GLOBAL JOURNAL OF COMMERCE & MANAGEMENT PERSPECTIVE
(Published By: Global Institute for Research & Education)
www.gifre.org

TOWARDS KNOWLEDGE BASED MEDICAL PRESCRIPTION SYSTEM IN HEALTH SECTOR IN UGANDA: A CASE OF MBUYA MILTARY HOSPITAL

Conrad M. Mubaraka*, Mamman Jibia Salisu** & Kirungi Priscilla***

*Deputy Principal, College of Higher Degrees & Research, Kampala International University, Kampala, Uganda
**Lecturer, Hassan Usman Katsina Polytechnic – Katsina – Nigeria
***Master of Science Computer Science, Kampala International University, Uganda, Kampala

Abstract

This project was carried out with an aim to support health workers in Mbuya hospital, Kampala, Uganda in the medicine administration process by introducing an interactive knowledge-based prescription system that would eliminate prescription errors. The research employed the Quasi Experimental design, the study found that the system was significantly effective though at low levels and thus recommend that more functionalities may be added to realize full business logic of the military hospital.

Key Word: *Prescription, Knowledge-based, Hospital.*

1. Introduction

Traditional Drug Prescription System is the world-wide commonly used system where a human specialist or expert in a certain medical field such as gynecology, checks or asks a patient for any signs or symptoms. When that information cannot help in determining the disease, laboratory tests are carried out. Then the specialist bases on this information to tell what one is suffering from and uses his/her knowledge to prescribe medicine combinations that can cure that disease. The traditional drug prescription system is advantageous because it is relatively cheaper and handles a wide range of problems. However, the traditional drug prescription system is disadvantageous since it is associated with high administrative and operational costs, has high possibilities of prescription errors and it is associated with very low levels of accuracy. (Womakuyu, 2009).

An interactive knowledge-based drug prescription system is an electronic way to generate prescriptions through an automated data-entry process utilizing electronic prescribing software (Venot,1992). Knowledge-based drug prescription systems have been described as the solution to improved patient safety and reducing sky-rocketing medication costs. It is estimated that approximately 7,000 deaths occur each year in the United States due to medication errors. These errors are predominately due to hand-writing illegibility, wrong dosage, and missed drug-drug reactions. With approximately three billion prescriptions written annually, which constitutes one of the largest paper-based processes in the United States, the writing of prescriptions can be streamlined and efficient by using an automated prescribing system.

The general health sector of Uganda is relatively poor compared to other sectors. According to Dukes, Mildred and Swartz (1998), one of the challenges Uganda faces is drug prescription is errors and this problem lacks enough media coverage. Clinics provide very poor health services to the people not only because they have little medicine in stock, but also because of inadequate medical workers like nurses and doctors, some of who are poorly trained and usually overworked. This slows down the process since people waste a lot of time in queues waiting to be treated and others end up going back unattended to; and also leaves the staff exhausted thus prone to prescription errors which has led to dire consequences.

In most Ugandan health facilities, when you reach at the reception, you are welcomed by a line of patients waiting to be attended to. When your turn reaches, you are asked to give your details (name, health problem you have, etc) by the receptionist. After giving in this information, the receptionist sends you to the next queue waiting to see the doctor. When you finally manage to enter the doctor's room after hours of waiting, the doctor assesses and examines you thoroughly and writes down the prescription on a piece of paper which you are supposed to take to the pharmacy from where you receive the medicine (Womakuyu, 2009).

Such problems do not only affect Uganda as a nation but also other African states like Sudan whose patients are transferred to Ugandan Hospitals, Mulago. Therefore designing and developing an interactive and knowledge-based drug prescription system would eliminate the risk of medication errors during drug prescription. It also reduces the administrative and operational costs in the hospital, enhance performance since it is computer based, and also leads to future cost avoidance. Besides lack of enough well skilled medical personnel compared to the large number of patients attended to daily. The dire consequences of such loop holes include unintended death and injury resulting into temporary or permanent disability.

2. Literature Review

Akerkar, (2009) asserts that knowledge-based systems are artificial intelligence tools working in a narrow domain to provide intelligent decisions with justification. Knowledge is acquired and represented using various knowledge representation techniques rules, frames and scripts. The basic advantages offered by such systems are documentation of

knowledge, intelligent decision support, self learning, reasoning and explanation. Knowledge-based systems are systems based on the methods and techniques of Artificial Intelligence.

An interactive system is one which enables users to actively interact with its data or objects. This type of system is dynamic and supports user interactivity (Brown, 2006; Canallen, 1999a; Jeong & Lambert, 2001). Therefore an interactive knowledge-based system is one which has a knowledge base and inference engine which enables users to input data (like age and a disease one has) and bases on this data to provide answers and suggestions (recommends medicine combinations to cure the disease). This system accepts one's personal information entered including name, age, plus what a patient is suffering from and bases on this information to prescribe the appropriate medicine combinations to cure the disease.

According to (Brown, 2006), automated drug prescription systems are advantageous in the following ways; (i) It is very convenient since it is faster than the traditional system; (ii) Provides advice on decisions; (iii) Analyses a disease and suggests the best solution; (iv) Develops a solution faster human specialists and experts thus increasing on productivity; (v) Provides accurate information hence reducing medication errors. (vi) reduces administrative and operational costs; (vii) Provides portable knowledge; (viii) Overcomes cognitive limits in processing and storage. This is because the human mind is limited in its ability to process and store information. Also people find it difficult to recall information in an error-free way when it is needed. However, automated drug prescription systems are associated with the following limitations (Brown, 2006; Giudici, 2003; Schegg et. al., 2002): (i) High development costs; (ii) Difficulties in maintenance; and (iii) These kinds of systems are not widely used or tested.

Medicine prescription and health information record-keeping are changing from paper-based to computerized processes in healthcare systems all over the world. Electronic prescribing can be a stand-alone process, but is usually part of an electronic health record system which may also link to pathology, radiology and patient administration systems (Crane, 2006; Jeong et. al., 2005; Josep-Liuis Ferrer- Gorrila, 2005). However, in Uganda and other African countries, the majority of prescribing in primary care is manual. Automated prescription is rarely used in many hospital-based organizations but this is likely to change with recent government incentives to encourage adoption of e-technology.

Bates, (2003) reveals that highly unstable critically ill patients are more vulnerable to medication errors, and the risk of errors is increased in these patients because of the number of drugs they receive. Therefore, reducing errors is crucial to improving patients' outcomes. Information technology and automated systems have been introduced to improve the medication process. For example interactive knowledge based prescription systems which are computer-controlled dispensing units providing secure prescription in care units as seen in this study. These systems have improved medication use in medical units, with an impact on administration time errors, omissions, and work activities.
The effects of e-prescription on the quality of service depend on a range of factors that include the healthcare setting, user training and behavior, availability of appropriate hardware and technical support, the computer system used including the availability and quality of decision support, and integration of the system into work practices (Kuiper, 2007).

3. Methodology

The study employed the quasi-experimental method specifically after design or post test design. Further, this study was a field experiment using Mbuya Hospital as the research environment.

4. System Design

The user commences the operation by entering the username and password. The system determines whether the person who has logged in is on administrative or user level. In case the user is on administrative level, he/she can access the menu form thus being with the privilege of accessing all the information. However, if one logs in on the user level, he/she will only be limited to have access to the information that can only be used to prescribe.

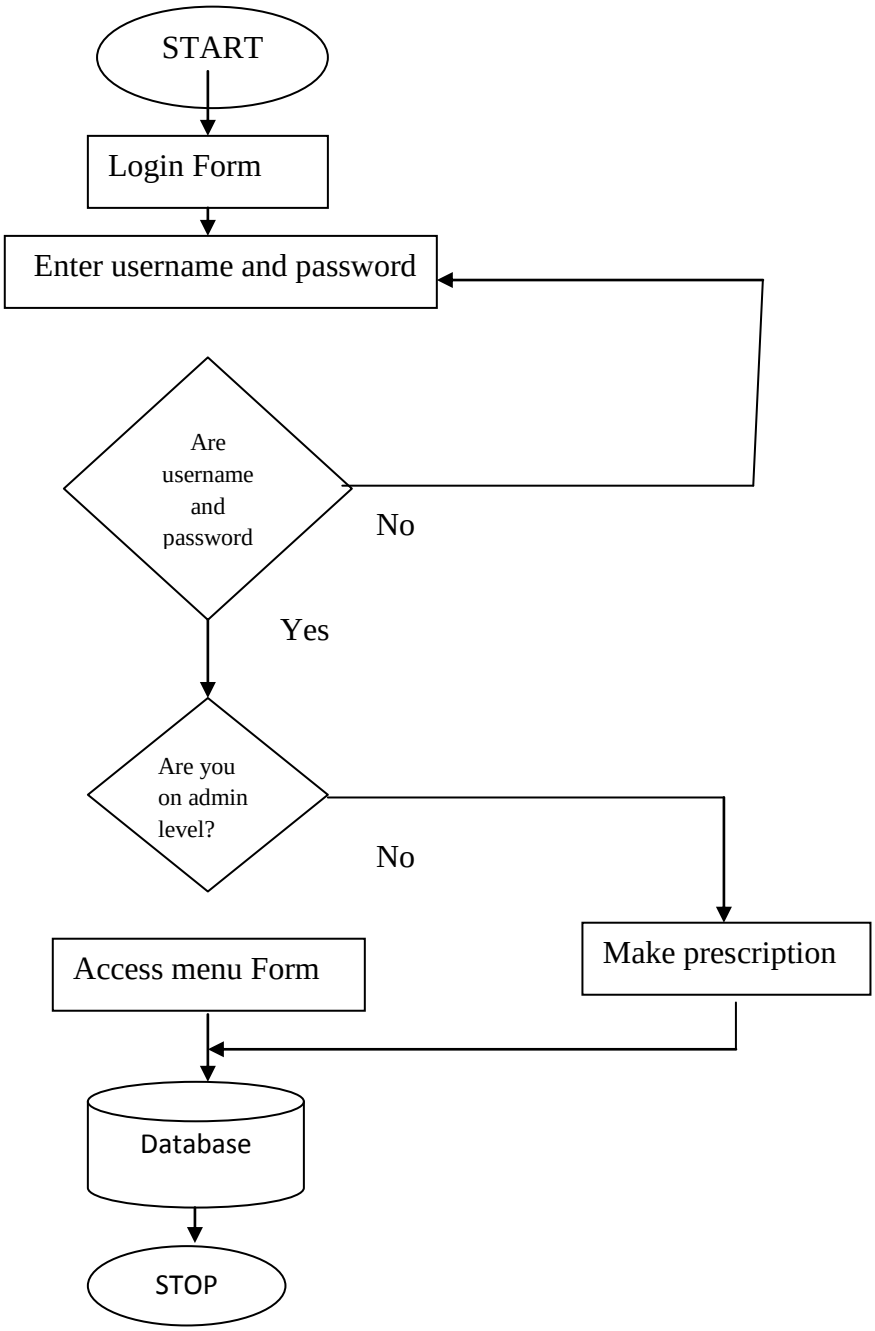

Figure 1 Data Flow Diagram for the system

5. Findings

Automated drug prescription improved patient safety and overall quality of care. Illegibility from hand-written prescriptions was eliminated, decreasing the risk of prescription errors and deceasing liability risks. Computerized prescription improved reporting ability. Query reporting was performed which was impossible with a paper prescription system. For example finding all patients who have had a particular medication prescribed to them during a drug recall, the frequency of medication prescribed by certain providers. The new system has provision for monitoring the patients' reaction to the prescribed medicine. This is because the system is able to capture a patient's reaction (whether positive, negative or no reaction). The overall evaluation shows that supportability was ranked satisfactory, followed by availability, maintainability and reliability respectively.

Table 1
Summary of Level of Assessment

Indicator	Mean	Interpretation	Rank
Supportability	2.63	Satisfactory	1
Reliability	2.05	Fair	4
Availability	2.36	Fair	2
Maintainability	2.33	Fair	3
Total Mean	2.34	Fair	

Table 1 reveals that supportability of the system was assessed as satisfactory while others were assessed as fair meaning there is still a lot to be done to get the knowledge based system achieve its full intention.

6. Implementation

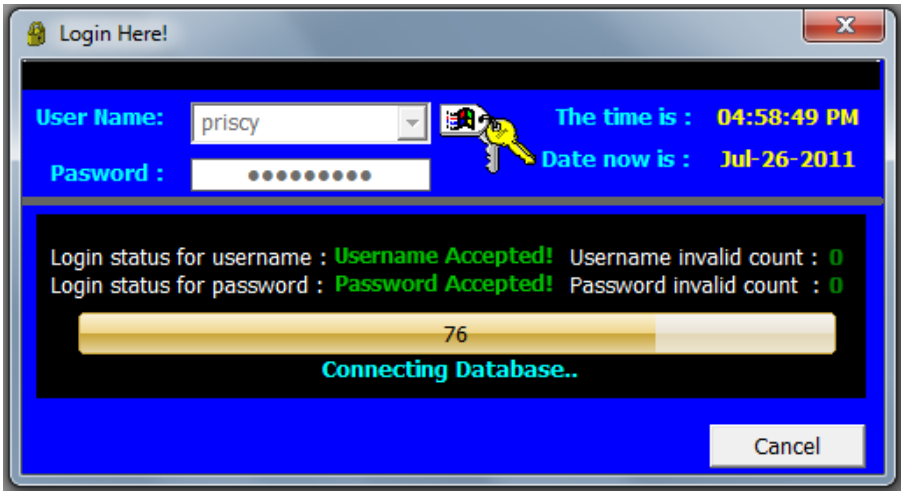

Figure 2 Login Form

A user can either type in his/her username or use the drop down menu to select it.

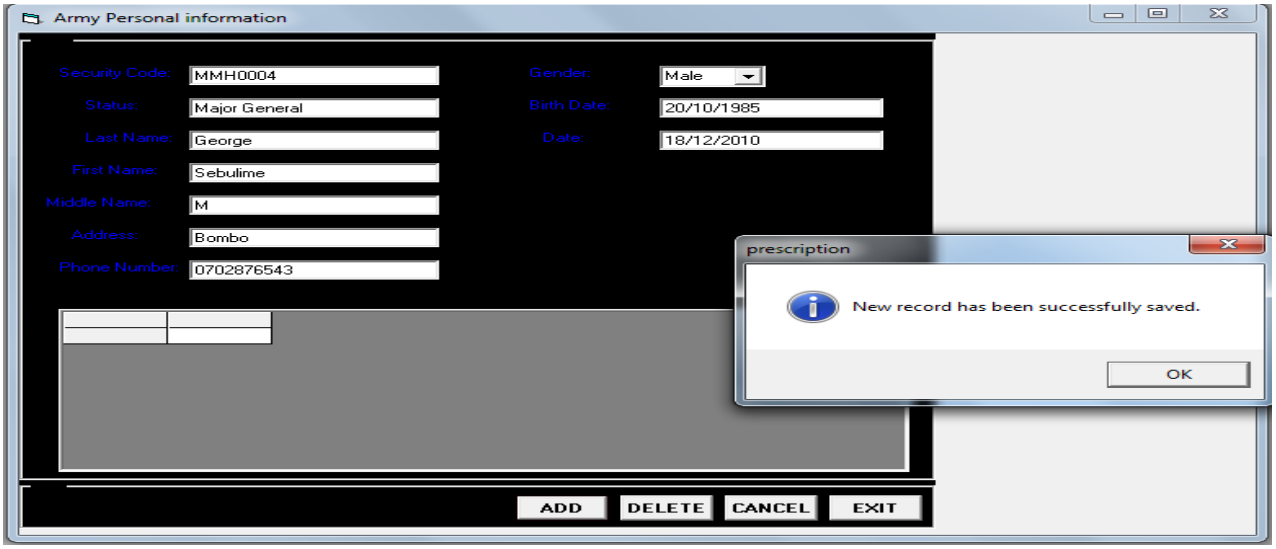

Figure 3: Soldiers' Details Entry Form

The personal information of each soldier that was registered to be treated from the hospital was entered into the system through this form.

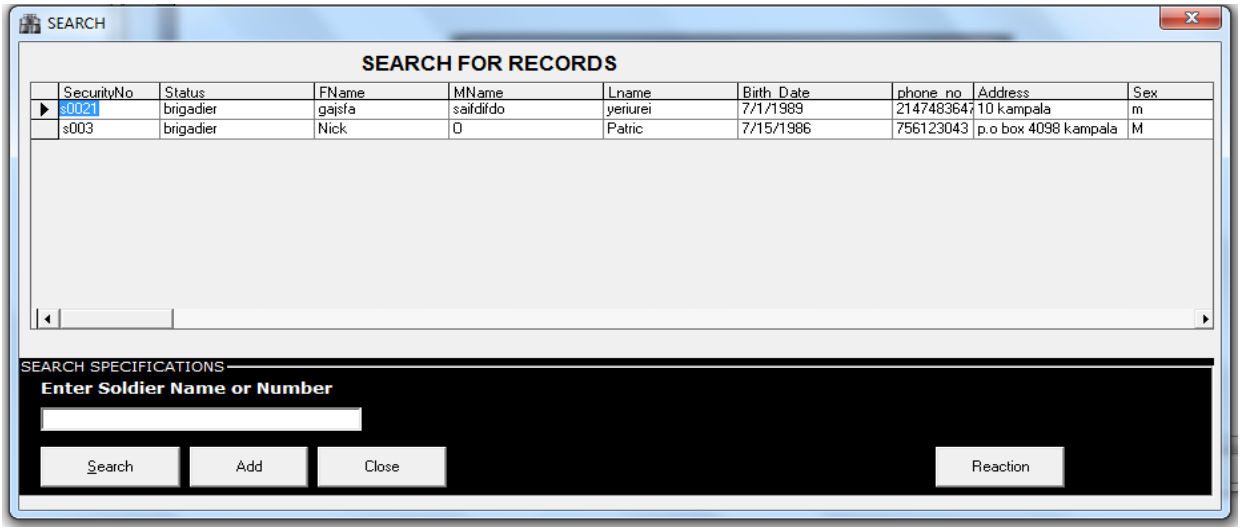

Figure 4 Soldiers' Details Search Form

The search form makes it faster for the user to access any information or records needed.

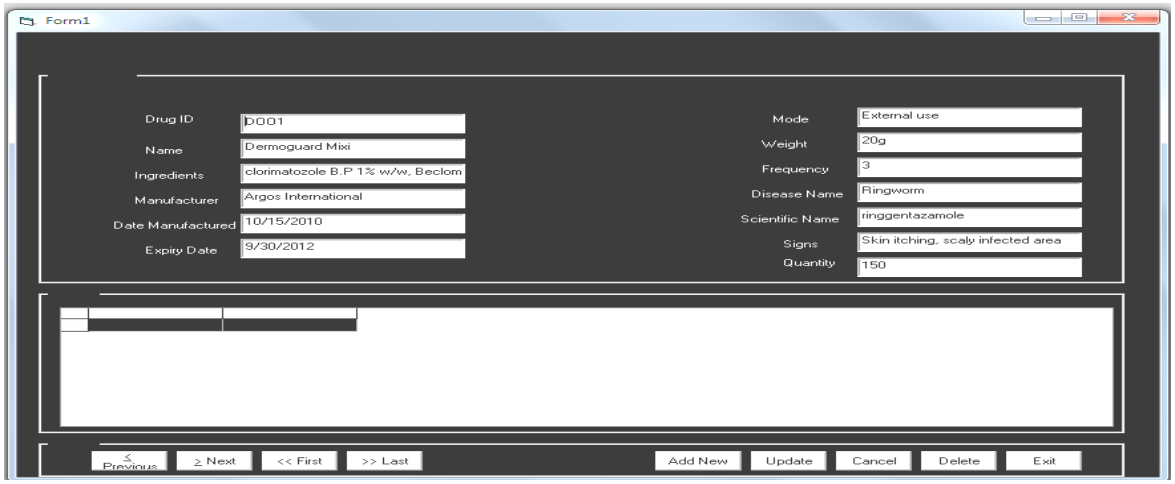

Figure 5 Drug Details Form

This is the interface through which details about a particular drug are captured and stored in the drugs table in the database.

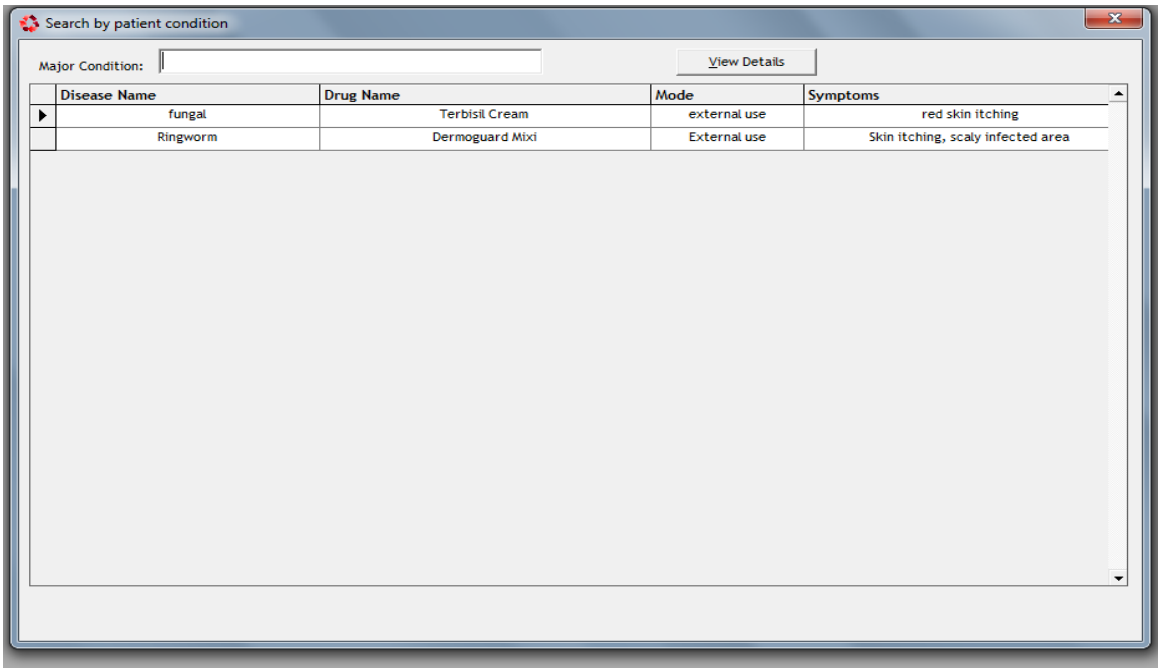

Figure 6 Prescription Form

The drug details entered can be searched using the prescription form above.

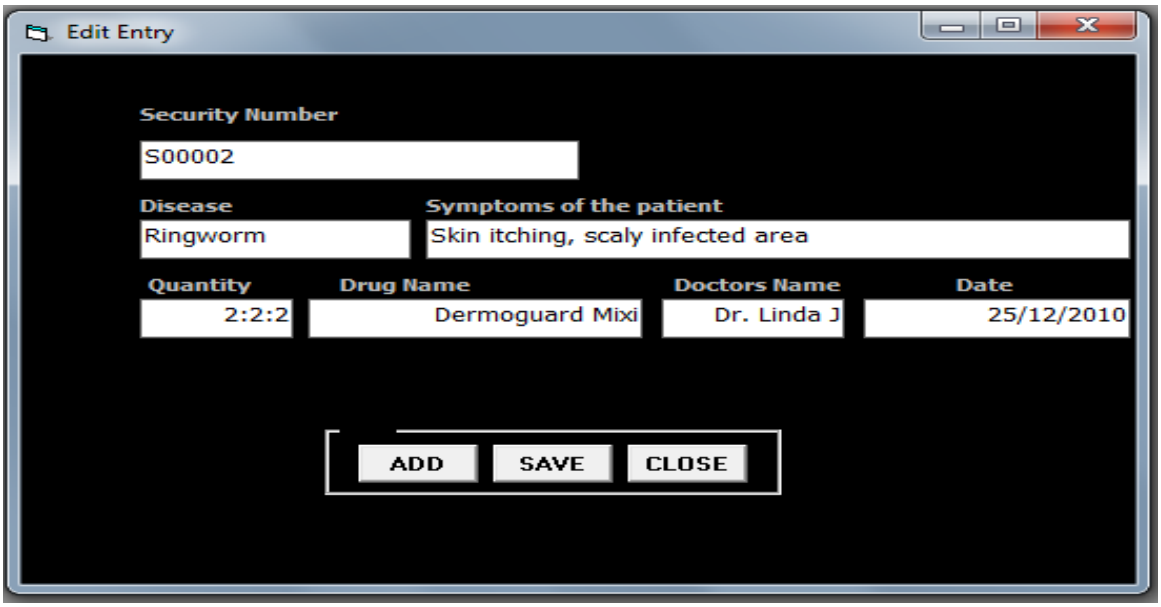

Figure 7 Edit Entry Form

After prescribing the user simply clicks in the margin of the corresponding to the disease a patient has.

Figure 8 System Users' Form

This captures details of the system users and also registers new users.

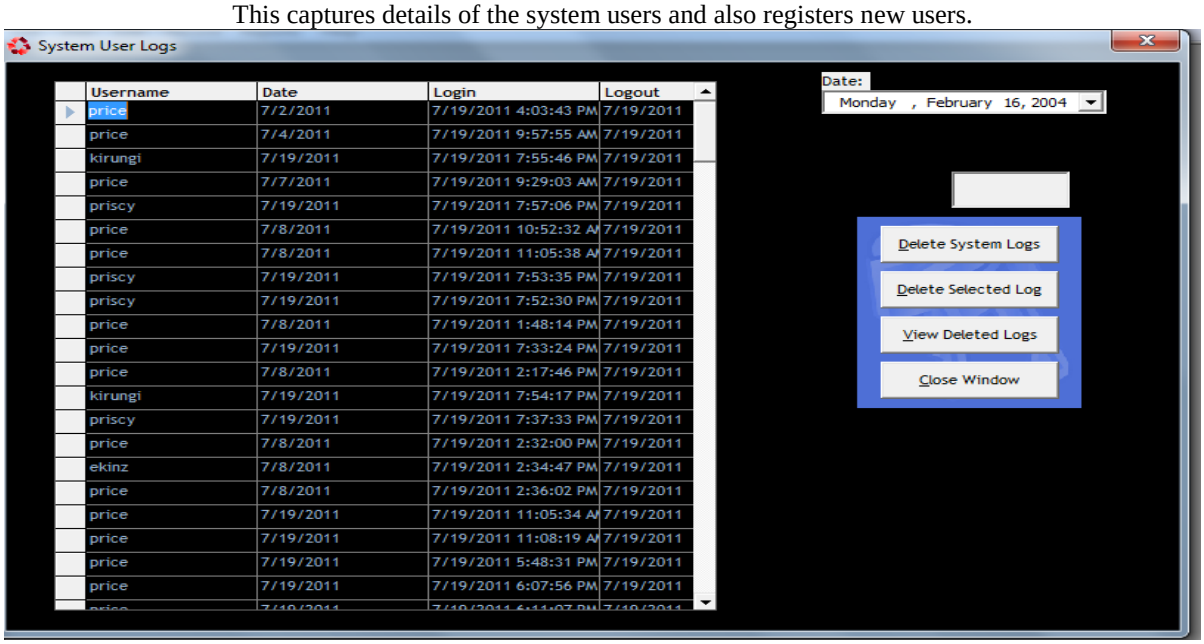

Figure 9 Logged in Users Form

This form keeps record of every user who logged into the system at a selected date.

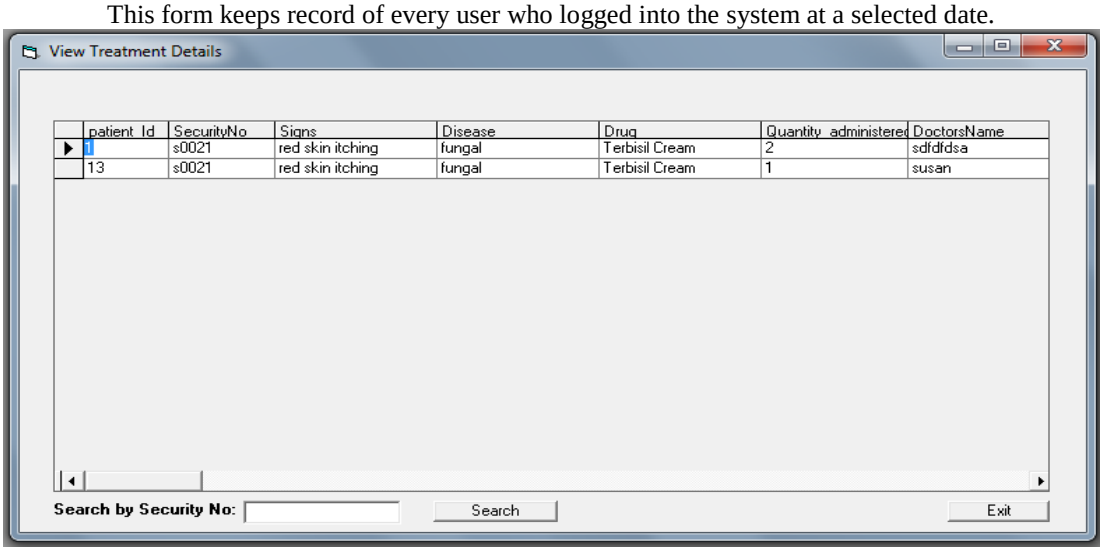

Figure 10 Treatment Details Form

This search form is used to search and view all details of patients who have been treated from the hospital.

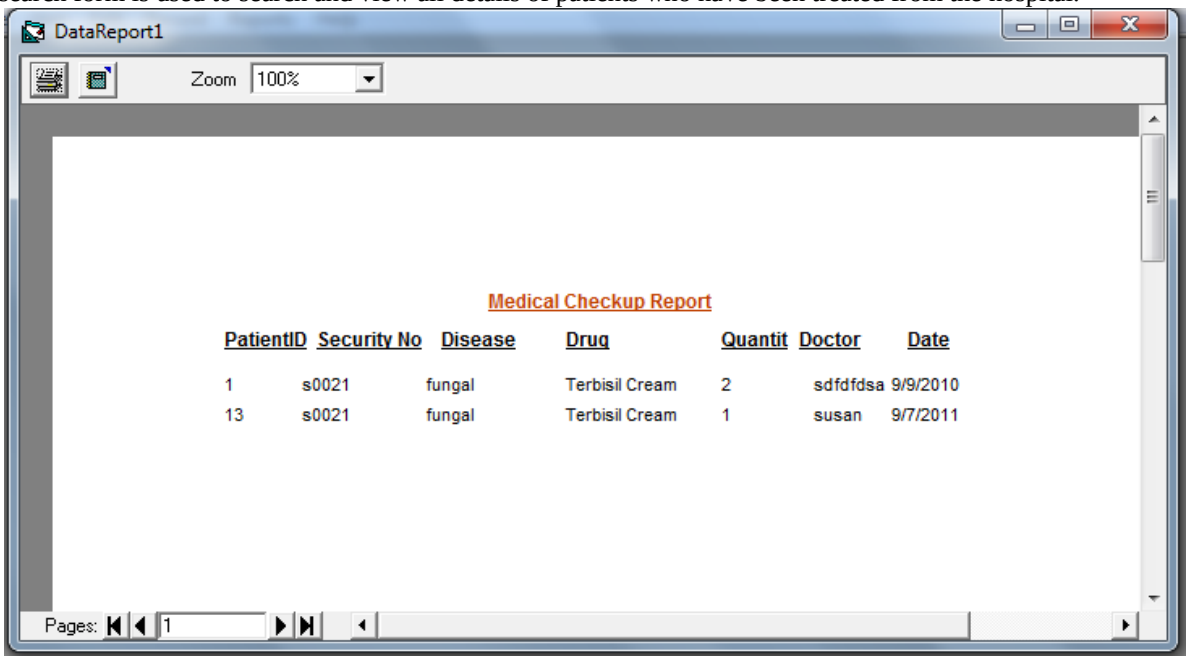

Figure 11 Treatment Report

The report illustrated above shows medical details of the patients treated from the hospital.

DrugID	Name	Ingredients	Manufacture	Date_manufactured	Expiry_date	Mode	weight	frequency	Disease	Signs	scie
DOO1	Dermoguard Mixi	clorimatozole B.P 1% w/w, Beclomethasone Dipropion...	Argos International	2010-10-15	2012-09-30	External use	20g	3	Ringworm	Skin itching, scaly infected area	ringg
D002	Terbisil Cream	Terbinafine Hydrochloride, Benzyl Alcohol	Lords Healthcare Nai	2009-07-11	2011-10-01	external use	15	3	fungal	red skin itching	Terbi Hydr Crea

Figure 12 Patients Table

The figure shows some of the signs and symptoms for different diseases plus the medicine supposed to treat them amongst other details.

Username	Date	Login	Logout	Level
price	2011-07-02	16:03:43	00:00:00	Administrator
price	2011-07-04	09:57:55	00:00:00	Administrator
price	2011-07-07	09:29:03	00:00:00	Administrator
price	2011-07-08	10:52:32	00:00:00	Administrator
price	2011-07-08	11:05:38	00:00:00	Administrator
price	2011-07-08	13:48:14	00:00:00	Administrator
price	2011-07-08	14:17:46	00:00:00	Administrator
price	2011-07-08	14:32:00	00:00:00	Administrator
ekinz	2011-07-08	14:34:47	00:00:00	user
price	2011-07-08	14:36:02	00:00:00	Administrator

Figure 13 Drugs Details

7. Conclusions and Recommendation

The system reduced the workload, saves time and increasing productivity and competence. The researchers thus recommend that functions to calculate the charges for the services rendered should be incorporated so that the system design can benefit other hospitals. The design was done this way because soldiers do not directly cater for their medical expenses since it is an allowance given to them by the government.

References

Akerkar R.A and Sajja P.S .(2009) ”knowledge based system “ , Jones and Bartleft publishes , Sudbury MA, USA

Bates, D.W. and Atul A.G. (2003) “Patient Safety: Improving Safety with Information Technology.” *The New England Journal of Medicine* 348(25):

Crane J, Crane FG. (2006). preventing medication errors in hospitals through a systems approach and technological innovation: a prescription for 2010. *Hosp Top*;84(4):3-8.

Dukes G., Mildred M., and Swartz B. (1998). Responsibility for Drug-Induced Injury: A Reference Book for Lawyers, the Health Profession and Manufacturers. Second Enlarged Edition. IOS Press, Amsterdam, Netherland

Kuiper SA, McCreadie SR, Mitchell JF and Stevenson JG. (2003). Medication errors in inpatient pharmacy operations and technologies for improvement. *Am J Health Syst Pharm* 2007; 64(9):955-9.

Womakuyu, F. (2009, July 12). PRESCRIPTION. Kampala, Uganda: The New Vision.