result
Stores Drugs
Schedules
Treatment Administration for In-Patient
Exit
Exit
Exit
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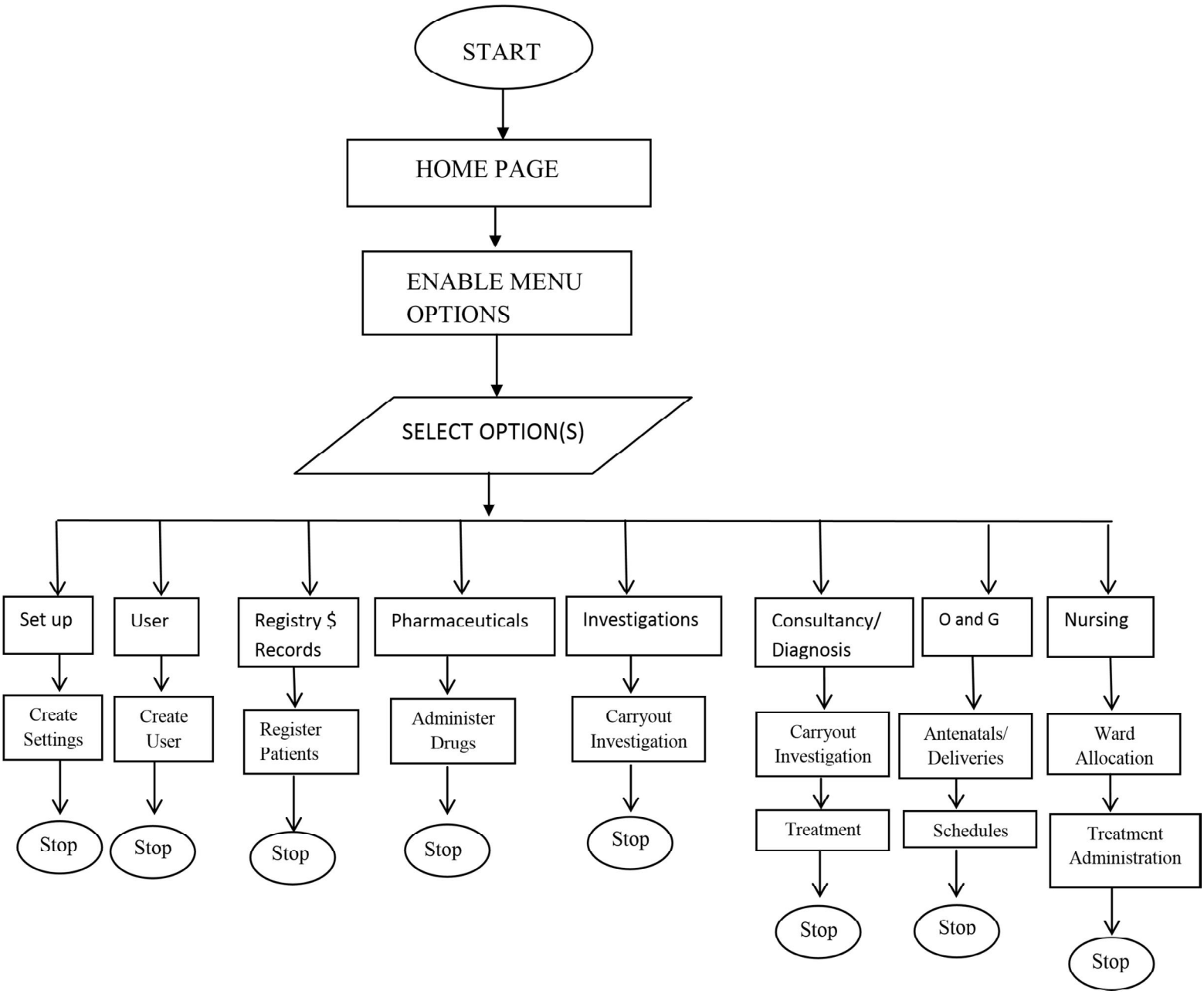
Exit

3.4 Problems Identified

After the research work done in (Asokoro General Hospital,)FCT, the following problems were identified:

1. A lack of planned approach towards working.
2. An inaccurate information system.
3. There was nothing unique as could be used to identify patients(both IP and OP) thereby causing chaos in the entire system.
4. Delays in the retrieval of information.
5. There was no defined record track of IP and OP previous and current medical history poor and limited availability of accurate, complete and timely information.
6. Lack of proper appointment scheduling.
7.

3.5


START
HOME PAGE
ENABLE MENU OPTIONS
SELECT OPTION(S)
Set up
User
Registry $ Records
Pharmaceuticals
Investigations
Consultancy/ Diagnosis
O and G
Nursing
Create Settings
Create User
Register Patients
Administer Drugs
Carryout Investigation
Carryout Investigation
Antenatals/ Deliveries
Ward Allocation
Treatment
Schedules
Treatment Administration
Stop
Stop
Stop
Stop
Stop
Stop
Stop
Stop
Stop

CHAPTER FOUR

4.0 SYSTEM DOCUMENTATION AND IMPLEMENTATION

In this chapter we have discussed the system design which has taken place to ensure a structured implementation process will follow. We have examined both the database element and the interface element stages, outlining the important decisions made and the processes carried out to achieve the design guidelines required. In this chapter a main objective was met which meant the analysis data had been successfully modeled into a design ready for implementation.

The data modeling was carried out to a point at which the data had a balance between the level of integrity and the level that could feasibly be implemented still allowing for a flexible system. As well as discussing the database design we also examined the interface design considering its usability, its layout and its structure.

The design processes and outcomes discussed in this chapter will be followed through into the implementation stage.

4.1 Objectives of the Design

The newly proposed system for the Federal Medical Center, Owo is expected to provide an automated process for the administrative and clinical operations that health professionals need to perform their jobs effectively and efficiently. Therefore the objectives of the system to be designed are:

1. To automate the core system of the hospital i.e register patients for admission, records of consultancy and consultants, registry, record investigations done on patients from various investigation departments and the pre and post natal care of patients in the Obstetrics and

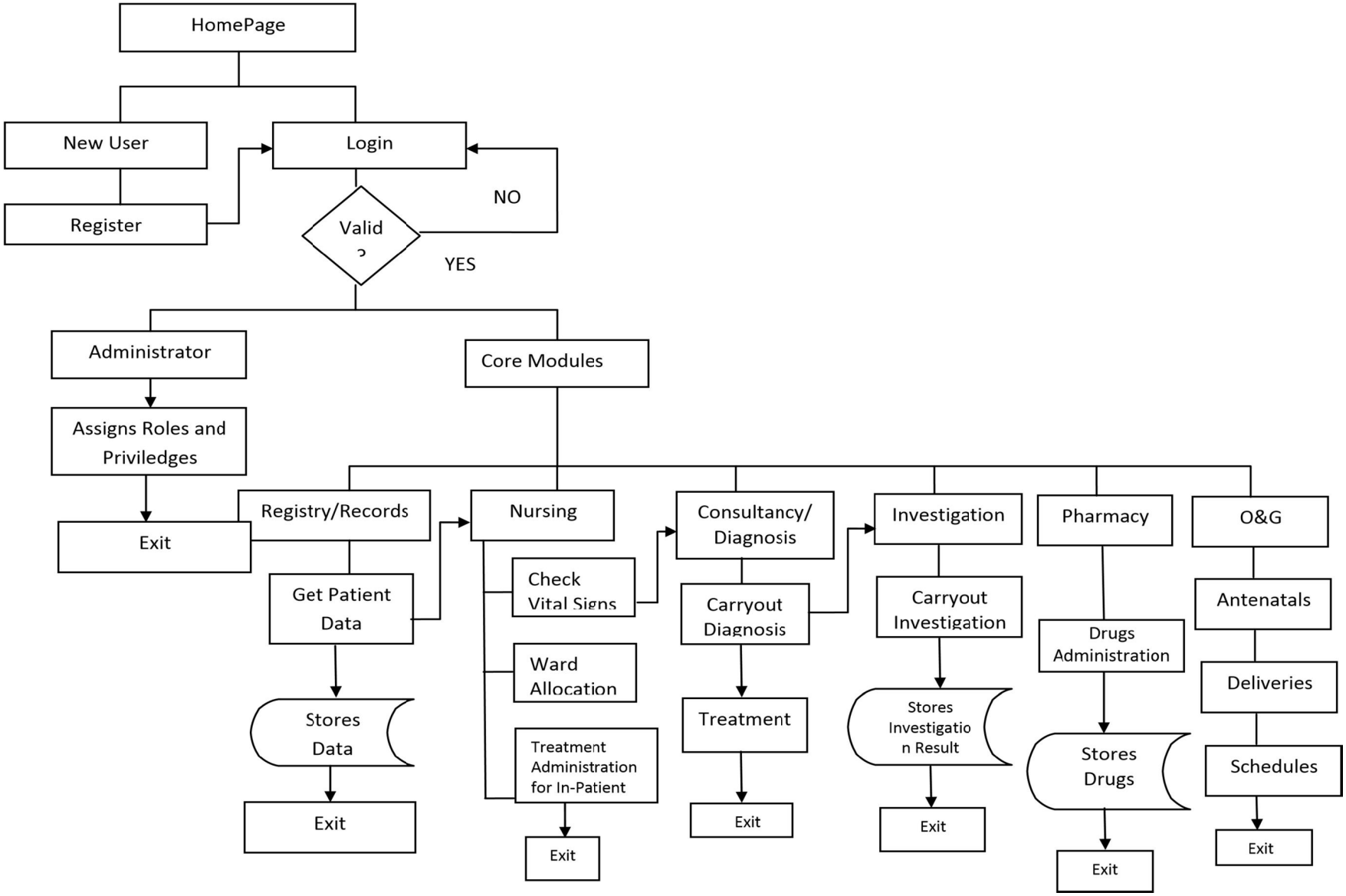
2. To integrate all functional parts of the hospital into one location thereby enhancing communication and a good network flow.

3. To make the system completely menu-driven and hence user-friendly. This is necessary to allow non-programmers use the system effectively and system could act as catalyst in achieving objective.

4. To ensure data integrity and security by protecting their data against non-authorized users or guiding against loss of patient's file or record.

5. This newly proposed system helps to eliminate swapping of patient's record and information.

6.


HomePage
New User
Login
Register
Valid
NO
YES
Administrator
Core Modules
Assigns Roles and Priviledges
Exit
Registry/Records
Nursing
Consultancy/ Diagnosis
Investigation
Pharmacy
O&G
Get Patient Data
Check Vital Signs
Ward Allocation
Treatment Administration for In-Patient
Carryout Diagnosis
Carryout Investigation
Drugs Administration
Antenatals
Deliveries
Schedules
Stores Data
Treatment
Stores Investigation Result
Stores Drugs
Exit
Exit
Exit
Exit
Exit
Exit
Exit

4.3 Database Specification

The database software to be used in handling the backend of this thesis is the SQL Server 2008 version. This solution uses the client/server architecture to access the records stored in the database. The database also provides security to the information stored there in by supporting techniques that grants access to the data examples are password tables, assigning roles and privileges to users etc. The database server handles only data retrieval and updates transactions, and does not participate in the applications interface in any way.

Data Dictionary

This contains all data definitions for cross-referencing and for managing and controlling access to the information repository / database. It provides a very thorough interface description (comparable to Interface Control Documents) that is independent of the model itself. Changes made to a model may be applied to the data dictionary to determine if the changes have affected the model's interface to other systems.

Data dictionaries do not contain any actual data from the database, only book keeping information for managing it. Without a data dictionary, however, a database management system cannot access data from the database. Below is the illustration of the data dictionary of the database:

Table 4.1: Data Dictionary of the database

S/N	VARIABLE NAME	VALUE	DESCRIPTION
1	Oid	uniqueidentifier	It uniquely identifies records
2	OptimisticLockField	Int	Handles concurrency in records

3	GCRecord	Int	Takes record of all deleted data
4	Description	Nvarchar(100)	

5	PatientName	uniqueidentifier	Name of the Patient
6	Doctor	uniqueidentifier	Name of the Doctor
7	Pharmacist	Nvarchar(100)	Name of the Pharmacist
8	Dosage	uniqueidentifier	Dosage of drug to be taken
9	Description	Nvarchar(100)	Uniquely identifies the client's record in the database
10	Amount	Nvarchar(100)	Amount the drug/service cost
11	Quantity	Nvarchar(100)	No. of items
12	TotalAmount	Nvarchar(100)	Sum total of drug/service cost
13	SheetCode	Int	Uniquely identifies sheet.
14	Notes	Nvarchar(100)	Doctor/Nurse/Pharm's notes
15	DrugCategory	Uniqueidentifier	Group the drug falls under
16	AnyPrevious	Nvarchar(100)	Any previous appointment
17	ClinicalDetails	Nvarchar(100)	Clinical notes
18	StateNo	Nvarchar(100)	No. assigned to a state
19	DateRecieved	Datetime2(7)	Date the drug was received
20	DateIssued	Datetime2(7)	Date drug was issued
22	NoOfPieces	Nvarchar(100)	No of pieces of the item
23	NoOfBlocks	Nvarchar(100)	No of Blocks of item
24	Type	Nvarchar(100)	Type of investigation
25	LabNo	Uniqueidentifier	Laboratory Number
26	LabScientist	Uniqueidentifier	Name of the Laboratory Staff
27	ChiefLabScientist	Uniqueidentifier	Name of the Head of Lab Staff
28	Diagnosis	Uniqueidentifier	Consultants Diagnosis
29	RequiredExam	Uniqueidentifier	Investigation Required
30	Quantity	nvarchar(100)	Quantity of Drugs

31	DiscountPercent	nvarchar(100)	Percentage Discounted
32	DiscountComputed	nvarchar(100)	Computed Discount
33	DateOfCollection	Datetime2(7)	Date the drugs were collected
34	BatchNo	nvarchar(100)	Drug batch number
35	NAFDACRegNo	nvarchar(100)	NAFDAC's registration number
36	ExpiryDate	Datetime2(7)	Expiry date of drug
37	CollectedBy	nvarchar(100)	Name of who collected the drugs
38	ManufactureDate	Datetime2(7)	Drug Manufacture Date
39	DirectionOfUse	nvarchar(100)	how the drug should be used
40	Constituents	nvarchar(100)	Constituents of the drug
41	StockDate	Datetime2(7)	Date stock was taken

Programs Identified In The Module

1. Registry/Records

This module is responsible for the assigning of unique number to and registration of InPatient(IP), Out-Patient(OP), Emergency-Patient and new born babies. It manages repeated visits, appointment scheduling. Keeps track of IP and OP previous and current

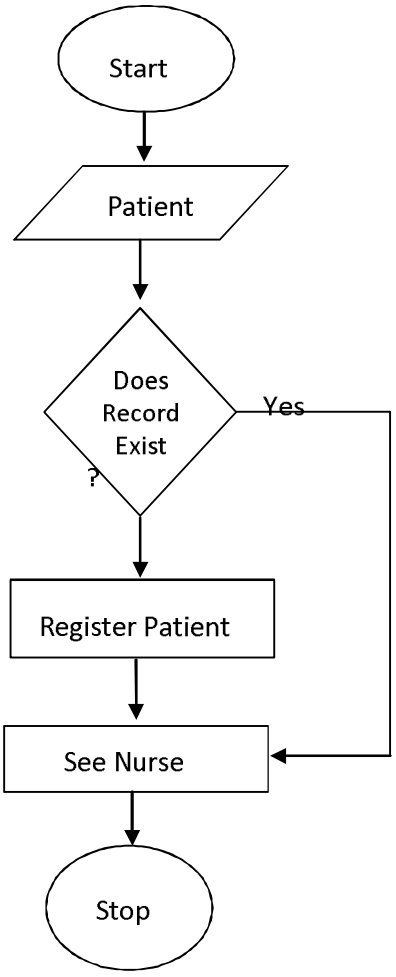


Fig 4.2 Registry/Records Flowchart

2. Nursing Module

In this module the capturing of patient‘s vital signs, fluid chart, dietary restrictions, admissions, discharges, transfers in/out. Also keeps track of prescription sheet and ward management.

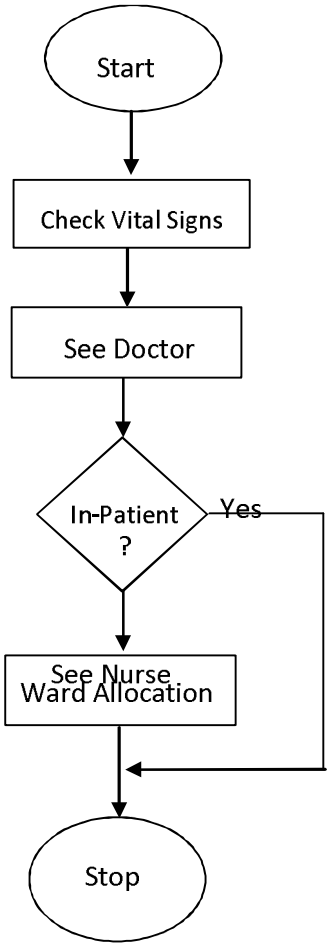


Fig 4.3 Nursing Flowchart

3. Consultancy and Diagnosis Module

This module is automates diagnosis, treatment analysis and prescription, places request for investigation and accesses investigation result.

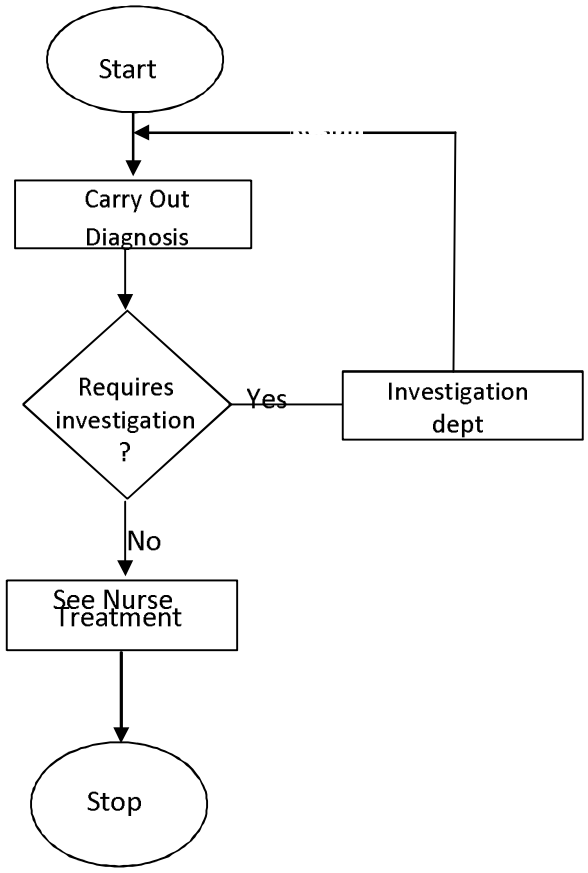


Fig 4.4: Consultancy Flowchart

4. Investigations

This module automates various investigations done in the hospital(e.g histopathology, chemical pathology, microbiology, haematology and radiology). Enable entry of test request from the any department and consultancy unit in free text format. Handles scheduling and automation of examinations for inpatients, casualties and outpatients. It also maintains the status and the results of various investigations done at the hospital.

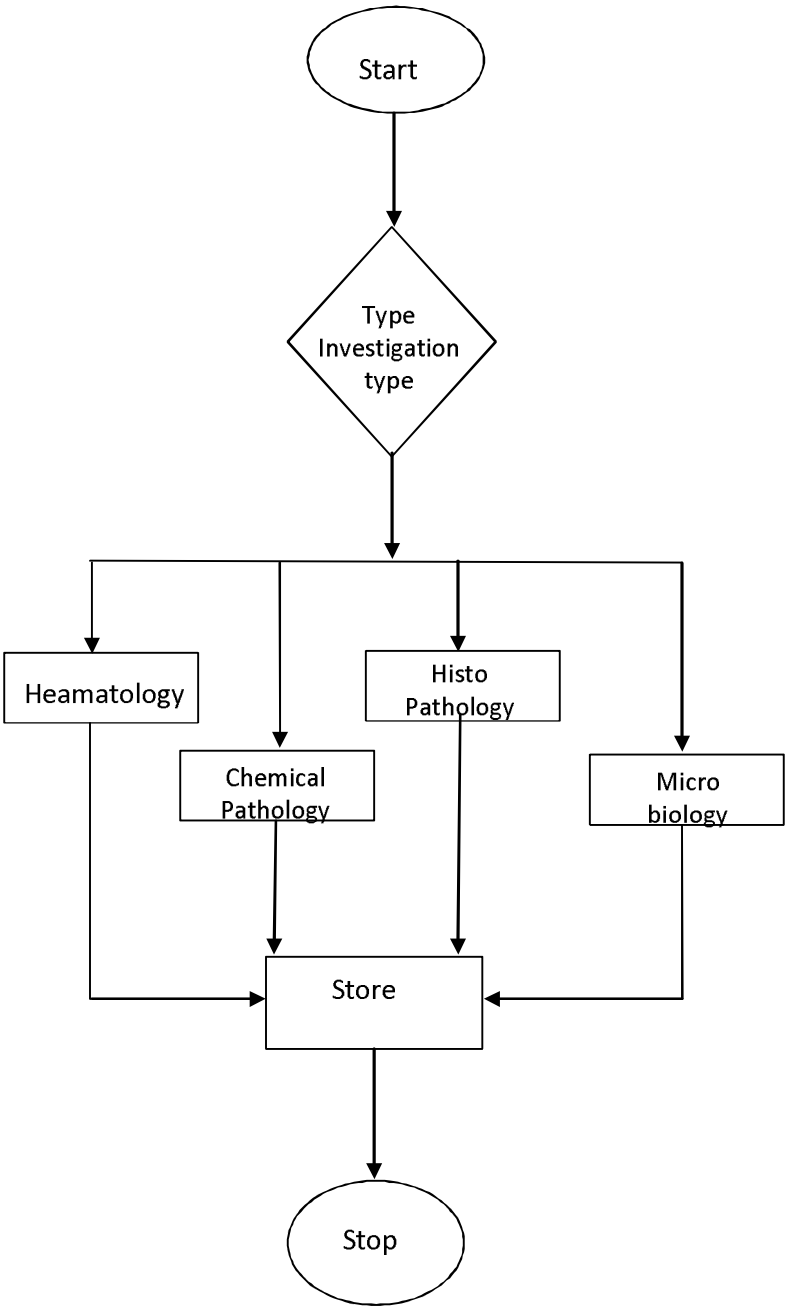


Fig 4.5: Investigation Flowchart

5. Pharmaceuticals

This module maintains details relating to all the pharmaceuticals and other general medical items available in the hospital. It captures entry of prescriptions and medication orders at both outpatients and ward levels, online updating of stock quantity, captures stock returns and automates selection of the earliest expiring batches.

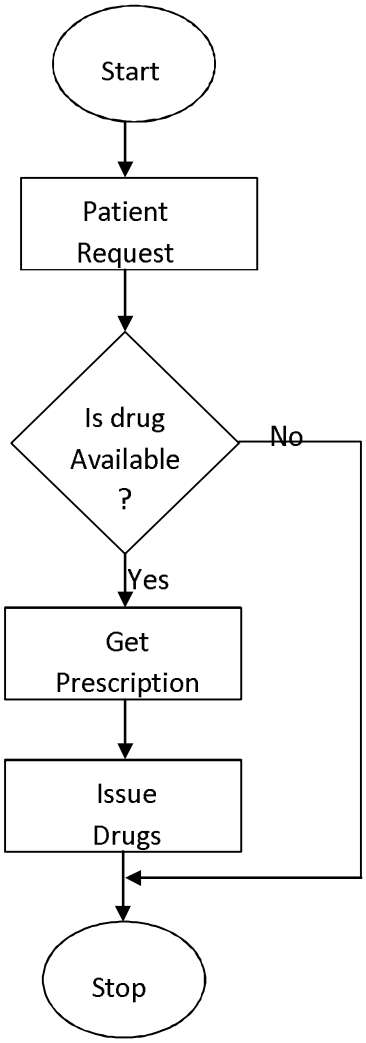


Fig 4.6: Pharmacy(Prescription) Flowchart

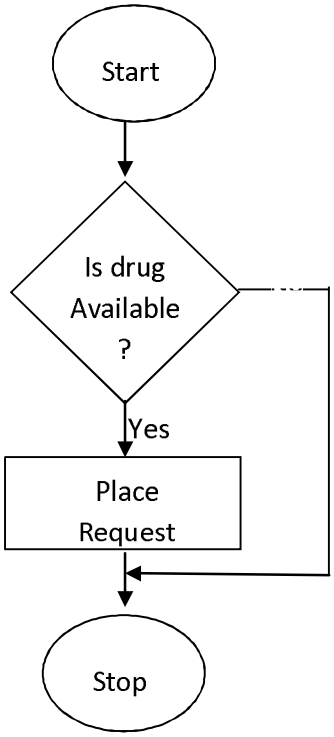


Fig 4.7: Pharmacy (Stock) Flowchart

4.4.2 Identifying information of the various modules in the database

Investigations

Table 4.2 Chemical Pathology data

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Notes	nvarchar(100)	☑
SpecimenDate	nvarchar(100)	☑
SpecimenTime	nvarchar(100)	☑
RecievedDate	nvarchar(100)	☑
RecievedTime	nvarchar(100)	☑
SpecimenCondition	nvarchar(100)	☑
ClinicalDetails	nvarchar(100)	☑
Specimen	nvarchar(100)	☑
PatientName	uniqueidentifier	☑
Diagnosis	uniqueidentifier	☑
Consultant	uniqueidentifier	☑
Pathologist	uniqueidentifier	☑
LabScientist	uniqueidentifier	☑
ChiefLabScientist	uniqueidentifier	☑
LabNo	uniqueidentifier	☑
		☐

Table 4.3

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Notes	nvarchar(100)	☑
RecievedDate	nvarchar(100)	☑
ReportedDate	nvarchar(100)	☑
ReportedTime	nvarchar(100)	☑
SpecimenNature	nvarchar(100)	☑
SpeciemenCollection	nvarchar(100)	☑
SpeciemenCollectionDate	nvarchar(100)	☑
PatientName	uniqueidentifier	☑
LabNo	uniqueidentifier	☑
RequiredExamination	uniqueidentifier	☑
Diagnosis	uniqueidentifier	☑
Haematologist	uniqueidentifier	☑
LabScientist	uniqueidentifier	☑
ChiefLabScientist	uniqueidentifier	☑
		☐

Table 4.4 Histopathology data

Column Name	Data Type	Allow Nulls
DateIssued	nvarchar(100)	☑
NoOfPieces	nvarchar(100)	☑
NoOfBlocks	nvarchar(100)	☑
Type	nvarchar(100)	☑
PatientName	uniqueidentifier	☑
LabNo	uniqueidentifier	☑
LabScientist	uniqueidentifier	☑
ChiefLabScientist	uniqueidentifier	☑
Diagnosis	uniqueidentifier	☑
RequiredExam	uniqueidentifier	☑
Consultant	uniqueidentifier	☑
		☐

Table 4.5

Column Name	Data Type	Allow Nulls
Code	bigint	☐
EntityCode	nvarchar(50)	☑
EntityType	nvarchar(50)	☑
ReferenceCode	nvarchar(50)	☑
HospitalCode	nvarchar(50)	☑
BranchCode	nvarchar(50)	☑
Notes	nvarchar(MAX)	☑
UnitCode	bigint	☑
LabNo	bigint	☑
Type	nvarchar(50)	☑
Antibiogram	nvarchar(50)	☑
IsolateStage	nvarchar(50)	☑
LabScientist	nvarchar(50)	☑
Date	datetime2(7)	☑
ChiefLabScientist	nvarchar(50)	☑
MachineName	nvarchar(50)	☑
IpAddress	nvarchar(50)	☑
MachineUserName	nvarchar(150)	☑

Pharmaceticals

Table 4.6

Column Name	Data Type	Allow Nulls
Notes	nvarchar(100)	☑
CostPrice	nvarchar(100)	☑
Quantity	nvarchar(100)	☑
SellingPrice	nvarchar(100)	☑
DiscountedAmount	nvarchar(100)	☑
DiscountPercent	nvarchar(100)	☑
DiscountComputed	nvarchar(100)	☑
DateOfCollection	nvarchar(100)	☑
BatchNo	nvarchar(100)	☑
NAFDACRegNo	nvarchar(100)	☑
PharmacyCode	nvarchar(100)	☑
ExpiryDate	nvarchar(100)	☑
CollectedBy	nvarchar(100)	☑
ManufactureDate	nvarchar(100)	☑
DirectionOfUse	nvarchar(100)	☑
Constituents	nvarchar(100)	☑
StockDate	nvarchar(100)	☑
DrugName	uniqueidentifier	☑
DrugCategory	uniqueidentifier	☑
SupplierCode	uniqueidentifier	☑
Dosage	uniqueidentifier	☑

Table 4.7

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Description	nvarchar(100)	☑
Amount	nvarchar(100)	☑
Quantity	nvarchar(100)	☑
TotalAmount	nvarchar(100)	☑
SheetCode	nvarchar(100)	☑
Notes	nvarchar(100)	☑
Pharmasist	nvarchar(100)	☑
PatientName	uniqueidentifier	☑
DrugCategory	uniqueidentifier	☑
Pharmacist	uniqueidentifier	☑
Dosage	uniqueidentifier	☑
Doctor	uniqueidentifier	☑
Duration	uniqueidentifier	☑
		☐

Registry and Records Table 4.8 Patients

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
FirstName	nvarchar(100)	☑
MiddleName	nvarchar(100)	☑
LastName	nvarchar(100)	☑
Gender	uniqueidentifier	☑
OptimisticLockField	int	☑
GCRecord	int	☑
OtherNames	nvarchar(100)	☑
MaritalStatus	uniqueidentifier	☑
Notes	nvarchar(100)	☑
Tribe	uniqueidentifier	☑
Occupation	uniqueidentifier	☑
Profession	uniqueidentifier	☑
Religion	uniqueidentifier	☑
Photo	varbinary(MAX)	☑
		☐

Table 4.9

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
Notes	nvarchar(100)	☑
AddressType	uniqueidentifier	☑
City	nvarchar(100)	☑
Country	uniqueidentifier	☑
State	uniqueidentifier	☑
LGA	uniqueidentifier	☑
Town	nvarchar(100)	☑
StreetNumber	nvarchar(100)	☑
OptimisticLockField	int	☑
GCRecord	int	☑
Patients	uniqueidentifier	☑
		☐

Consultancy

Table 4.10 Clinical Notes

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Patient	uniqueidentifier	☑
Title	nvarchar(100)	☑
Notes	nvarchar(100)	☑
Date	datetime	☑
		☐

Table 4.11

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Patient	uniqueidentifier	☑
Witness	nvarchar(100)	☑
Date	datetime	☑
Notes	nvarchar(100)	☑
DischargeType	uniqueidentifier	☑
DischargeNurse	uniqueidentifier	☑
DischargeDoctor	uniqueidentifier	☑
		☐

Nursing

Table 4.12 Treatments

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Notes	nvarchar(100)	☑
DrugType	nvarchar(100)	☑
DrugDescription	nvarchar(100)	☑
Dosage	nvarchar(100)	☑
Route	nvarchar(100)	☑
Instructions	nvarchar(100)	☑
Physician	nvarchar(100)	☑
Instruction	nvarchar(100)	☑
Pharmacist	nvarchar(100)	☑
AttendantNurse	nvarchar(100)	☑
Frequency	nvarchar(100)	☑
Duration	nvarchar(100)	☑
PatientName	nvarchar(100)	☑
		☐

Table 4.13

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
Type	nvarchar(100)	☑
DateVisited	datetime	☑
Notes	nvarchar(100)	☑
PatientName	uniqueidentifier	☑
ConsultantNurse	uniqueidentifier	☑
		☐

Table 4.14

Column Name	Data Type	Allow Nulls
Code	bigint	☐
EntityCode	nvarchar(50)	☑
EntityType	nvarchar(50)	☑
EntityCategory	nvarchar(50)	☑
ReferenceCode	nvarchar(50)	☑
HospitalCode	nvarchar(50)	☑
BranchCode	nvarchar(50)	☑
UnitCode	bigint	☑
AttendantNurse	nvarchar(100)	☑
Physician	nvarchar(100)	☑
BedNo	nvarchar(50)	☑
Notes	nvarchar(MAX)	☑
Date	datetime2(7)	☑
Type	nvarchar(50)	☑
ScreenCode	nvarchar(50)	☑
ShiftCode	nvarchar(50)	☑
MachineName	nvarchar(50)	☑
IpAddress	nvarchar(50)	☑
MachineUserName	nvarchar(150)	☑

Obstetrics and Gynaecology

Table 4.15

Column Name	Data Type	Allow Nulls
Code	bigint	☐
EntityCode	nvarchar(50)	☑
EntityType	nvarchar(50)	☑
EntityCategory	nvarchar(50)	☑
ReferenceCode	nvarchar(50)	☑
HospitalCode	nvarchar(50)	☑
BranchCode	nvarchar(50)	☑
UnitCode	bigint	☑
AttendantNurse	nvarchar(100)	☑
Physician	nvarchar(100)	☑
BedNo	nvarchar(50)	☑
Notes	nvarchar(MAX)	☑
Date	datetime2(7)	☑
Type	nvarchar(50)	☑
ScreenCode	nvarchar(50)	☑
ShiftCode	nvarchar(50)	☑
MachineName	nvarchar(50)	☑
IpAddress	nvarchar(50)	☑
MachineUserName	nvarchar(150)	☑

Table 4.16

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
BloodLoss	nvarchar(100)	☑
Physician	nvarchar(100)	☑
Booked	nvarchar(100)	☑
WhereBooked	nvarchar(100)	☑
Parity	nvarchar(100)	☑
ChildrenAlive	nvarchar(100)	☑
ChildrenDead	nvarchar(100)	☑
PregnancyAge	nvarchar(100)	☑
RuptureOfMembrane	nvarchar(100)	☑
DiagnosisCode	nvarchar(100)	☑
DeliveryTime	nvarchar(100)	☑
DeliveryType	nvarchar(100)	☑
ChildSex	nvarchar(100)	☑
CircumferenceHead	nvarchar(100)	☑
BirthLength	nvarchar(100)	☑
BirthWeight	nvarchar(100)	☑
PerinumState	nvarchar(100)	☑

Table 4.17 Schedules

Column Name	Data Type	Allow Nulls
Oid	uniqueidentifier	☐
OptimisticLockField	int	☑
GCRecord	int	☑
FondusHeight	nvarchar(100)	☑
PresentationAndPosition...	nvarchar(100)	☑
FoetalHeart	nvarchar(100)	☑
Oedema	nvarchar(100)	☑
Urine	nvarchar(100)	☑
Weight	nvarchar(100)	☑
Heamoglobin	nvarchar(100)	☑
BloodPressure	nvarchar(100)	☑
TreatmentCode	nvarchar(100)	☑
DateVisited	datetime	☑
Notes	nvarchar(100)	☑
PatientName	nvarchar(100)	☑
		☐

4.5 Program Structure

1. Registry/Records

This module is responsible for the assigning of unique number to and registration of InPatient(IP), Out-Patient(OP), Emergency-Patient and new born babies. It manages repeated visits, appointment scheduling. Keeps track of IP and OP previous and current

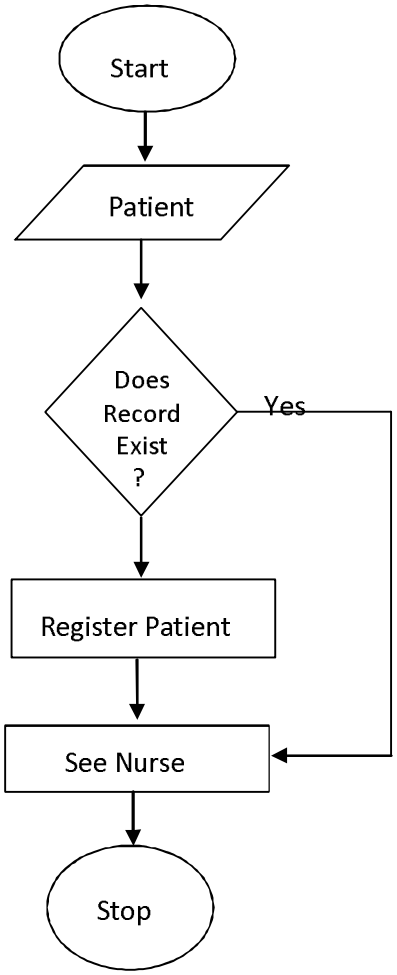
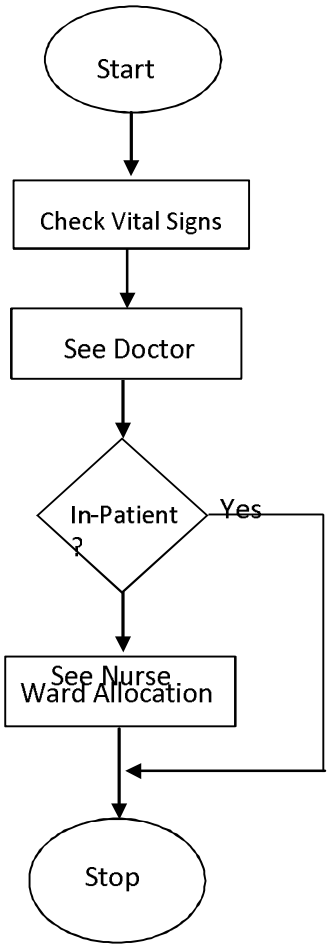


Fig 4.8 Registry/Records Flowchart

2. Nursing Module

In this module the capturing of patient's vital signs, fluid chart, dietary restrictions, admissions, discharges, transfers in/out. Also keeps track of prescription sheet and ward management.

Fig 4.9 Nursing Flowchart



3. Consultancy and Diagnosis Module

This module is automates diagnosis, treatment analysis and prescription, places request for investigation and accesses investigation result.

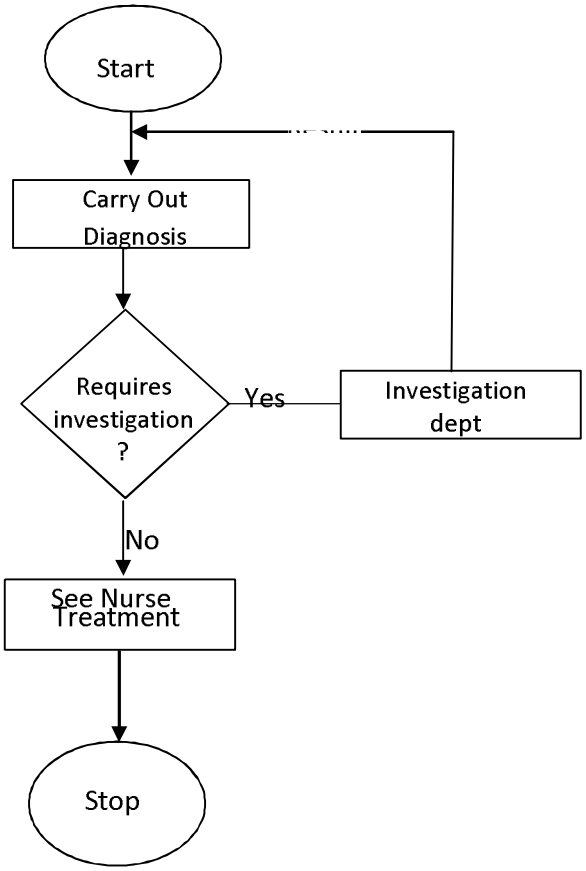


Fig 4.10: Consultancy Flowchart

4. Investigations

This module automates various investigations done in the hospital(e.g histopathology, chemical pathology, microbiology, haematology and radiology). Enable entry of test request from the any department and consultancy unit in free text format. Handles scheduling and automation of examinations for inpatients, casualties and outpatients. It also maintains the status and the results of various investigations done at the hospital.

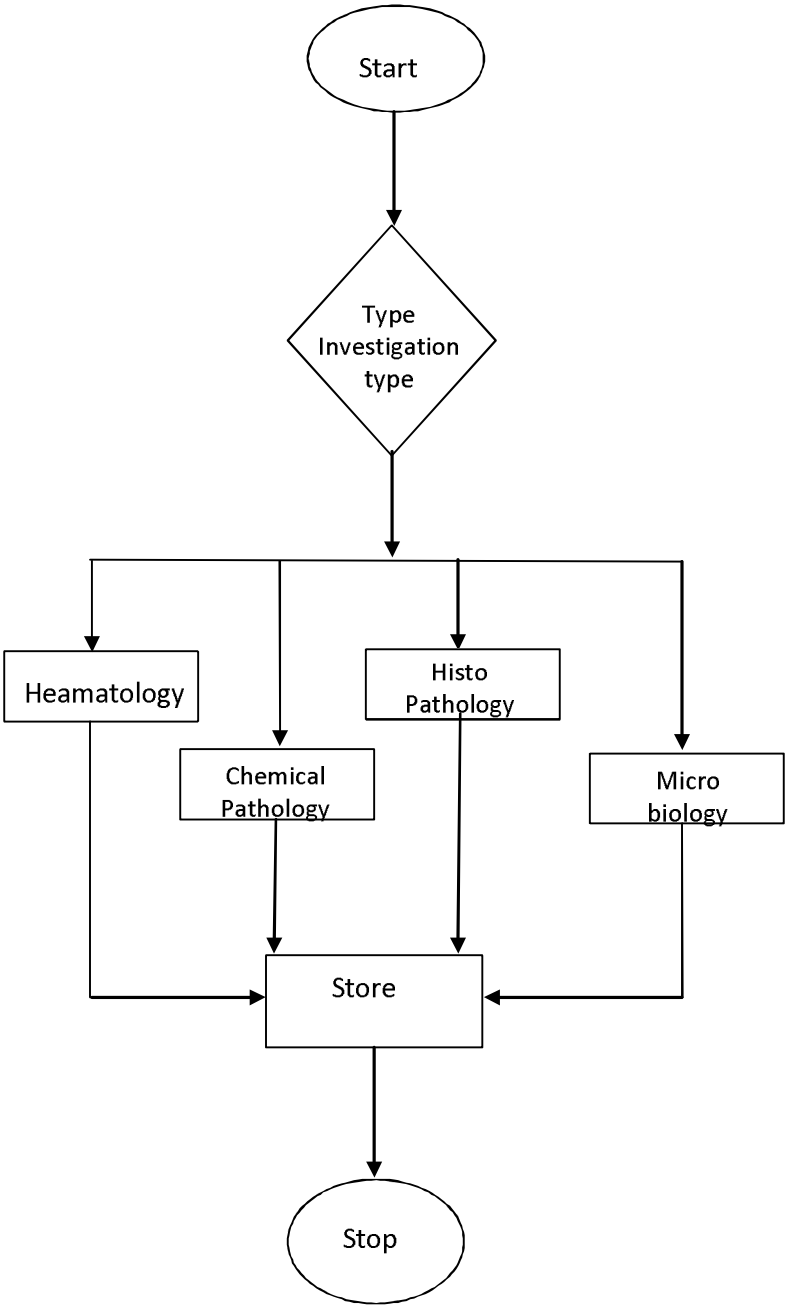


Fig 4.11: Investigation Flowchart

5. Pharmaceuticals

This module maintains details relating to all the pharmaceuticals and other general medical items available in the hospital. It captures entry of prescriptions and medication orders at both outpatients and ward levels, online updating of stock quantity, captures stock returns and automates selection of the earliest expiring batches.

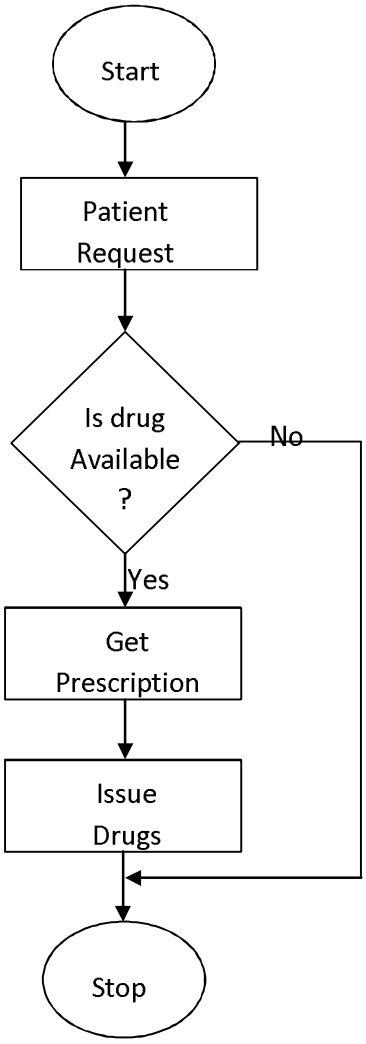


Fig 4.12: Pharmacy(Prescription) Flowchart

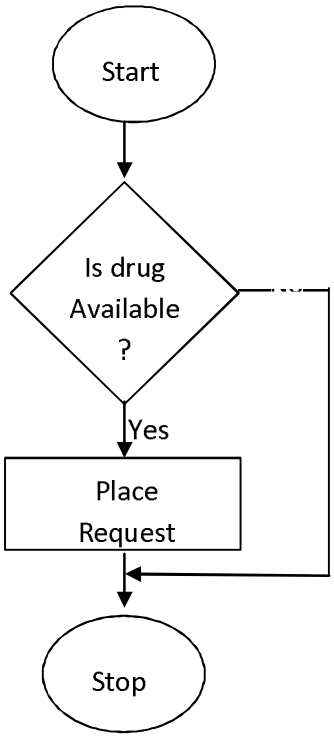


Fig 4.13: Pharmacy (Stock) Flowchart

4.6 Input and Output Format

Investigations Histopathology/Cytology Form (Existing Form)

(HISTOPATHOLOGY/CYTOLOGY)

HISTOPATHOLOGY/CYTOLOGY NO……

HOSPITAL NO…….....

SURNAME OTHER NAMES AGE SEX TRIBE:

NATIONALITY: _____

_____ _____

PROVISION DIAGNOSIS……EXAM REQUIRED……

CLINICAL

DETAILS…….....……

……

……

ANY PREVIOUS BIOPSY/CYTOLOGY YES/NO

_____ IF YES, STATE NUMBER……

FOR LABORATORY USE ONLY

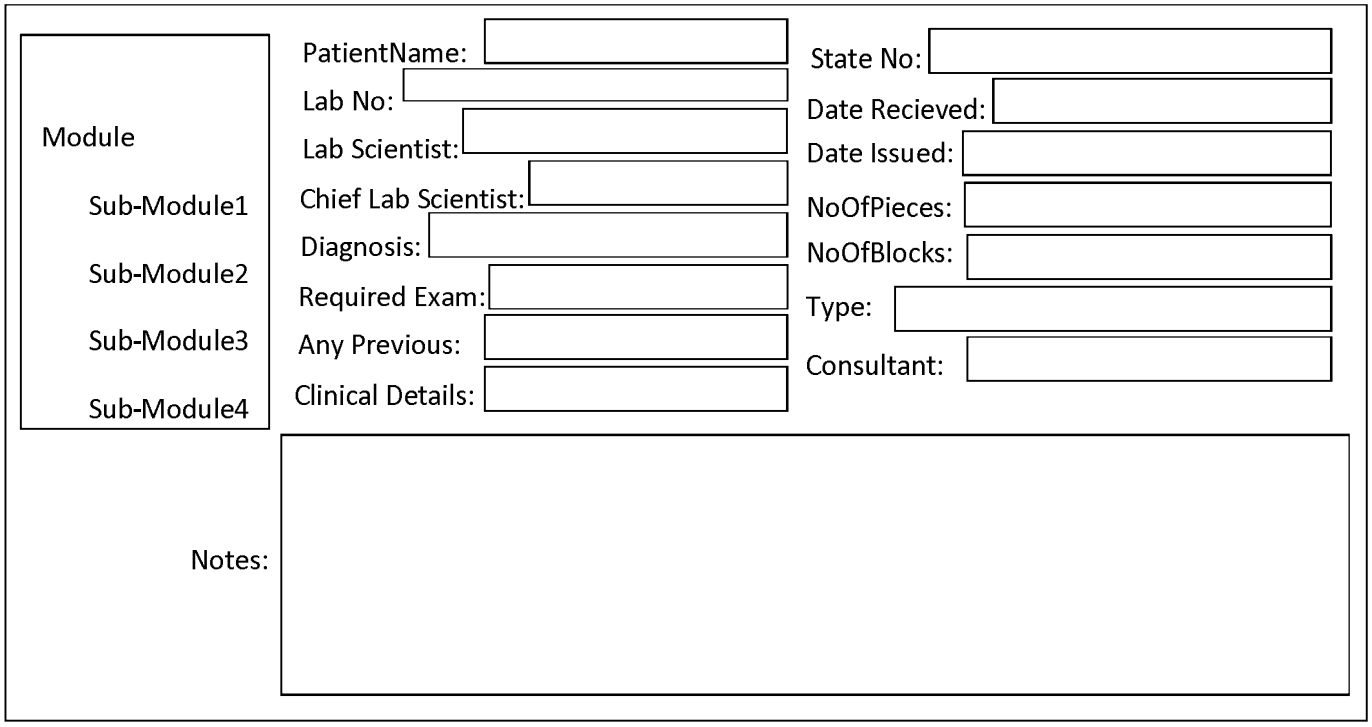
DATE RECEIVED…… NO. OF PIECES…… NO. OF BLOCKS…….....

DATE ISSUED……

NAME OF DOCTOR(NOT SIGNATURE PLS)

Request for frozen section should be submitted to the department of morbid anatomy 24 hrs before

Table 4.18: Histopathology (Sample Output)



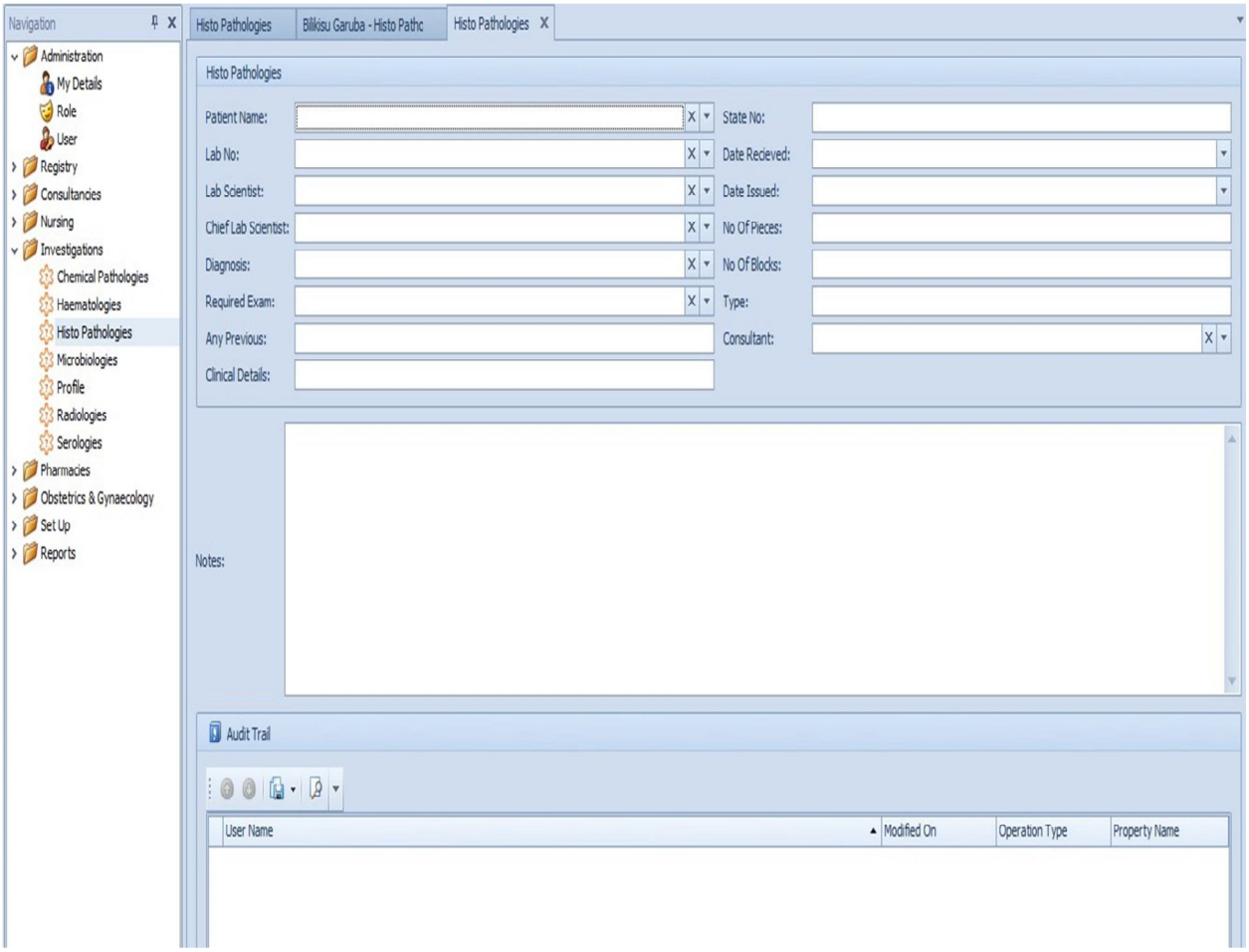


Fig 4.14: Proposed Automated Histopathology Form Table 4.19: LABORATORY REPORT FORM - MICROBIOLOGY

NAME	AGE	SEX	CLINIC	HOSPITAL NO.	LAB. NO
REPORT	ANTIBIOGRAM		ISOLATES		
			1	2	3
Macroscopy/Appearance	Penicillin				
	Ampicillin				
	Streptomycin				
	Chloramphenical				
	Tetracycline				
	Erythromycin				
	Septrin				
	Cloxacillin				

	Sulponamide			
	Naliddixic Acid			
Microscopy/Gram Staining	Ntrofurantoin			
	Collstin S.			
	Genticin			
	Pefloxacine			
	Augumentine			
Culture	Amoxyllin			
	Cerftriazone			
	Ofloxacin			

Other Drugs(Specify)

S = Sensitivity

R = Resistance **MED. LAB SCIENTIST** **DATE**

Table 4.20: Microbiology Sample Output

Module

Sub-Module1

Sub-Module2

Sub-Module3

Sub-Module4

PatientName:

Isolated State:

Unit Code:

Diagnosis:

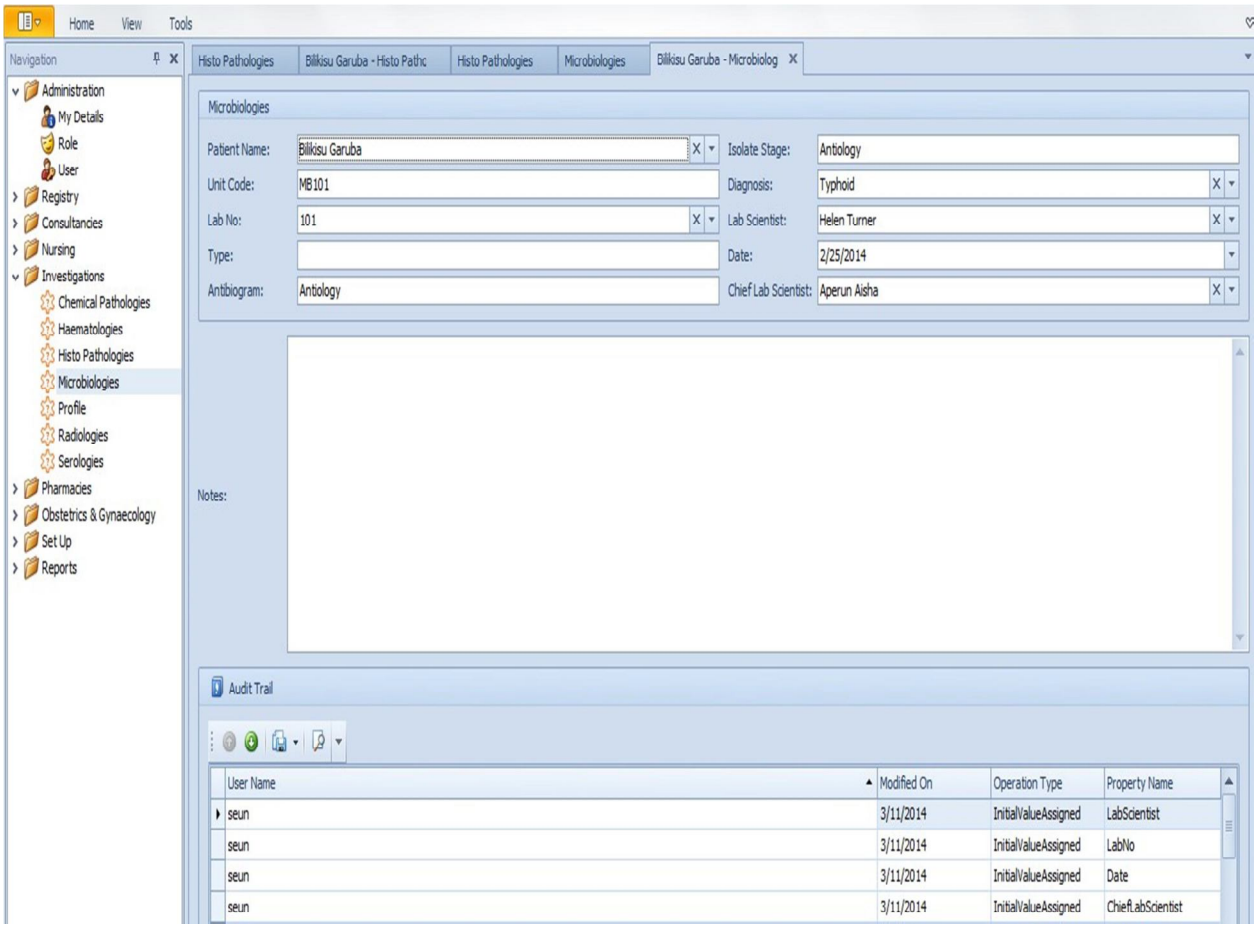
Lab No: Date Issued:

Type:

Lab Scientist:

Antibiogram:

Notes:


Home
View
Tools
Navigation
Administration
My Details
Role
User
Registry
Consultancies
Nursing
Investigations
Chemical Pathologies
Haematologies
Histo Pathologies
Microbiologies
Profile
Radiologies
Serologies
Pharmacies
Obstetrics & Gynaecology
Set Up
Reports
Histo Pathologies
Bilikisu Garuba - Histo Pathc
Histo Pathologies
Microbiologies
Bilikisu Garuba - Microbiolog
Microbiologies
Patient Name: Bilikisu Garuba
Unit Code: MB101
Lab No: 101
Type:
Antibiogram: Antiology
Isolate Stage: Antiology
Diagnosis: Typhoid
Lab Scientist: Helen Turner
Date: 2/25/2014
Chief Lab Scientist: Aperun Aisha
Notes:
Audit Trail
User Name
Modified On
Operation Type
Property Name
seun 3/11/2014 InitialValueAssigned LabScientist
seun 3/11/2014 InitialValueAssigned LabNo
seun 3/11/2014 InitialValueAssigned Date
seun 3/11/2014 InitialValueAssigned ChiefLabScientist

CHEMICAL PATHOLOGY REQUEST/REPORT FORM(**Existing System**)

SURNAME	OTHERNAMES		TICK HERE	BLOOD CONT.	RESULT
TIME & DATE OF SPECIMEN COLLECTION		AGE		Sodium (120-140)	Mmol/l
				Lithium (<1)	
HOSPITAL	SPECIMEN	SEX		ENZYMES	
				Amylase (70-300)	I.U/L
WARD/CLINIC	CONSULTANT			Alkaline Phosphatase	
LAB NO.				Gamma GTP (4-28)	
DATE & TIME RECEIVED				HB DH (55-140)	
CONDITION OF SPECIMEN				CPK (up to 50)	
CLINICAL DETAILS				SGOT(up to 18)	
				SGPT (up to 22)	
				Fast Glucose (2.8-5.5)	
				2hpp Glucose	

TICK HERE	BLOOD	RESULT			
	Bilirubin Total (up to 20)	Umol/l		Ing.Phosphase (0.65-1.3)	
	Conj. Bilirubin (up to 5)	Umol/		Total Protein (58-80)	
	LIPID PROFILE			Albumin (35-50)	
	Total Cholesterol (2.5-6.5)			Globulin (20-45)	
	Trigiyceride (0.45-1.72)	Mmol/l		Creatinine(50-132)	
	LDL-C (1.68-4.35)	Mmol/l		Urea (2.5-5.8)	
	HDL-C(0.78-2-20)	Mmol/l		Uric Acid (0.12-0.36)	
	ELECTROLYTES			URINE (Spot/124hrs)	
	Bicarbonate(20-30)	Mmol/l		Glucose	
	Chloride (95-110)	Mmol/l		Protein	
	Potassium (3-5)	Mmol/l		Bilirubin	
	GTT (Oral/Parental) Fasting ..... 1hr..... 2hr.....	$^1/_2$hr..... $1^1/_2$hrs..... $2^1/_2$hrs.....		Urobilinogen	
				Ketones	
				pH	
				Emu (Preg Test)	

CONSULTANT CHEM. PATHOLOGIST'S COMMENT		CSF	
		Glucose (2.7-3.9)	
		Protein (15-45)	
		FAECES	
		Occult blood	
		Faecal Fat	
Signature CONSULTANT CHEM.PATHOLOGIST			
	MED. LAB SCIENTIST SIGNATURE:		CHIEF MED. LAB SCIENTIST SIGNATURE:

HAEMATOLOGY REQUEST/REPORT FORM (**Existing System**)

SURNAME	FIRST NAME(S)	Unit No._____ GP_____ CAS_____			Lab No.	Date	Time
					Received		
WARD/CLINIC	PHYSICIAN/SURGEON	Age	Sex	State	Reported		

Nature of Specimen (Tick appropriate box)

Finger prick — Blood in sequestrene

Clotted blood — Blood in heparin

Blood in ACD — Defibrinated blood

Marrow — Other (Specify)

Clinical Details _____

Examination(s) Required _____

Specimen Collected:

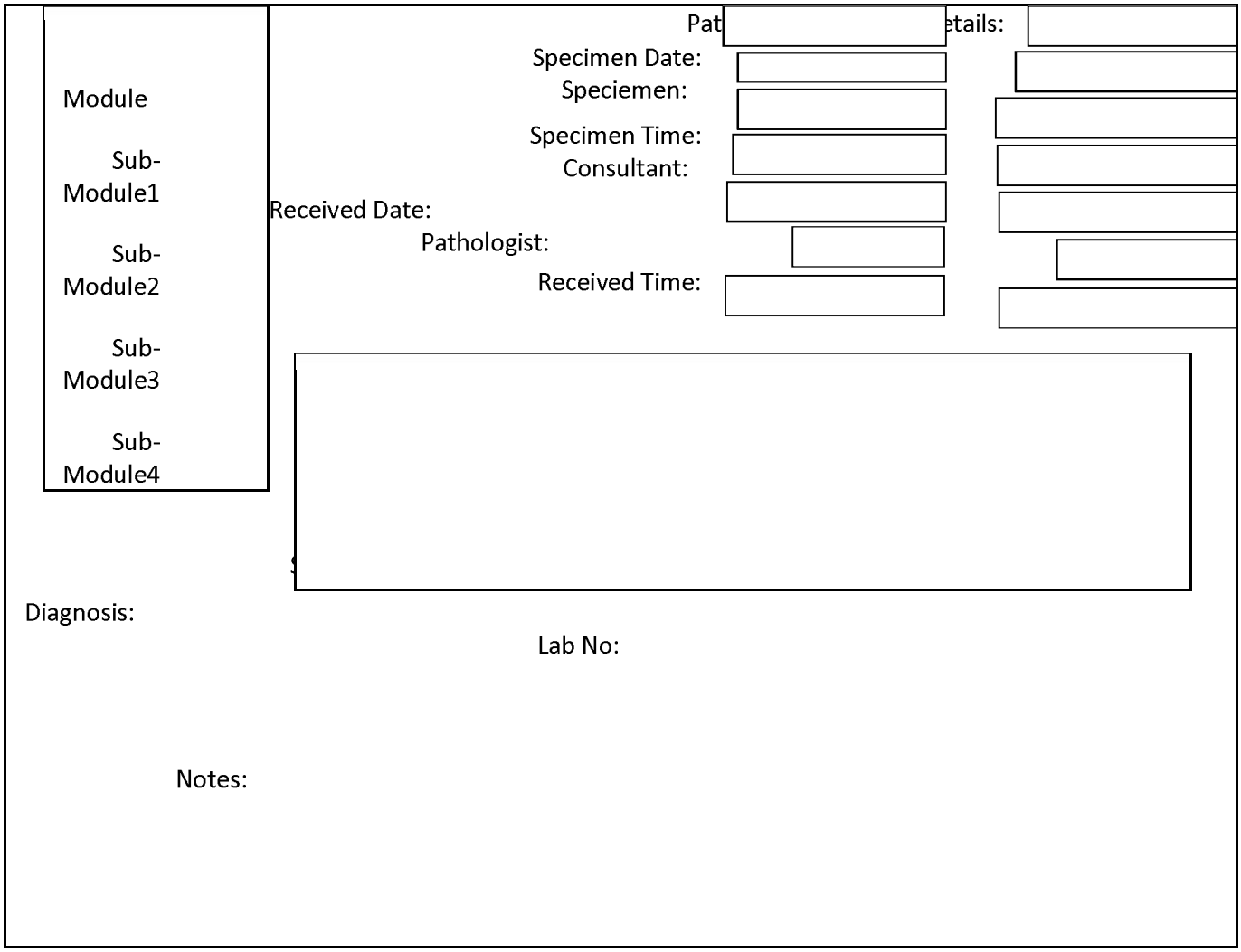
Date: Time:

PCV_____% Hb _____ G/100ml
MCHC _____% WBC _____ /cmm
Retics _____% ESR _____ mm/hr
Retics Index _____% Eosinophils_____/cmm
Platelets_____/cmm

FILM APPEARANCE		DIFFERENT COUNT (%)	
Aniscocytosis		Blast	
Poikilocytosis		Myel	
Polychromasia		Meta Myel	
Macrocytosis		Eosin Myel	
Hypochromia		Eosin	
Sickel Cells		Baso	
Target Cells		Neut	
Spherocytes		Prim Lymph	
Nucleated RBC		Lymph	
Microcytosis		Prim Mono	
Others		Mono	
		Other	

	MED. LAB. SCIENTIST:			
	CHIEF MED. LAB SCIENTIST			

Table 4.23: Chemical Pathology (Sample OutPut)



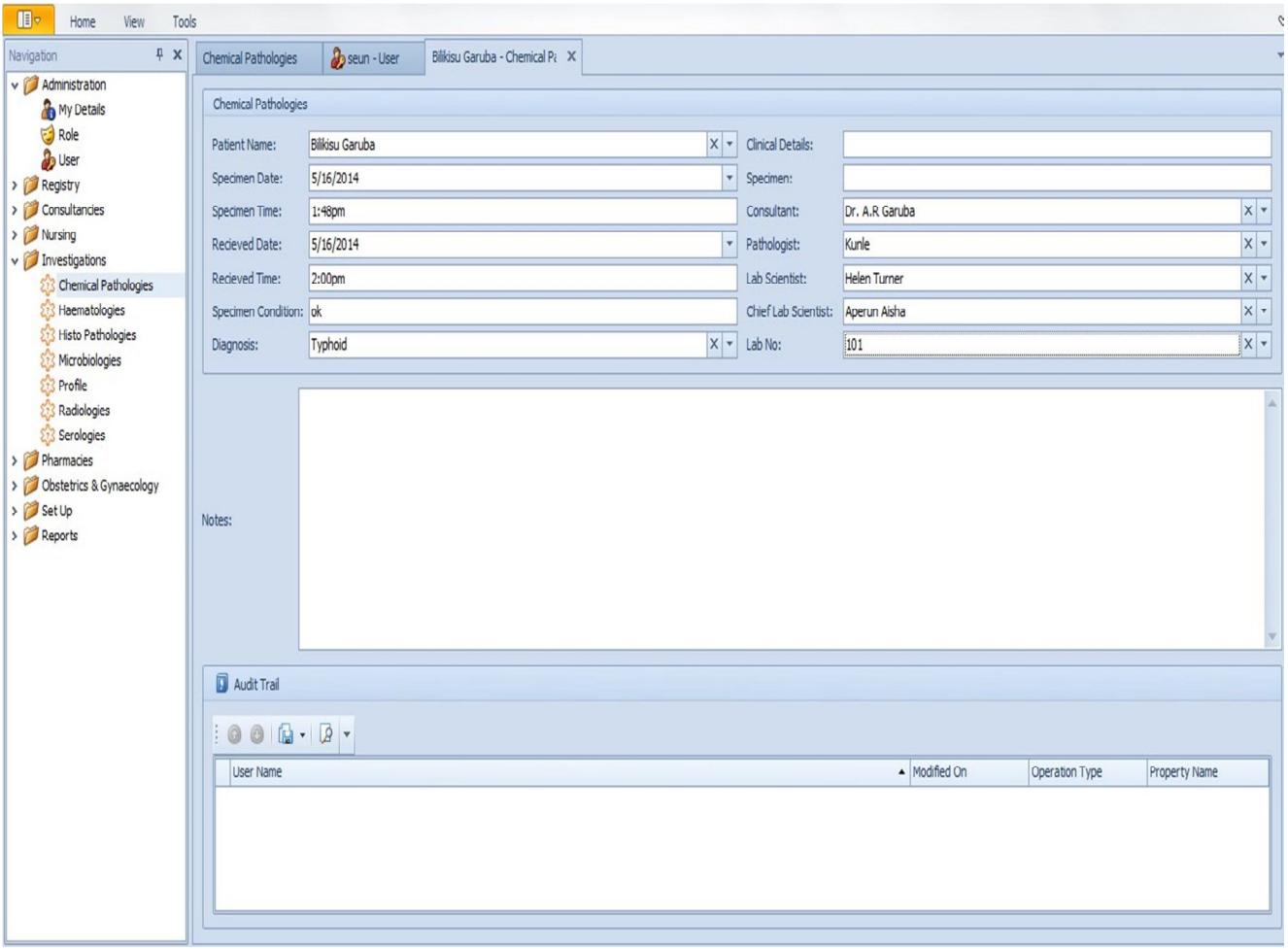
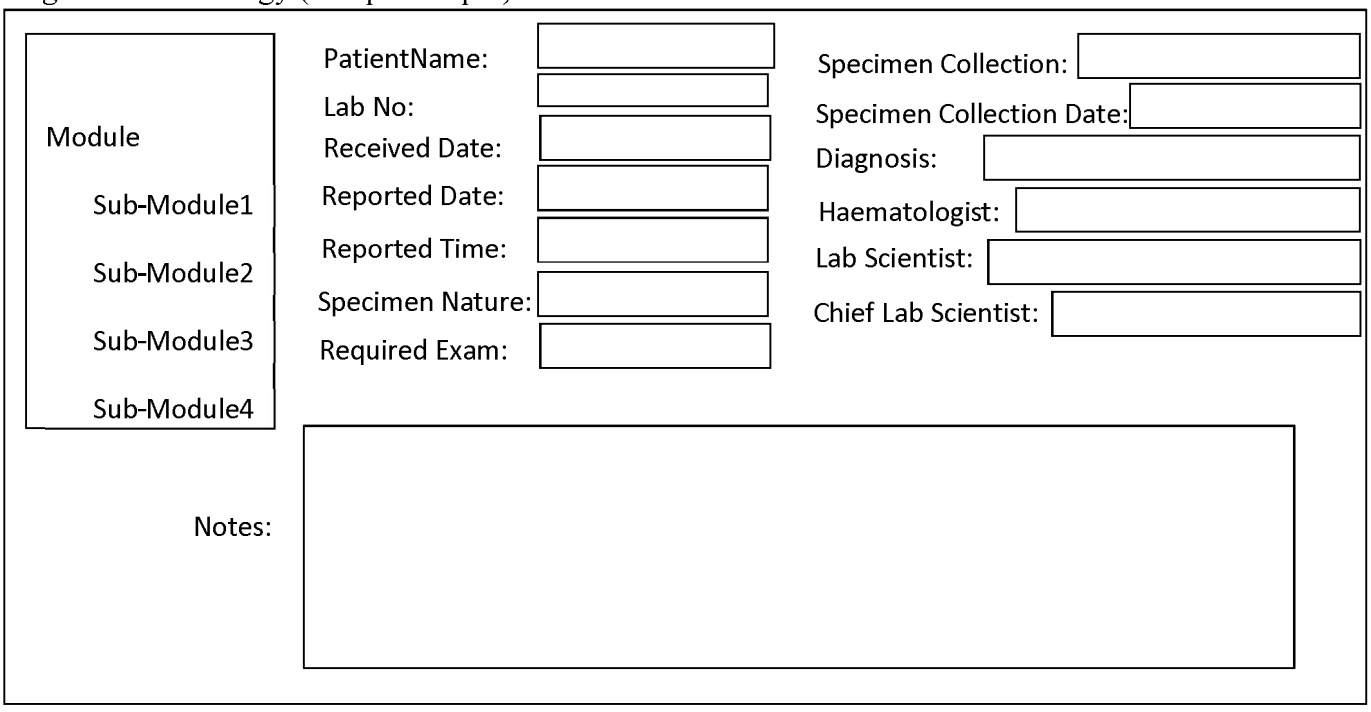


Fig 4.16:Proposed Automated Chemical Pathology Form

Fig 4.24: Hematology (Sample Output)



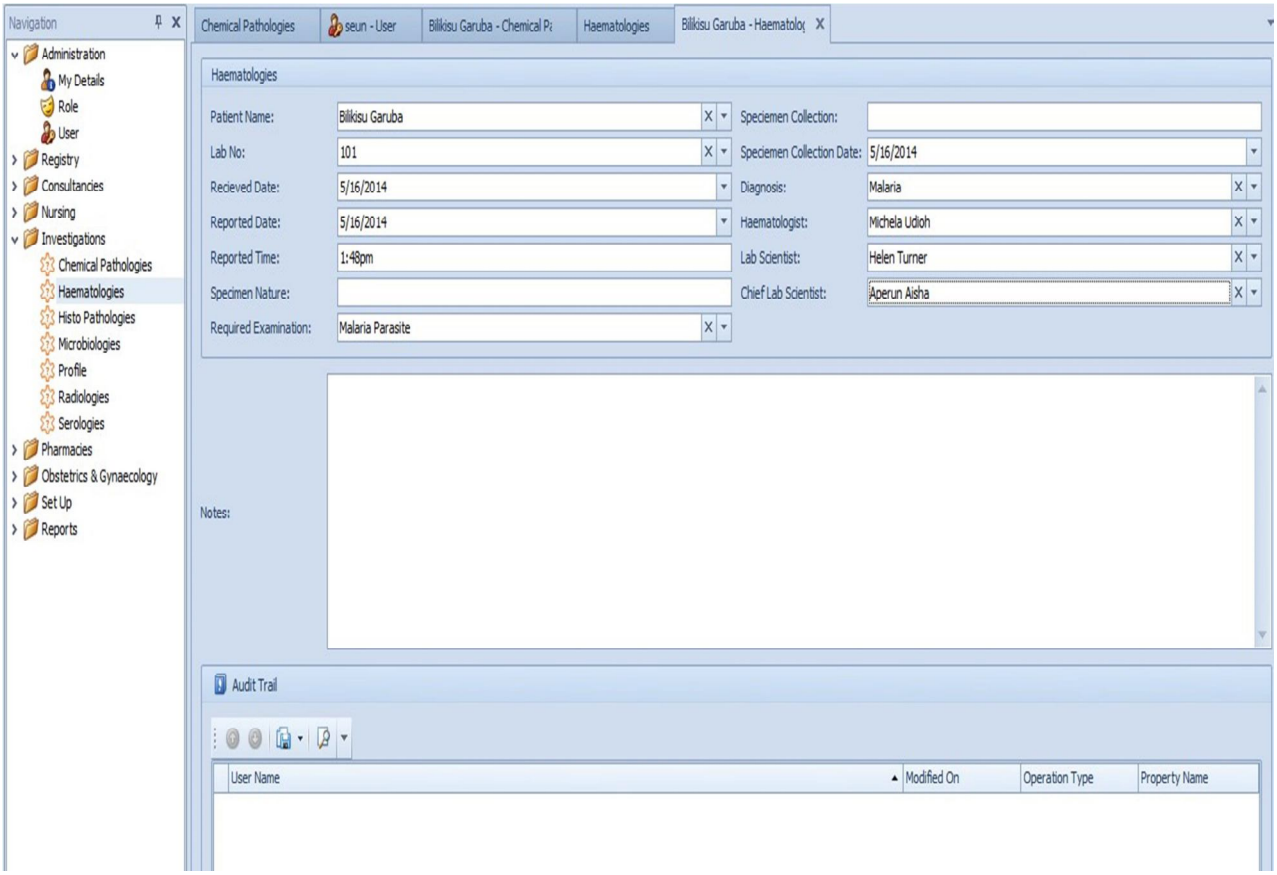


Fig 4.17: Proposed Automated Heamatology Form

Nursing Care/Treatment FORM (Existing Form)

NURSING PROCESS/CARE PLAN SHEET

Name:.....

Address:..... Ward:.....

Age:.....
Occupation:.....
Medical Diagnosis:..... Case
Note No:.....

DATE/TIME	NURSING DIAGNOSIS	NURSING OBJECTIVE	NURSING ACTIONS AND INTERVENTIONS	SCIENTIFIC RATIONALE	EVALUATION	SIGNATURE

Table 4.25: Nursing care/Treatment (Sample output)

Module Sub-Module1 Sub-Module2 Sub-Module3	PatientName: Drug Type: Drug Description: Dosage: Route:		Instruction : Pharmacist: Attendant Nurse: Frequency: Duration:
Notes:			

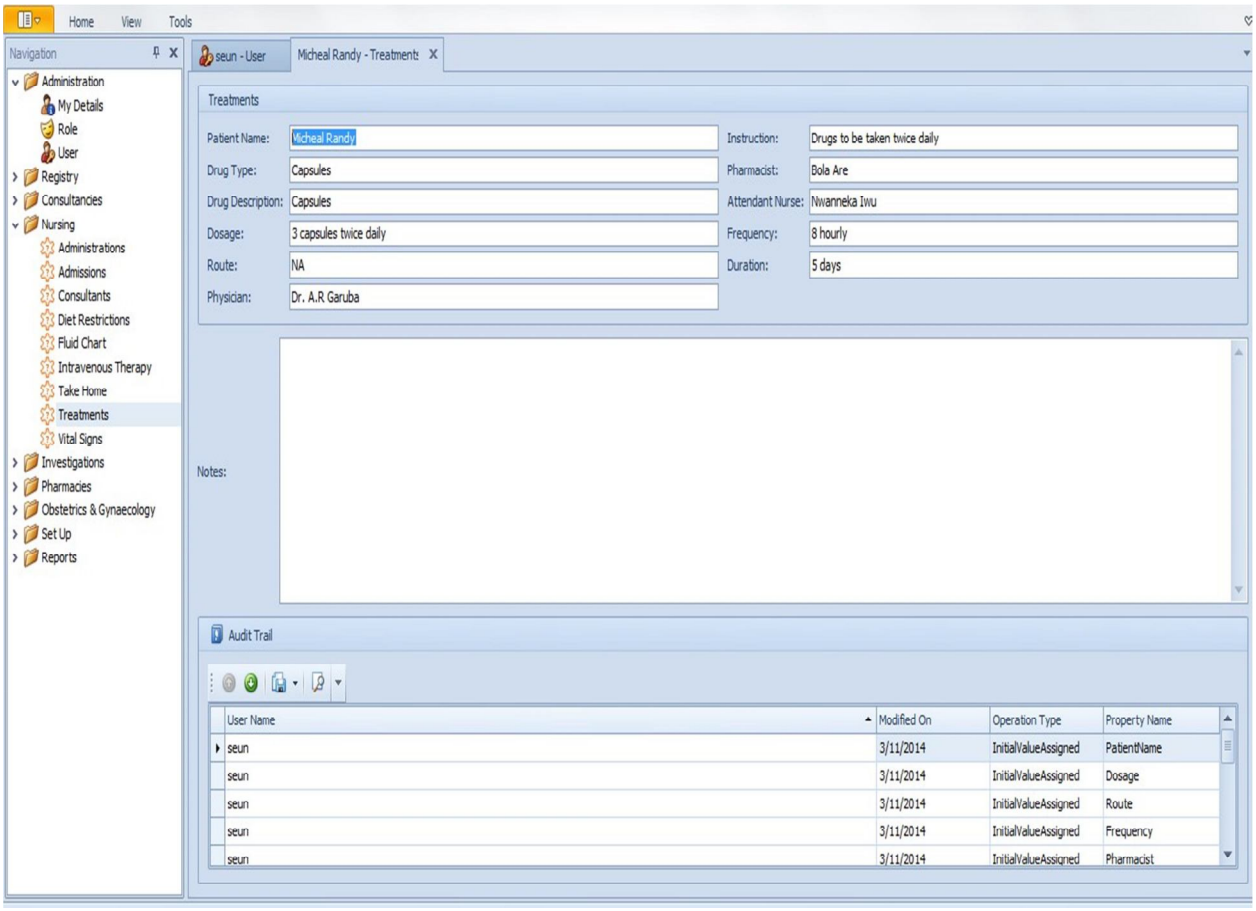


Fig 4.18: Proposed Automated Nursing Treatment Form
Nursing Administrations FORM (Existing Form)

NURSES NOTES

SURNAME	FIRSTNAME	ATTENDING PHYSICIAN/SURGEON	HOSPITAL NO

DATE	TIME	REMARKS-MEDICATIONS	NAME	SIGNATURE

Table 4.26: Nursing Administration (Sample Output)

Module

Sub-Module1

Sub-Module2

Sub-Module3

Timing:

Duration:

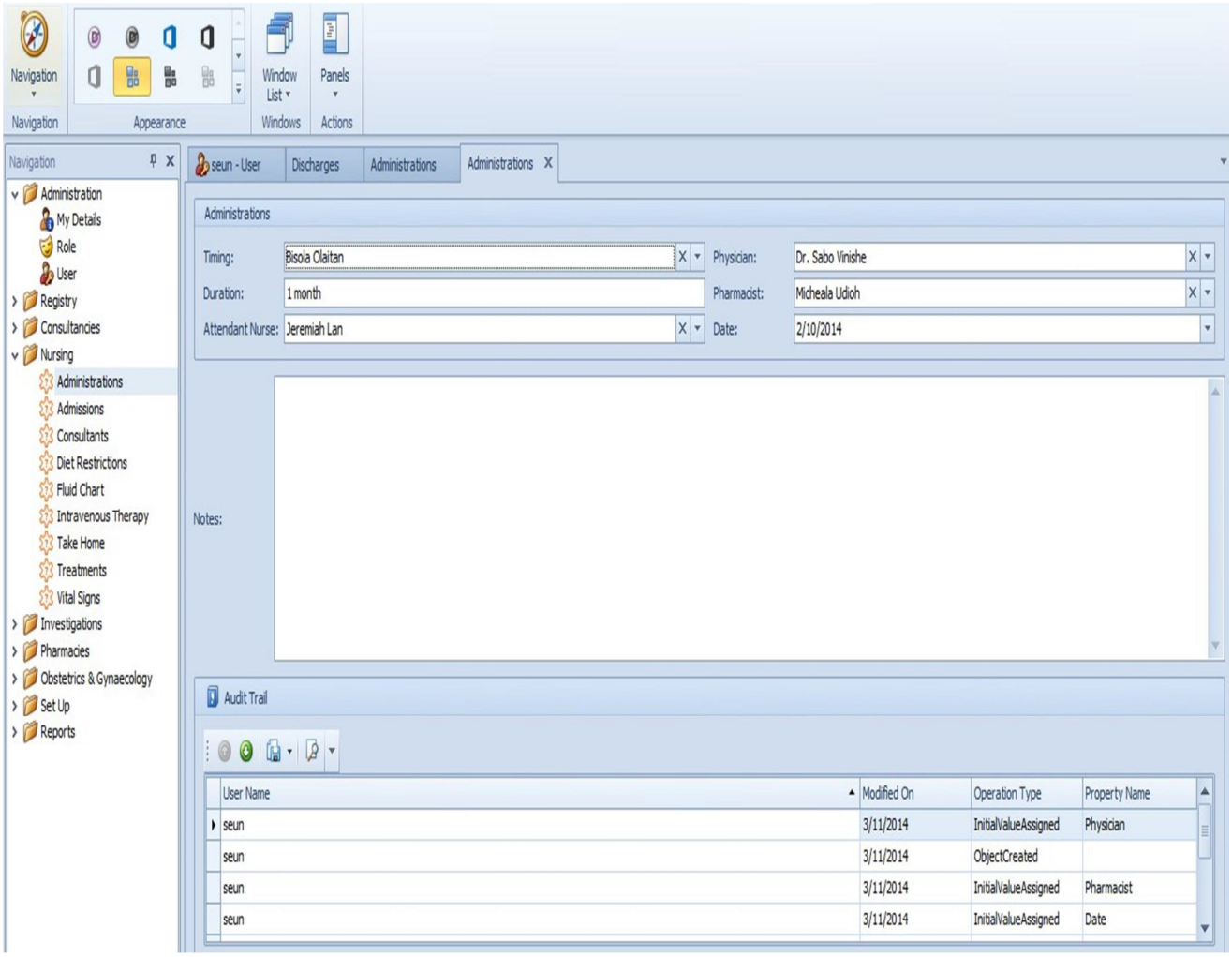
Attendant Nurse:

Physician:

Pharmacist:

Date:

Notes:


Navigation
Appearance
Window List
Windows
Panels
Actions
Navigation
Administration
My Details
Role
User
Registry
Consultancies
Nursing
Administrations
Admissions
Consultants
Diet Restrictions
Fluid Chart
Intravenous Therapy
Take Home
Treatments
Vital Signs
Investigations
Pharmacies
Obstetrics & Gynaecology
Set Up
Reports
seun - User
Discharges
Administrations
Administrations
Administrations
Timing: Bisola Olaitan
Duration: 1 month
Attendant Nurse: Jeremiah Lan
Physician: Dr. Sabo Vinishe
Pharmacist: Micheala Udioh
Date: 2/10/2014
Notes:
Audit Trail
User Name
Modified On
Operation Type
Property Name
seun 3/11/2014 InitialValueAssigned Physician
seun 3/11/2014 ObjectCreated
seun 3/11/2014 InitialValueAssigned Pharmacist
seun 3/11/2014 InitialValueAssigned Date

Pharmacy Stocks FORM (Existing Form)

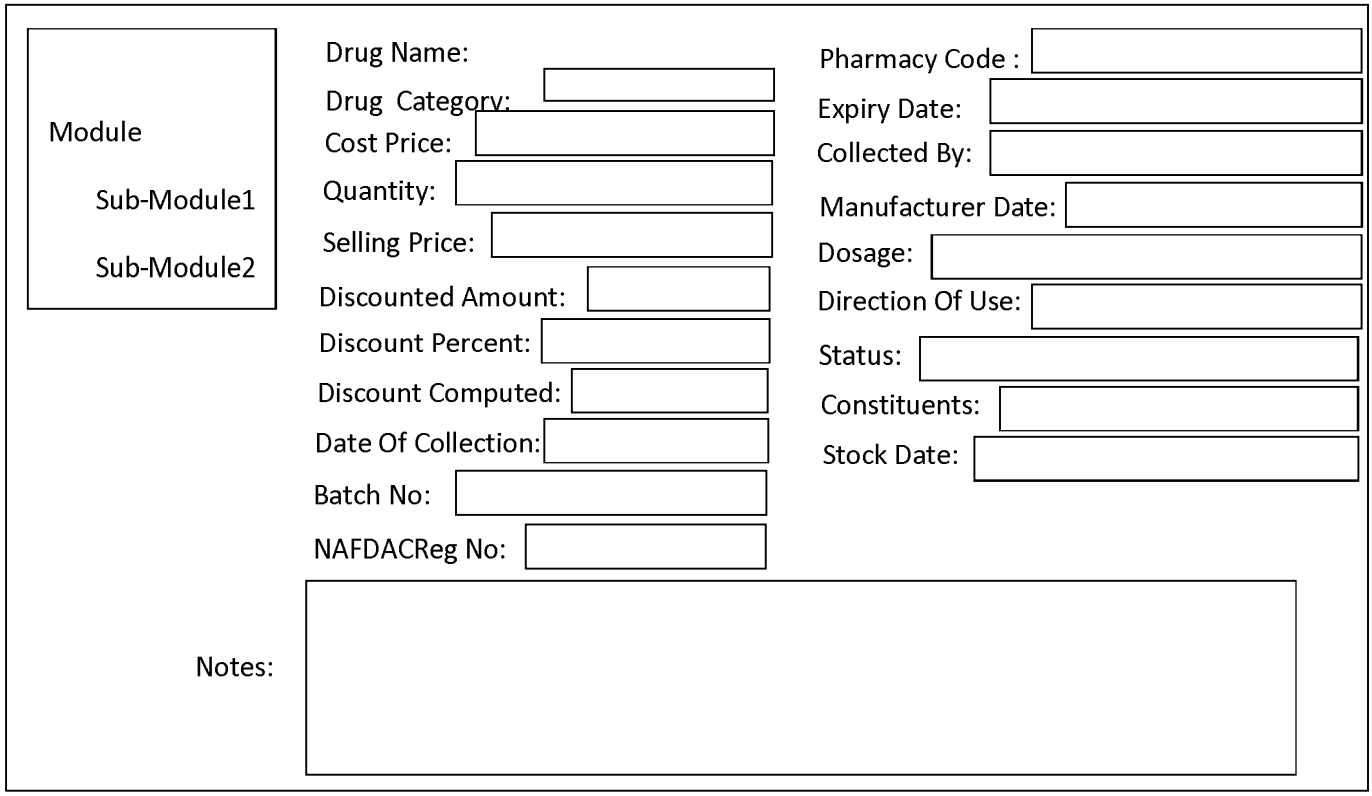
PHARMACY STOCKS FORM

SIV NO:……..DATE:……

No.	*Description*	*Unit of Issue*	*Quantity*		*Price per unit*	*Total amount*	*Ledger Amount*	*Remarks*
			Required	*Supplied*				

Signature of Pharmacist(Collector):……..…Approved by:……

Table 4.27:


Module
Sub-Module1
Sub-Module2
Drug Name:
Drug Category:
Cost Price:
Quantity:
Selling Price:
Discounted Amount:
Discount Percent:
Discount Computed:
Date Of Collection:
Batch No:
NAFDACReg No:
Pharmacy Code :
Expiry Date:
Collected By:
Manufacturer Date:
Dosage:
Direction Of Use:
Status:
Constituents:
Stock Date:
Notes:

.....Rank:.....

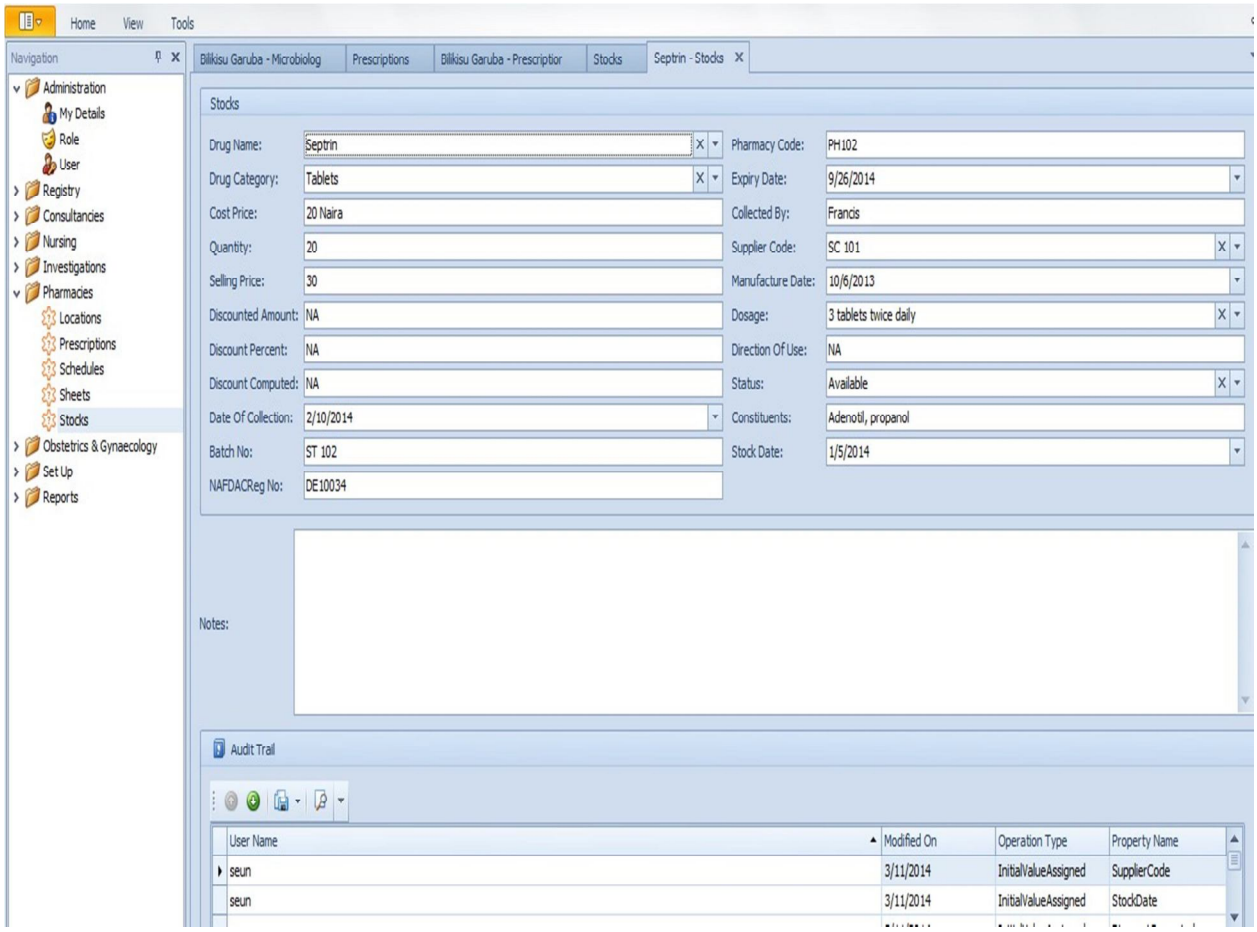


Fig 4.20: Proposed Automated Pharmacy Stocks Form

Table 4.28: Pharmacy Prescription (Sample Output)

Module

Sub-Module1

Sub-Module2

Patient Name:

Drug Category:

Pharmacist:

Description:

Dosage:

Duration:

Amount:

Quantity:

Total Amount:

Sheet Code:

Notes:

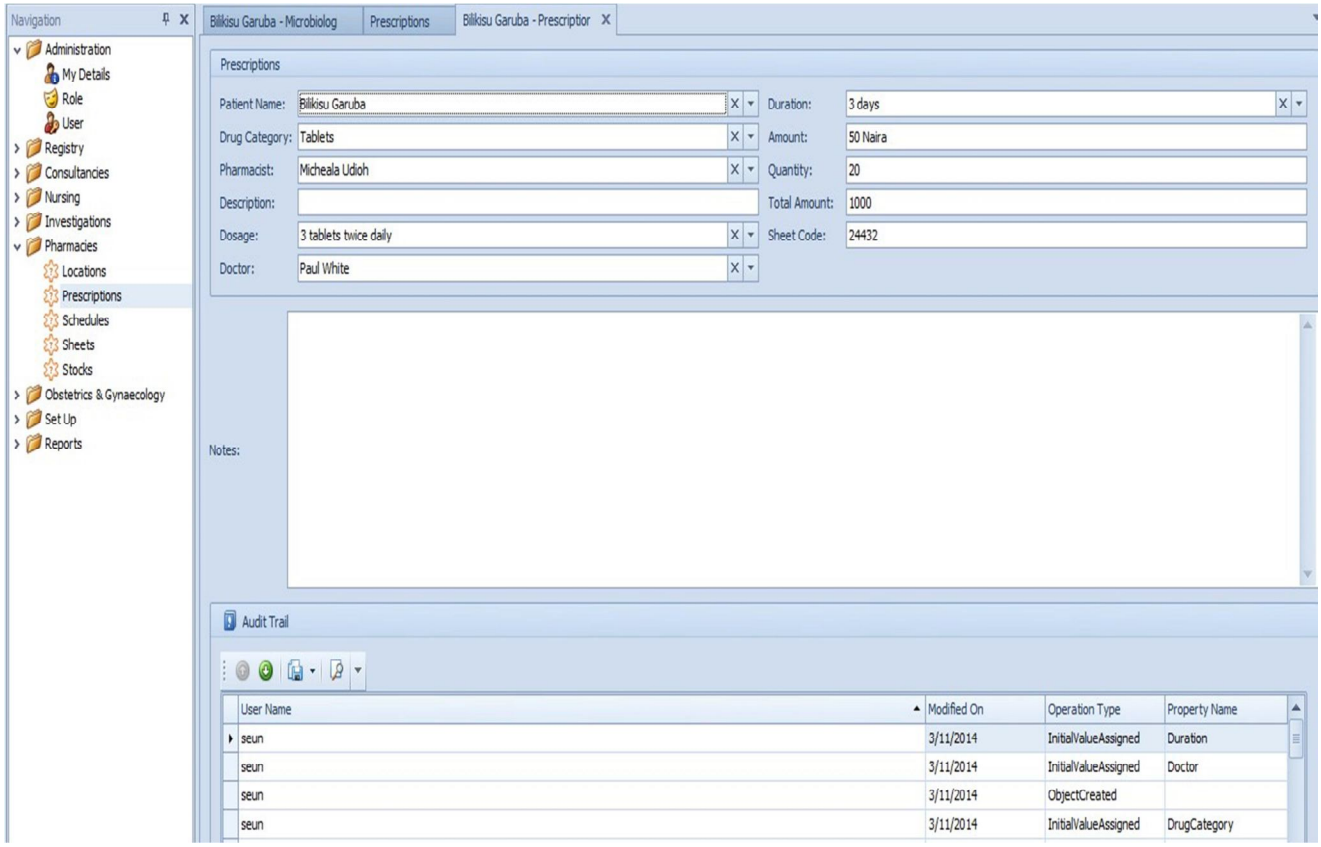
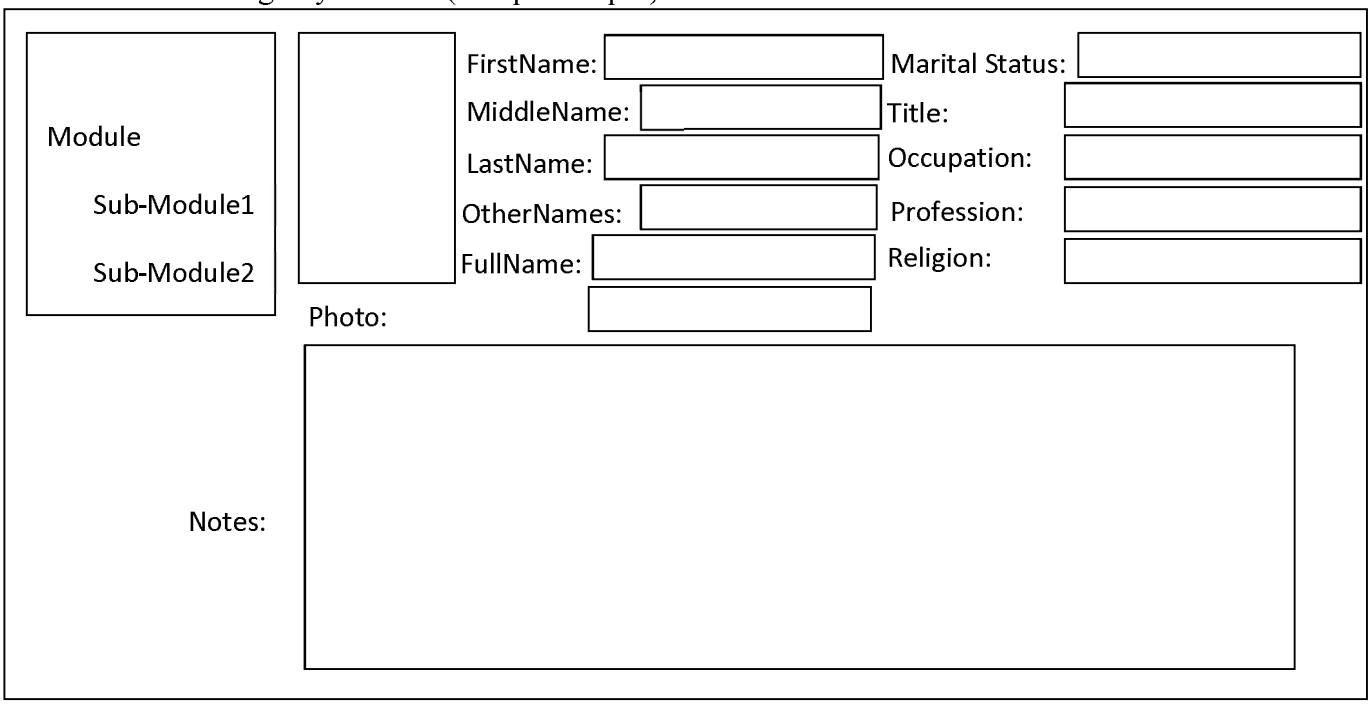


Fig 4.21: Proposed Automated Pharmacy Prescription Form

Table 4.28: Registry/Records(Sample Output)



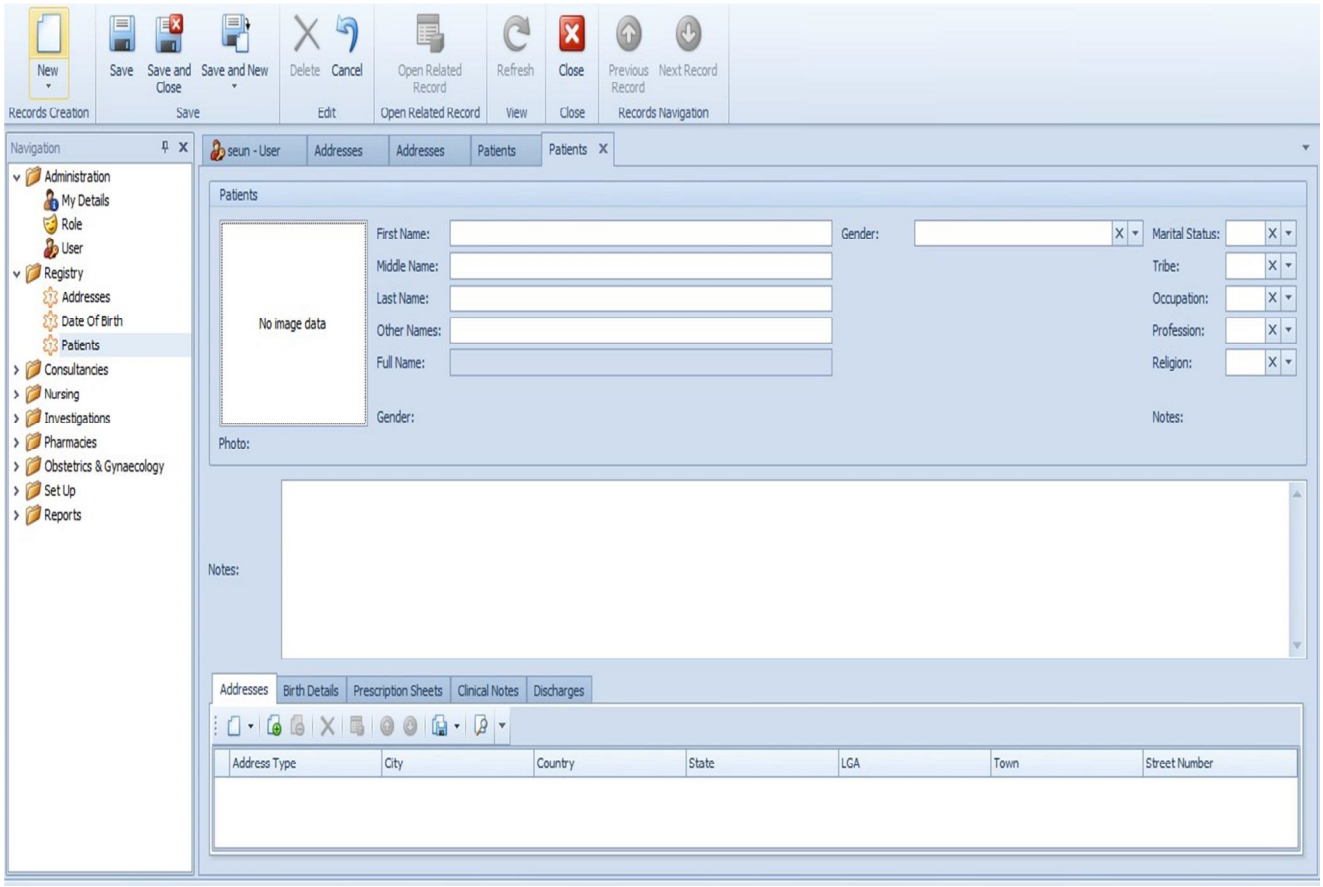


Fig 4.22: Proposed Automated Registry/Records Form

Table 4.29: Antenatals (Sample Output)

Module Sub-Module1 Sub-Module2 Sub-Module3	Patient Name: Last Menstural Period: Grade: Blood Group: Height: Weight: Pelvis: Nipples:	Feet : Expiry Date: General: Attendant Nurse: Physician: Expected Date Of Delivery: Date:
Notes:		

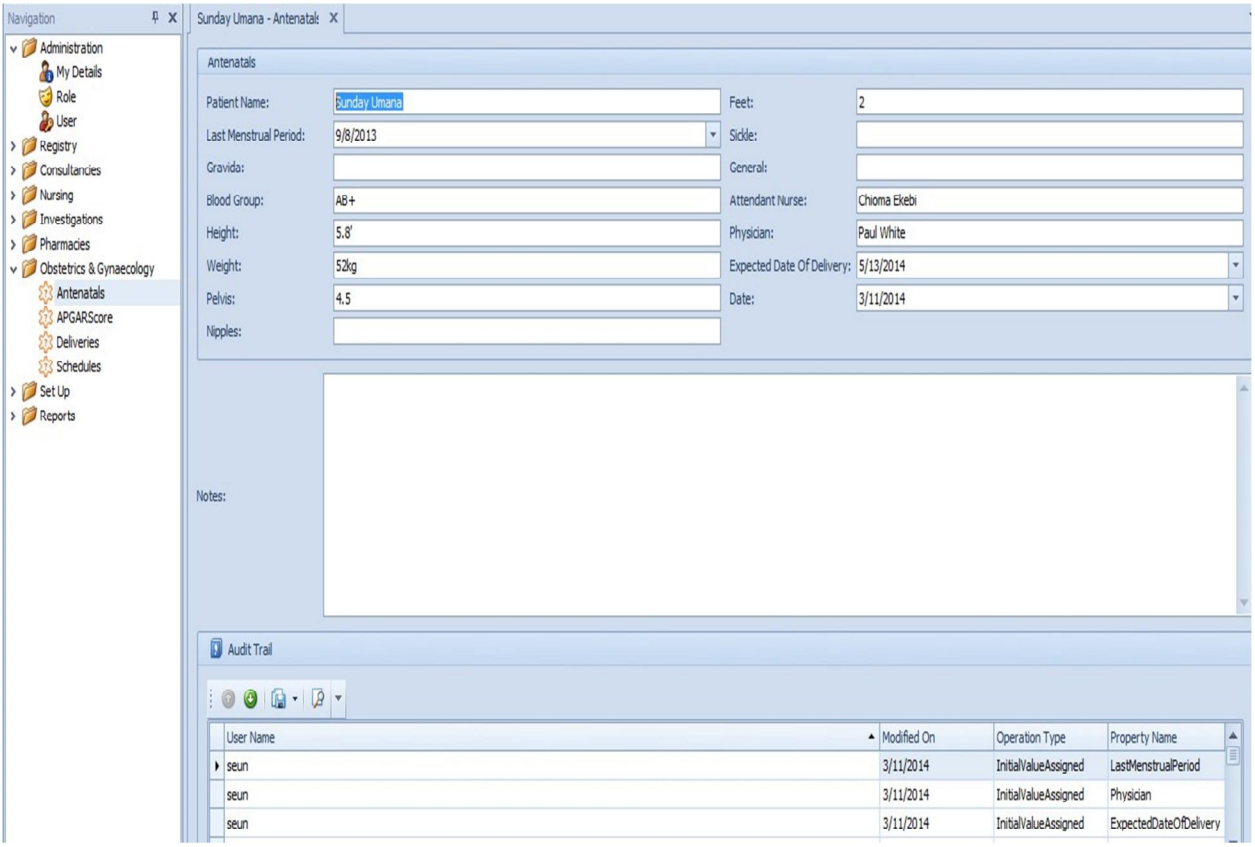
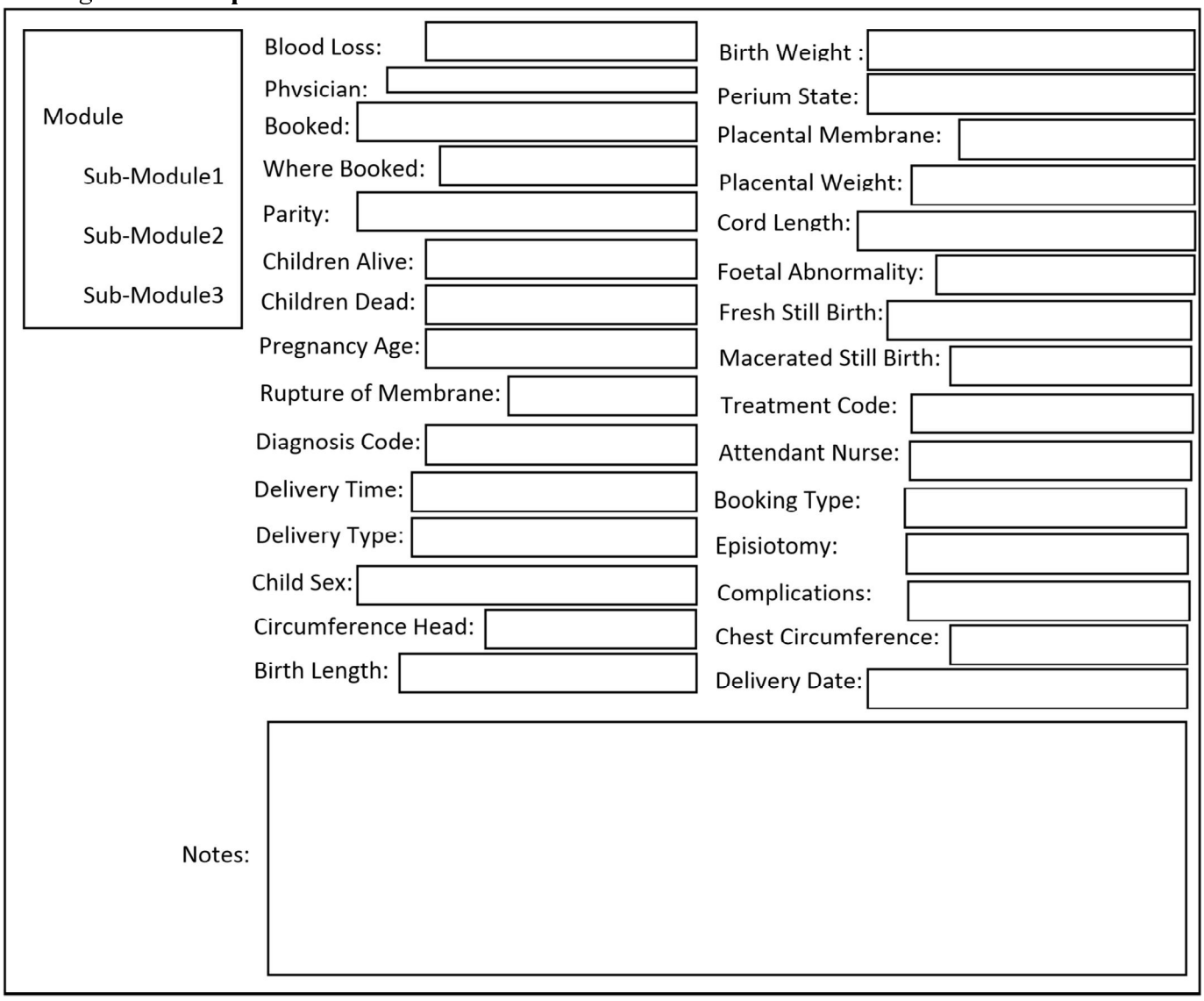

Navigation
Administration
My Details
Role
User
Registry
Consultancies
Nursing
Investigations
Pharmacies
Obstetrics & Gynaecology
Antenatals
APGARScore
Deliveries
Schedules
Set Up
Reports
Sunday Umana - Antenatals
Antenatals
Patient Name: Sunday Umana
Last Menstrual Period: 9/8/2013
Gravida:
Blood Group: AB+
Height: 5.8'
Weight: 52kg
Pelvis: 4.5
Nipples:
Feet: 2
Sickle:
General:
Attendant Nurse: Chioma Ekebi
Physician: Paul White
Expected Date Of Delivery: 5/13/2014
Date: 3/11/2014
Notes:
Audit Trail
User Name
Modified On
Operation Type
Property Name
seun 3/11/2014 InitialValueAssigned LastMenstrualPeriod
seun 3/11/2014 InitialValueAssigned Physician
seun 3/11/2014 InitialValueAssigned ExpectedDateOfDelivery

Fig 4.23: Proposed Automated Antenatals Form Table 4.29:



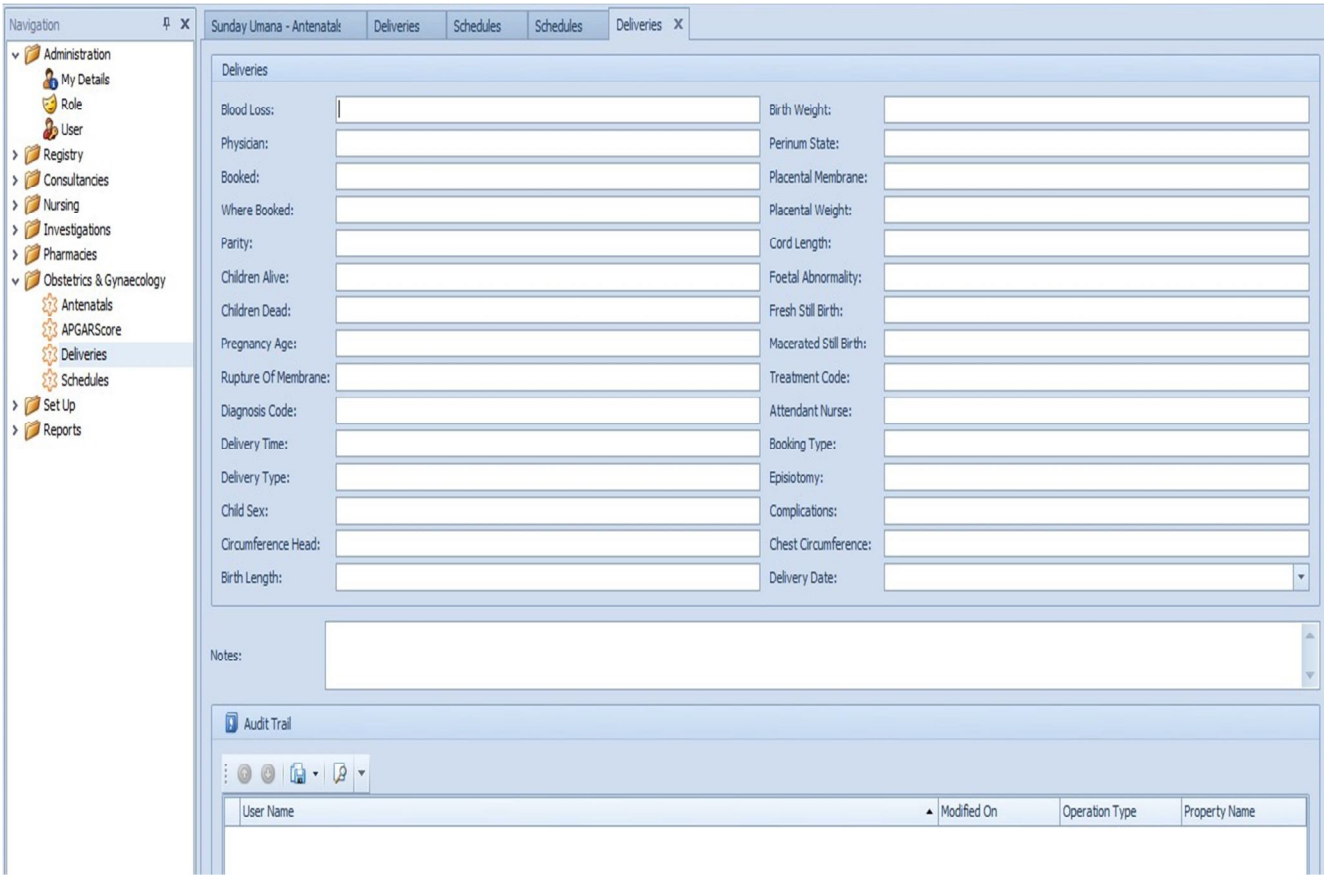

Navigation
Administration
My Details
Role
User
Registry
Consultancies
Nursing
Investigations
Pharmacies
Obstetrics & Gynaecology
Antenatals
APGARScore
Deliveries
Schedules
Set Up
Reports
Sunday Umana - Antenatal
Deliveries
Schedules
Schedules
Deliveries
Deliveries
Blood Loss:
Physician:
Booked:
Where Booked:
Parity:
Children Alive:
Children Dead:
Pregnancy Age:
Rupture Of Membrane:
Diagnosis Code:
Delivery Time:
Delivery Type:
Child Sex:
Circumference Head:
Birth Length:
Birth Weight:
Perinum State:
Placental Membrane:
Placental Weight:
Cord Length:
Foetal Abnormality:
Fresh Still Birth:
Macerated Still Birth:
Treatment Code:
Attendant Nurse:
Booking Type:
Episiotomy:
Complications:
Chest Circumference:
Delivery Date:
Notes:
Audit Trail
User Name
Modified On
Operation Type
Property Name

Table 4.30: Schedules (Sample Output)

Module

Sub-Module1

Sub-Module2

Sub-Module3

Patient Name:

Fondus Height:

Presentation And Positioning:

Foetal Heart:

Oedema:

Weight :

Haemoglobin:

Blood Pressure:

Treatment Code:

Date Visited:

Notes:

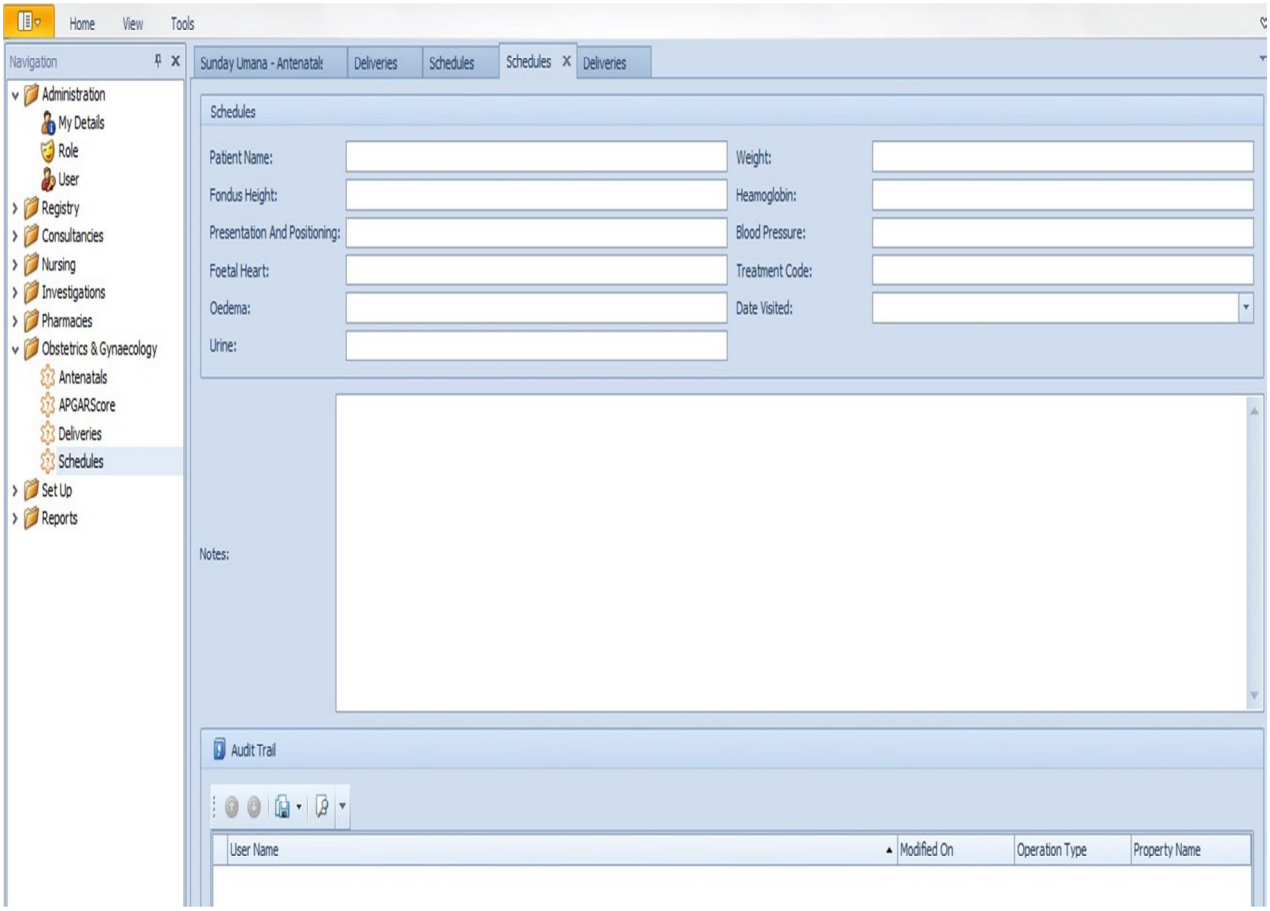


Fig 4.25:Proposed Automated Schedules Form

Table 4.31: Consultancy(Clinical Notes) Sample Output

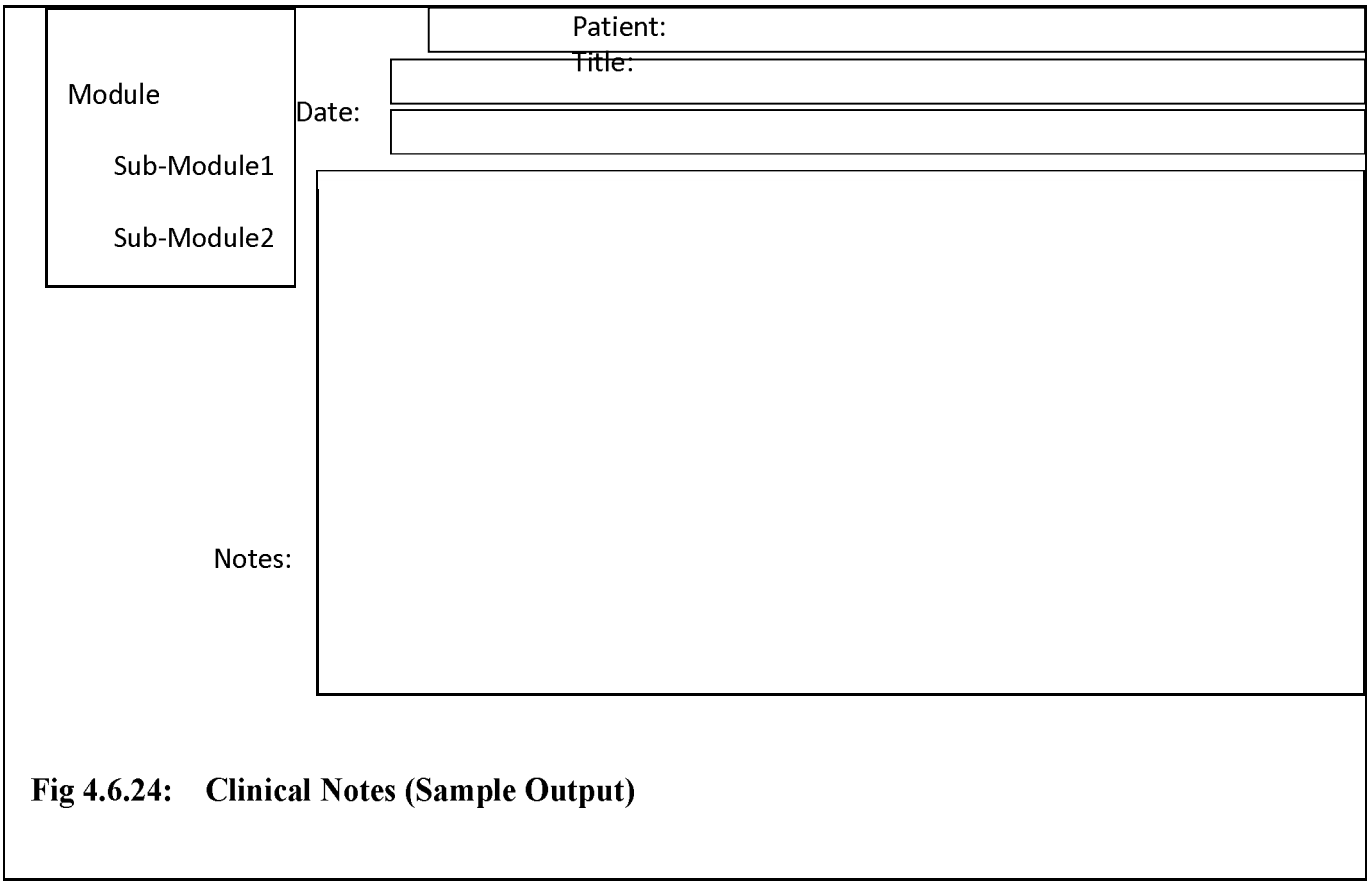
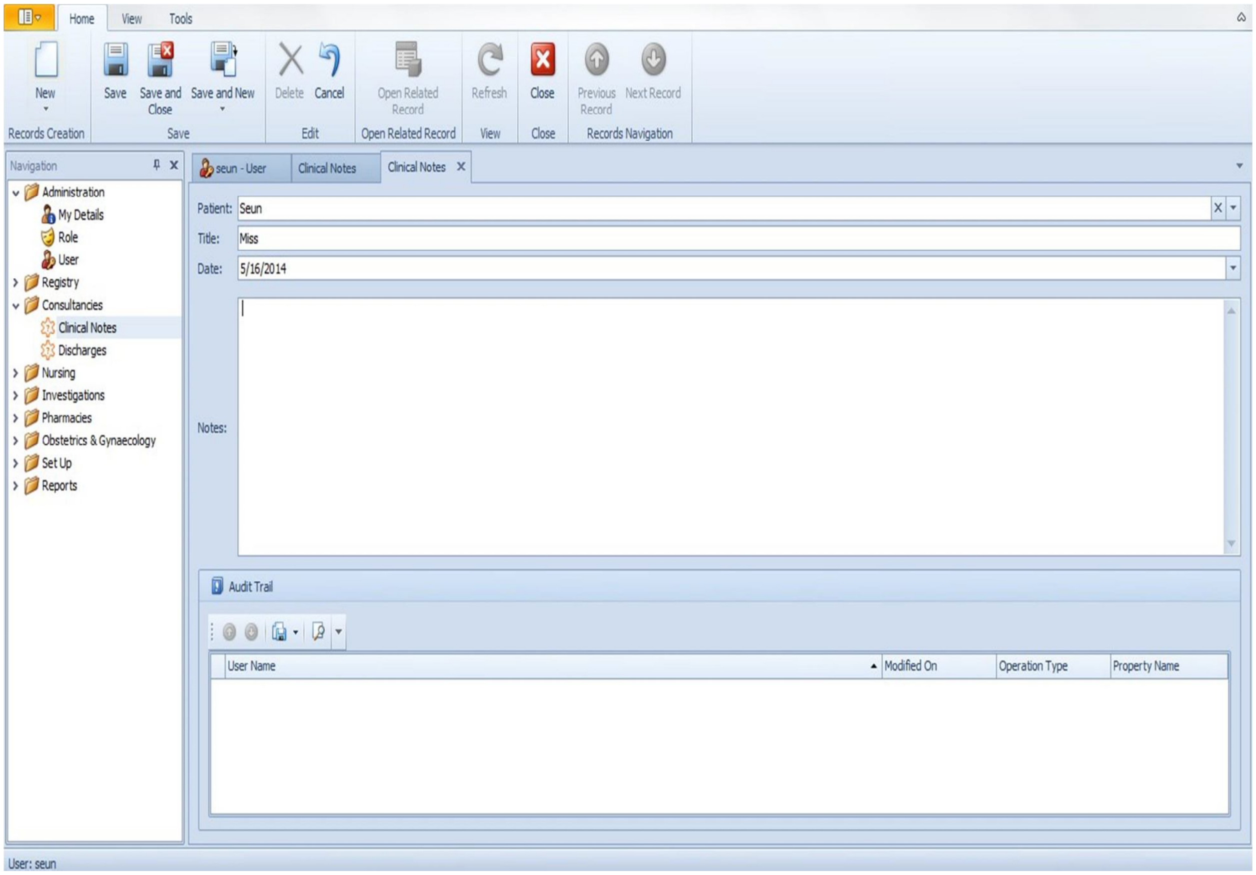
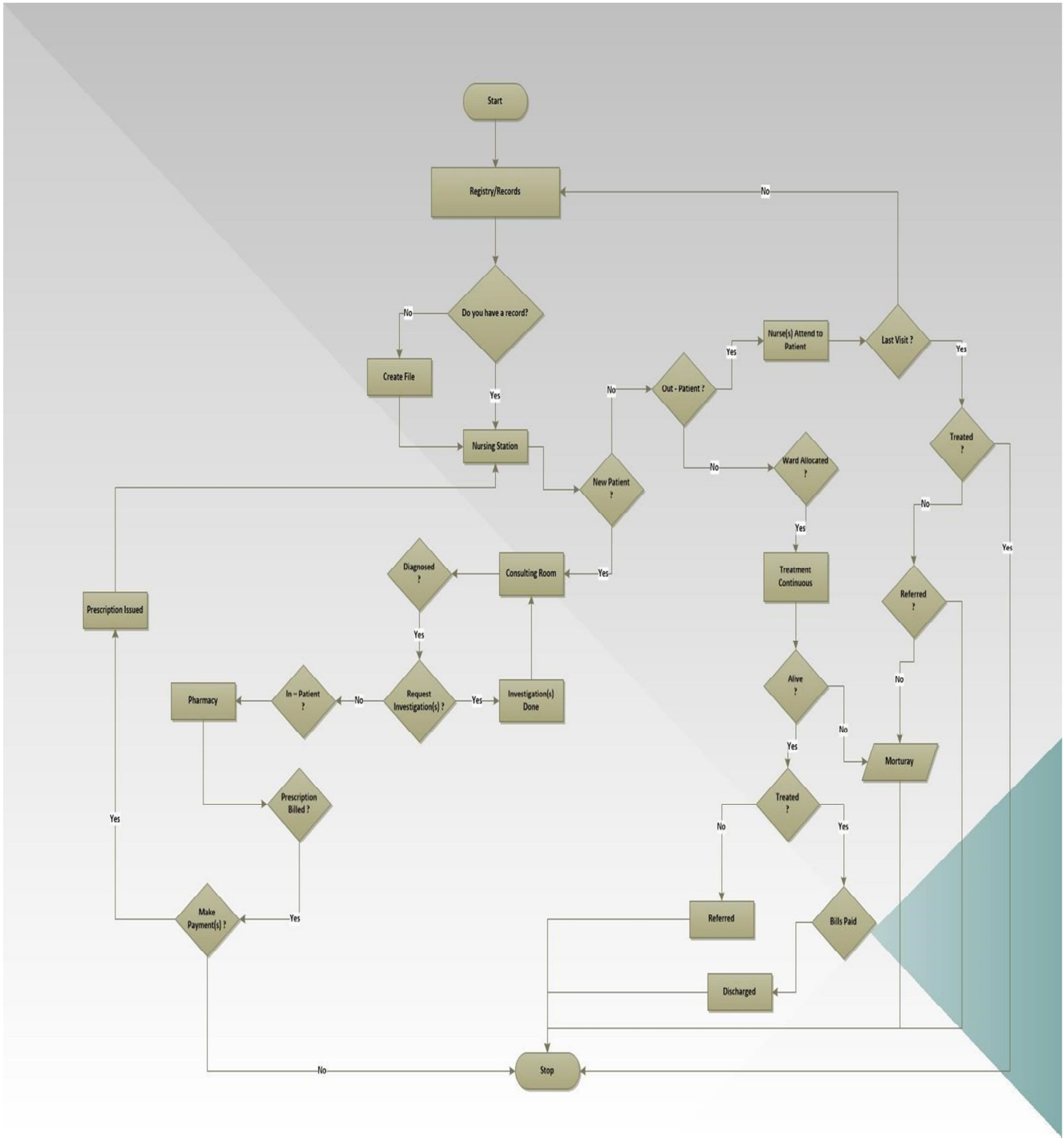


Fig 4.6.24: Clinical Notes (Sample Output)


Home
View
Tools
New
Save
Save and Close
Save and New
Delete
Cancel
Open Related Record
Refresh
Close
Previous Record
Next Record
Records Creation
Save
Edit
Open Related Record
View
Close
Records Navigation
Navigation
Administration
My Details
Role
User
Registry
Consultancies
Clinical Notes
Discharges
Nursing
Investigations
Pharmacies
Obstetrics & Gynaecology
Set Up
Reports
seun - User
Clinical Notes
Clinical Notes
Patient: Seun
Title: Miss
Date: 5/16/2014
Notes:
Audit Trail
User Name
Modified On
Operation Type
Property Name
User: seun


Start
Registry/Records
No
Do you have a record?
No
Create File
Yes
Nursing Station
New Patient ?
No
Out - Patient ?
Yes
Nurse(s) Attend to Patient
Last Visit ?
Yes
Treated ?
No
Referred ?
No
Mortuary
Yes
Ward Allocated ?
No
Yes
Treatment Continuous
Alive ?
No
Yes
Treated ?
No
Referred
Yes
Bills Paid
Discharged
Yes
Diagnosed ?
Consulting Room
Yes
Yes
Request Investigation(s) ?
Yes
Investigation(s) Done
No
In – Patient ?
Pharmacy
Prescription Billed ?
Yes
Make Payment(s) ?
Yes
Prescription Issued
Yes
No
Stop

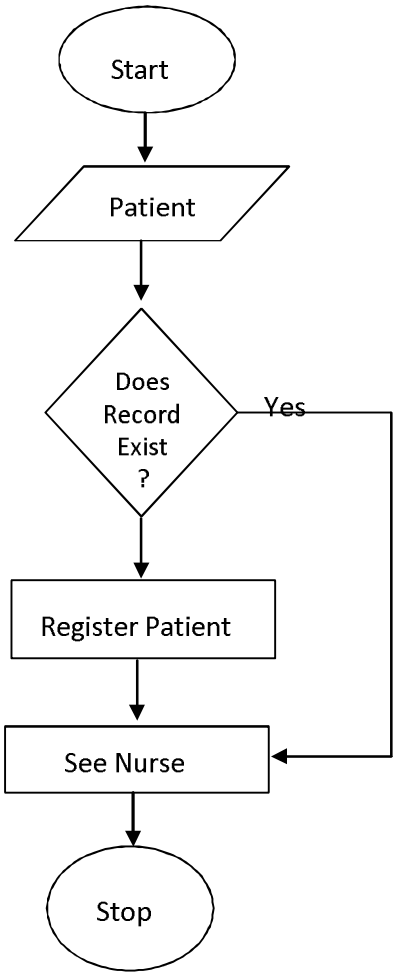


Fig 4.28: Pre-Iterative Data Flow

Pre-Iterative Flow

The pre-iterative flow simply shows diagrammatically a sequence of the first steps that occurs in a health care system in the software. In this case, the patient is first referred to the registry and records and a check is made to know if his/her record exist in the system. If the record doesn‘t exist, the patient is made to register. Then (s)he gets to see the nurse and the clinical process starts. But if the record exists the patient‘s record is taken directly to the nurse and the pre-iterative process flows ends at this point.

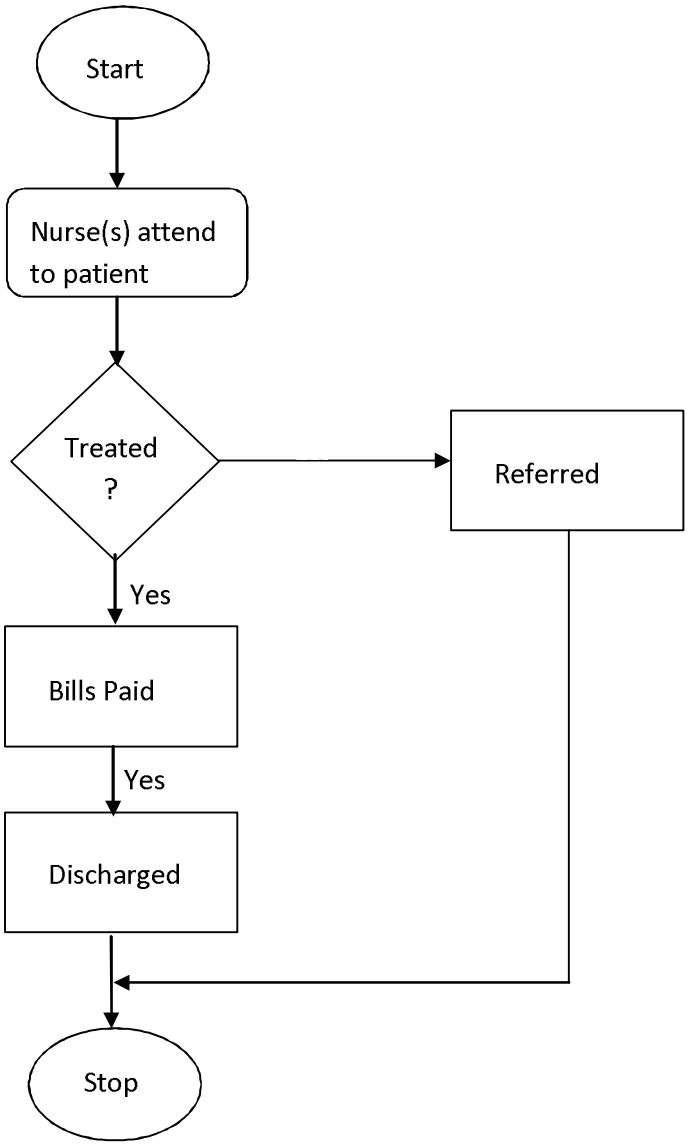


Fig 4.29: Iterative Data Flow

Iterative Data Flow

The Iterative flow is the sequence of events in the software that occurs repeatedly. In the health care environment, the iterative sequence of events starts with the nursing station. The patient is either treated or not.If (s)he is treated a rundown of the treatment is taken and (s)he is referred to the billing section for the bills to be paid and only after the bills are paid will the patient be discharged. If the patient is not treated then (s)he is referred to another hospital and the sequence of events at this stage comes to a halt.

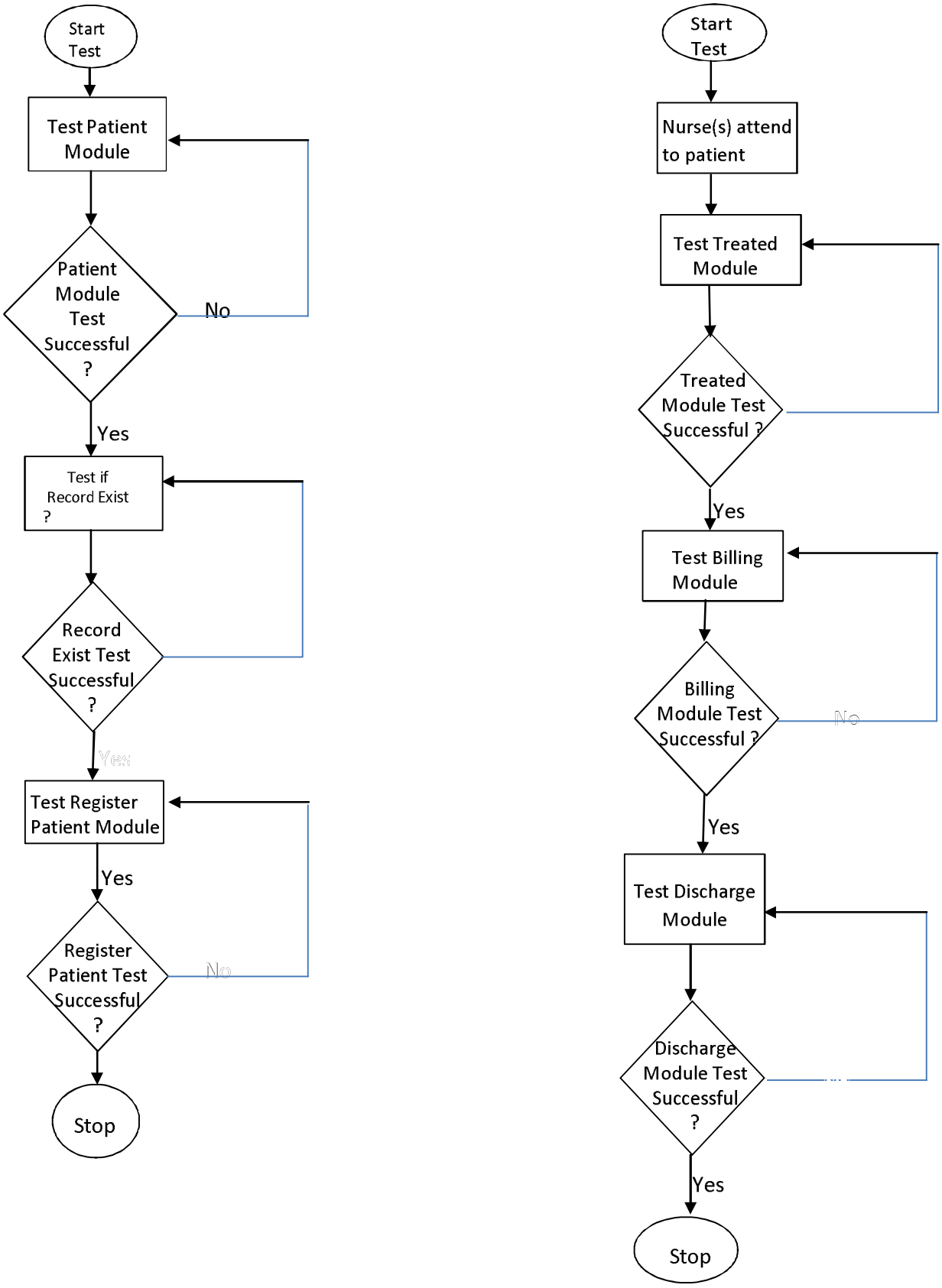


Fig 4.30: Post Iterative Flow Post-Iterative Flow

The post iterative-flow is the sequence of events that occurs before the software as a whole is produced. At this stage testing(debugging i.e checking to ensure that there are no errors) in all the various steps in the stages

4.7Choice of Programming Language

The programming language used for the front end or client side of this thesis is the C sharp programming language version 4.0 (also known as C#).

C# Overview [Visual Studio 2012]

C# is a unified development model that includes the services necessary for you to build enterprise-class applications with minimum amount of coding. C# is part of the .NET Framework, and when coding C# applications you have access to classes in the .NET Framework. You can code your applications in any language compatible with the common

develop C# applications that benefit from the common language runtime, type safety, inheritance, and so on.

It was based on the mentioned reason that C# 4.0 (Version 2012) has been chosen as the programming language in developing the Hospital Information Management System application.

Microsoft SQL Server is a relational database management system developed by Microsoft. As a database, it is a software product whose primary function is to store and retrieve data as requested by other software applications, be it those on the same computer or those running on another computer across a network.

Why choose SQL Server

Microsoft SQL Server is a comprehensive database server and information platform offering a complete set of enterprise-ready technologies and tools that help people derive the most value from information at the lowest total-cost-of-ownership. Enjoy high levels of performance, availability, and security; employ more productive management and development tools; and