Anti-Retroviral Dispensing Tool

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DECLARATION

This report is my original work submitted to the faculty of information Technology of Strathmore University in partial fulfillment of the Bachelors in Business Information Technology course for the fourth year Information System Project.

This report has not been submitted to any other institution or university for any other course but only for the BBIT course offered at Strathmore University. The author hereby declares the contents of this report are my own findings or those provided by the Ministry of Public Health and Sanitation and the Clinton Health Access Initiative.

Author

Sign_____Date_____

Kevin Marete

This report has been submitted for examination to our approval as the faculty supervisor

Sign_____Date_____

Mr. Nicodemus Maingi, Lecturer, Faculty of Information Technology

ABSTRACT

ADT, short for Anti-retroviral Dispensing Tool. The system is centered on managing the dispensing of ARVs to patients at VCT facility level as well managing the patient‘s information. The motivation for creating the system was to save lives using the current state of development of IT in Kenya and to provide a solution to the growing need if turning data into information. The national level needs to drill down the data coming from these facilities and develop a plan to stem this HIV pandemic. This report is my original work submitted to the faculty of Information Technology.

Using web-based technology through offline technology the system has been able to harness the web environment into an efficient reporting tool for national data on ARVs and trends of HIV in Kenya.

Through the development of the ADT system, there has been an increased level of reporting from the facilities to the national level. NASCOP (i.e. National Aids & STI control program) is able to know the current situation on the ground using this system.

The HIV Situation in Kenya can be efficiently managed by use of this system. It facilitates better resource management and planning that will lead to revolutionary change in the HIV crisis in Kenya.

1.0 INTRODUCTION

The Clinton Health Access Initiative (CHAI) is a global health organization committed to strengthening integrated health systems in the developing world and expanding access to care and treatment for HIV*I*AIDS, malaria and tuberculosis. CHAI's solution-oriented approach focuses on improving market dynamics for medicines and diagnostics; lowering prices for treatment; accelerating access to life-saving technologies; and helping governments build the capacity required for high-quality care and treatment programs.

Since its inception, CHAI has helped more than 4 million people gain access to the medicines needed for treatment, which represents nearly half of all the people living with HIV and on treatment in developing countries. CHAI has partnered with IT solution company Hewlett Packard (HP) in providing health care solutions through donation of mobile phones, laptop computers and other media.

HP creates new possibilities for technology to have a meaningful impact on people, businesses, governments and society. The world's largest technology company, HP brings together a portfolio that spans printing, personal computing, software, services and IT infrastructure to solve customer problems.

Cases of their partnership include their recent alliance that seeks to provide structural and systemic improvements in testing and treating more than 120,000 infants exposed to HIV each year, a collaboration that was facilitated at the Clinton global Initiative's 2010 annual meeting. With support from CHAI and the Kenya Ministry of Public Health & Sanitation, HP is providing technology that will capture, manage and return early infant diagnosis (EID) HIV test results in just one to two days after results are ready – a significant improvement from the previous paper-based system, which took two to three months. The turnaround time for test results is especially critical, as infants diagnosed with HIV must begin anti-retroviral treatment (ART) as quickly as possible to ensure survival. Without immediate treatment, half of HIV-positive infants are unlikely to survive past age two.

Collaboration between Strathmore University and HP as well as the Ministry of Public Health and Sanitation has yielded good results in developing a sound IT framework for disease reporting in the past. To support CHAI and the Ministry of Public Health & Sanitation in this effort, HP has supported students from Strathmore University who developed a custom database application utilizing cloud computing to improve the tracking process and making test results available online, as well as via SMS/GSM-enabled printers in real time.

The Ministry of Public Health and Sanitation is a branch of the government ministries, whose main aim is to support the attainment of the health goals of the people of Kenya by implementing priority interventions in public health, guided by the strategic framework provided from the Medium-Term Plan 2008-2012 and the wider health sector. The vision of the ministry is to make Kenya a nation free of preventable diseases and illhealth, and in partnering with CHAI, is aiming to do this through IT solutions the likes of the Early Infant Diagnosis System (EID) and IDSR.

The National AIDS and STIs Control Programme (NASCOP) was established in 1987 to spearhead the Ministry of Health's interventions on the fight against HIV/AIDS.

NASCOP therefore operates as a division within the Ministries of Health and is mainly involved with technical co-ordination of HIV and AIDS programmes in Kenya. NASCOP contributes to the bulk of the implementation of the Kenya National HIV and AIDS Strategic Plan III (KNASP III).

The focus of this paper is assisting NASCOP in its mission which is to prevent HIV/STI infections and improve quality of life for those infected and affected by providing strategic information, developing policies, guidelines, coordination of partners, provision of quality HIV/STI services in order to mitigate the socioeconomic impact of HIV/STI in Kenya. This is the focus of this paper that is discussed in the problem statement below,

1.1 PROBLEM STATEMENT

The mandate of NASCOP is to prevent HIV/STI infections and improve quality of life for those infected and affected by providing strategic information, developing policies, guidelines, coordination of partners, provision of quality HIV/STI services in order to mitigate the socioeconomic impact of HIV/STI in Kenya. To do this NASCOP needs reliable on the ground information from the facilities that deal with the patients.

NASCOP was provided a solution to assist with their mission. The Management Sciences for Health provided a software solution that could be used at the facility level. It was a Microsoft Access System that was used by the facility pharmacist during drug dispensing. It was called the ADT (Anti-Retroviral Dispensing Tool).

As it used Microsoft access technology it was a typical stand-alone system. At the facility level it was a great success at the facility level as they could manage their patient's information and their drug inventory management.

This kind of system has proved to be somewhat difficult to operate and maintain in the long term. The main issue was that the facility data could not be used by the very people who need it to strategically plan on Kenya's HIV situation. The system being a stand-alone could only be accessed at each individual facility and only used there.

Another flaw was that of the database management system being used. Given the vast number of records that ADT occupies, the software in question (Microsoft Access) was not capable of handling data up to a certain storage size. This would eventually mean that some records would have to be stored separately from other records, say in a different archiving media. Apart from this, the Access software has issues with concurrent users, multiple windows operating systems, sensitive data needs in terms of the kind of medical data being stored (safety requirements), internet limitations, remote access issues and cannot be used on devices such as the Apple Macintosh or Linux Systems.

To add onto the drawbacks of the traditional system, this system had to be installed onto every computer at every facility. This meant that in an environment where the software was not networked, data had inconsistencies and correction had to be applied repetitively. Every user had "their own" copy of data that was non-uniform with the others. To tackle these issues, the web based ADT system was built.

Reporting mechanisms were also not adequately provided in the traditional system for the national level users at NASCOP who needed data for planning, forcing the data administrators and other managerial personnel to utilize Microsoft's Excel for mathematical and statistical data analysis and graph generation.

1.2 PROPOSED SOLUTION

The solution proposed through the guidance of the NASCOP and CHAI is a web based Anti-Retroviral Dispensing Tool that has come to be known as ADT. This system is based on the internet architecture, employing web browsers as its operating interface and using a coding framework known as Code Igniter. Similar to the previous system, the proposed system aids the pharmacists in dispensing of ARVs, but adds a great number of new and improved features to it.

Firstly, the proposed system provides data accessibility at the national level. As data entry is done at facility it can be accessed at both facility and national level. This is effectively achieved through the use of the centralized database management system that is based on an open-source (free) framework known as MySQL. Basically, the data saved at any level coalesces into one central database, giving all users a consistent state of information.

The new system uses a new technology called offline web technology. It is assisted by HTML5 that provides database functionality at the browser level. This provides a seamless accessibility to the web system even if there is no internet present. Facilities can work without internet connections and then commit there transactions through synchronization of the local database (within browser) and the central database (in the server).

The database management system being used is more scalable, can take a greater capacity of storage and being web based, and is accessible on all operating systems that have browser support. Needless to say, networking support is offered as a result of its online ubiquity. This also goes a long way into ensuring consistency and the use of views and stored procedures provide abstraction and security to the data on the back end of the server.

Finally, with regards to reporting, the system utilizes a vast array of charts and widgets that support data analysis and mathematical calculations, known respectively as Fusion Charts and Fusion Widgets. This is the only proprietary software used in the project. The charts form the dashboards that help in managerial and data administrator policy and decision making and give an overview of the HIV situation within the country.

2.0 LITERATURE REVIEW

2.1 EXISTING SOLUTIONS

The Antiretroviral Therapy Dispensing Tool (ADT) – an easy-to-use electronic pharmacy management software has made effectively managing HIV medications much easier. The tool was provided to 319 health facilities in Kenya through USAID's Health Commodities and Services Management Program implemented by Management Sciences for Health.

The dispensing tool is a valuable resource that allows pharmacy staff to keep track of patient information, and records on the antiretroviral drugs prescribed and dispensed. There are over 600,000 Kenyans on antiretroviral treatment – approximately 83% of these patients are treated in sites that use the dispensing tool.

Keeping track of medication consumption allows staff to accurately forecast the amount of medicines needed. In order to effectively treat the virus, health providers must maintain an uninterrupted supply of antiretroviral drugs and medicines to treat related opportunistic infections. As of December 2012, Over 600,000 patients in Kenya were on ARV treatment – 83% of these patients are treated at sites that use the dispensing tool.

2.1.1 OTHER SOLUTIONS

The NASCOP staff has used other common proprietary software such as Microsoft Office Word and Excel to report data in the past.

2.2 FACT FINDING METHODS

2.2.1 Questionnaires

Wikipedia defines a questionnaire as a research instrument consisting of a series of questions and other prompts for the purpose of gathering information from respondents. Although they are often designed for statistical analysis of the responses, this is not always the case.

Strengths of questionnaires

- Practical Large amounts of information can be collected from a large number of people in a short period of time and in a relatively cost effective way
- Can be carried out by the researcher or by any number of people with limited affect to its validity and reliability
- The results of the questionnaires can usually be quickly and easily quantified by either a researcher or through the use of a software package
- Can be analyzed more 'scientifically' and objectively than other forms of research
- When data has been quantified, it can be used to compare and contrast other research and may be used to measure change
- Positivists believe that quantitative data can be used to create new theories and / or test existing hypotheses

Weaknesses of questionnaires

- Is argued to be inadequate to understand some forms of information - i.e. changes of emotions, behavior, feelings etc.
- Phenomenologists state that quantitative research is simply an artificial creation by the researcher, as it is asking only a limited amount of information without explanation
- Lacks validity
- There is no way to tell how truthful a respondent is being
- There is no way of telling how much thought a respondent has put in
- The respondent may be forgetful or not thinking within the full context of the situation
- People may read differently into each question and therefore reply based on their own interpretation of the question - i.e. what is 'good' to someone may be 'poor' to someone else, therefore there is a level of subjectivity that is not acknowledged
- There is a level of researcher imposition, meaning that when developing the questionnaire, the researcher is making their own decisions and assumptions as to what is and is not important...therefore they may be missing something that is of importance.

2.2.2 Interview

An interview is a conversation between two people (the interviewer and the interviewee) where questions are asked by the interviewer to obtain information from the interviewee.

Advantages of using an Interview

· If the respondent lacks reading skills to answer a questionnaire.

· Are useful for untangling complex topics.

· The Interviewer can probe deeper into a response given by an interviewee.

· Interviews produce a higher response rate.

Disadvantages of using an Interview

· The interviewer can affect the data if he/she is not consistent.

· It is very time consuming.

· It is not used for a large number of people.

· The Interviewer may be biased and ask closed questions.

2.2.3 Observation

Observation is either an activity of a living being, such as a human, consisting of receiving knowledge of the outside world through the senses, or the recording of data using scientific instruments.

Advantages.

-data gathered can be highly reliable.

-the analyst is able to see what is being done.

-observation is less expensive compared to other technique.

-allows the systems analyst to do work measurement.

Disadvantages.

-people feel uncomfortable being watched, they may perform differently when being observed.

-the work being observed may not involve the level of difficulty or volume normally experienced during that time period.

-some activities may take place at odd times; it might be inconvenience for the system analyst.

-the task being observed is subjected to types of interruptions.

-some task may not be in the manner in which they are observed.

-Sometimes people act temporarily and perform their job correctly when they are being observed; they might actually violate the standard of manner.

2.3 MODELLING METHODS

2.3.1 Structured Modeling Methods.

Breaking down a program into more manageable blocks of code aimed on improving the clarity, quality, and development time of a computer program by making extensive use of subroutines, blocks structures.

Advantages.

- Readable
- Modular
- Maintainable
- Reusable

Disadvantages.

- Lack of encapsulation
- Same code repetition
- Lack of information hiding
- Initially takes longer to build
- Might run a little slower

2.3.2 Object Oriented Modeling Methods.

Object-oriented is a language model organized around "objects" rather than "actions" and data rather than logic.

Advantages.

- Data Encapsulation
- Data Hiding
- Easy to maintain the code
- Reusability of classes

Disadvantages.

- Wastage of time in case of small projects or codes

2.4 CONSTRUCTION METHODS

2.4.1 Programming Language.

a) PHP

PHP is a general-purpose server-side scripting language originally designed for Web development to produce dynamic Web pages.

Advantages:

- Open source
- Simple and very easy to learn.
- Support for both structural programming and Object Oriented Programming. Use of variable variables $$var.
- PHP can be used on all major operating systems, including Linux, many Unix variants (including HP-UX, Solaris and OpenBSD), Microsoft Windows, Mac OS X, RISC OS, and probably others. PHP has also support for most of the web servers today. This includes Apache, Microsoft Internet Information Server, Personal Web Server, Netscape and iPlanet servers, Oreilly Website Pro server, Caudium, Xitami, OmniHTTPd, and many others. For the majority of the servers PHP has a module, for the others supporting the CGI standard, PHP can work as a CGI processor.
- One of the Sexiest feature of PHP is that it can plugin with most of the databases. It support with Adabas D, dBase, Empress, FilePro (read-only), Hyperwave, IBM DB2, Informix, Ingres, InterBase, rontBase, mSQL, Direct MS-SQL, MySQL, ODBC, Oracle (OCI7 and OCI8), Ovrimos, PostgreSQL, SQLite, Solid Sybase, Velocis and Unix dbm
- Powerful built in functions.

- PHP also has support services using protocols such as LDAP, IMAP, SNMP, NNTP, POP3, HTTP, COM (on Windows)
- PHP has extremely useful text processing features, from the POSIX Extended or Perl regular expressions to parsing XML documents. For parsing and accessing XML documents, PHP 5 standardizes all the XML extensions on the solid base of libxml2 and extends the feature set adding SimpleXML and XMLReader support.
- Easy deployment and cost effective hosting.

Disadvantages:

- Security flaws due to unknown vulnerabilities.
- Not good to create desktop Applications

Three main areas where PHP scripts are used:

- Server-side scripting
- Command line scripting
- Writing desktop applications

b) JAVA

Java is a programming language originally developed by James Gosling at Sun Microsystems. The language derives much of its syntax from C and C++ but has a simpler object model and fewer low-level facilities.

Advantages of JAVA

- Java is simple: Java was designed to be easy to use and is therefore easy to write, compile, debug, and learn than other programming languages. The reason that why Java is much simpler than C++ is because Java uses automatic memory allocation and garbage collection where else C++ requires the programmer to allocate memory and to collect garbage.

- Java is object-oriented: Java is object-oriented because programming in Java is centered on creating objects, manipulating objects, and making objects work together. This allows you to create modular programs and reusable code.
- Java is platform-independent: One of the most significant advantages of Java is its ability to move easily from one computer system to another.
- The ability to run the same program on many different systems is crucial to World Wide Web software, and Java succeeds at this by being platform-independent at both the source and binary levels.
- Java is distributed: Distributed computing involves several computers on a network working together. Java is designed to make distributed computing easy with the networking capability that is inherently integrated into it.
- Writing network programs in Java is like sending and receiving data to and from a file. For example, the diagram below shows three programs running on three different systems, communicating with each other to perform a joint task.
- Java is interpreted: An interpreter is needed in order to run Java programs. The programs are compiled into Java Virtual Machine code called bytecode.
- The bytecode is machine independent and is able to run on any machine that has a Java interpreter. With Java, the program need only be compiled once, and the bytecode generated by the Java compiler can run on any platform.
- Java is secure: Java is one of the first programming languages to consider security as part of its design. The Java language, compiler, interpreter, and runtime environment were each developed with security in mind.
- Java is robust: Robust means reliable and no programming language can really assure reliability. Java puts a lot of emphasis on early checking for possible errors, as Java compilers are able to detect many problems that would first show up during execution time in other languages.
- Java is multithreaded: Multithreaded is the capability for a program to perform several tasks simultaneously within a program. In Java, multithreaded programming has been smoothly integrated into it, while in other languages, operating system-specific procedures have to be called in order to enable multithreading. Multithreading is a

necessity in visual and network programming.

Disadvantages of JAVA

- Performance: Java can be perceived as significantly slower and more memory-consuming than natively compiled languages such as C or C++.
- Look and feel: The default look and feel of GUI applications written in Java using the Swing toolkit is very different from native applications. It is possible to specify a different look and feel through the pluggable look and feel system of Swing.
- Single-paradigm language: Java is predominantly a single-paradigm language. However, with the addition of static imports in Java 5.0 the procedural paradigm is better accommodated than in earlier versions of Java.

2.4.2 Database Management Systems

a) MS Access

It is a database management system from Microsoft that combines the relational Microsoft Jet Database Engine with a graphical user interface and software-development tools.

Advantages.

- Cost-Microsoft Access 2003 costs between $100 and $200, as opposed to larger systems that may cost thousands of dollars.
- Ease of Use-Like many other Microsoft applications; Access contains Wizards that walk you through each step of the way. You do not need to have database experience in order to use it.

Disadvantages.

- Visual Data Integration-Easy to use Data Integration environment.
- Multi-User Functionality-Microsoft Access is not meant to have multiple users at any given time. While it can support them, problems with functionality can pop up.
- Single File Save-All the information from your database is saved into one file - this can limit what you can do with it and slow down reports, queries, and forms.

- Database management Systems (DBMS)-Access is a simple database, not a full-fledged database management system.
- Data-Each database can store no more than 2 GB of data, although you may build as many unrelated databases as you'd like.
- Speed-Since Microsoft Access cannot handle large data requests, if you are using close to the maximum amount of data, it will run slowly.

b) MYSQL

It is the world's most used relational database management system (RDBMS) that runs as a server providing multi-user access to a number of databases.

Advantages.

- It's FREE.
- Easy to install
- Great support
- Secure

Disadvantages.

Has some issues with stability and clustering, it is very difficult to install a consistent database cluster with MySQL with the regular version.

c) ORACLE

This is a very robust DBMS that has very many functions and features and below are the advantages and disadvantages;

Advantages

- It supports very large size databases i.e. can store a large number of resources
- Security; very hack proof.
- Consistency
- High level availability
- Lower downtime

- Good performance
- Oracle runs faster

Disadvantages

- Expensive to maintain and develop.
- Complex to maintain

2.5 EVALUATION METHODS

The evaluation methods used include:

- Criteria-based evaluation
- Goal-based evaluation
- Goal-free evaluation

2.5.1 Goal-based Methods

The aim of goal-based evaluation is to investigate whether the project has achieved its goals. This question is posed at the end of the project process, often within the context of a summative evaluation.

Advantages.

- Goals are clearly set.
- A timeline is given.
- It acts as a checklist for reference and progress.

Disadvantages.

- Pressure may increase if goals are not met.

2.5.2 Criteria-based evaluation

Criteria-based evaluation means that some explicit general criteria are used as an evaluation yardstick. This means that it is criterion based in that there are some determinants to the evaluation.

2.5.2 Goal-Free evaluation

The goal-free evaluation means that no such explicit goals are used. Goal-free evaluation is an inductive and situational driven strategy. Goal-free evaluation is defined as gathering data on a broad array of actual effects and evaluating the importance of these effects in meeting demonstrated needs. The aim of goal-free evaluation is to:

- Eliminate the perceptual biases introduced into an evaluation by knowledge of goals.
- Maintain evaluator objectivity and independence through goal-free conditions
- Avoid the risk of narrowly studying stated program objectives and thereby missing important unanticipated outcomes
- Remove the negative connotations attached to discovery of unanticipated effect.

2.6 METHODOLOGY USED

2.6.1 ANALYSIS AND DESIGN APPROACH

ADT was created through the spiral methodology to allow for recursivity in the investigation process. The Spiral method comprises of both the waterfall methodology and prototyping models. It allows for incremental releases of the product, or incremental refinement through each time around the spiral. The spiral model also explicitly includes risk management within software development. Identifying major risks, both technical and managerial, and determining how to lessen the risk helps keep the software development process under control.

2.6.2 FACT FINDING

The ADT web based system used interviews as methods of collecting data.

2.6.3 MODELING

The Object Oriented model seemed to have best suited the creation of ADT, especially since the Code Igniter framework supports object creation and modularization of the whole system involved.

2.6.4 CONSTRUCTION

The ADT system used PHP for programming and MYSQL for database management.

2.6.5 EVALUATION

The ADT system used intends to use goal-based evaluation method.

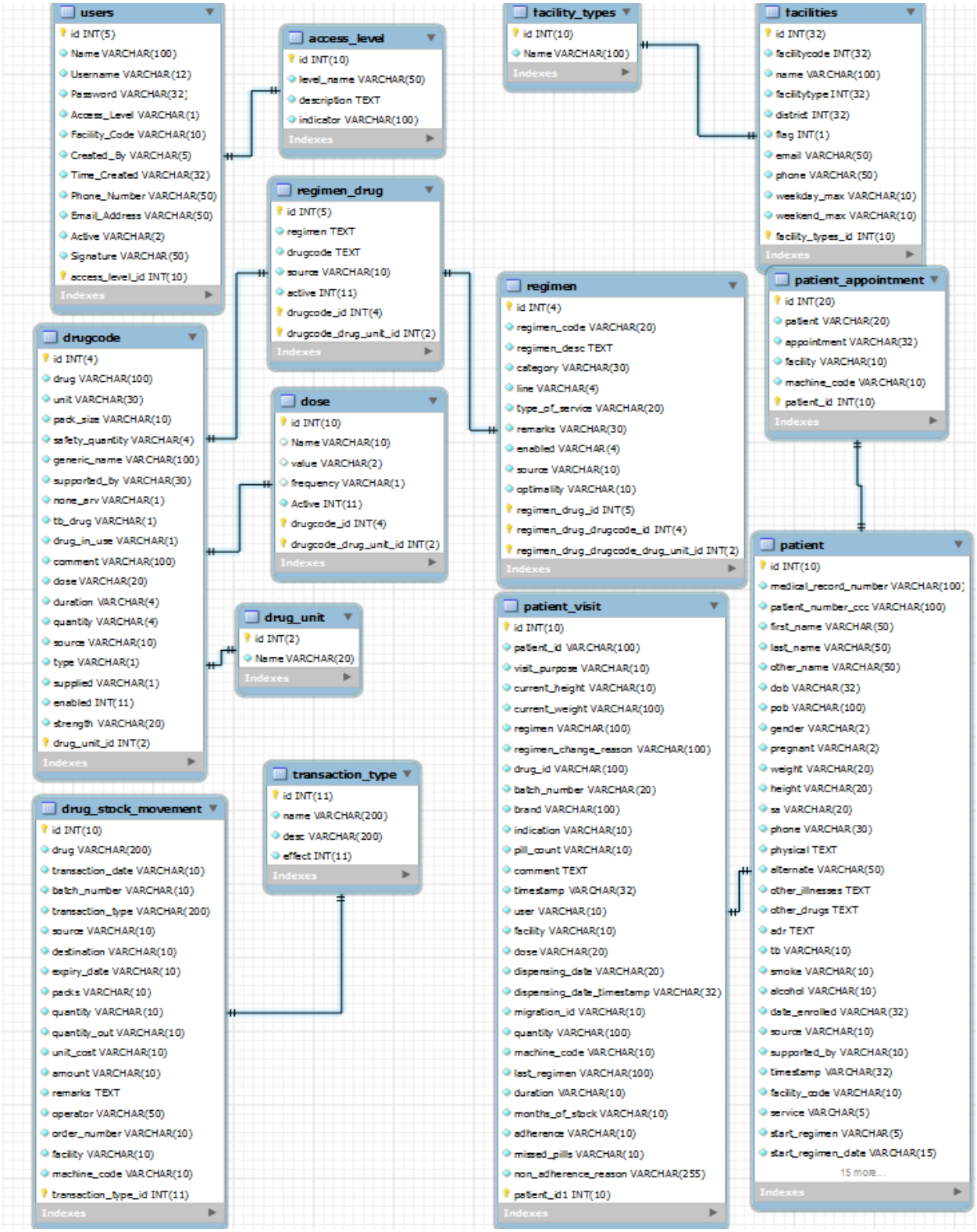
2.7 PROJECT SCHEDULE

Activity	Start Date	End Date	Duration	Deliverables
Problem Definition	16/07/2012	30/07/2012	14 days	Identify problem and proposed solution
Proposal Writing	31/03/2012	14/08/2012	14 days	Drafted proposal
Proposal Presentation	15/08/2012	22/08/2012	7 days	Critiqued proposal
Analysis and design	23/08/2012	7/09/2012	14 days	Use case, sequence diagram, entity relation diagram and class
Database design	8/09/2012	29/09/2012	21 days	Database schema
Progress Presentation	30/09/2012	10/10/2012	11 days	Intermediate proposal and analysis diagrams
Graphical user interface design	11/10/2012	18/10/2012	7 days	Front and back end interfaces
Functionality implementation	19/10/2012	19/01/2013	90 days	Proposed System
Testing and debugging	-	-	Continuous through the whole project	
System evaluation and presentation	-	14/02/2013		
Project Documentation	15/02/2013	26/02/2013	-	-

3.0 ANALYSIS AND DESIGN

3.1 USE CASE DIAGRAM

3.2 ENTITY RELATIONAL DIAGRAM

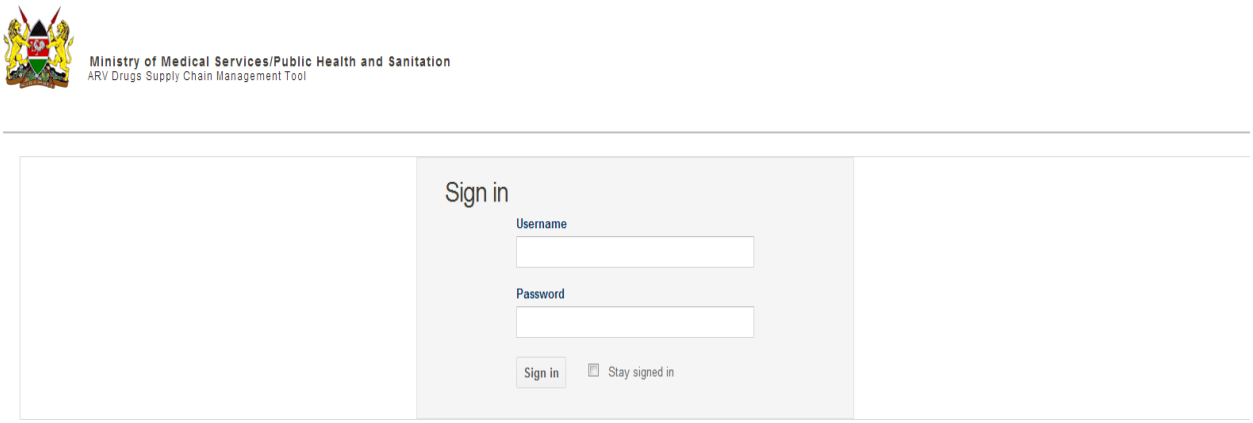


4.0 IMPLEMENTATION

4.1 FUNCTIONALITIES IMPLEMENTED SUCCESSFULLY

Here are some of the screenshots from the project that have been successfully implemented.

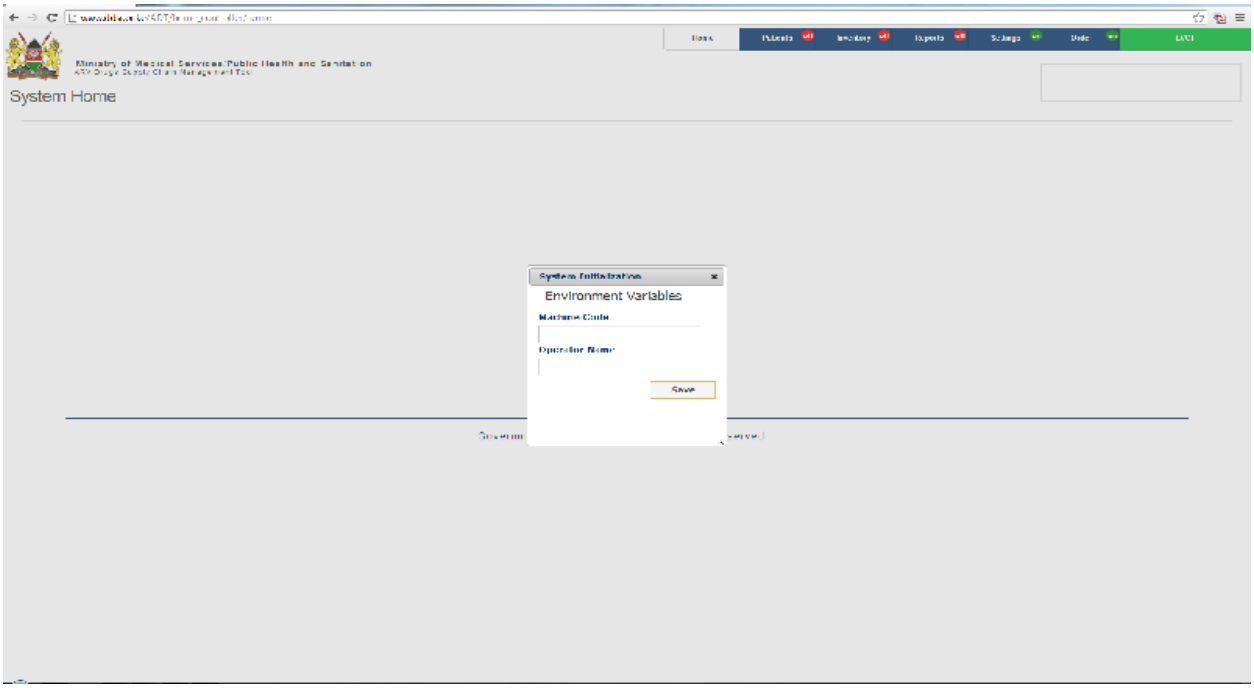
Login Module



The login module allows users at facility, national and administrator levels to login. Depending on each user it would lead to different homepage module.

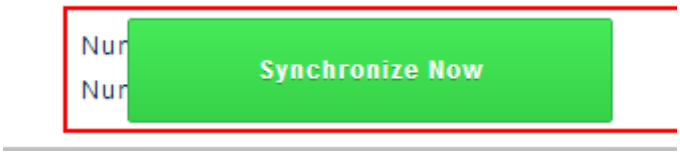
A) Facility Level Users e.g. Pharmacists and clinic officers

There homepage would display as illustrated below. The users if logged in for the first time they would be required to enter their **Operator name (Their Name)** and **machine code (Number of computer if there are multiple in organization e.g. 5)**

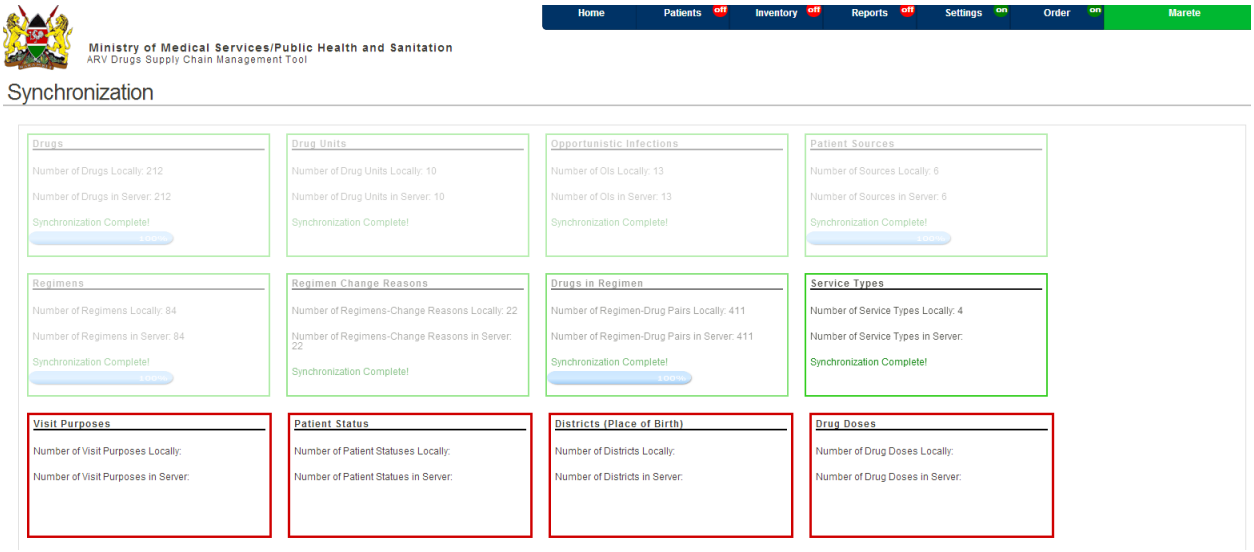


Here is where the user has entered their operator name and machine code. A notification on the top right corner notifies them of any information that is out of sync i.e. if local database in browser is consistent with that in the server. If it is not as below it is in red and if in sync then it is green. To synchronize just click on the button that shows up when you hover on the notification

Here is the sync button:



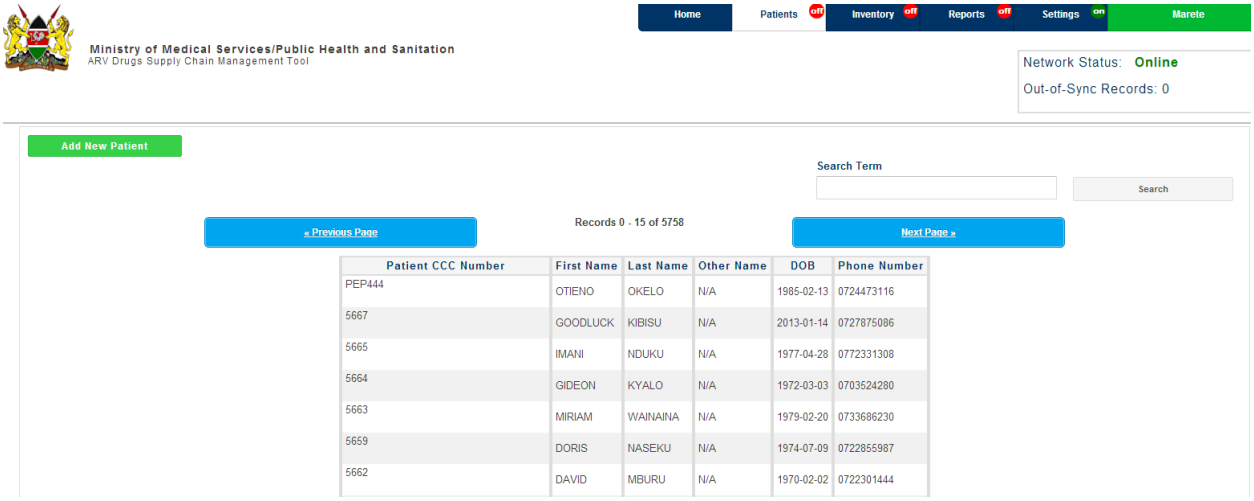
When clicked it displays the synchronization of data from server to local database. As shown below.



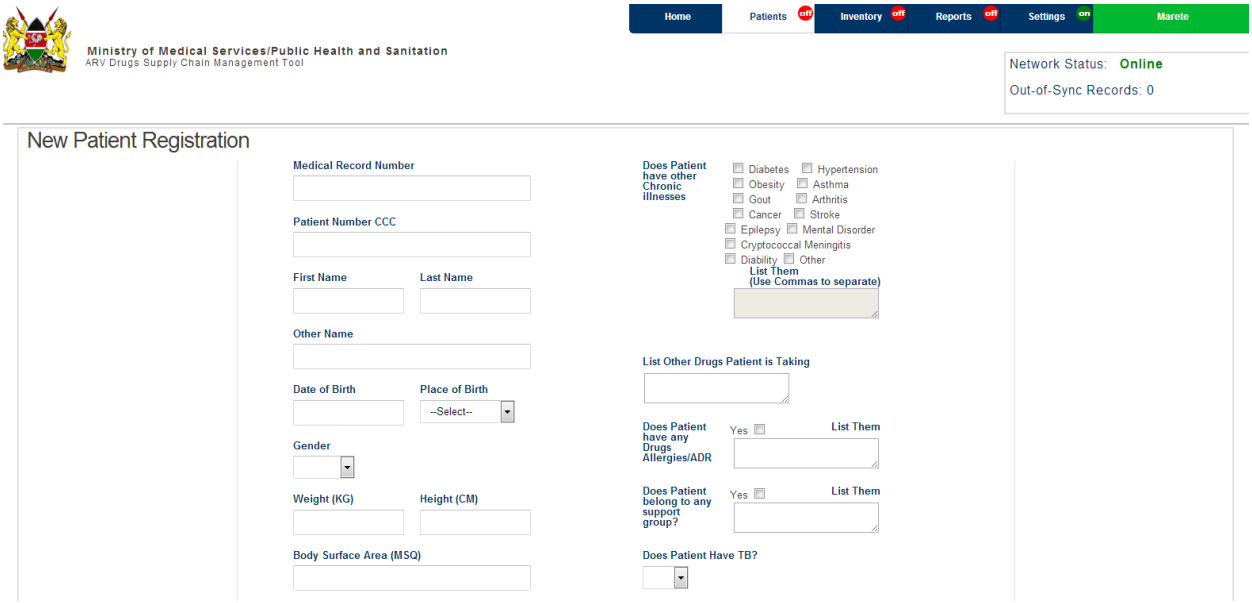
Once the synchronization is complete the user can now perform their duties. Which include:-

- Adding/Editing/ Dispensing patients
- Adding Inventory
- Generating reports
- Placing Orders i.e. satellite facilities to central sites

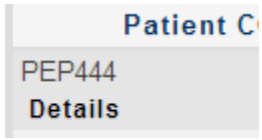
1.)Adding /editing Patients

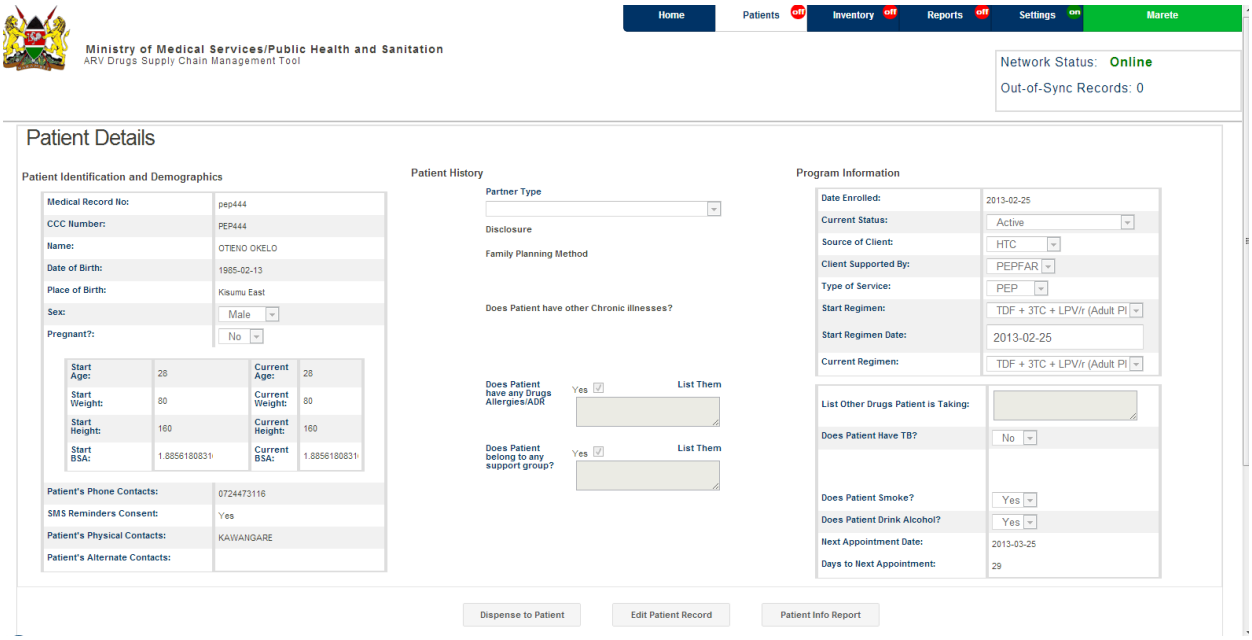


To add patients just click on the patient tab on the top of the menu bar and go to the patients listing page. Here there is a button on the left top position of the page written add patient click on it and it will take you to the add patient page illustrated here below.

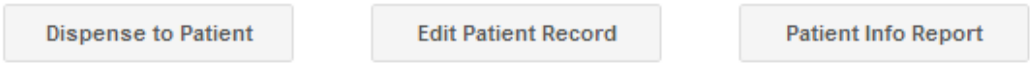


To edit patient information, go to the patient listing page by click on the patient tab on the menu bar. Hover the mouse cursor on the patient you want to edit and a details link will appear click on it to go to edit patient options.

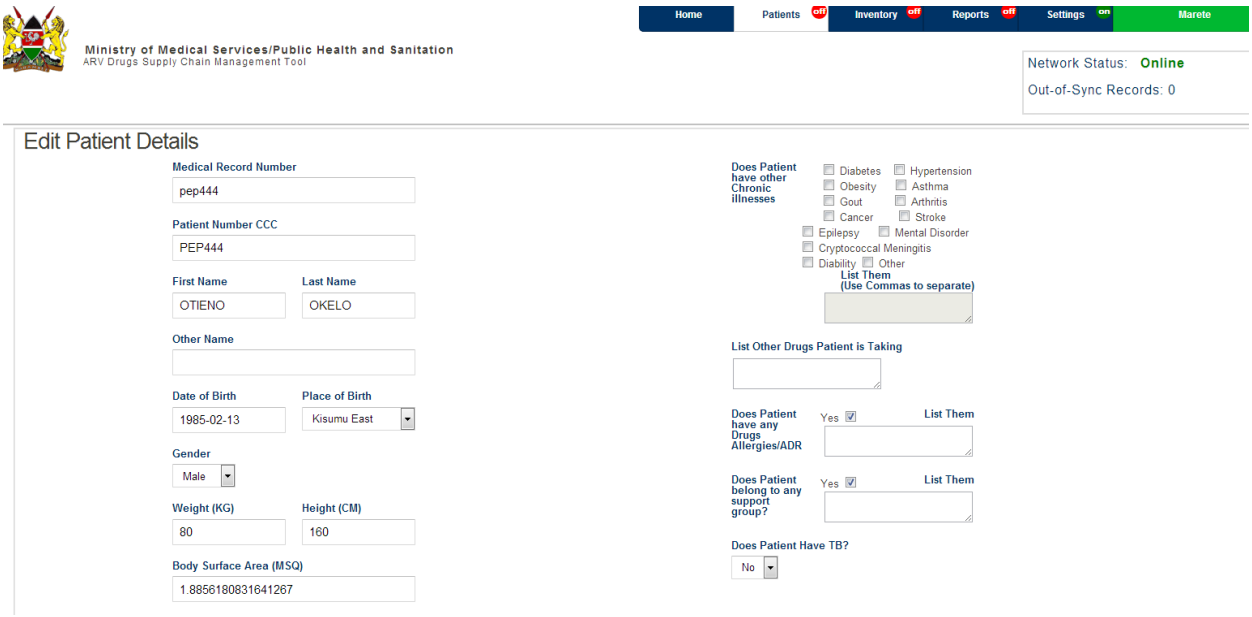




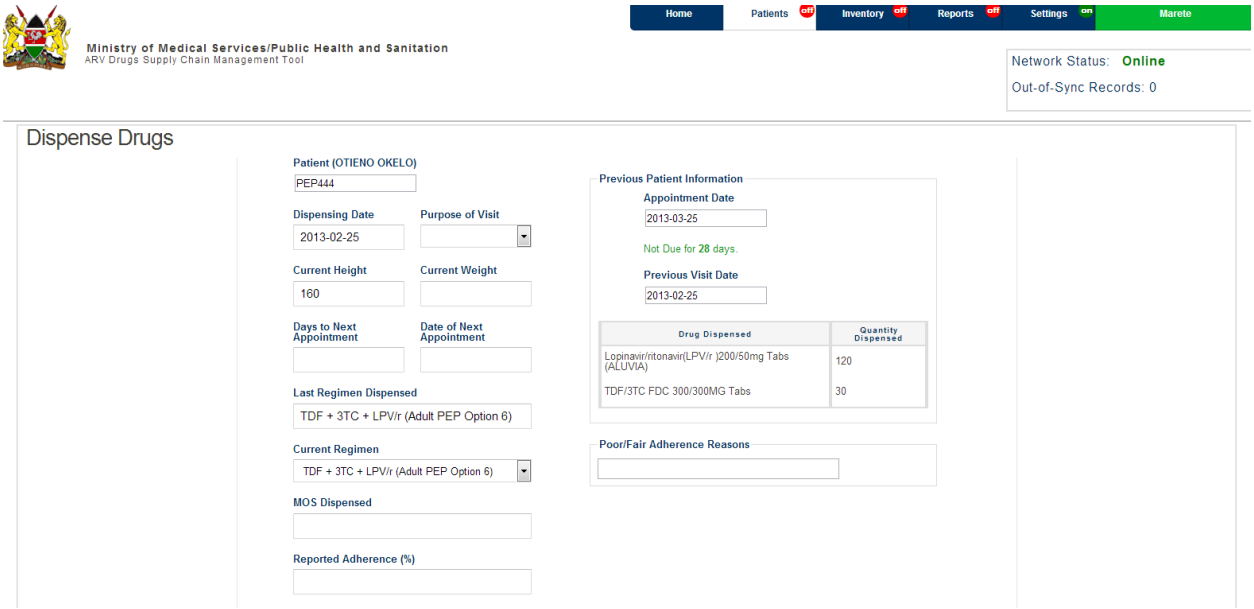
Above is the edit patient listing where you can edit, dispense and view patient summary info. Through clicking on the below options.



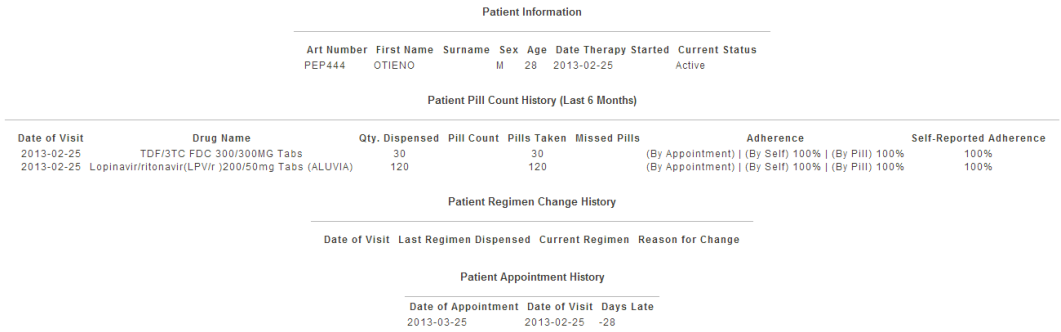
To edit click on **Edit Patient Record** to go to edit patient page



To dispense click on **Dispense to Patient** to go to dispense page



To view patient summary info click on **Patient Info Report**



Patient Information

Art Number	First Name	Surname	Sex	Age	Date Therapy Started	Current Status
PEP444	OTIENO		M	28	2013-02-25	Active

Patient Pill Count History (Last 6 Months)

Date of Visit	Drug Name	Qty. Dispensed	Pill Count	Pills Taken	Missed Pills	Adherence	Self-Reported Adherence
2013-02-25	TDF/3TC FDC 300/300MG Tabs	30		30		(By Appointment) | (By Self) 100% | (By Pill) 100%	100%
2013-02-25	Lopinavir/ritonavir(LPV/r)200/50mg Tabs (ALUVIA)	120		120		(By Appointment) | (By Self) 100% | (By Pill) 100%	100%

Patient Regimen Change History

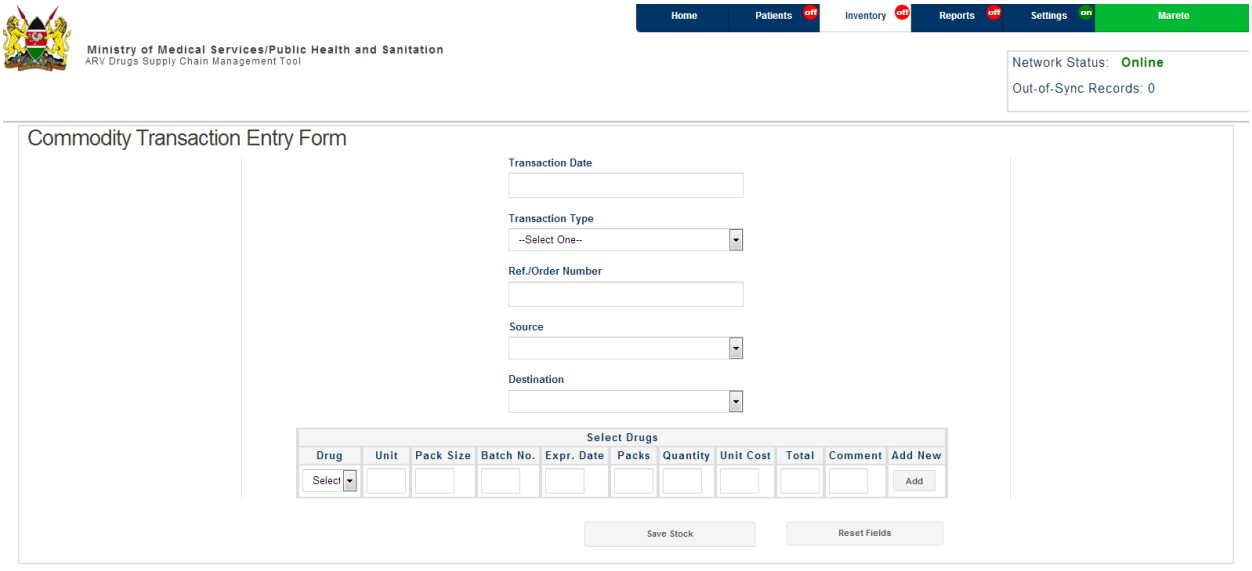
Date of Visit	Last Regimen Dispensed	Current Regimen	Reason for Change

Patient Appointment History

Date of Appointment	Date of Visit	Days Late
2013-03-25	2013-02-25	-28

2) Adding Inventory

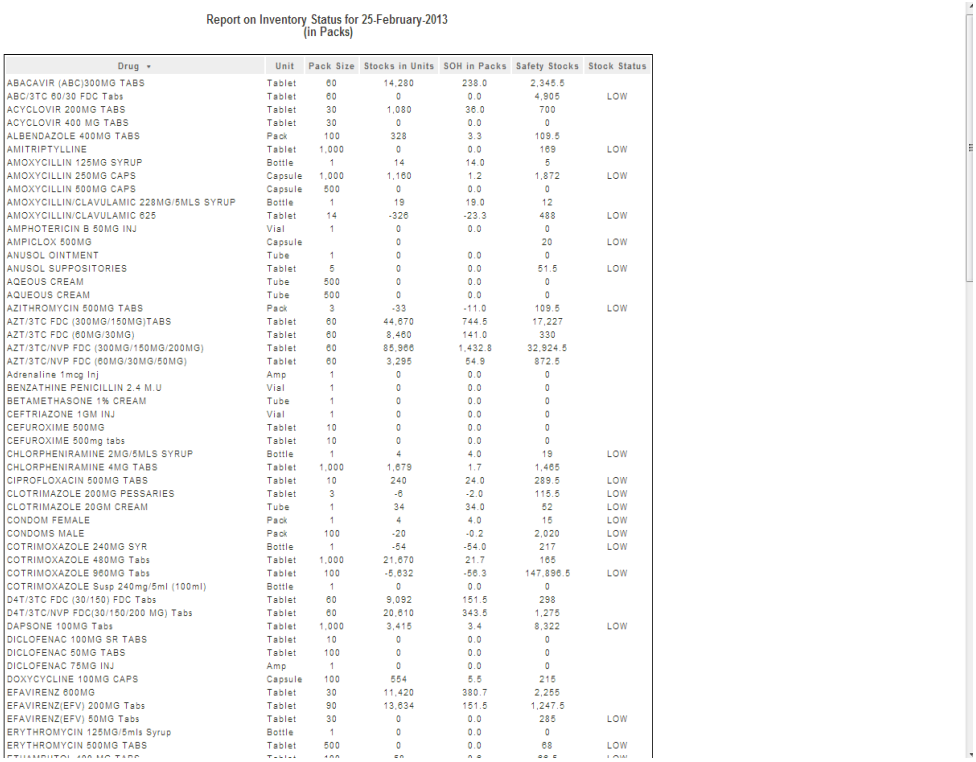
To add inventory click on the **inventory** tab on the menu bar. It will take you to the inventory listing that lists the current drugs in the system. Click on the left-top side of the page a button labeled **New Inventory.**



3) Generate Reports

To generate reports click on the **reports** tab on the menu bar. It will take you to the reports listing that list the available reports that can be generated

.A sample report would be **Drug Stock on Hand Report**

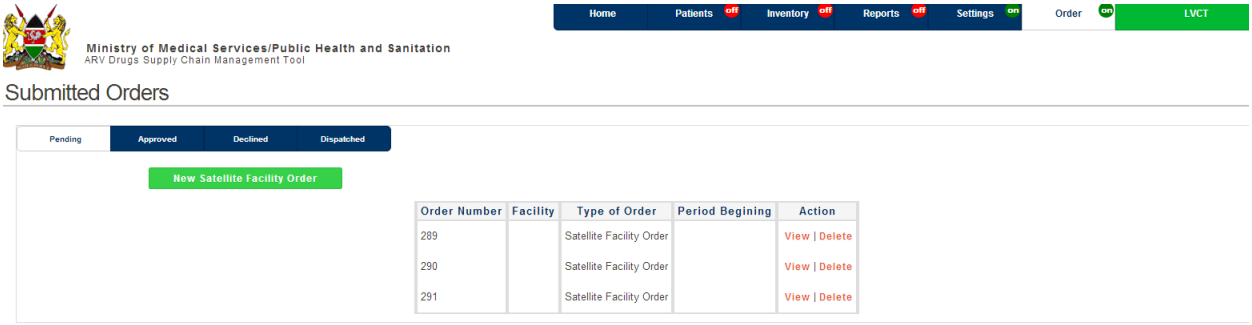


Report on Inventory Status for 25-February-2013
(in Packs)

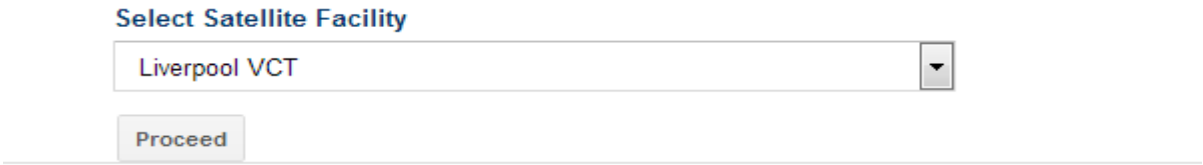
Drug	Unit	Pack Size	Stocks in Units	SOH in Packs	Safety Stocks	Stock Status
ABACAVIR (ABC)300MG TABS	Tablet	60	14,280	238.0	2,345.5	
ABC/3TC 60/30 FDC Tabs	Tablet	60	0	0.0	4,905	LOW
ACYCLOVIR 200MG TABS	Tablet	30	1,080	36.0	700	
ACYCLOVIR 400 MG TABS	Tablet	30	0	0.0	0	
ALBENDAZOLE 400MG TABS	Pack	100	328	3.3	109.5	
AMITRIPTYLLINE	Tablet	1,000	0	0.0	169	LOW
AMOXYCILLIN 125MG SYRUP	Bottle	1	14	14.0	5	
AMOXYCILLIN 250MG CAPS	Capsule	1,000	1,160	1.2	1,872	LOW
AMOXYCILLIN 500MG CAPS	Capsule	500	0	0.0	0	
AMOXYCILLIN/CLAVULAMIC 228MG/5MLS SYRUP	Bottle	1	19	19.0	12	
AMOXYCILLIN/CLAVULAMIC 625	Tablet	14	-326	-23.3	488	LOW
AMPHOTERICIN B 50MG INJ	Vial	1	0	0.0	0	
AMPICLOX 500MG	Capsule		0		20	LOW
ANUSOL OINTMENT	Tube	1	0	0.0	0	
ANUSOL SUPPOSITORIES	Tablet	5	0	0.0	51.5	LOW
AQEOUS CREAM	Tube	500	0	0.0	0	
AQUEOUS CREAM	Tube	500	0	0.0	0	
AZITHROMYCIN 500MG TABS	Pack	3	-33	-11.0	109.5	LOW
AZT/3TC FDC (300MG/150MG)TABS	Tablet	60	44,670	744.5	17,227	
AZT/3TC FDC (60MG/30MG)	Tablet	60	8,460	141.0	330	
AZT/3TC/NVP FDC (300MG/150MG/200MG)	Tablet	60	85,966	1,432.8	32,924.5	
AZT/3TC/NVP FDC (60MG/30MG/50MG)	Tablet	60	3,295	54.9	872.5	
Adrenaline 1mcg Inj	Amp	1	0	0.0	0	
BENZATHINE PENICILLIN 2.4 M.U	Vial	1	0	0.0	0	
BETAMETHASONE 1% CREAM	Tube	1	0	0.0	0	
CEFTRIAZONE 1GM INJ	Vial	1	0	0.0	0	
CEFUROXIME 500MG	Tablet	10	0	0.0	0	
CEFUROXIME 500mg tabs	Tablet	10	0	0.0	0	
CHLORPHENIRAMINE 2MG/5MLS SYRUP	Bottle	1	4	4.0	19	LOW
CHLORPHENIRAMINE 4MG TABS	Tablet	1,000	1,679	1.7	1,465	
CIPROFLOXACIN 500MG TABS	Tablet	10	240	24.0	289.5	LOW
CLOTRIMAZOLE 200MG PESSARIES	Tablet	3	-6	-2.0	115.5	LOW
CLOTRIMAZOLE 20GM CREAM	Tube	1	34	34.0	52	LOW
CONDOM FEMALE	Pack	1	4	4.0	15	LOW
CONDOMS MALE	Pack	100	-20	-0.2	2,020	LOW
COTRIMOXAZOLE 240MG SYR	Bottle	1	-54	-54.0	217	LOW
COTRIMOXAZOLE 480MG Tabs	Tablet	1,000	21,670	21.7	165	
COTRIMOXAZOLE 960MG Tabs	Tablet	100	-5,632	-56.3	147,896.5	LOW
COTRIMOXAZOLE Susp 240mg/5ml (100ml)	Bottle	1	0	0.0	0	
D4T/3TC FDC (30/150) FDC Tabs	Tablet	60	9,092	151.5	298	
D4T/3TC/NVP FDC(30/150/200 MG) Tabs	Tablet	60	20,610	343.5	1,275	
DAPSONE 100MG Tabs	Tablet	1,000	3,415	3.4	8,322	LOW
DICLOFENAC 100MG SR TABS	Tablet	10	0	0.0	0	
DICLOFENAC 50MG TABS	Tablet	100	0	0.0	0	
DICLOFENAC 75MG INJ	Amp	1	0	0.0	0	
DOXYCYCLINE 100MG CAPS	Capsule	100	554	5.5	215	
EFAVIRENZ 600MG	Tablet	30	11,420	380.7	2,255	
EFAVIRENZ(EFV) 200MG Tabs	Tablet	90	13,634	151.5	1,247.5	
EFAVIRENZ(EFV) 50MG Tabs	Tablet	30	0	0.0	285	LOW
ERYTHROMYCIN 125MG/5mls Syrup	Bottle	1	0	0.0	0	
ERYTHROMYCIN 500MG TABS	Tablet	500	0	0.0	68	LOW

4) Place Order

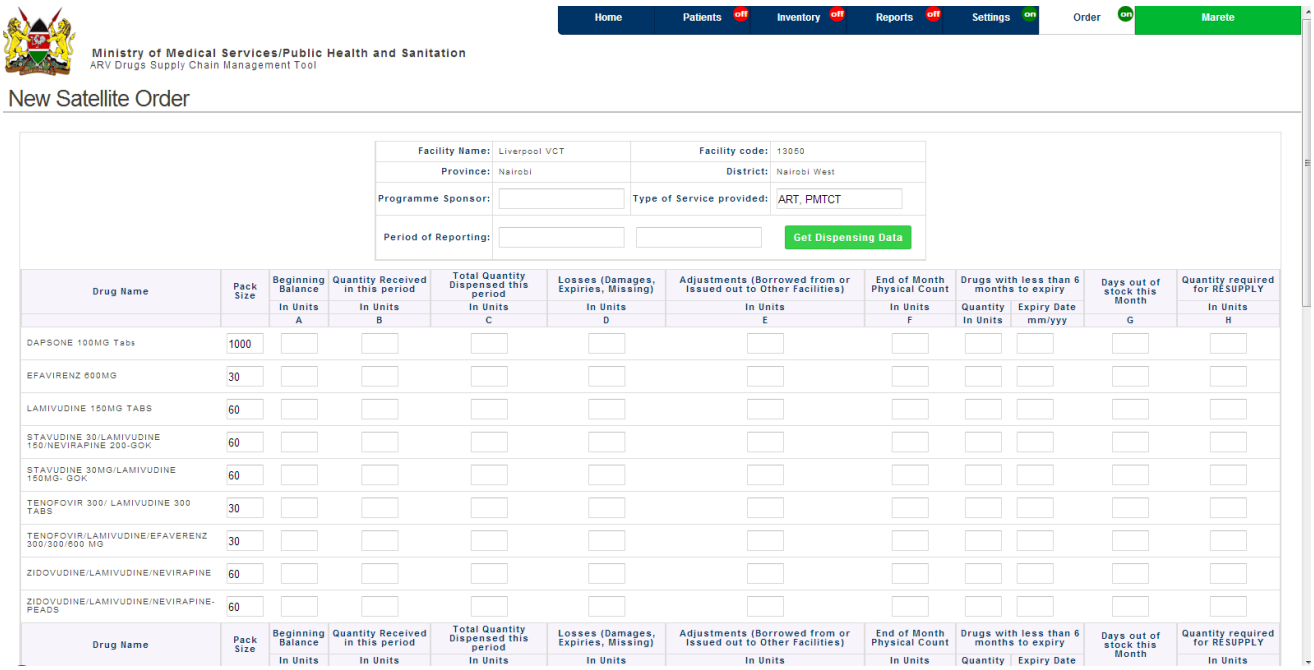
To make an order as a satellite facility click on the **settings** tab which then displays an order tab will click on **order** tab on the menu bar. The order listings are illustrated below.



To make a new order click on the **New Satellite Facility Order** Button, then select the satellite facility and click proceed.



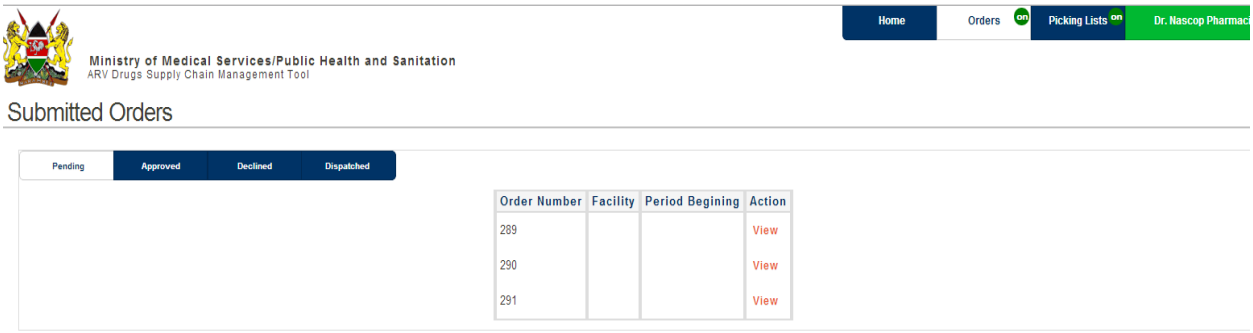
Then fill out the order form that is shown below:



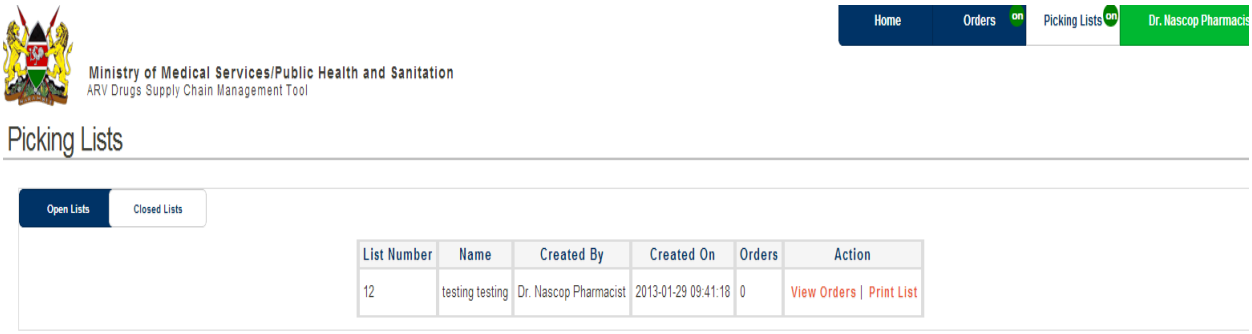
B) NASCOP Official

When logged in as a NASCOP official your homepage looks as shown below.

This person should be able to view orders that have been made by central sites or stand-alone sites to the suppliers i.e. KEMSA and Kenya Pharma and view picking lists. As shown below:-

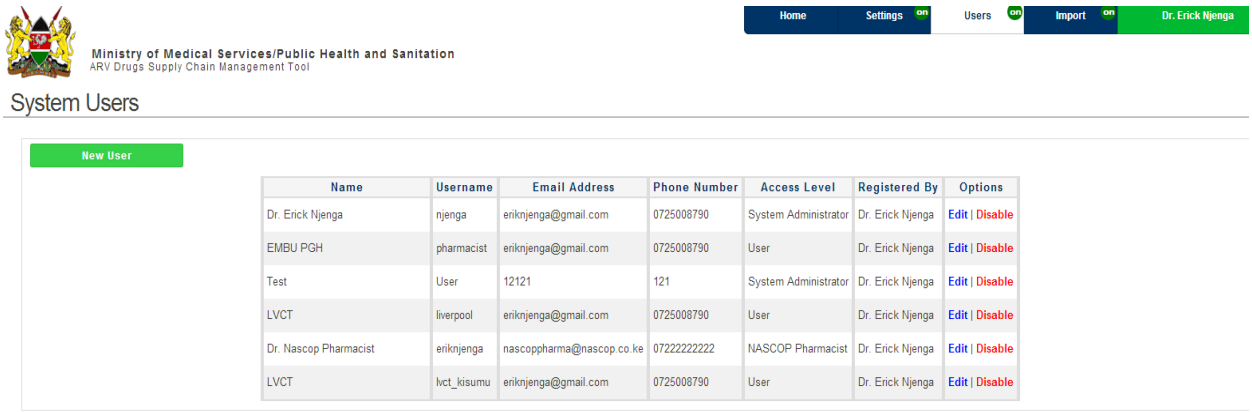


And to view picking lists, is as shown:-

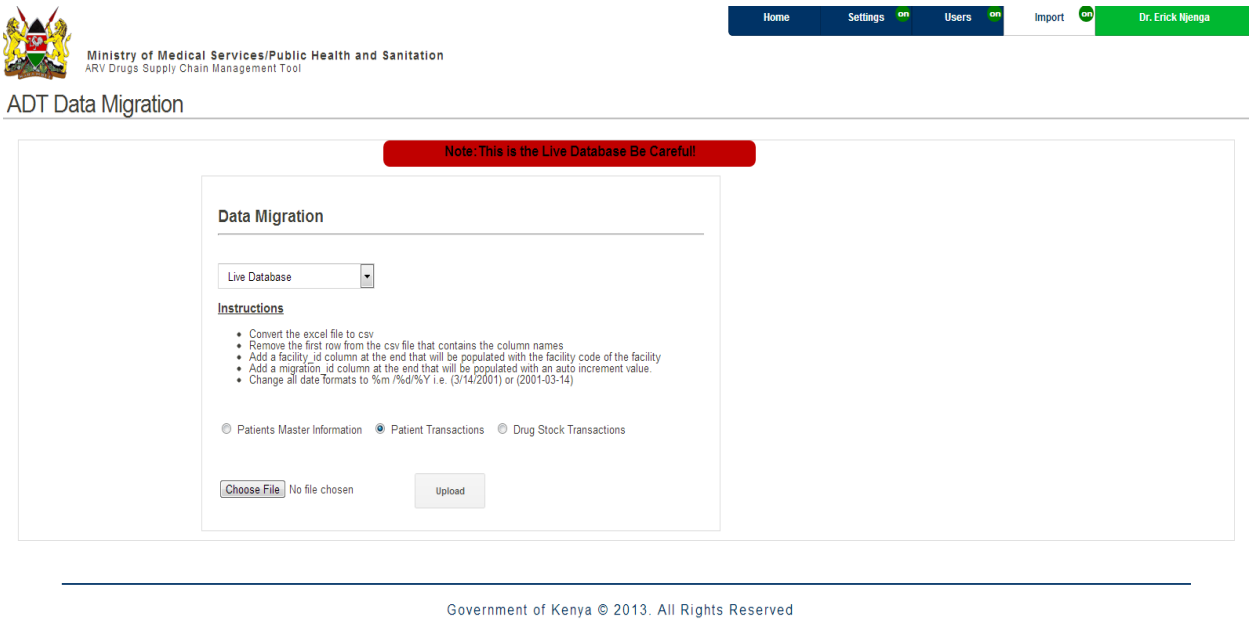


C) System Administrator

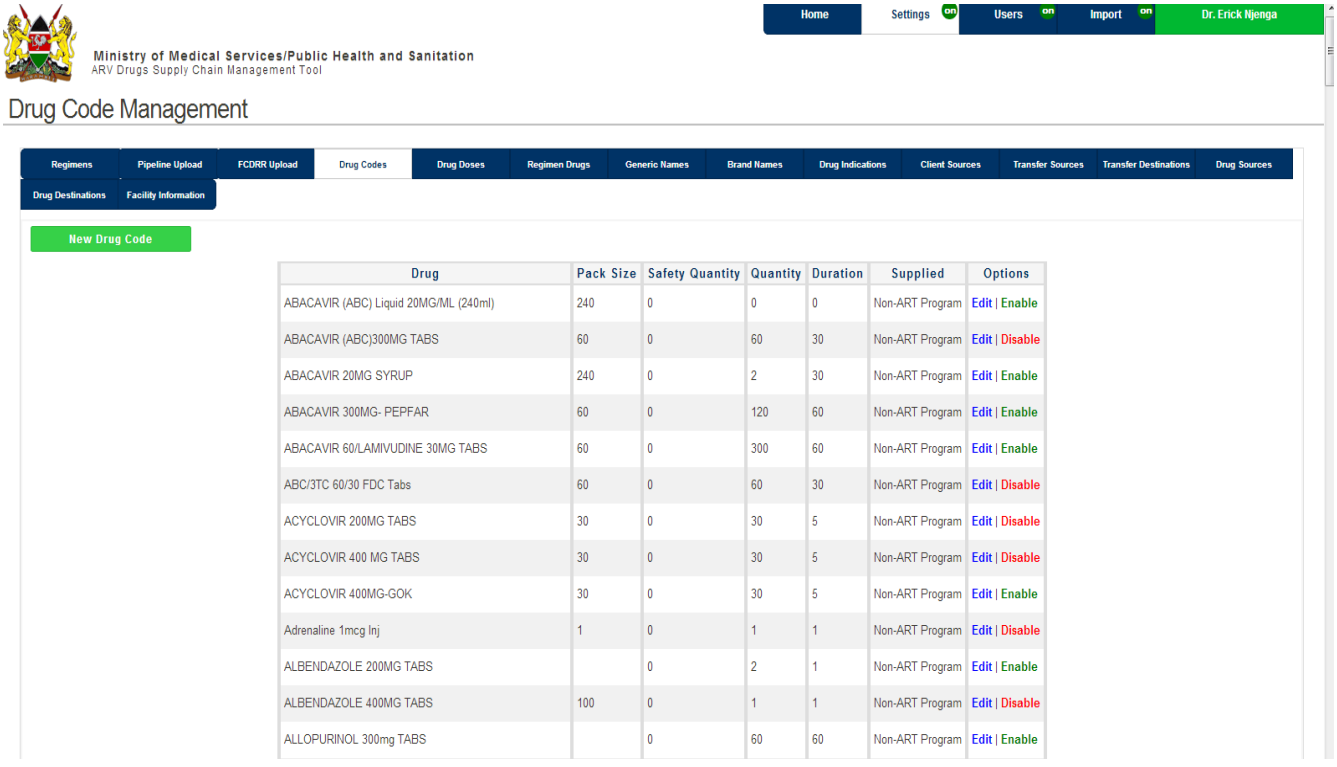
When logged in as a system admin, you are provided with tabs to perform administrative functions such as adding and editing users



The admin also needs to migrate historical data from facilities that are being brought into this new system. This as shown below:-



As well as perform various arrays of settings such as add, edit drug codes. This is as shown below:-



Drug	Pack Size	Safety Quantity	Quantity	Duration	Supplied	Options
ABACAVIR (ABC) Liquid 20MG/ML (240ml)	240	0	0	0	Non-ART Program	Edit | Enable
ABACAVIR (ABC)300MG TABS	60	0	60	30	Non-ART Program	Edit | Disable
ABACAVIR 20MG SYRUP	240	0	2	30	Non-ART Program	Edit | Enable
ABACAVIR 300MG- PEPFAR	60	0	120	60	Non-ART Program	Edit | Enable
ABACAVIR 60/LAMIVUDINE 30MG TABS	60	0	300	60	Non-ART Program	Edit | Enable
ABC/3TC 60/30 FDC Tabs	60	0	60	30	Non-ART Program	Edit | Disable
ACYCLOVIR 200MG TABS	30	0	30	5	Non-ART Program	Edit | Disable
ACYCLOVIR 400 MG TABS	30	0	30	5	Non-ART Program	Edit | Disable
ACYCLOVIR 400MG-GOK	30	0	30	5	Non-ART Program	Edit | Enable
Adrenaline 1mcg Inj	1	0	1	1	Non-ART Program	Edit | Disable
ALBENDAZOLE 200MG TABS		0	2	1	Non-ART Program	Edit | Enable
ALBENDAZOLE 400MG TABS	100	0	1	1	Non-ART Program	Edit | Disable
ALLOPURINOL 300mg TABS		0	60	60	Non-ART Program	Edit | Enable

5.0 UNIT AND INTERGRATION TESTING

Test Plan Identifier

ADT release 1.0 MTP 0.9

The structure of this document is primarily based on the IEEE 829-2008 Standard for Software Test Documentation.

Test Items

The scope of this Testing activity will include

- ADT 1.0 web application and supporting infrastructure like the server where the application will be stored
- Windows as well as Linux based platforms

The scope of this testing activity will not include:

- ADT's documentation e.g. Requirements and design specification or user, operations & installation guides.
- Other systems that ADT web application integrates with (including the MSH ADT system).
- Supporting operational processes such as internet controlled by the ISP or customer service e.g. the downtime of Internet connection that the pharmacist has experienced before the internet is up again

Features to be tested will consist of several phases (see introduction) and each phase may or may not include testing of any or more of the following aspects of the ADT web application:

- Accessibility
- Availability
- Coding Standards
- Compatibility
- Functionality
- Legal
- Navigation
- Performance
- Reliability
- Scalability
- Security

Features not to be tested

The intention is to test the listed aspects above but if time are not adequate, and then only the high priority test cases will be tested.

Approach

A risk-based approach will be used to carry out the test, that is, a test case will either be high, medium or of low priority and then scheduled from the highest to the lowest.

Exceptions.

- Scheduling conflicts arise, for example, lower priority tests that involve an expert of a module of the system(the DBA or the software developer)can be postponed if he/she is on leave,
- If a lower priority is a pre-requisite of another higher priority test e.g. login validation might be low priority but its only after you login that one is able to carry out the higher priority tests.
- If there are many low priority test cases, they can be implemented using few resources.

TESTING LEVELS

The testing of ADT version 1.0 will consist of Unit, System /Integration (combined) and Acceptance levels. Due to the budget constraints and time line established; most testing will be done by one test manager with the development teams participation.

UNIT testing (test case list, sample output, data printouts, defect information) will be done by the developer and will be approved by the development team leader who must provide evidence of the testing before the unit is accepted and passed on to the test person.

SYSTEM/INTERGRATION Testing will be performed by the test manger and development team leader. No specific test tools are available for this project. Programs will enter into system/Integration test after all critical defects have been corrected.

ACCEPTANCE Testing as usual will be performed by the actual end users with the assistance of the test manager and development team leader. The acceptance will be for a duration of 2-3 weeks after completion of the System/Integration test process.

Manual and automated testing will be combined and used because:

- Effectiveness for different classes of faults: For example, race conditions are very difficult to find with convectional testing, but they can be detected with static analysis techniques.

- Applicability at different points in a project: For example, we can apply inspection techniques very early to requirements and design representations that are not suited to more automated analysis.
- Differences in purpose: For example, systematic (nonrandom) testing is aimed at maximizing fault detection, but cannot be used to measure reliability; for that, statistical testing is required.
- Trade-offs in cost and assurance: For example, one may use a relatively expensive technique to establish a few key properties of core components (e.g. a security kernel) when those techniques would be too expensive for use throughout a project.

ITEM PASS/FAIL CRITERIA

The test process will be completed once the test cases have been implemented. The entrance criteria for each phase of testing must be met before the next phase can commence. Formal approval will be granted by ADT's Project Manager. Approval of the web application considers it live.

Suspension criteria and resumption requirements

In general, testing will be suspended if:

- The server(either apache or the HP hardware server) hosting the web application is down
- The database holding the data for the web application is not available
- There is no internet connection; the web application won't be accessed
- The computer being used has no source of power like electricity or battery
- The pilot process in a health facility has stopped e.g. if there is no data to enter into the system because the system cannot be tested without data
- Certain individual test cases are suspended or skipped if prerequisite test have not been carried out or have previously failed.

And will resume if:

- The apache server hosting the web application is up
- The database holding the data for the web application is available
- There is internet connection ;the web application will be available for access

The assumption used is that full complete testing cannot be done without reasonable amounts of data.

Test Deliverables

A master test plan document will be one of the main deliverables generated as a result of the testing activities as well as individual test plans for each phase of the testing cycle

- Acceptance test plan
- System/Integration test plan
- Unit test plans Screen prototypes
- Report mock-ups: to acquire feedback from users
- Defect/Incident reports and summaries

All documents will be delivered as PDF documents.

Testing Tasks

TASK	Assigned To	Status
Create Acceptance Test Plan	TM, PM, Client	
Create System/Integration Test Plan	TM, PM, Dev.	
Define Unit Test rules and Procedures	TM, PM, Dev.	
Define Turnover procedures for each level	TM, Dev	
Verify prototypes of Screens	Dev, Client, TM	
Verify prototypes of Reports	Dev, Client, TM	

Key

TM-Test Manager

PM-Project Manager

DEV-Development Team

Environmental needs

The following elements are required to support the overall testing effort at all levels within the reassigned sales project:

- Access to the source code of the ADT system for the purpose of white-box testing which include controlled rights to access the apache server where the system is being hosted. This would also enable the tester to access the database tables
- Access to the PC computers used by the pharmacists to enter data
- Access to the nightly backup/recovery process.

Due to its structure and the development tools used to create it, the ADT system should be tested with a client side PC with a minimum of the following requirements:

- I GB RAM
- 160 GB HDD
- Google Chrome Browser(Specifically used for its support of local database storage)
- Internet connection(at least once a week for offline-online synchronization testing)

Staffing and training needs

The testing team decided that it would be effective and efficient to have at least on full time tester assigned to the project for the system/integration and acceptance testing phases of the project. In case that the test person is not available the /test manger will assume this role. During synchronization, internet is required as a training need. Complete and proper testing be achieved if the following are addressed:

- The tester(s) will need to be trained on the basic operations of ADT's GUI.Operations staff members also require proper a thorough training before the project is accepted.
- Operation staff members also need to be trained on how to give feedback incase a problem occurs.

Schedule

- This document should be completed by 26th February 2013
- Test execution is expected to last 4 weeks for each of the health facilities where tests will be carried out and start at least 3 days after the test plans have been approved and the web application has been hosted; the delay of about 3 days allows seamless and easy change from the plan which is a concept to the test which is more practical.

Risks and contingencies

The following seeks to identify some of the more likely project risks and propose possible contingencies:

- Web application is not available or does not work-the developers have to check the server where the application is hosted or the source code to try solving the problem.
- Downtime of the server-Testing will not go on until this is rectified-Alternative sources of internet like modems provided by the local data bundles providers or user smart phones. But also the use of the offline module will assist use of the system without need of internet connection.
- Shortage or unavailability of testing staff due to them working part-time and have other high priorities, in addition no slack time is allocated for illness or vacation for any of the testers including the one working full time –may need to recruit more staff to the testing or reduce the number of test cases.
- A large number of defects/incidents make it functionally impossible to run all of the test cases-execute as many test cases as possible. Managers will ultimately, make the decision which test cases will be executed and which ones won't.
- Not enough time to complete all test cases. If time cannot be extended, individual test cases will be skipped, starting with the lowest priority.

Approvals

The Project Manager Must approve this plan.

6.0 CONCLUSIONS AND RECOMMENDATIONS

In conclusion, the development process for the ADT system has been both rewarding and challenging. I am proud of my work. The experience of working with a brilliant team both (CHAI and LVCT staff) has greatly improved my skill and given me an understanding of how HIV treatment works. When I was starting out Mr. Maingi told me that "we are not here to build systems but much more we are here to save lives". Now I understand.

My recommendations would be to have both 3rd years and 4th years participate in a project so that when the 4th year graduates the third year can take over and then the 2nd year who now is a third year is brought in an thus continuity and sustainability in this Strathmore and CHAI projects.

And also widen the scope that instead of only systems development the Students can also take part in awareness campaigns by developing multimedia applications that can be used in fight against the HIV pandemic and serve as their 4th year multi-media project.

Again I would like to thank Mr. Maingi CHAI and LVCT.

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