**Medicine Dispensing Cart**

**Saginaw Valley State University**

**College of Nursing**





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# Problem Definition

The purpose of this feasibility study is to determine the best approach for the development of a medicine dispensing cart that will be utilized by Saginaw Valley State University College of Nursing. The medicine dispensing cart will simplify the medication administration process and provide safe, fast, and secure transportation of medications to the patients.

The medicine dispensing cart they have now uses an All-in-One computer attached to a cart with a series of drawers that will open through Software installed on the All-in-One computer.

There are four main issues with the current setup, some hardware, and some software.

1. The All-in-One computer has a hard drive that is continually crashing.
2. A backlight issue on the built-in monitor has caused the College of Nursing to use an external monitor to view anything displayed on the screen.
3. Software installed on the All-in-One computer is designed to be used in a hospital setting. It has many features that are not going to be used by the College of Nursing.
4. The cart is always required to be plugged in, making it unusable to move it from bed to bed dispensing medication.

The medicine dispensing cart can be broken down into three subsystems:

1. Software, installed on a laptop, that a nurse uses to interact with the drawers to dispense medication to the patient.
2. The drawer system on the cart that will dispense chosen medication.
3. The scanner will scan a nurse’s ID card, medication barcodes, and patient barcodes.

The College of Nursing will supply a USB scanner and the drawer system. At the same time, the Computer Science department will provide a laptop. The laptop will be attached to the drawer system and handle the software component to control which drawer to open. The scanner will be connected to the computer and enable the Software to track medication and patients through their barcodes.

The feasibility study will focus on producing solutions that will accomplish the following objectives:

1. Selection of hardware used to control the drawer system – laptop and USB to serial cabling.
2. Selection of programming language used for the software system installed on the laptop.
3. Determine how to control the drawer system through the laptop.
4. Determine how to store the patient, nurse, and medication data.
5. Determine the permission levels for operators: nurses, charge nurses, and administrators.
6. Determine different scenarios that could negatively affect the system.
7. Determine the system’s requirements.
8. Determine user interface for the Software.

# Executive Summary

The system will allow the nursing students to become acquainted with the Software they may need to interact with within a realistic healthcare setting. In addition to this, there will also be a particular focus on expediting repetitive tasks that are important to the simulation and, this way, providing a more realistic nursing experience. These crucial tasks include:

1. Designating of medication to a patient and the subsequent dispensing.
2. Adding nurses or patients to a roster.
3. Checking for dangerous drug interactions.
4. Reviewing patient history for allergies before dispensing a particular medication.
5. A report will show drug administration times, drug count, and which patients received what drugs.
6. A database will store information regarding nurses, patients, and medication.

Based on the information surmised from the cart’s issues and how costly it would be to fix, we have determined that developing an in-house solution using the .NET framework running on a laptop connected to the physical cart is the most effective solution. As a consequence of developing the software in-house and having the existing Software as a reference to study, we can mimic the current Software and redesign it to our liking. We can also include the College of Nursing faculty in the development process by proposing changes to better suit their needs.

The study covers how specific operators interact with the system, what the system must accomplish and store, and how it interacts with the physical cart. The Software will allow a charge nurse to manage a patient, manage medication within the cart, manage the nurses authorized to use the cart, and manage a given nurse’s rank. The CIS Capstone class will complete the project in-house by February 24th, 2021, and then we will return the medical cart to the College of Nursing.

# Method of Study

This study was conceived when Dr. Scott James approached Sharon Panepucci, the Nursing Simulation Coordinator, and Adrienne Galbraith, the Nursing Simulation Educator, offering to facilitate a solution for a malfunctioning medicine dispense cart used in the simulations they oversee and conduct. Dr. Scott James felt that not only would it be a good project for CIS422-424 class, but that it would also be useful for the SVSU nursing students. By providing the College of Nursing with a solution by fixing the cart, their nursing students will receive necessary, realistic experience using automated medical technology before they go into their career field. We closely collaborated with the College of Nursing and gained valuable insight into what the system must do.

After gathering requirements from the College of Nursing and testing the cart ourselves, we were able to surmise the primary functions necessary for the system to perform, so we began compiling a list of requirements. We came up with several different alternatives for fixing the cart and chose the best solution to fit the College of Nursing.

To further disseminate our understanding of the system and what would be required to produce similar Software, we decomposed the system into various forms of charts and diagrams (context diagram, data flow diagram, HIPO diagram, use case diagram, etc.). In addition to diagrams, we wrote a cost-benefit analysis for the system, including the project’s tangible and intangible benefits. We then implemented the schedule for developing the Software, came up with the rainy-day scenarios and typical use-cases, and, most importantly, created a database design for the system.

After analyzing the College of Nursing’s existing Software, we started working on the cart’s software design prototype. Our GUI representatives had team meetings where they collaborated to come up with the best ideas for the database schemas and software design. We discussed different ways to improve the Software’s design and functionality as the original Software itself was quite outdated. We had also gathered any additional requirements or suggestions for improvement of the original Software.

Using an iterative waterfall approach, we have completed its first two stages: gathering documentation requirements and implementing the software design.

# Analysis of Objectives

## Objectives of the System

* 1. Develop a graphical user interface for the software component of the system.
  2. Develop a graphical user interface that will enable the nurse, charge nurse, or administrator to interact with the medical dispenser’s drawer system.
  3. Develop a system that will automate the process of drug dispensing.
  4. Develop an authorization process for when nurses need to validate their credentials to log into the system.
  5. Develop a database system that will securely store medication and patient data.
  6. Develop a scanning system that will scan the barcodes.
  7. Develop a graphical user interface that will showcase a patient roster and requisite patient and medication information.
  8. Keep track of expired or wasted medication.
  9. Develop a method for drug validation by providing the charge nurse authorization to sign-off on narcotic administration.
  10. Develop a system that is compliant with health standards and safety guidelines.
  11. Control and track the drug distribution by the cart.
  12. Control and track the stocking of the cart.
  13. Ensure patient data protection.
  14. Ensure that they can maintain the system.
  15. Develop a friendly user interface that will be straightforward to the nurses, charge nurses, or administrators.

## Objectives of the Study

* 1. Develop requirements that define what data the system must output and what transformations the system must do.
  2. Gather hardware and software specifications for the system.
  3. Determine the system’s core functionalities and their purpose to develop the system’s primary goals.
  4. Develop the schedule table that will determine the time and effort required to implement the system.
  5. Develop the criterion that evaluates the system’s functions to the nurse, charge nurse, or administrator.
  6. Develop a cost analysis that will meet the College of Nursing budget.
  7. Develop strategies for rainy days scenarios.
  8. Develop appropriate data structures and algorithms to determine how the data flows in the system.
  9. Determine the system’s GUI layout that will be user friendly, intuitive, and relevant.
  10. Build Software that can handle multiple operator roles.

Alternatives Considered

## Alternative 1

Do nothing. The cart itself is functional, and it merely is not mobile. Consequently, it requires an external monitor, power cable, mouse, and keyboard to facilitate any use.

## Alternative 2

Use an existing cart and develop a solution in-house using a .NET framework. Should we understand how the current program communicates with the physical cart, we can replace the all-in-one computer with a laptop with a USB-to-Serial cable connected to the cart. This laptop would then run the program designed in-house that emulates the proprietary program’s functionality that came with the cart. Some examples of the Software’s relevant functionality will be keeping track of each medication, the cart’s quantity, and how a nurse will dispense it.

## Alternative 3

Replace the touchscreen with a new one as the Software and the cart still function. The primary issue is that the touchscreen is nonfunctioning and requires an external monitor and mouse to allow continuous usage. Should replacing the screen with a functioning one prove cost-effective, the cart should continue working as intended.

## Alternative 4

Construct a new cart using material such as a cash register drawer to mimic that of the current cart, then create new Software to operate the drawers using the .NET Framework. We can buy cash register drawers from Walmart® and adhere them to a cart. We can then take the cash register drawers and stack them on top of one another to create a tower that will hold the medication.

# Differences in Alternatives

## Alternative 1 and 3

The main difference here is the College of Nursing’s amount of work. With Alternative 1, neither the Computer Science Department nor the Nursing Department does anything. They just need to work around the limitation. In Alternative 3, the work put on the College of Nursing. They would have to take time to raise money to be able to fix the screen. This alternative would be highly inefficient and would not result in anyone learning anything.

## Alternative 2 and 4

The main difference here is the amount of work the cart is going to require. Alternative 2, which is the most ideal, will allow us to reuse the cart. We can use a console cable to intercept the codes to open the doors to the medical dispensing cart. Using those codes, we can reuse the cart and force the doors to open whenever needed. Alternative 4 is the same concept but will only happen if we cannot reverse engineer the cart. We will have to pick up a cart from a store such as Walmart and pick up drawers to open from the computer. We can do this by getting some cash registers and taking the top part off. From there, we can use the same concept as reverse-engineering the med cart.

## Recommendation

Based on the in-depth analysis of all plausible alternatives, we decided Alternative 2 is the best option available. Alternative two gives us the ability to provide them with the cart and drawer system they are comfortable using with a software system tailored to their needs. Using an existing cart and developing a solution using a .NET framework will be the least expensive and most efficient option. If we can reuse the cart, the only substantial cost would be a laptop. We must develop Software that interacts with the drawer system and a scanner that keeps track of the medication and dispenses it as needed.

# Development Plan

|  |
| --- |
| Project starting date: September 2020  Project completion date: April 2021 |

|  |
| --- |
| Required tasks to be completed: Each phase will be kept in a project notebook as progress continues throughout the project’s life. |
| 1. Define the goals, scope, and objectives. 2. Carry out requirements and constraints for the system. 3. Create step-by-step instructions on the system’s implementation. 4. Assign project tasks. 5. Develop required system interfaces. 6. Develop hardware requirements. 7. Design database schemas. 8. Develop a plan for software development activities. This plan will include software development approaches, methods, and processes. 9. Perform prototyping, then writing the code, integrating, testing, and debugging the Software. 10. Assemble hardware parts. 11. Installation of Software onto the cart’s computer. 12. Testing of Software on the hardware and debugging if needed. 13. Develop user manual. 14. Deliver finished system, provide training if necessary. |

# Appendix A: Term Definitions

**Administer** - The action in which a registered nurse provides medication to a patient.

**Allergy** – A harmful immune response as a result of an adverse reaction to a substance.

**Automated** - Technology by which a procedure is performed with minimum human assistance.

**Charge Nurse** – A nurse that has permission to stock/restock the cart.

**Controlled Medication** – Medication that requires a second nurse’s validation before a nurse can administer it.

**Discharged Patient** – A patient who is no longer under the care of a given facility, either because they were sent home or transferred to another health facility.

**Dispensing** –Open a selected drawer with medication.

**Drug Interaction** –The measurable influence one medication may have over another.

**Maintenance Personnel** –Someone who isresponsible for fixing or maintaining the cart.

**Medicine Dispensing Cart** - A mobile cart with medication located in storage drawers controlled by Software.

**Narcotic** - A controlled medication that assists with pain management. The nurse must validate it before being administered.

**Nurse –** A person trained to care for the sick or infirm, especially in a hospital. In our system, this is someone who can administer medication to a patient.

**Order** –An electronic request made by a physician prescribing a medication. Administering medication without an order cannot be done unless it is an extreme emergency. At which point, a physician must complete the order after the fact in the system.

**Patient** - A person receiving or registered to receive medical treatment.

**Wasted Medication** – Medication that was partially used while being dispensed and needed to be properly disposed of (wasted).

# Appendix B: System Requirements

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Med-Cart Dispense System Requirements

## Software Requirements

* 1. **Concerning Software Environment**
     1. The software shall run in a Windows 10 environment.

Test: Visible inspection of software for Windows 10 installation

* + 1. The environment shall have .Net framework 4.7 or higher installed

Test: Visible inspection of software information on the system

* + 1. The environment shall have internet connectivity

Test: Check internet connection and attempt to run the software

Patient Records

* 1. **Concerning Patient Creation**
     1. The software shall allow the manual creation of new patients by authorized users.

Test: Attempt to create a patient under an authorized user.

* + 1. The software shall not allow the manual creation of new patients by unauthorized users.

Test: Attempt to create a patient under an unauthorized user.

* + 1. The software shall require and accept a patient’s first name.

Test: Attempt to input the first name for a patient into the software.

* + 1. The software shall require and accept a patient’s middle name or initial.

Test: Attempt to input the middle name or initial of a patient into the software.

* + 1. The software shall require and accept a patient’s last name.

Test: Attempt to input the last name of a patient into the software.

* + 1. The software shall require and accept a patient’s MRN.

Test: Attempt to input the MRN of a patient into the software.

* + 1. The software shall require and accept a patient’s room number.

Test: Attempt to input the room number of a patient into the software.

* + 1. The software shall require and accept a patient’s bed number.

Test: Attempt to input the bed number of a patient into the software.

* + 1. The software shall require and accept a patient’s admission date.

Test: Attempt to input the admission date of a patient into the software.

* + 1. The software shall require and accept a patient’s DOB.

Test: Attempt to input the DOB of a patient into the software.

* + 1. The software shall require and accept a patient’s sex.

Test: Attempt to input the sex of a patient into the software.

* + 1. The software shall require and accept a patient’s weight.

Test: Attempt to input the weight of a patient into the software.

* + 1. The software shall require and accept a patient’s height.

Test: Attempt to input the height of a patient into the software.

* + 1. The software shall accept a valid patient’s phone number.

Test: Attempt to input the phone number of a patient into the software.

* + 1. The software shall accept a patient’s address.

Test: Attempt to input the address of a patient into the software.

* + 1. The software shall accept a valid patient’s email.

Test: Attempt to input the email of a patient into the software

* + 1. The software shall require and accept a patient’s primary physician.

Test: Attempt to input the primary physician of a patient into the software.

* + 1. The software shall display the patient’s prescribed medications from the database.

Test: Check if the patient’s prescribed medications appear in the GUI.

* + 1. The software shall display the patient’s allergies from the database.

Test: Check if the patient’s allergies appear in the GUI.

* + 1. The software shall record a saved patient into a database.

Test: Check the database after a patient has been saved.

* 1. **Concerning Patient Searching**
     1. The software shall allow active patients to be searched by their first name.

Test: Attempt to search through the list of active patients using a patient’s first name.

* + 1. The software shall allow active patients to be searched by their last name.

Test: Attempt to search through the list of active patients using a patient’s last name.

* + 1. The software shall allow active patients to be searched by their patient ID number.

Test: Attempt to search through the list of active patients using a patient’s ID number.

* + 1. The software shall allow active patients to be searched by their admission date.

Test: Attempt to search through the list of active patients using a patient’s admission date.

* 1. **Concerning Patient Modification**
     1. The software shall allow specific patient demographics to be modified by an authorized user.

Test: Attempt to modify patient demographics under an authorized user.

* + 1. The software shall not allow specific patient demographics to be modified by an unauthorized user.

Test: Attempt to modify patient demographics under an unauthorized user.

## Medication Records

* 1. **Concerning Medication Creation**
     1. The software shall allow the creation of ad-hoc orders by an authorized user.

Test: Attempt to create an ad-hoc order under an authorized user.

* + 1. The software shall not allow the creation of ad-hoc orders under non-authorized users.

Test: Attempt to create an ad-hoc order under a non-authorized user.

* 1. **Concerning Medication Showing**
     1. The software shall retrieve and display medication information from the database.

Test: Visible inspection of the medication information within the GUI.

* + 1. The software shall retrieve and display drug interactions from the database.

Test: Visible inspection of drug interactions from the GUI.

* + 1. The software shall show a patient’s medical history within the GUI

Test: Visible inspection of a patient’s medical history in the GUI

* + 1. The software shall display the last time a medication was administered to a patient.

Test: Visible inspection of the software for the last patient administration.

* 1. **Concerning Medication Modification**
     1. The software shall allow authorized users to inactivate an ad-hoc order and enter a new one.

Test: Attempt to inactivate an ad-hoc order and create a new order under an authorized user.

* 1. **Concerning Medication Dispensing**
     1. The software shall accurately record the date and time of when a nurse dispenses a medication on the screen.

Test: Compare the recorded date and time with the actual date and time.

* + 1. The software shall record the nurse identification number when dispensing medication on the screen.

Test: Observe if the software recorded the nurse’s identification number.

* + 1. The software shall update the database records of the dispensed medication.

Test: Visible inspection of the database for an updated dispense record

* + 1. The software shall require authorization from a second nurse for dispensing narcotic medication.

Test: Attempt to dispense a narcotic medication with a second nurse.

* + 1. The software shall notify the user if the patient is allergic to a medication they are attempting to administer.

Test: Attempt to dispense medications that a patient is allergic to and observe if the software displays a pop-up for the user.

* + 1. The software shall notify the user if the patient’s currently prescribed medications conflicts with what they are attempting to administer.

Test: Attempt to dispense a medication that conflicts with a patient’s currently prescribed medications and observe if the software displays a pop-up for the user.

* + 1. The software shall only open the drawer of the medication being dispensed.

Test: Dispense medication and observe if the designated drawer is open.

* + 1. The software shall display the correct dosage for the medication.

Test: Observe if the dosage amount listed matches what is in the database.

* + 1. The software shall choose a drawer that has a sufficient amount of medication to be dispensed.

Test: Attempt to withdraw more medication than is present and observe if the system flags the interaction.

* 1. **Concerning Medication Waste**
     1. The software shall require a second user to authorize medication waste.

Test: Attempt to waste medication and observe for an authorization prompt

* + 1. The software shall display reasons for wasting a medication.

Test: Visible inspection of the waste medication window

## User

* 1. **Concerning User Creation**
     1. The software shall accept the creation of new system users by an authorized user.

Test: Attempt to create a new user by an authorized user.

* + 1. The software shall not accept the creation of new system users by an unauthorized user.

Test: Attempt to create a new user by an unauthorized user.

* + 1. The software shall require and accept a unique username for the user.

Test: Attempt to input the username of the user as part of the user creation process.

* + 1. The software shall require and accept a username with a maximum character length of 40

Test: Attempt to input a username with more than 40 characters.

* + 1. The software shall require and accept a username with uppercase and lowercase letters.

Test: Attempt to input a username with uppercase and lowercase letters.

* + 1. The software shall require and accept a unique password for the user.

Test: Attempt to input the password of the user as part of the user creation process.

* + 1. The software shall require and accept letters, numbers, and special characters for a unique password.

Test: Attempt to input a password with letters, numbers, and special characters.

* + 1. The software shall require and accept a password with a minimum length of 12 characters.

Test: Attempt to input a password with less than 12 characters.

* + 1. The software shall require and accept a password with a maximum length of 64 characters.

Test: Attempt to input a password with more than 64 characters.

* + 1. The software shall require and accept a password with uppercase and lowercase letters.

Test: Attempt to input a password with uppercase and lowercase letters.

* + 1. The software shall accept the barcode or QR code of a user.

Test: Attempt to scan barcode or QR code for a user.

* + 1. The software shall allow the level of access for the user to be specified.

Test: Attempt to input the user’s level of access as part of the user creation process.

* + 1. The software shall allow the access level of a nurse to be selected by default for the user.

Test: Visible inspection of the operator access window within the GUI

* 1. **Concerning User Modification**
     1. The software shall allow specified user information to be modified by authorized users.

Test: Attempt to modify a user’s information under an authorized user and observe the changes.

* + 1. The software should not allow unauthorized users to modify user information.

Test: Attempt to modify a user’s information under an unauthorized user and observe the changes.

## Physician

* 1. **Concerning Physician Creation**
     1. The software shall allow the manual creation of a new physician by an authorized user.

Test: Attempt to create a physician under an authorized user.

* + 1. The software shall require and accept a physician’s first name

Test: Attempt to input the first name of a physician into the software.

* + 1. The software shall require and accept a physician’s middle name or initial

Test: Attempt to input the middle name or initial of a patient into the software.

* + 1. The software shall require and accept a physician’s last name.

Test: Attempt to input the last name of a physician into the software.

* + 1. The software shall accept a physician’s phone number.

Test: Attempt to input a phone number for a physician into the software.

* + 1. The software shall accept a physician’s address.

Test: Attempt to input an address for a physician into the software.

* + 1. The software shall accept a physician’s fax number.

Test: Attempt to input a fax number for a physician into the software.

* + 1. The software shall require and accept a physician’s credentials.

Test: Attempt to input a physician’s credentials into the software.

* + 1. The software shall accept a valid physician’s email address.

Test: Attempt to input an email address for a physician into the software.

* + 1. The software shall record a saved physician into a database.

Test: Check the database after a physician has been saved.

* 1. **Concerning Physician Modification**
     1. The software shall allow specified physician information to be modified by authorized users.

Test: Attempt to modify a physician record under an authorized user and observe the changes.

* + 1. The software should not allow unauthorized users to modify physician information.

Test: Attempt to modify physician information under an unauthorized user and observe the changes.

## Allergy

* 1. **Concerning Allergy Creation**
     1. The software shall accept the manual creation of an allergy by an authorized user.

Test: Attempt to create an allergy under an authorized user.

* + 1. The software shall require and accept an allergy’s name.

Test: Attempt to input the name of an allergy into the software.

* + 1. The software shall require and accept the type of allergy.

Test: Attempt to input the type of allergy into the software.

* + 1. The software shall require and accept the allergy severity information.

Test: Attempt to input the severity of an allergy into the software.

* + 1. The software shall record the saved allergy into a database.

Test: Check if the allergy appears in the database after being saved.

* 1. **Concerning Allergy Modification**
     1. The software shall allow authorized users to inactivate allergy records.

Test: Attempt to inactivate allergy record by an authorized user.

* + 1. The software shall not allow unauthorized users to inactivate allergy records by unauthorized users.

Test: Attempt to inactivate allergy record under an unauthorized user.

## System Authorization

* 1. **Concerning System Authorization**
     1. The software shall require user authorization to access the system.

Test: Attempt to gain access to the system without proper authorization.

* + 1. The software shall allow a user to gain access to the system using a barcode or QR code.

Test: Attempt to login to the system using a barcode or QR code.

## Drawer Operation

* 1. **Concerning Drawer Operation**
     1. The software will handle the opening of the cart drawer.

Test: Attempt to open a drawer using the software.

* + 1. The software shall display what medication is in each drawer.

Test: Compare data on the screen with the medication in the drawer.

* + 1. The software shall display if a drawer is full within the GUI.

Test: Attempt to insert enough medication in a drawer to display a full message

* + 1. The software shall display if a drawer is empty within the GUI.

Test: Attempt to empty a drawer of medication to display an empty message

## Importing

* 1. **Concerning Importing Patient Information**
     1. The software shall allow specified patient demographics to be imported into the IDE by an authorized user.

Test: Attempt to import patient information into the software by an authorized user.

* 1. **Concerning Importing Allergy Information**
     1. The software shall allow allergy information to be imported into the IDE by an authorized user.

Test: Attempt to import allergy information into the software by an authorized user.

* 1. **Concerning Importing Physician Information**
     1. The software shall allow physician information to be imported into the IDE by an authorized user.

Test: Attempt to import physician information into the software by an authorized user.

## Reporting & Analysis

* 1. **Concerning Reporting & Analysis**
     1. The software shall allow an authorized user to review a report and export it to a pdf or word document.

Test: Attempt to review a report and export from the software.

## Hardware Requirements

1. **Hardware Requirements**
   1. The hardware shall have at least one gigahertz or faster processor installed.

Test: Visible inspection of the hardware information on the system.

* 1. The hardware shall have at least 20 GB of hard drive space on a 64-bit processor.

Test: Visible inspection of the hardware information on the system.

* 1. The hardware shall have at least 2 GB of RAM on a 64-bit processor.

Test: Visible inspection of the hardware information on the system

* 1. The hardware shall have a graphics card that is compatible with DirectX 9 or later with the WDDM 1.0 driver

Test: Visible inspection of the hardware information on the system

* 1. The hardware shall have at least an 800x600 display or better

Test: Visible inspection of the hardware information on the system

* 1. The hardware shall include the medical cart with a drawer system

Test: Visible inspection of the cart.

* 1. The hardware shall include a scanner with the ability to scan barcodes and QR codes.

Test: Attempt to use the scanner and make sure the scanner can scan bar codes

# Appendix C: Cost-Benefit Analysis

## Overview

This analysis presents the costs and benefits associated with the proposed system. The College of Nursing will need to procure physical equipment for the system. The CIS Capstone students will handle the creation of the Software for the solution. By reusing the cart, we can save a great deal of money. We only need to have a laptop capable of running the program to control the cart and a barcode scanner to scan nurse IDs, patient IDs, medications, etc.

|  |  |
| --- | --- |
| **Item** | **Cost** |
| [Laptop](https://www.amazon.com/Lenovo-Chromebook-MediaTek-Processor-81JW0000US/dp/B07GLV1VC7/ref=sr_1_1_sspa?dchild=1&keywords=laptop+touchscreen&qid=1604414795&s=pc&sr=1-1-spons&psc=1&spLa=https://www.amazon.com/Dell-Inspiron-15-3000-Anti-Glare/dp/B08FCDF3CW/ref=sr_1_1_sspa?dchild=1&keywords=laptop%2Btouchscreen&qid=1606119918&refinements=p_89%3ADell&rnid=2528832011&s=electronics&sr=1-1-spons&spLa=ZW5jcnlwdGVkUXVhbGlmaWVyPUExRTExSUMxMzc4UUxPJmVuY3J5cHRlZElkPUEwMDQ1MTg4M0xRTzFBWFc0MkVQTyZlbmNyeXB0ZWRBZElkPUEwNjQzMzU4MjdKSzVRQzYyNkc5OCZ3aWRnZXROYW1lPXNwX2F0ZiZhY3Rpb249Y2xpY2tSZWRpcmVjdCZkb05vdExvZ0NsaWNrPXRydWU&th=1) | $519.00 |
| [Barcode Scanner](https://www.amazon.com/Tera-Barcode-Wireless-Cordless-Computer/dp/B07D799ZDD/ref=sr_1_1?dchild=1&keywords=scanner+qr&qid=1604415005&s=pc&sr=1-1) | $43.89 |
| [Laptop Locking Mount](https://www.amazon.com/MonMount-Laptop-Locking-Security-LAP1405/dp/B01CQ2N0CY/ref=pd_ybh_a_2?_encoding=UTF8&psc=1&refRID=QYA3K0MTD8VFBCKX1F45) | $69.51 |
| [Heavy Duty 100ft Extension cord](https://www.amazon.com/Woods-992555-Extension-Reinforced-Visibility/dp/B00ASNW1QA/ref=sr_1_10?dchild=1&gclid=CjwKCAiAtK79BRAIEiwA4OskBvw1gGHTSHWkNkrkQqU-yU7kcCOiGf_o1UqP06OI3Y4OL92eeia8IhoCddcQAvD_BwE&hvadid=174242388156&hvdev=c&hvlocphy=9017088&hvnetw=g&hvqmt=e&hvrand=3763510145785027&hvtargid=kwd-37389126&hydadcr=24628_9648893&keywords=heavy+duty+extension+cord&qid=1605150722&refinements=p_n_feature_keywords_two_browse-bin%3A7065065011&rnid=1248907011&s=lamps-light&sr=1-10) | $46.41 |
| **TOTAL:** | $678.81 |

## Benefits:

Tangible

* The hardware cost of savings in more than $15,000 for a fixed cart
* Software cost savings on customized Software
* Resource cost savings due to the time savings of manual process time
* The cart will mobilize electronic patient records
* Increased income of students into the Nursing Program due to available Medical Technology training
* Improved tracking of medication and patient data
* The cart will be mobile and able to be used in life-like situations
* The cart will be able to simulate the security of an actual hospital

Intangible

* Improved hands-on experience for College of Nursing students
* Enhanced patient safety due to the College of Nursing students’ training
* Improved medical facilities satisfaction of the College of Nursing
* Improvement in reviews from students about the College of Nursing
* Increased student knowledge capabilities
* Better reputation for the College of Nursing
* Improved user experience due to the customized, modern-looking Software
* Maintaining competition with nursing programs of other universities

## Cost Breakdown



# Appendix D: Context Diagram



# Appendix E: Software Subsystem Diagram



# Appendix F: Dataflow Diagrams

## DFD Level 0



## DFD Level 1



## DFD Level 1.1



## DFD Level 2.1



## DFD Level 3.1



## DFD Level 4.1



## DFD Level 5.1



# Appendix G: HIPO Diagrams























# Appendix H: Use Case Scenarios:

The following UML behavior diagrams represent Use Case Scenarios to visually describe a medicine dispensing cart system’s functional requirements and show the relationships between Actors (external entities that will be using the system) and Use Cases (goals that the users will be carrying out). A person figure represents the Actors, and ovals represent the Use Cases. In the following use case scenarios, we have three roles that directly interact with the dispensing cart: nurse (as a student), charge nurse (as a professor), and administrator.

## Add New Medication

In this use case scenario, we describe the scenario when the nurse wants to add a new patient into the system. We can see that a professor inherits from the charge nurse; since we are developing this system for a university, it is not an actual charge nurse who will be utilizing the system, but a professor. Arrow with “include” amplifies that the process of classifying the medication (whether it is a narcotic or not) is included in the process of entering medication data.



## Add New Patient

This use case scenario shows a use case for adding a new patient into the system. A student, who plays a role as a nurse, will enter patient information manually, or he/she can import the patient file, which will have all necessary data fields in it. The patient information process includes patient admission status, the patient’s room and bed, and dates when the patient was admitted or discharged.



## Dispense Medication

After the nurse selected a patient to whom the medication will be dispensed from the cart, the nurse will select medication. If the selected medication is an allergen to the patient, the nurse will have to acknowledge it by confirming it in the system. If the selected medication is a narcotic, a witness (another nurse, a student) needs to sign off. A witness has two options for logging in: entering username and password manually or scanning their id.



## Restock Cart

In this scenario, when a charge nurse adds medication into the cart, she/he must enter medication information into the system.



## Add User

The administrator has all access and hence, is the one to add new users into the system.

## 



## Waste/Return Medication



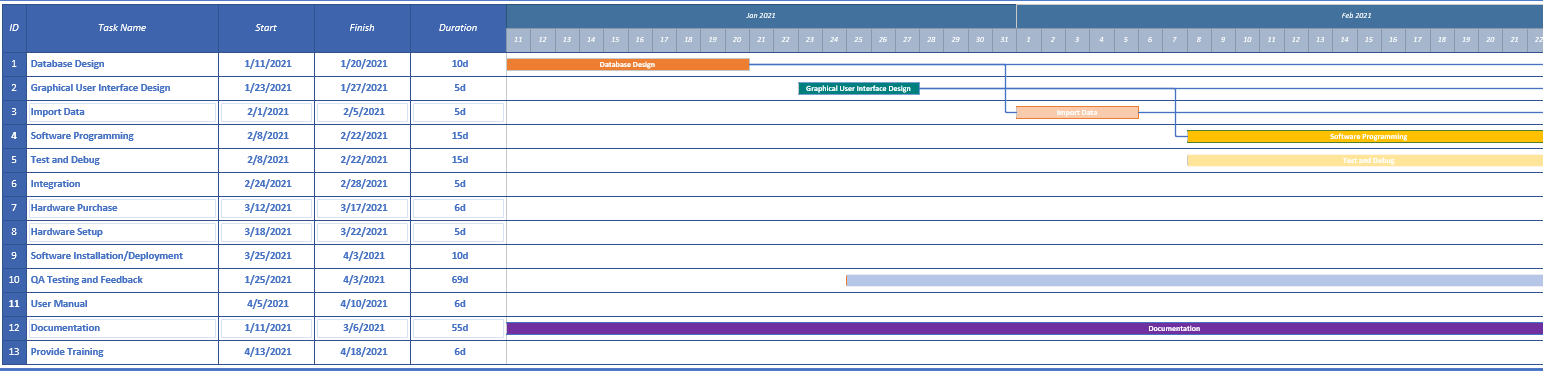
# Appendix I: State Machine Diagrams

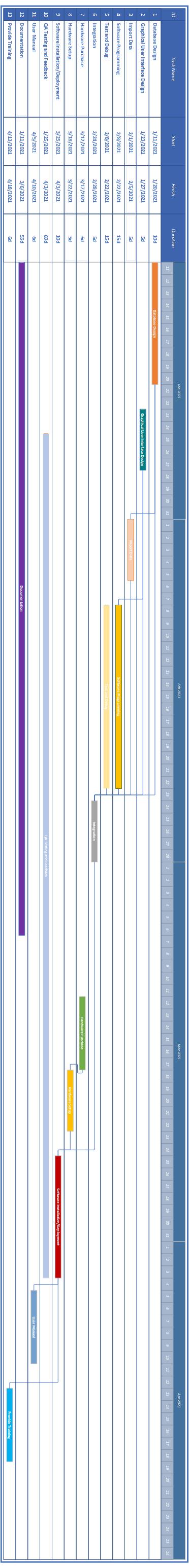
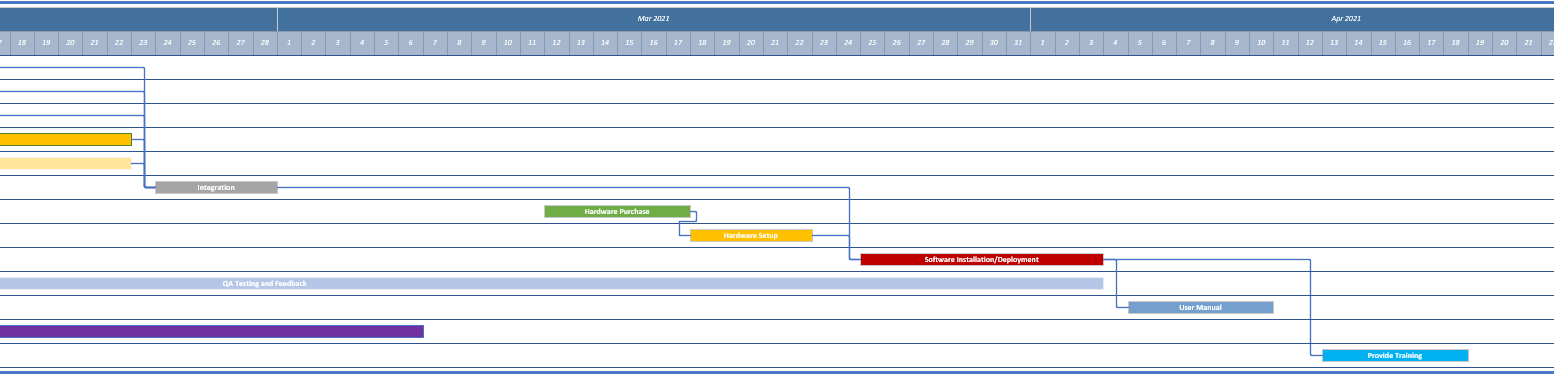


# Appendix J: IDEF0 Diagrams

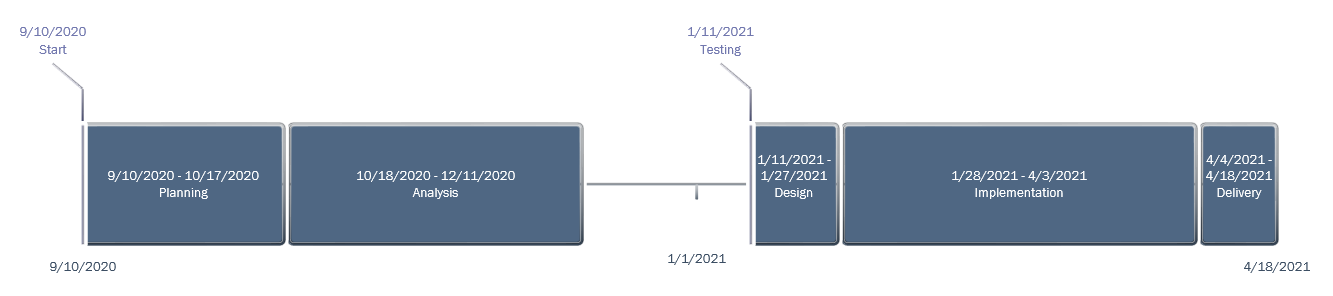


# Appendix K: Implementation Schedule





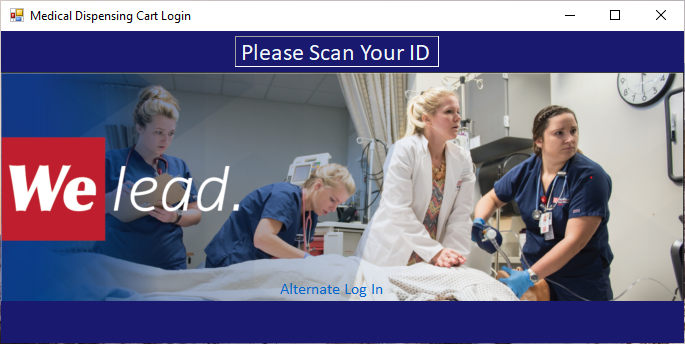
## Project Phase Schedule



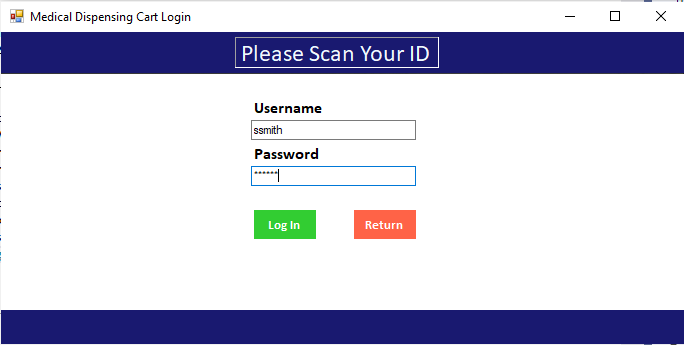
# Appendix L: System Storyboards

This appendix includes mockups for the cart software’s GUI design that our team came up with. It also contains notes explaining the functions that each screen will perform while using the Software. The following screens show almost all the Software’s GUI design in the following storyboards. It does not cover a complete representation of all the features implemented in the Dispending Cart software.

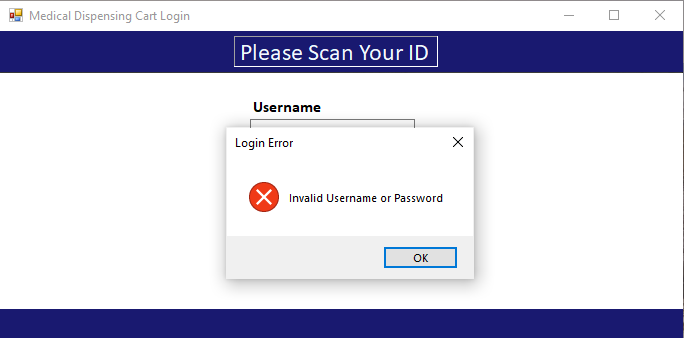
|  |
| --- |
| Medical Dispensing Cart – Login Screen |
| This screen is the first the nurse will see after they launch the program. The nurse will be able to log on by either scanning their ID/badge or choosing the standard (alternate) login procedure. |



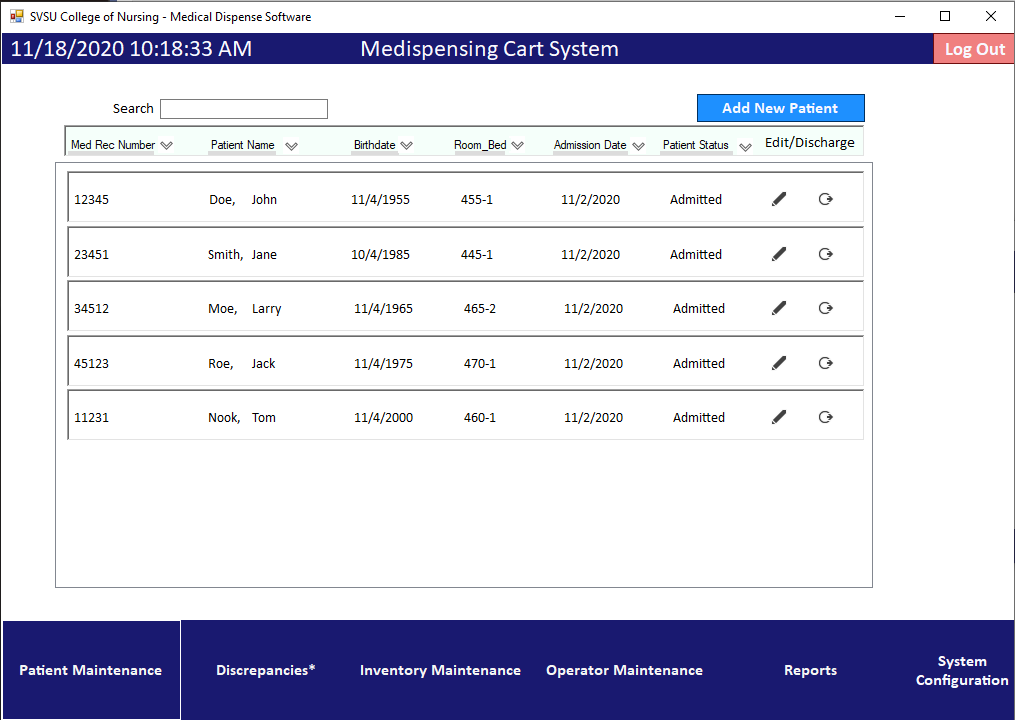
|  |
| --- |
| Medical Dispensing Cart – Alternate Login Screen |
| This screen is the alternate login procedure where the nurse will enter their credentials – username and password – and then the system will perform authentication. |



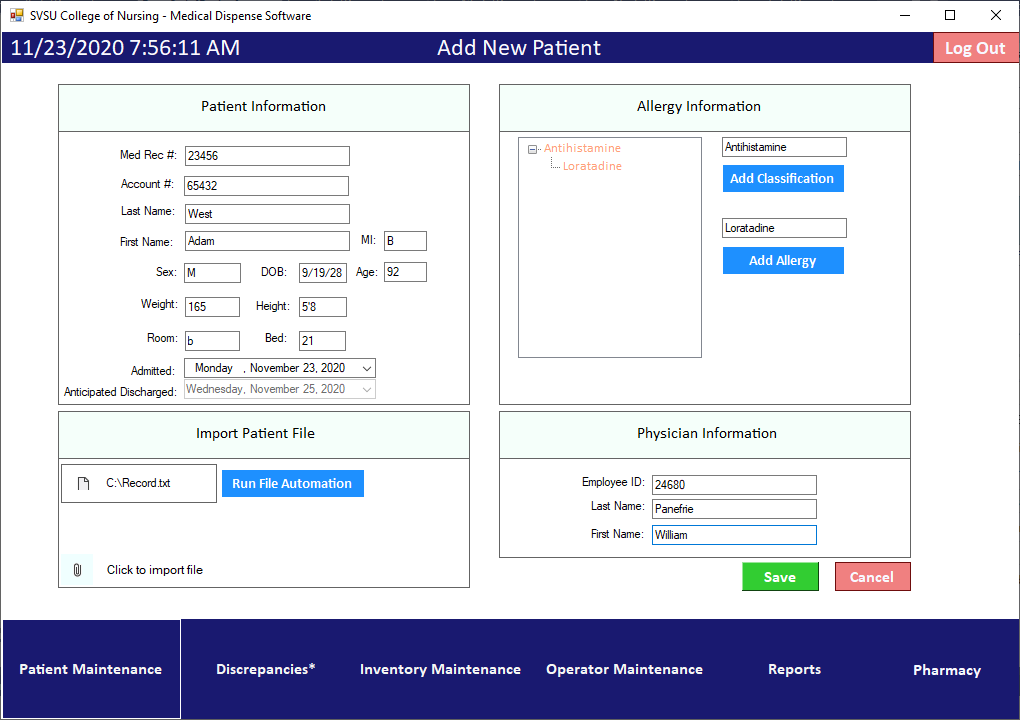
|  |
| --- |
| Medical Dispensing Cart – Login Screen Error Message |
| This screen is the error message the system generates if the nurse’s authentication fails. |



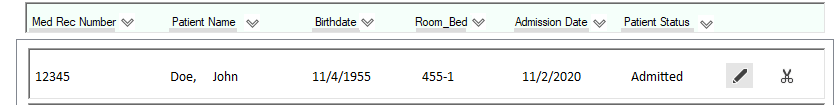
|  |
| --- |
| Medical Dispensing Cart – Patient Records (after logging in) |
| This screen is the first the nurse will see after successfully logging into the system. The nurse can see the patient records, the current date and time, the main menu tab bar on the bottom of the screen, which helps navigate the system’s functionality, and the log out button. |

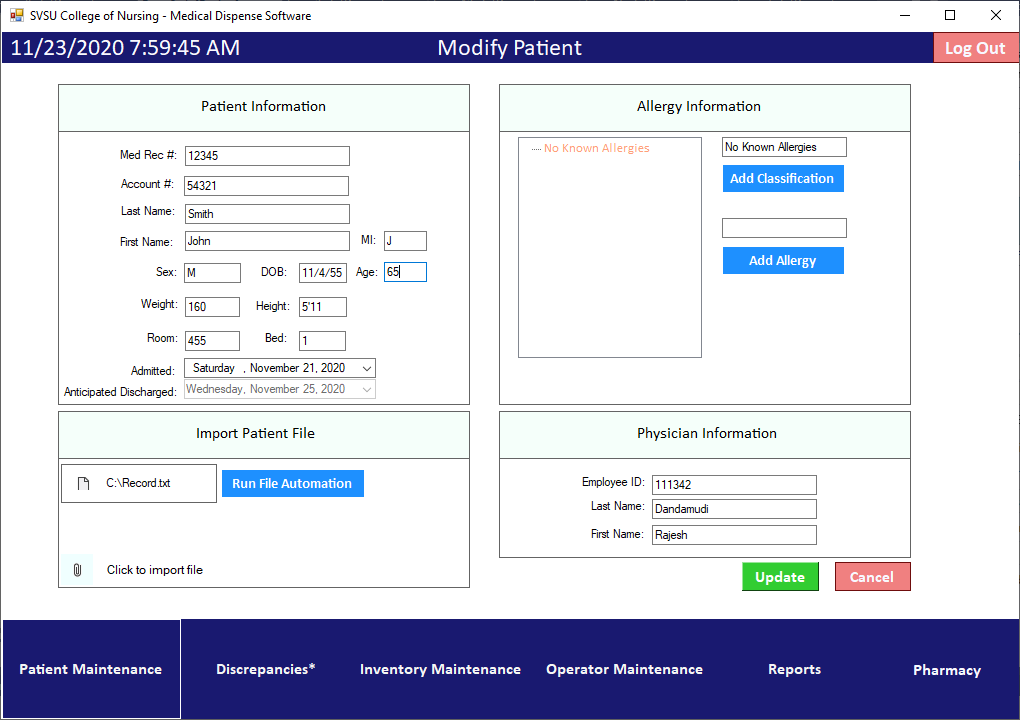


|  |
| --- |
| Medical Dispensing Cart – Adding New Patient |
| To add a new patient, the charge nurse will click the “add new patient” button from the patient records page. The screen will generate a blank form where the charge nurse will input information about the new patient. This screen also provides a conduit for record importation and a method for automation once the system has the necessary data from the imported file. |

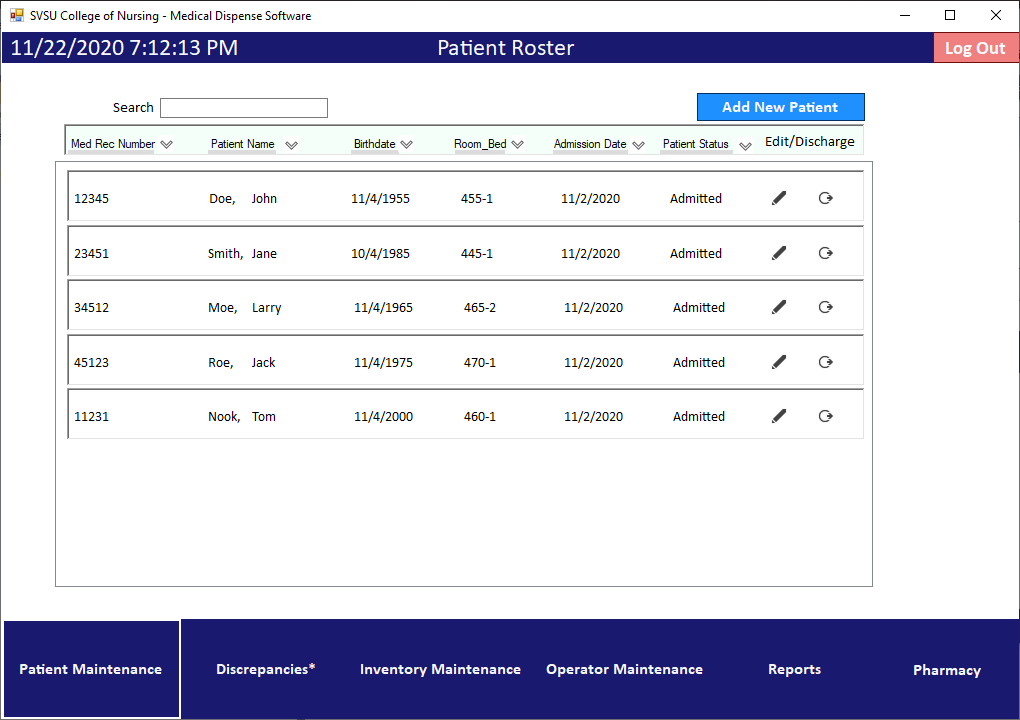


|  |
| --- |
| Medical Dispensing Cart – Modify Existing Patient Record |
| The charge nurse needs to click on the pen/pencil icon found within the patient record row to modify an existing patient. Once the charge nurse clicks the icon, all the previously entered data will be found and made available for modification. The charge nurse can upload another file for importation and automation if someone has added orders to the EMR. |

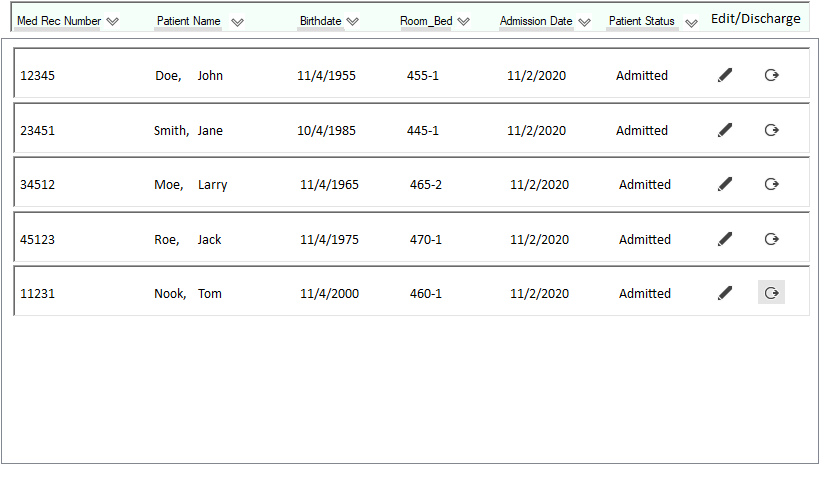




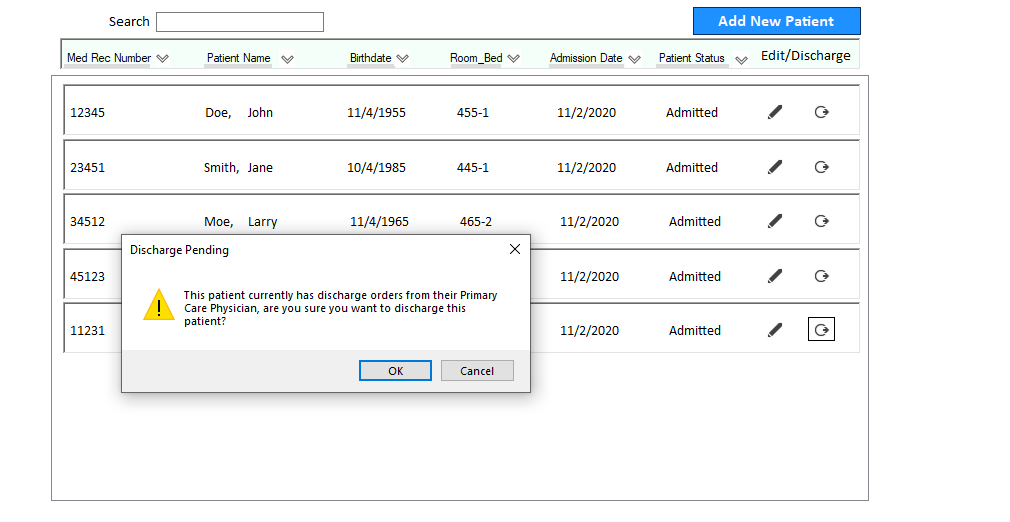
|  |
| --- |
| Medical Dispensing Cart –Discharging Patient |
| Like adding or modifying a patient, the charge nurse can discharge a patient from the same screen under Patient Maintenance; the discharge procedure will begin when the charge nurse clicks on the discharge icon. |



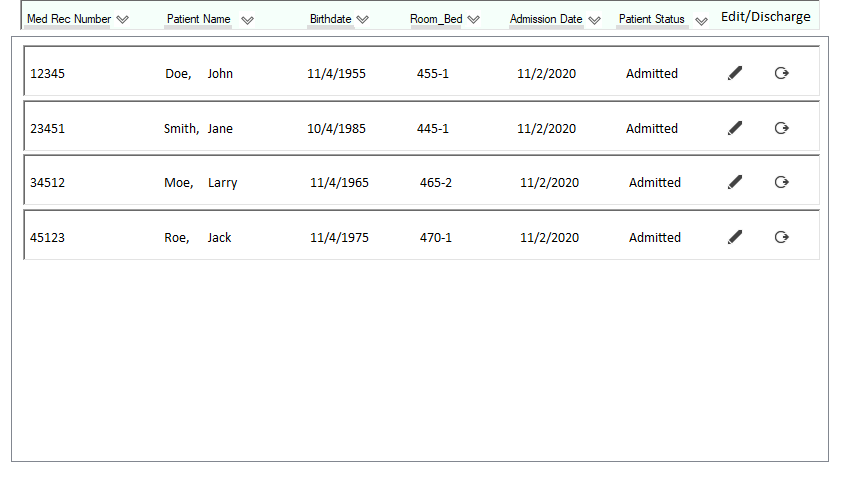
|  |
| --- |
| Medical Dispensing Cart – Discharging Patient(Select Patient: Tom Nook) |
| The charge nurse will need to click on the discharge (visual studio image library “Exit” icon) button to delete the patient successfully. |



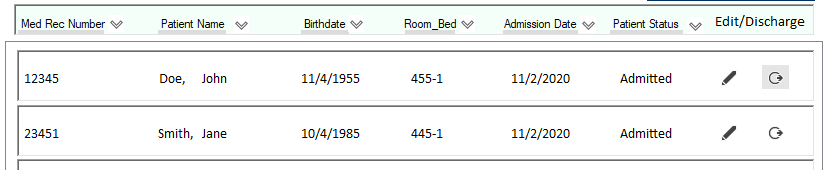
|  |
| --- |
| Medical Dispensing Cart – Discharging Patient(Prompt Nurse) |
| The charge nurse may have been provided information that the patient has discharge orders and can be discharged from the system, but a prompt requests the charge nurse to be sure they want to discharge the patient. |

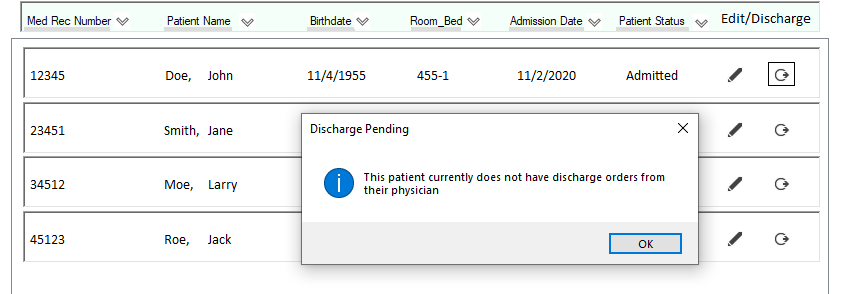


|  |
| --- |
| Medical Dispensing Cart – Discharging Patient(Successful discharge) |
| The patient that the charge nurse selected will be discharged, which the system then reflects that the patient has been removed from the system as an admitted patient. |

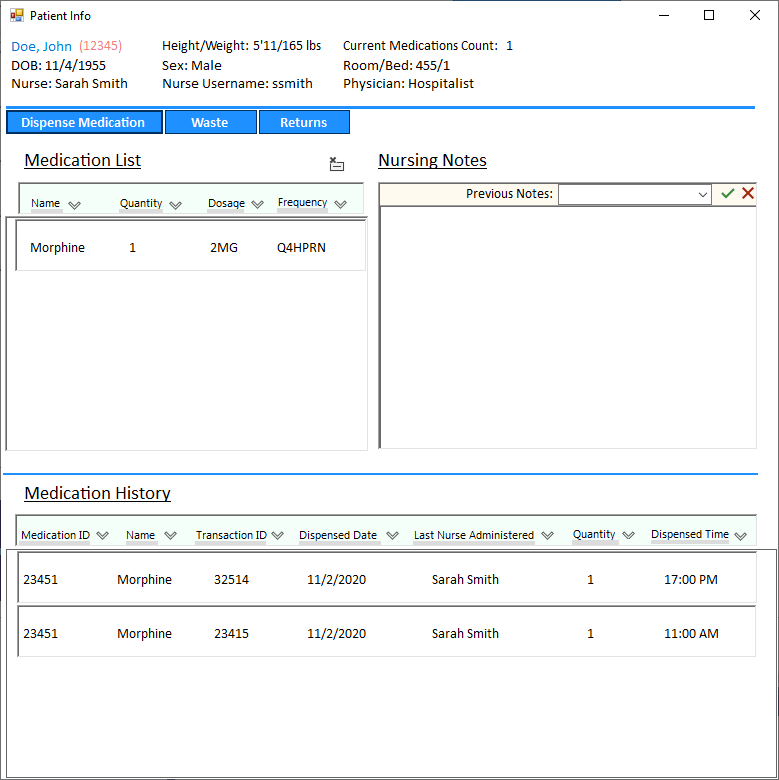


|  |
| --- |
| Medical Dispensing Cart – Discharging Patient(Select Patient: John Doe / Unsuccessful, need Dr order) |
| Suppose the charge nurse selects a patient from the patient list that does not have discharge orders yet. The charge nurse will receive a message informing them that the observed patient cannot be discharged from the system without discharge orders from the primary care physician. The discharge will be pending until information from the EMR states the patient’s doctor has signed off for the discharge. |

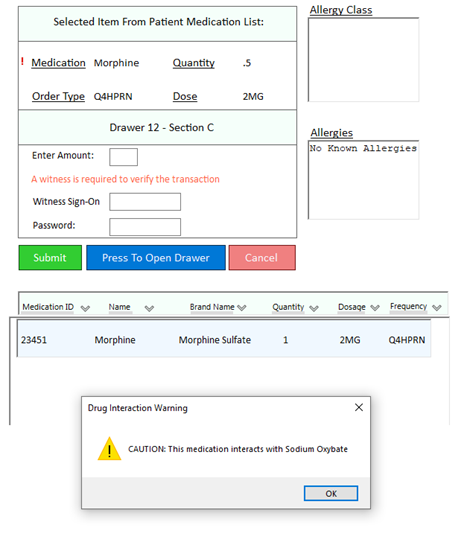




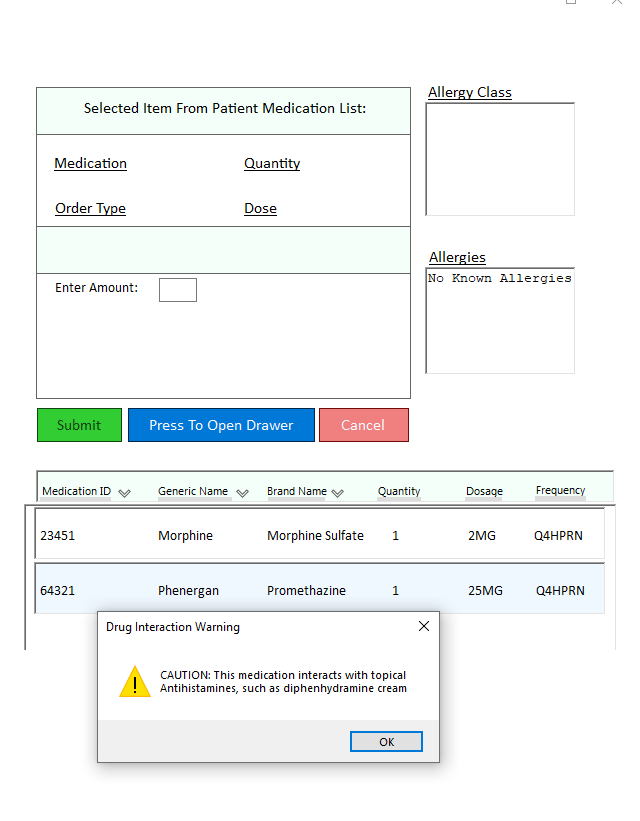
|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (After clicking patient record) |
| After the nurse scans a patient’s ID or clicks on a patient record from the patient table, the system will display a new, separate screen to show patient information (med rec #/height/ weight/current nurse, current medications, and transaction history). This screen allows the nurse to waste or return meds and administer the medication to the patient. |



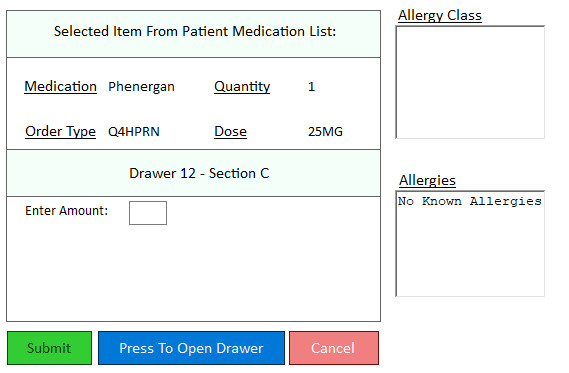
|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (After choosing morphine) |
| Once the nurse has chosen the medication they want to administer, the screen will ask for the quantity they wish to administer to the patient and verify that the drug’s administration is a narcotic (a narcotic will have a red exclamation mark next to the medication label). The program will generate a warning if there is an interaction with the selected medication or a potential, previously administered medication. |



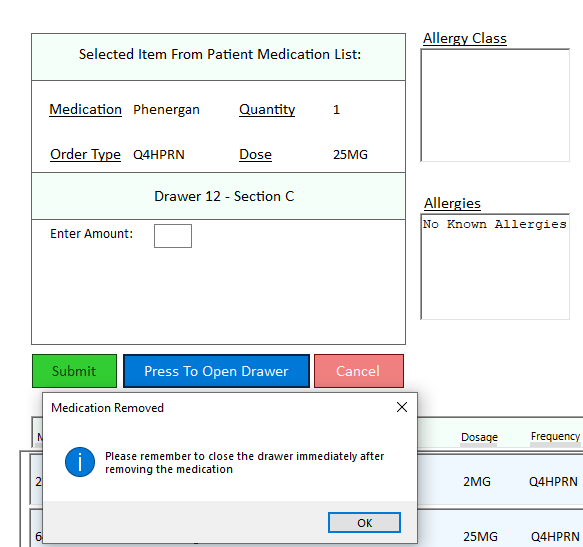
|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (After choosing Phenergan) |
| This sequence of screens shows a medication, Phenergan, that will be administered without needing a witness sign-off from another nurse. Once the nurse clicks on Phenergan from the patient’s med list, a Drug Interaction Warning will generate, claiming Phenergan could interact with topical Antihistamines. |



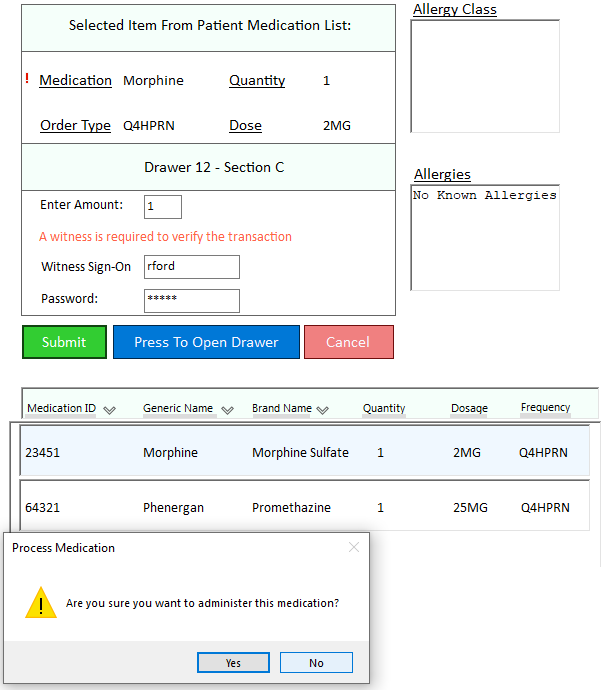
|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (Non-narcotic Differences) |
| This screen shows how information updates based on the type of medication chosen. In this example, the witness sign-off was removed, and the system did not generate the red exclamation mark next to the medication label, indicating a non-narcotic. |



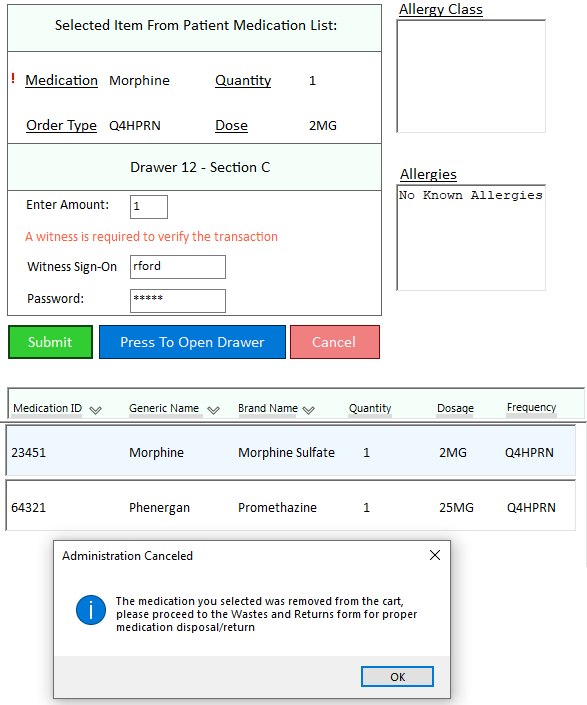
|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (Drawer Open Reminder) |
| This screen shows the reminder generated after the nurse clicks the “Press To Open Drawer” button, which triggers the corresponding drawer to open on the cart. The “Submit” button will be disabled (won’t function) until the nurse has pressed the button associated with opening the drawer. |



|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (Final Confirmation pt. 1) |
| This screen shows the final confirmation before the nurse asserts that they indeed want to administer the selected medication. Once confirmed, the system will update the dispense/transaction history; if canceled, the nurse will be notified to return or waste the medication based on the Waste and Return forms’ criteria. |



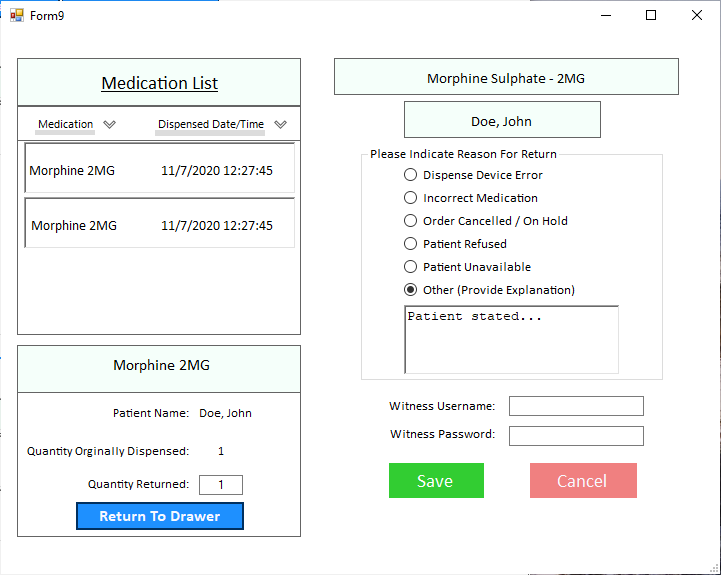
|  |
| --- |
| Medical Dispensing Cart – Dispense Medication (Final Confirmation pt. 2) |
| This screen shows the message generated after the nurse has canceled the administration of the selected medication. The message will inform the nurse that since the medication was removed from the system, it needs to be returned or wasted according to the Waste/Return protocol. |



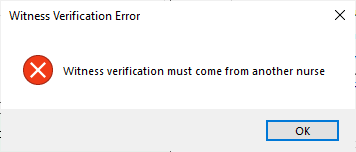
|  |
| --- |
| Medical Dispensing Cart – Return/Waste Medication |
| The Return and Waste forms are found above the medication list; clicking on either of these buttons will generate a new screen where the nurse will input information about the medication they wish to waste/return. |



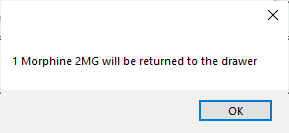
|  |
| --- |
| Medical Dispensing Cart – Return Medication |
| The system will generate a Return form, displaying a brief transaction history on the left, the quantity specified for return on the bottom left, and the reason for the return on the right. Like the Waste form, returning requires a witness sign off. |



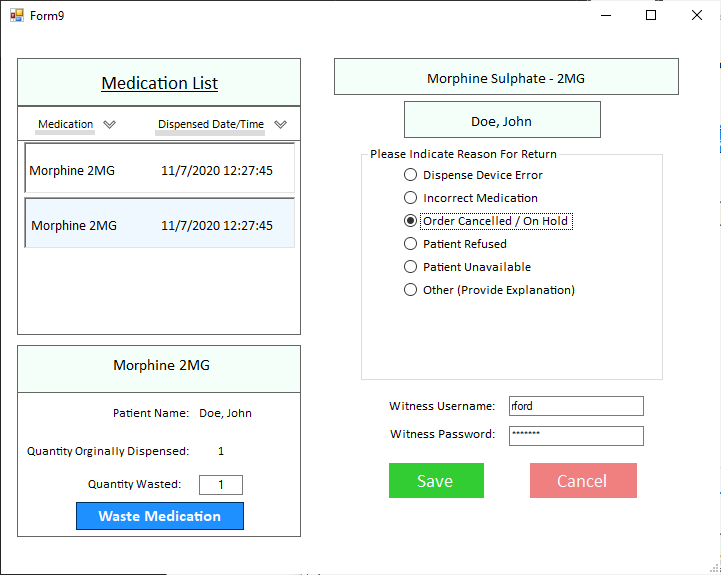
|  |
| --- |
| Medical Dispensing Cart – Return Meds (Alert: Nurse needs witness Sign Off) |
| This screen shows an error message because the nurse did not receive a witness signature or attempted to enter their credentials. |



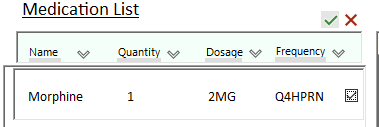
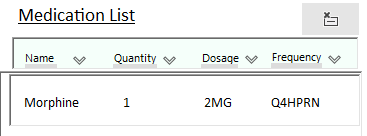
|  |
| --- |
| Medical Dispensing Cart – Return Meds (Medication was successfully returned) |
| Once the amount and witness sign off has been provided, the nurse will see a message confirming the medication has been successfully returned to the system. |

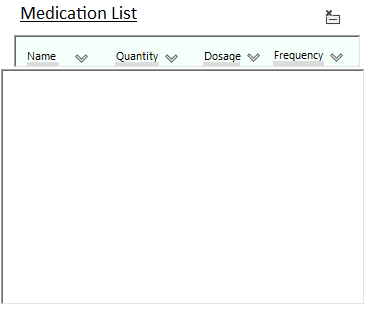


|  |  |
| --- | --- |
| Medical Dispensing Cart – Waste Meds (RN needs to specify a reason for waste) | |
| The Waste form is generated, displaying a brief transaction history on the left, the quantity specified for waste on the bottom left, and the reason for the waste on the right. Like the Return form, waste requires a witness sign off. |

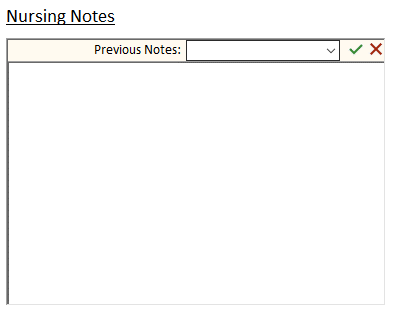


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| Medical Dispensing Cart – Delete Medication |
| To delete a medication while still under a patient’s profile, click the icon containing a box with the x above it; this will generate a checkbox next to any medication in the patient’s med list. Check the checkbox and then click the green checkmark to delete it or the red X to cancel the deletion prompt. |

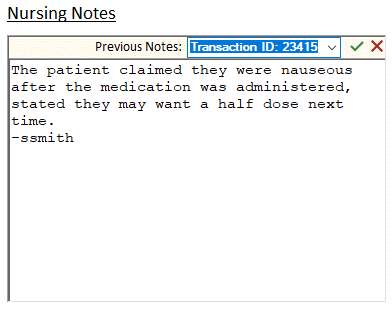
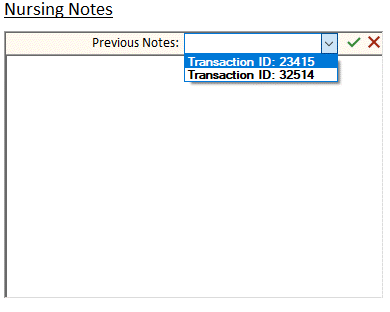




|  |  |
| --- | --- |
| Medical Dispensing Cart – View Nursing Notes | |
| The nursing notes are found within the dispense medication form next to the patient’s current medication list. The nursing note has a drop-down menu to allow the nurse to look at previous notes based on the transaction ID. |



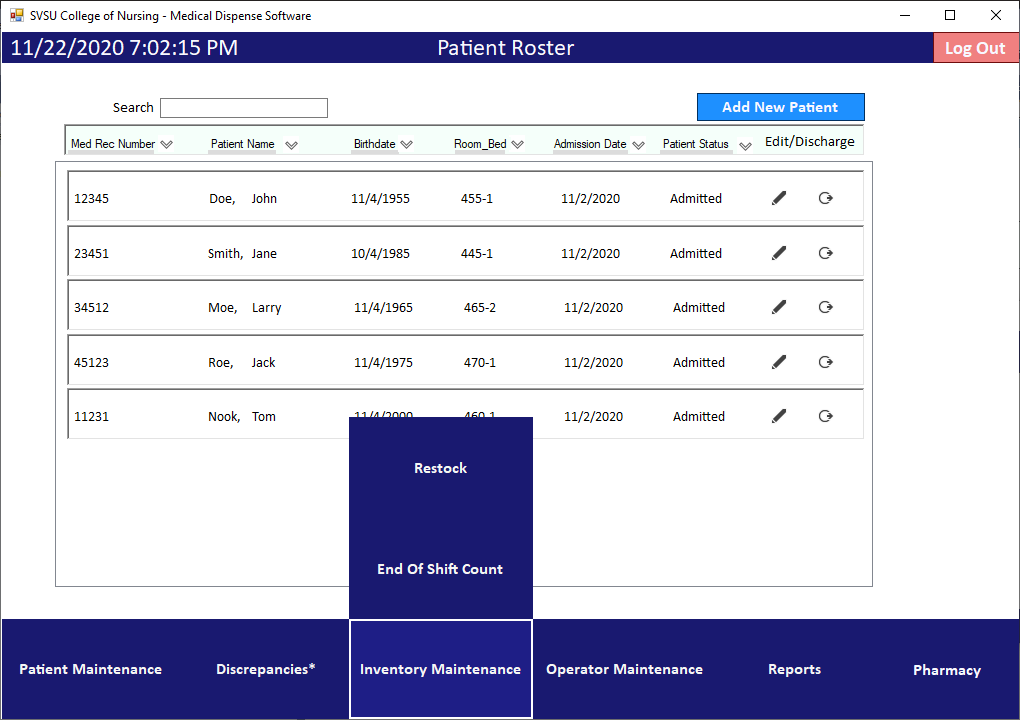
|  |  |
| --- | --- |
| Medical Dispensing Cart – View Nursing Notes | |
| This sequence of screens shows a nurse selecting a previous nursing note based on the transaction ID: 23415 and how the selected note corresponds with a previously administered medication. |



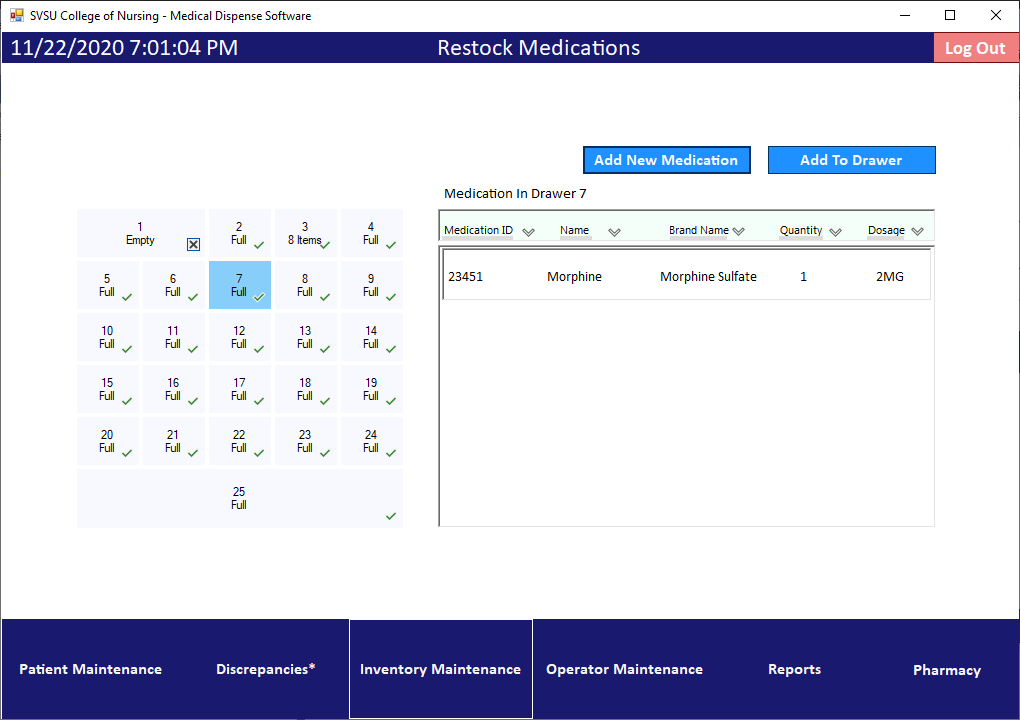
Graphical user interface, text, application, email

Description automatically generated

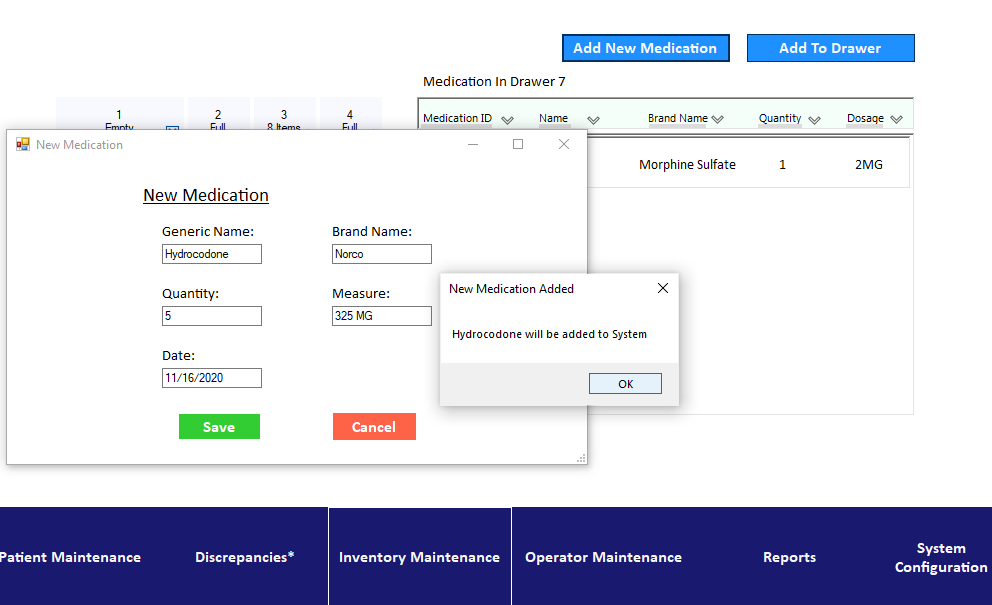
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (Restock) |
| To view the restock/cart view screen, click on the “Inventory Maintenance” tab on the main menu bar; a list of two options will appear; click “Restock.” This functionality of this system is for the charge nurse only. |



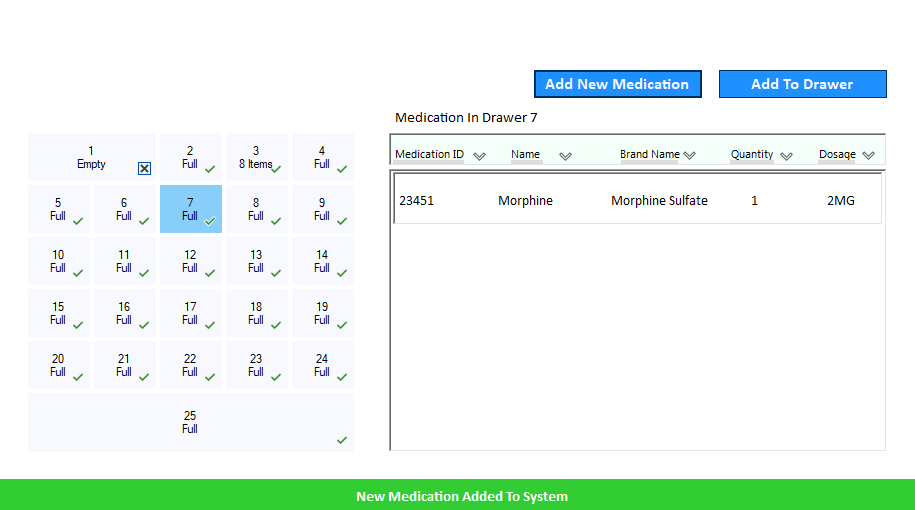
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (Restock – choose drawer) |
| If a charge nurse clicks on drawer #7, for example, the contents will populate in the table to display which medications (including quantities, dosages, etc.) are currently in that drawer. |



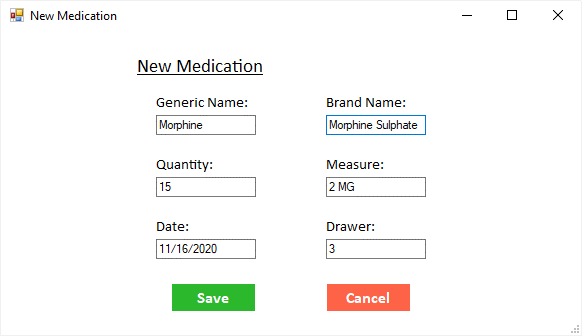
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (Restock – Add Medication) |
| Once the charge nurse clicks “Add New Medication”, the program will generate a new screen that will provide a form to fill out the necessary information about the new medication to be added to the system. The charge nurse can then save the medication to the system, which would successfully add it to the cart, or cancel the medication from being added. |



|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (Restock – Add To Drawer) |
| When the charge nurse has successfully added a medication, a green banner will display to the charge nurse, their addition to the system was successful. This banner could show for a few seconds before disappearing. |



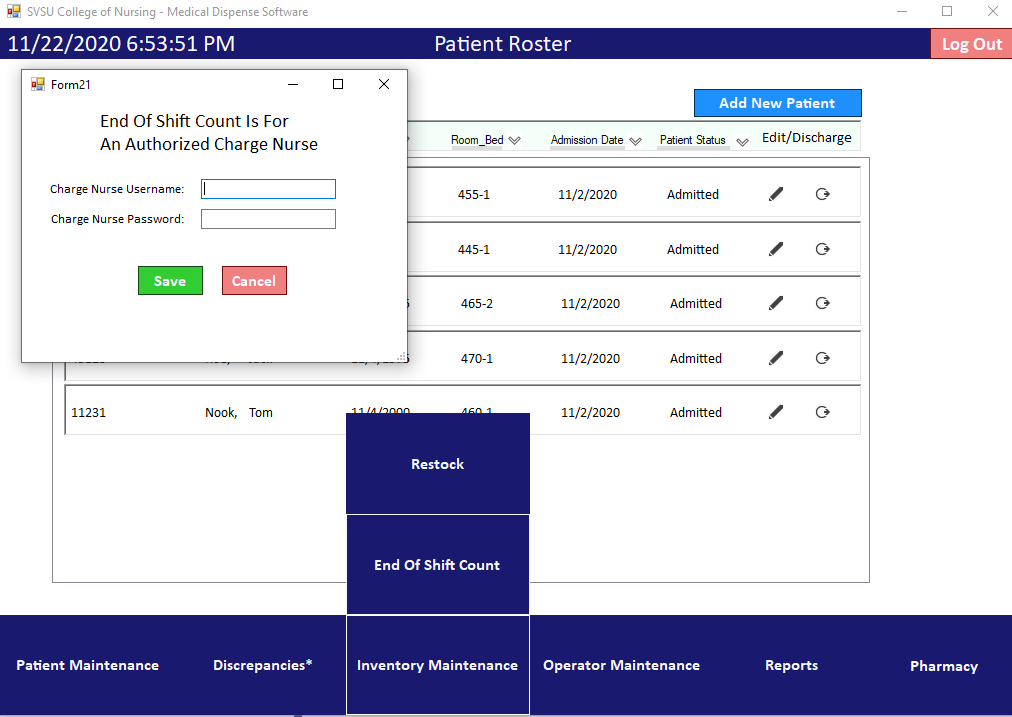
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (Restock – Add To Drawer) |
| When the charge nurse wants to add a medication to a drawer, they must first provide information about the medication: The name(s), how much they are adding, the dose of the medication, the date it is added, and which drawer they are adding it. Not implemented but could make the drawer field a drop-down menu where a nurse can select any available drawers from there; if the drawer is full, it could be indicated as a disabled field or removed from the list. |



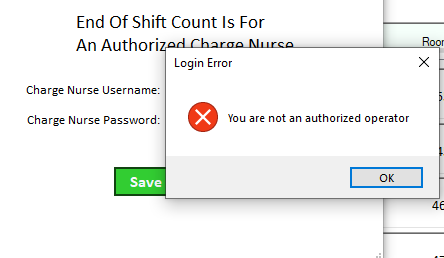
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (End of Shift Count) |
| The charge nurse can find the End of Shift count screen by clicking on the Inventory Maintenance command button on the Main Menu’s tab bar. |



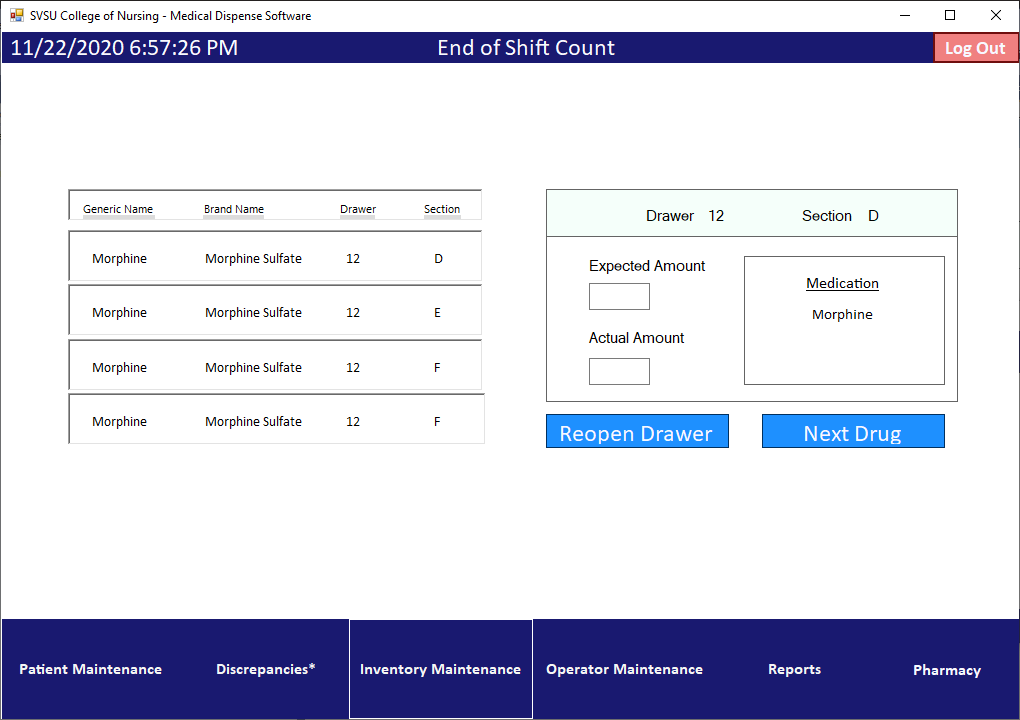
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (EoS – Authenticate Charge Nurse) |
| When a charge nurse attempts to open the End of Shift count screen, they must first authenticate that they have access rights to view/update information on this screen. |



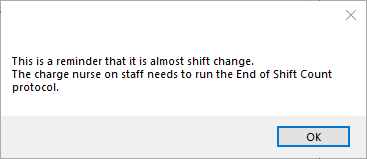
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (EoS – Invalid Operator) |
| If an unauthorized nurse attempts to log on to the End of Shift count page, they will see a message indicating they do not have authorization. This activity could be logged later as a separate report to show which nurses have attempted (successfully or not) to log into the End of Shift count screen. |



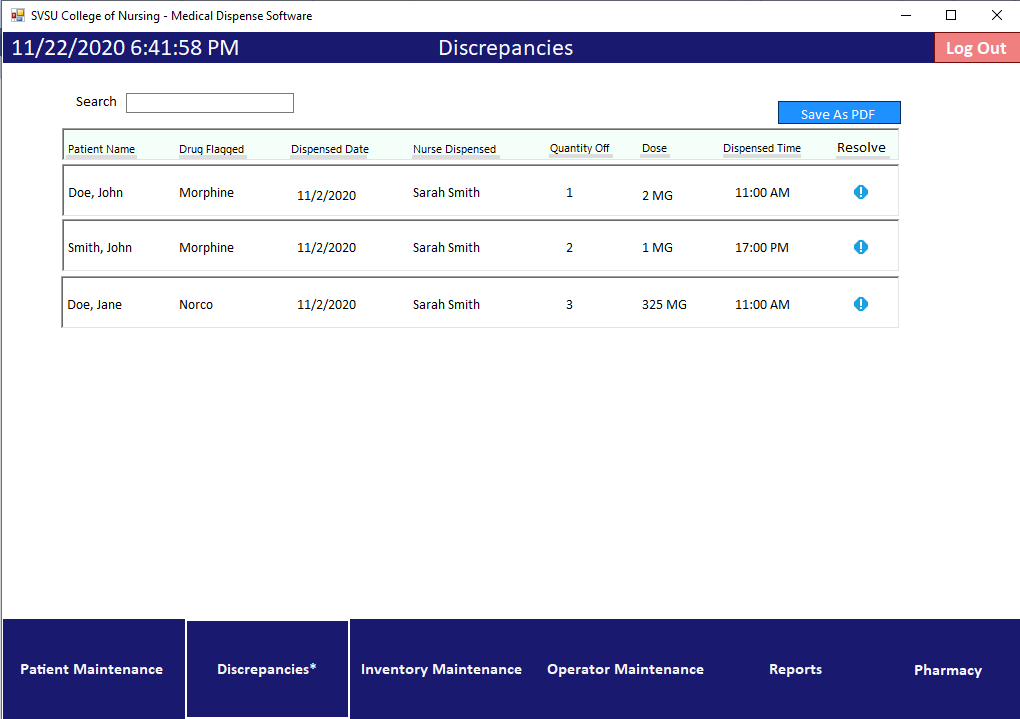
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (EoS -Valid Credentials) |
| After the charge nurse has provided valid credentials, the program will display the End of Shift count screen. The charge nurse can verify the expected quantity with the actual quantity; if the amounts do not match, the system will flag a discrepancy. |



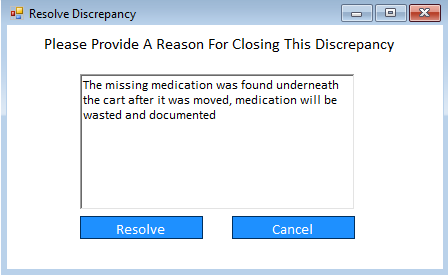
|  |
| --- |
| Medical Dispensing Cart – Inventory Maintenance (EoS -Reminder) |
| Depending on the time of the day, the system can display a reminder message informing the charge nurse on staff to perform the End of Shift Count. Not implemented, but the charge nurse could override the time of day the reminder message generates. |



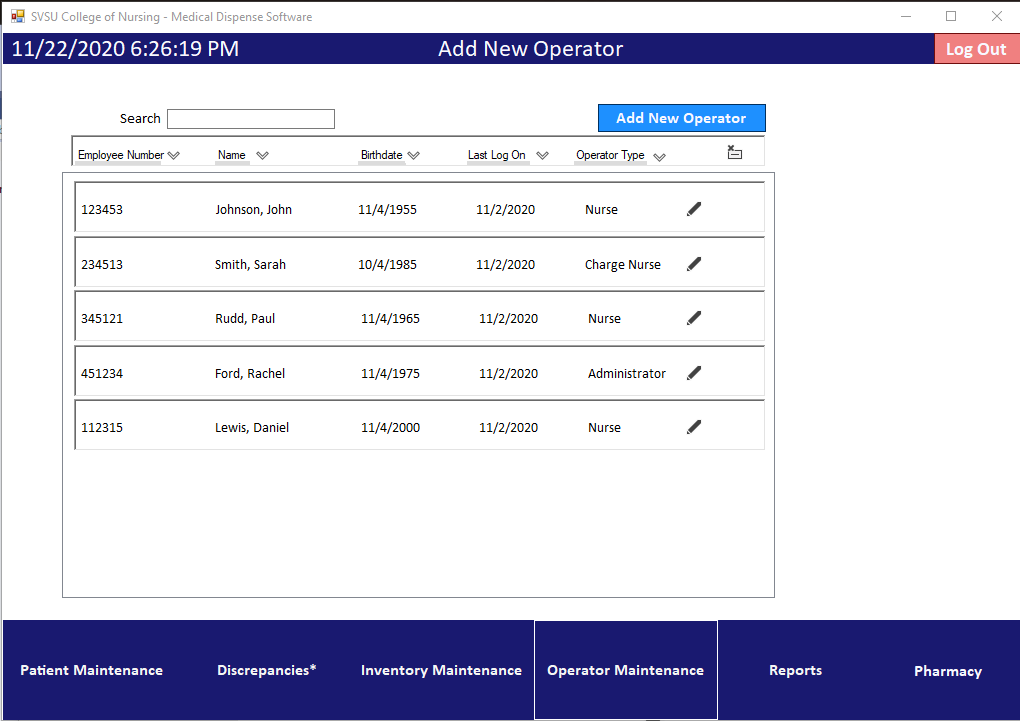
|  |
| --- |
| Medical Dispensing Cart – Discrepancies |
| A nurse can find a list of discrepancies by clicking the Discrepancies tab on the bottom tab bar, which will generate a table of system interactions that have caused a discrepancy in some way. A charge nurse will see the date and time the system flagged a discrepancy, which nurse was currently logged in, and which medication the system flagged. The nurse will also have the option to save all discrepancies to a PDF file and resolve any discrepancies. |



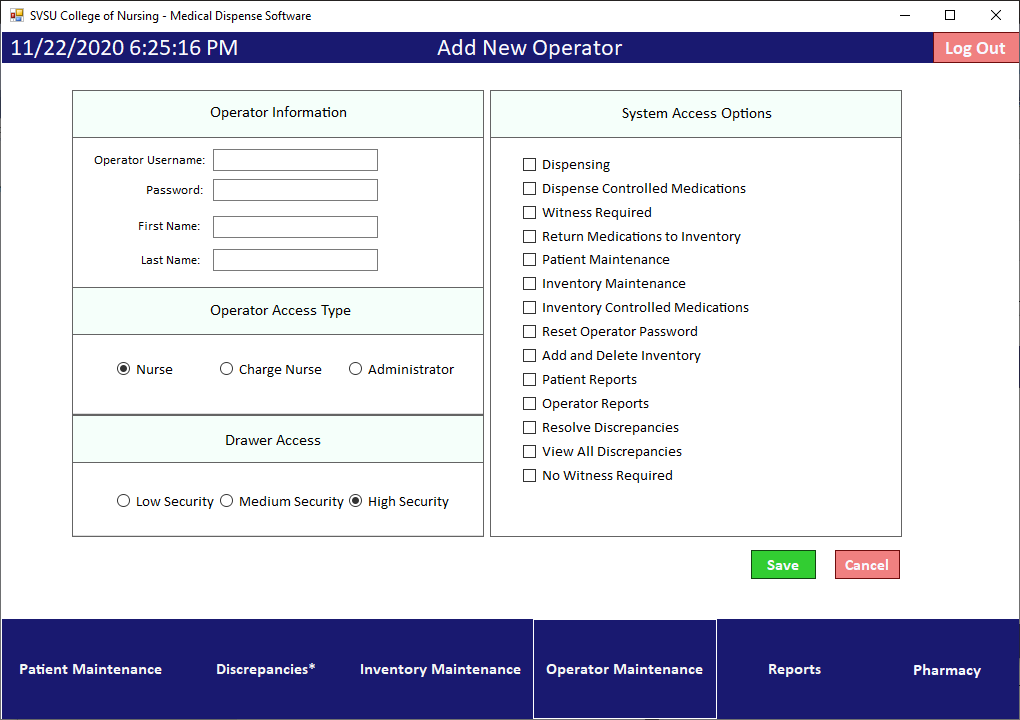
|  |
| --- |
| Medical Dispensing Cart – Discrepancies - Resolve |
| A nurse can resolve a discrepancy if they provide a reason for the resolution. |



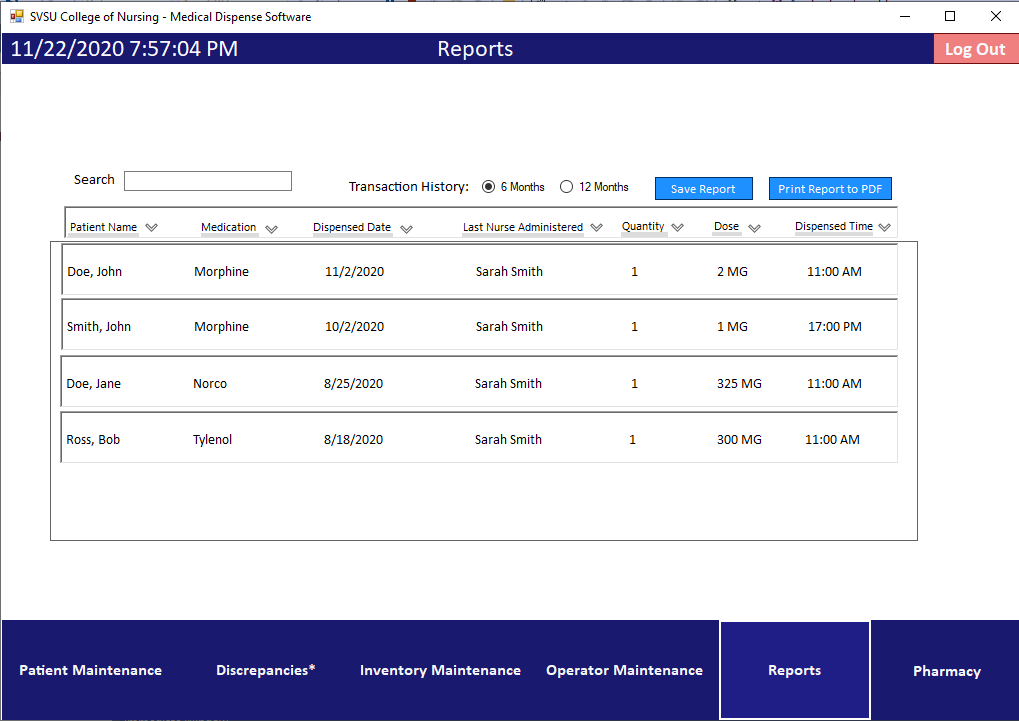
|  |
| --- |
| Medical Dispensing Cart – Operator Maintenance Screen |
| The operator screen can be found by clicking the “Operator Maintenance” tab on the tab bar; the program will generate a screen that shows all the operators added to the system. From here, the operator can add, modify, or delete an operator or search for a specific operator based on some constraint, should the system have many operators. |



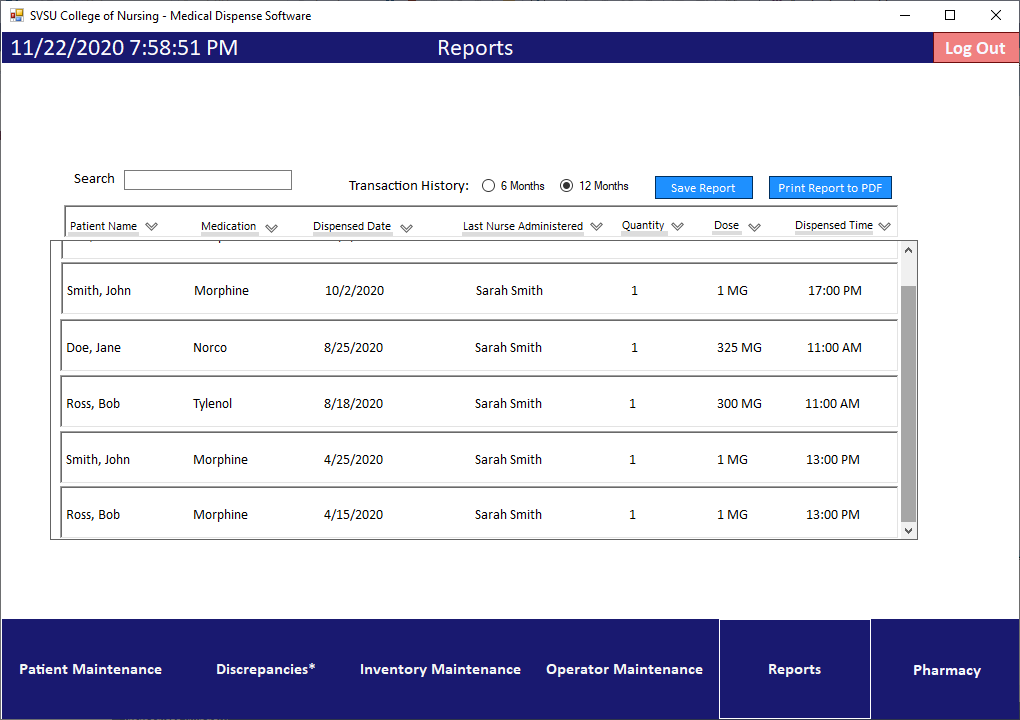
|  |
| --- |
| Medical Dispensing Cart – Add New Operator |
| The add new operator screen is generated after the charge nurse clicks the “Add New Operator” button from the operator maintenance screen. The operator, presumably an administrator, will then input necessary information about the operator they want to add for system use. Operator information such as username and password needs to be provided; additionally, operator access types like Charge Nurse and Drawer access indicating security levels need to be stated; however, default options are placed automatically. |



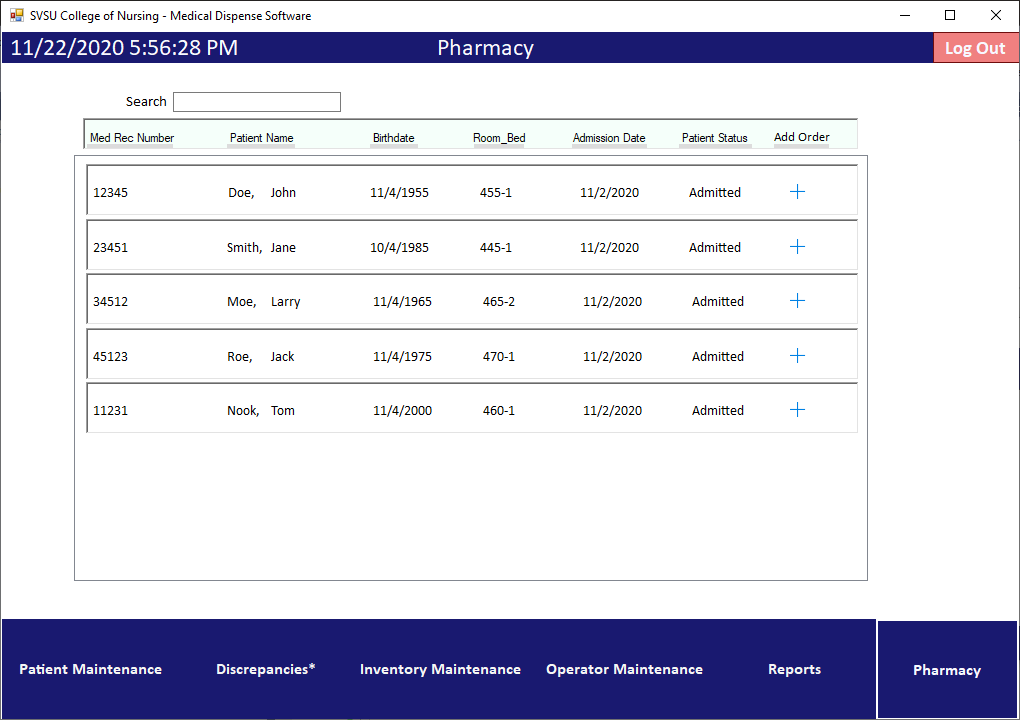
|  |
| --- |
| Medical Dispensing Cart – Reports |
| The nurse can view reports by clicking the “Reports” tab on the menu bar, generating a dispense history screen. The history will include the receiving patient, the medication they received, the nurse who administered the medication, and the date and time it was administered. This screen will default to the last six months of dispensing, but the nurse can view the dispense history from as far back as twelve months. |



|  |
| --- |
| Medical Dispensing Cart – Reports – Previous 12 Months |
| This screenshot shows additional records that appear after the nurse selects the previous 12 months. |



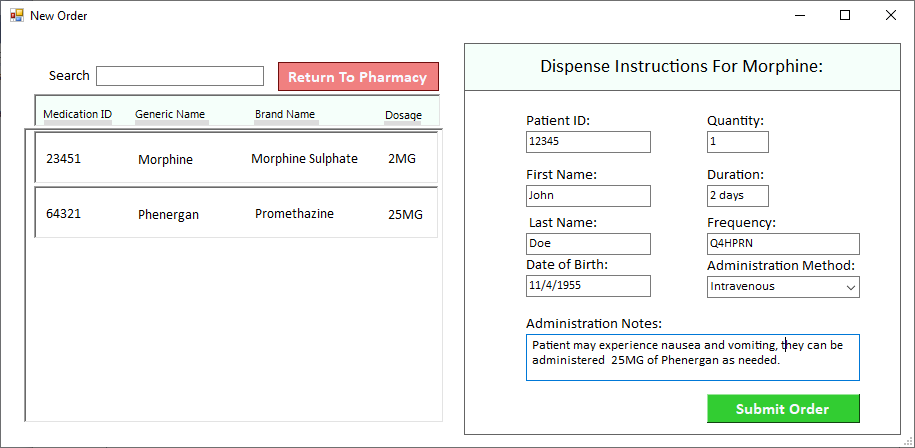
|  |
| --- |
| Medical Dispensing Cart – Pharmacy |
| The nurse will click the “Pharmacy” tab at the menu bar’s bottom right to get to the pharmacy screen. The screen generated will have an identical table as the patient records screen, with one addition. The nurse will be able to add a medication order to a patient by clicking the add symbol; Once clicked, a “New Order” form will display as a separate window, and the nurse will input information about the order |



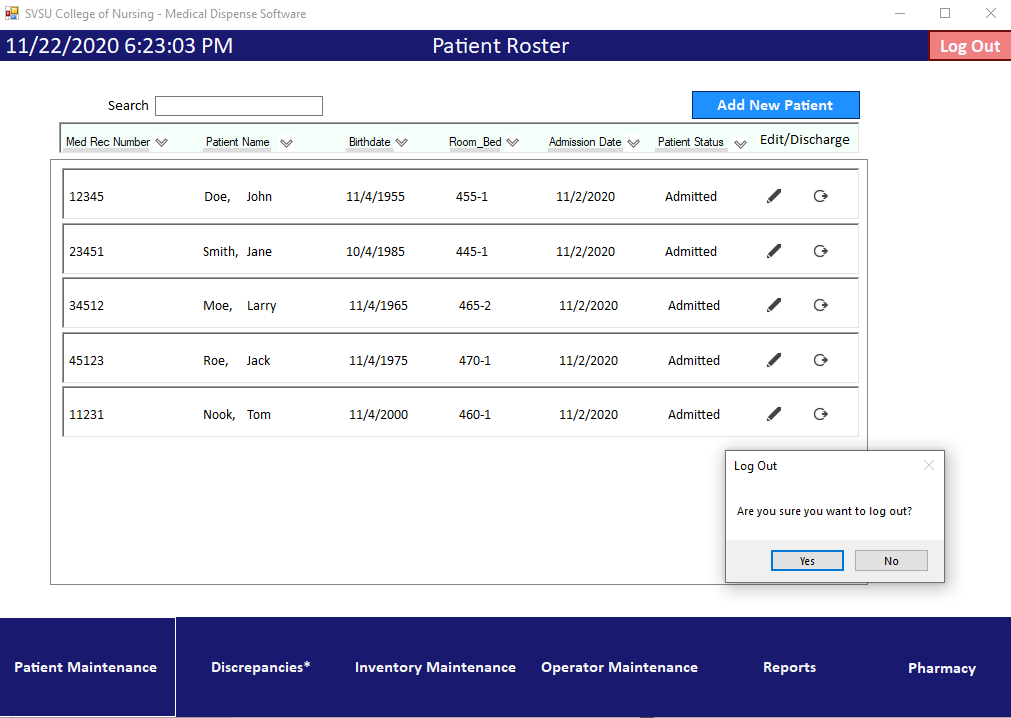
|  |
| --- |
| Medical Dispensing Cart – Pharmacy – Add New Order |
| This screen will display after the nurse clicks the add button associated with their selected patient. From here, the nurse will choose a medication to generate a new order from or return to the pharmacy window by clicking the “Return To Pharmacy” button. |



|  |
| --- |
| Medical Dispensing Cart – Pharmacy – Add New Order |
| This screen will display after the nurse clicks on one of the medications from the patient’s list. The nurse will input the quantity, duration, frequency, administration method, and any special administration notes needed. All other fields: patient ID, name(s), and date of birth will be read-only because that data is coming from the patient selected from the pharmacy table. |

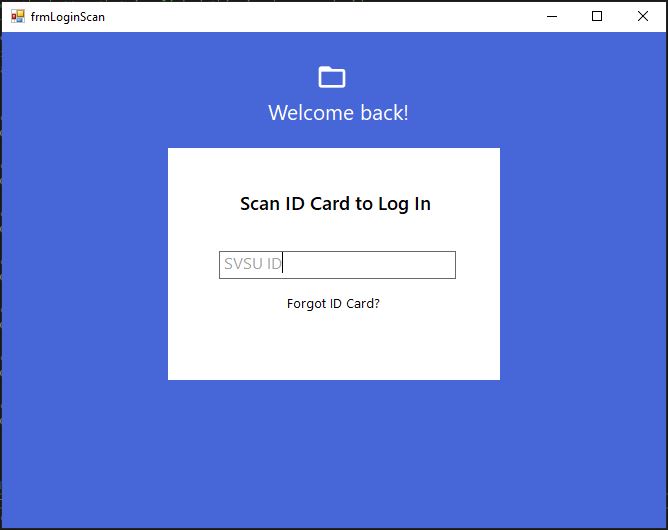


|  |
| --- |
| Medical Dispensing Cart – Log Out Screen |
| The log out prompt can be generated by clicking the “Log Out” button on the program’s upper right section. The nurse will then see a prompt asking them if they are sure they want to log out of the system. Once logged out, the program will return control to the log in screen, where another nurse can scan their ID (or use alternate log in) to log on to the system. |

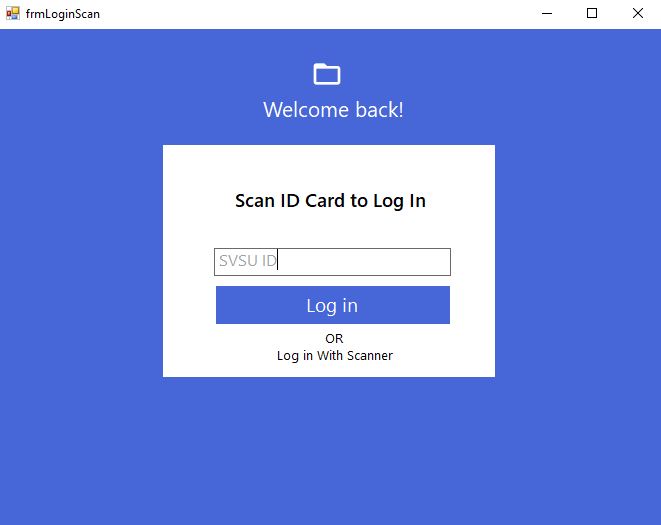


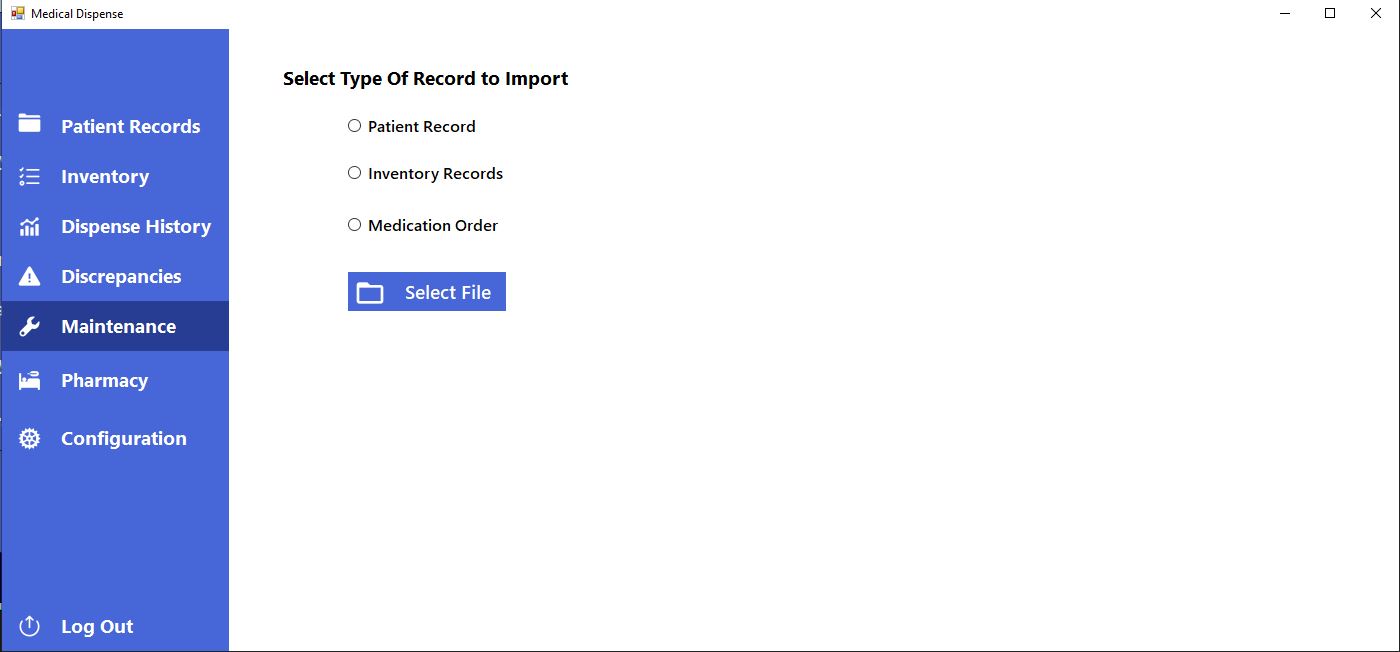
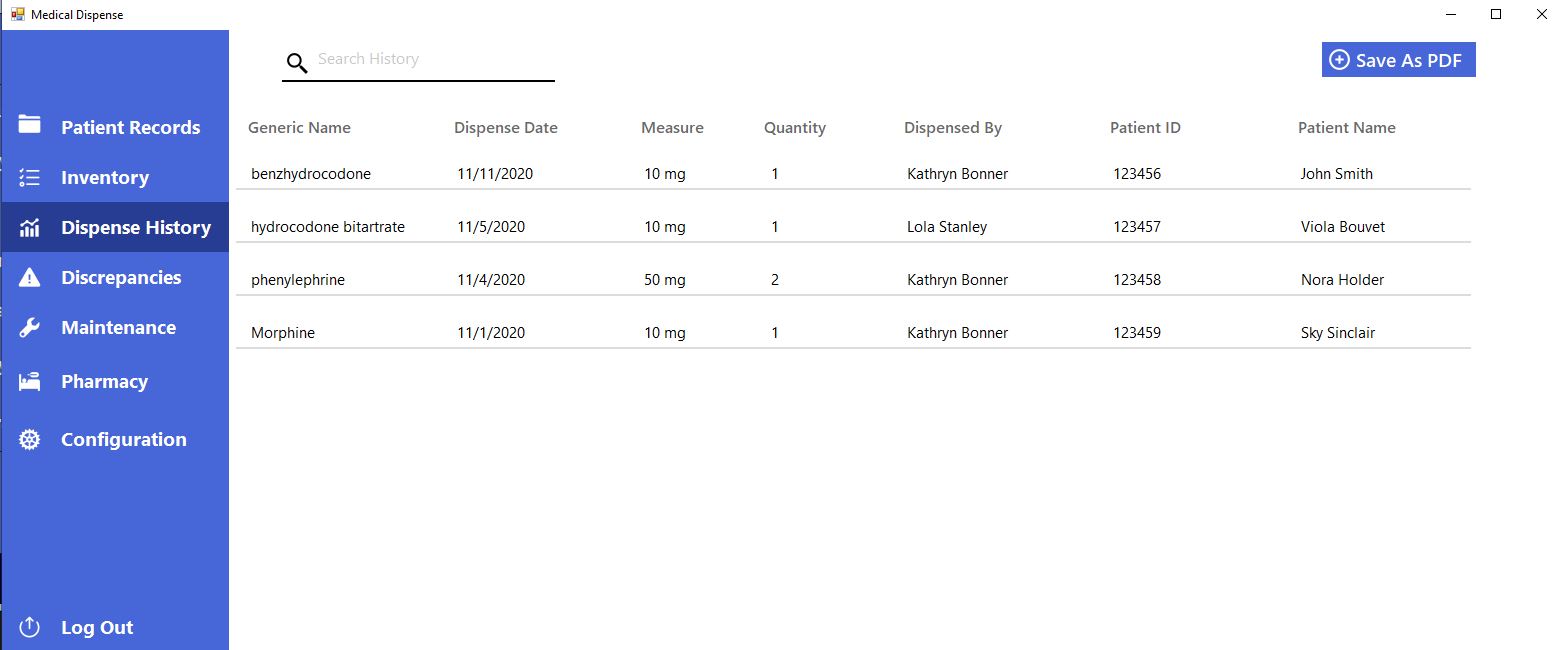
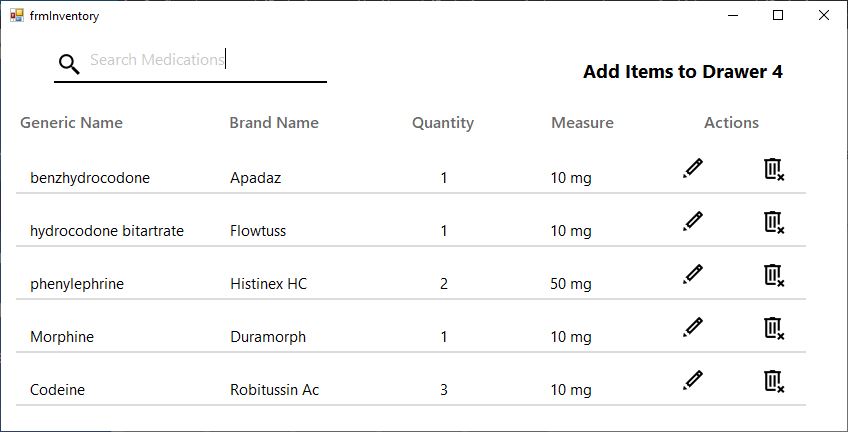
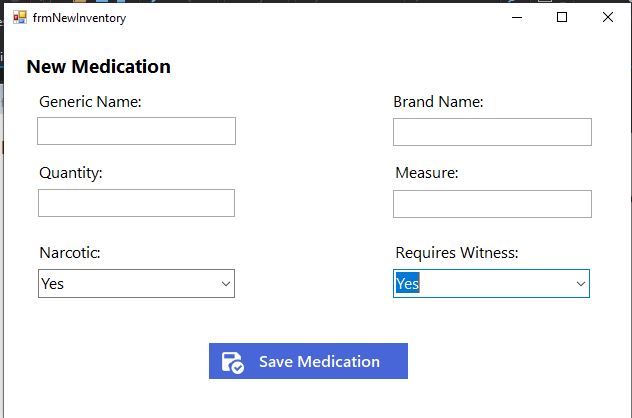
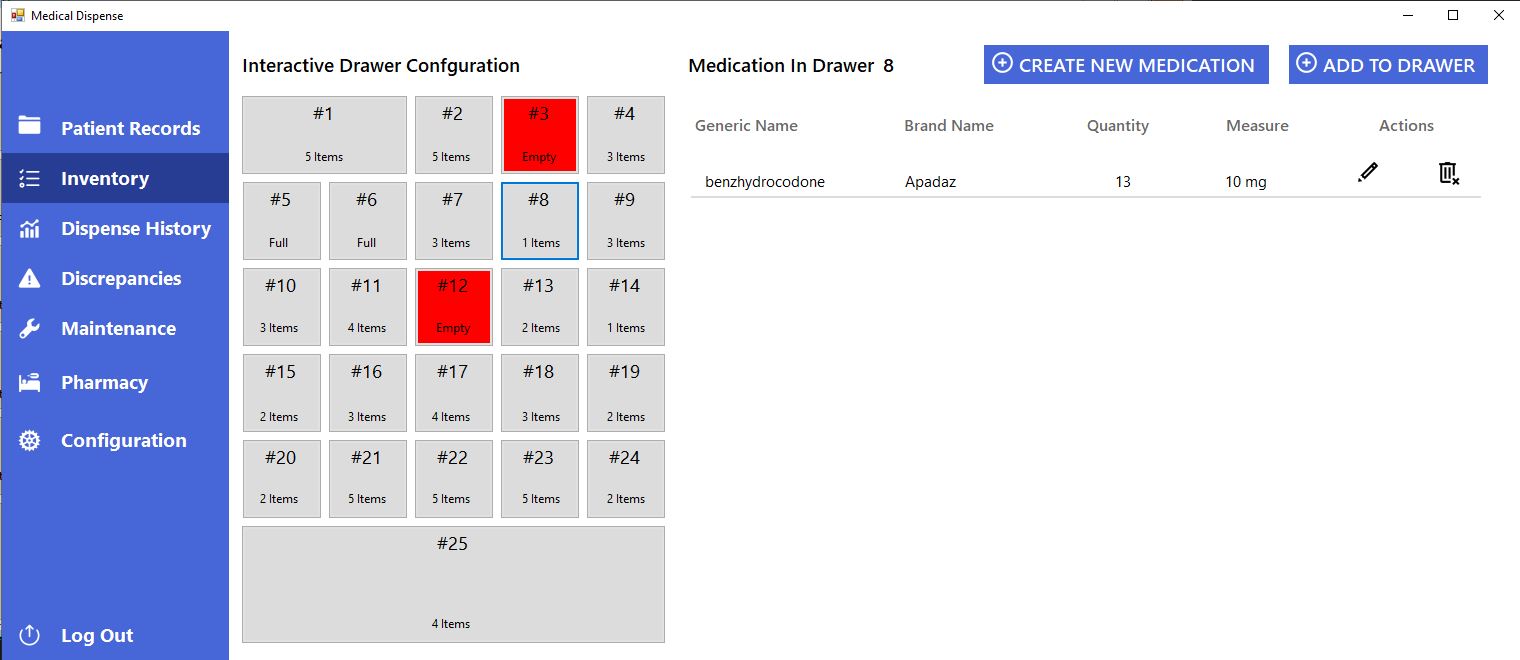
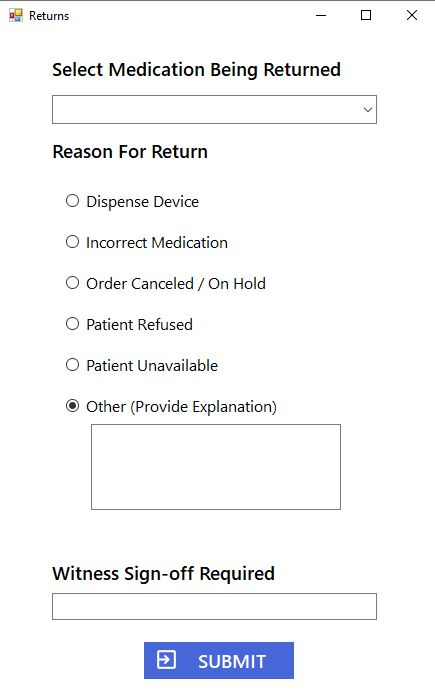
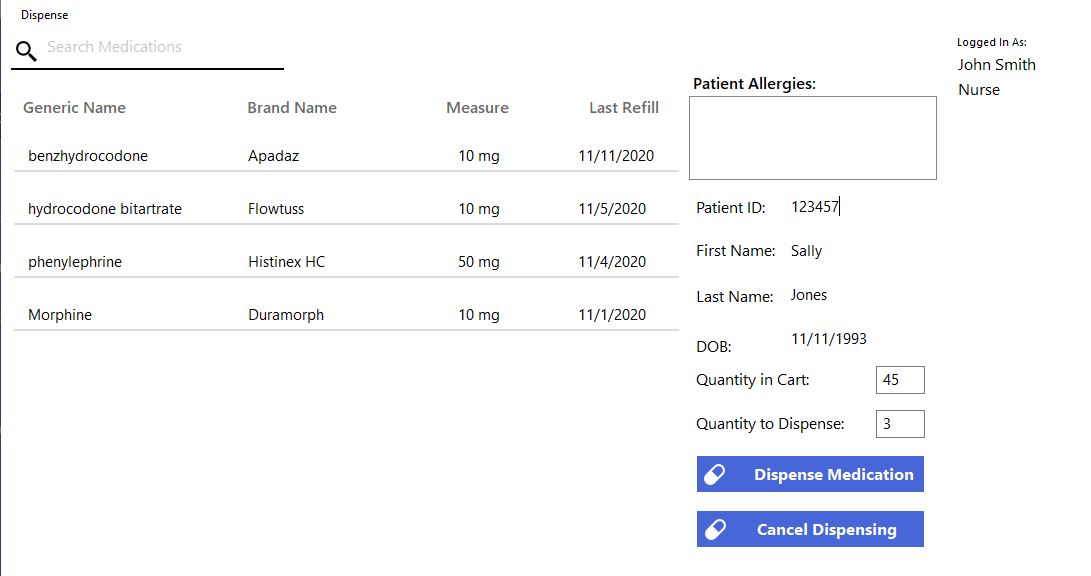
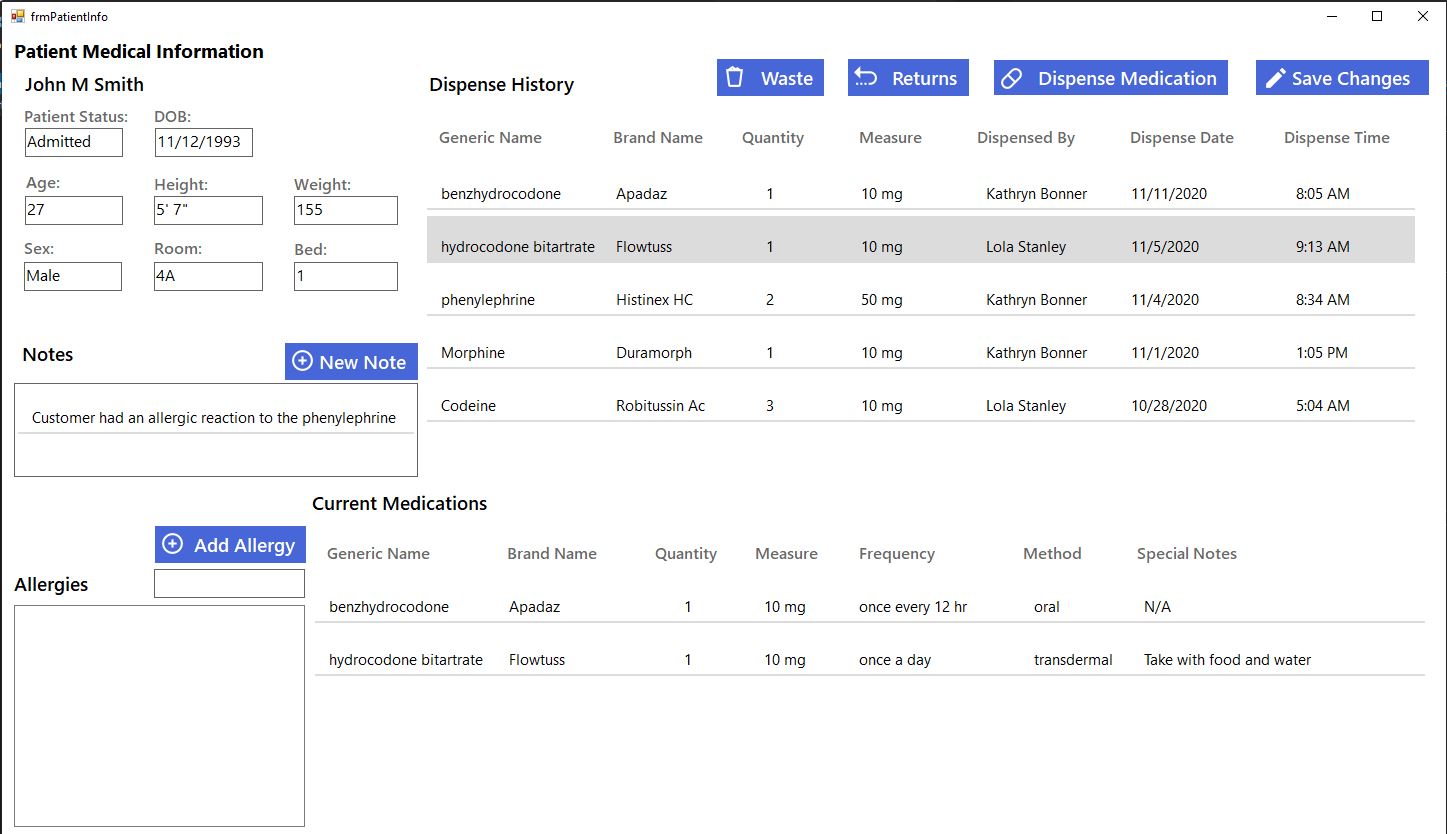
# Appendix M: Capstone Storyboards

This appendix shows the final GUI results for the Automated Medicine Cart Software. Three GUI representatives from each Capstone team diligently collaborated to develop the cleanest, user-friendly, logical, and highly functional graphical interface design that contains all required features and functions.



**Forgot ID card Login option**





**Wasting Medication Form**

**Patient Medical Information**

**Returning Medication Form**

**Returning Medication Form**

**Dispensing Medication**

**Drawer Configuration**

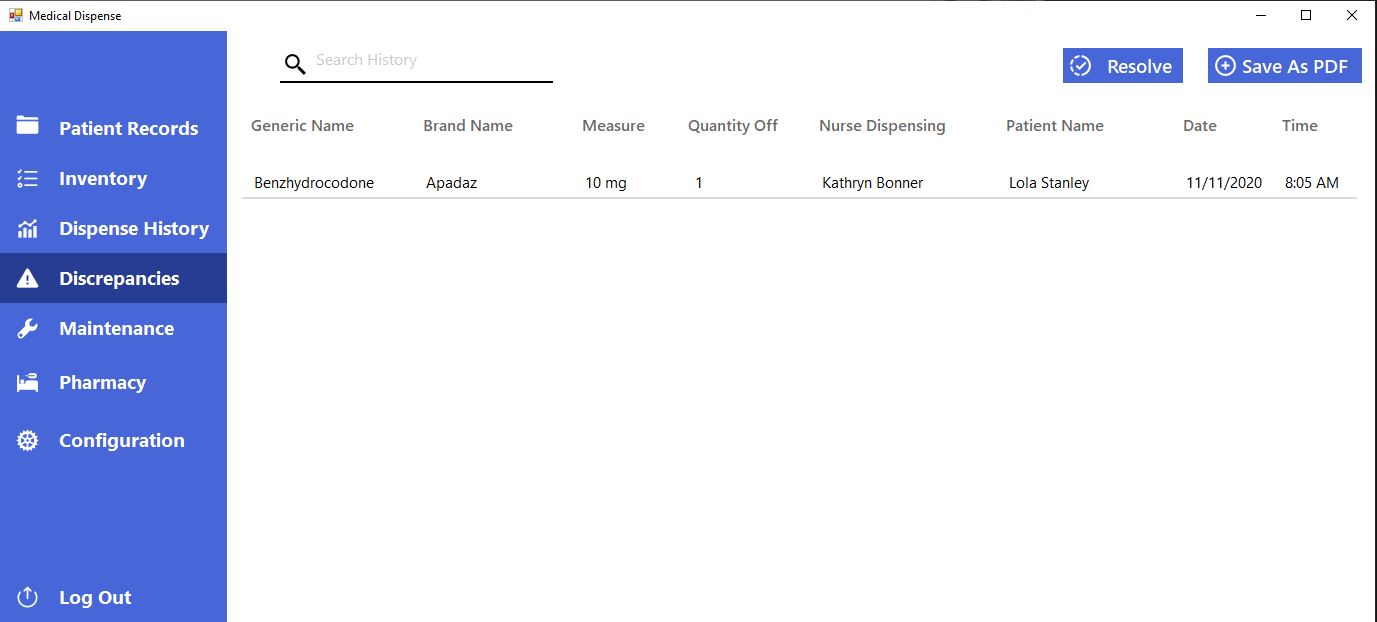
**Witness Sign off Warning**

**Adding Medication to a Drawer**

**Add New Medication**

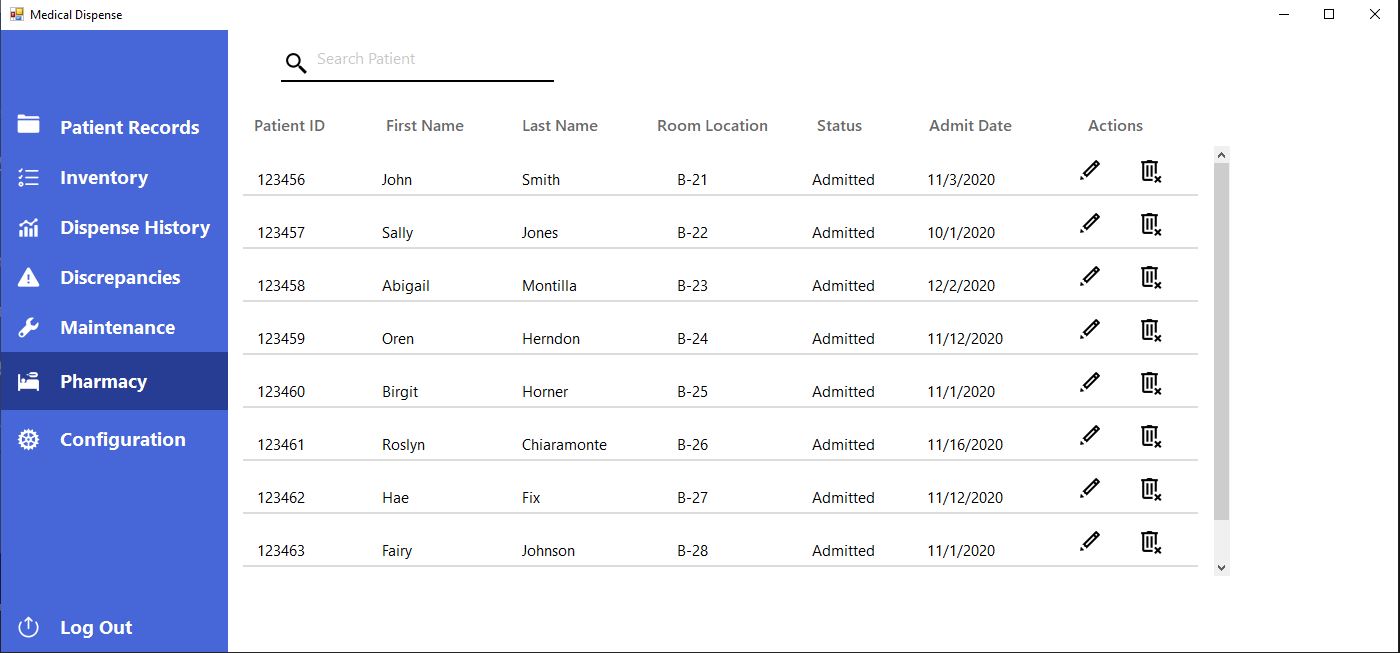
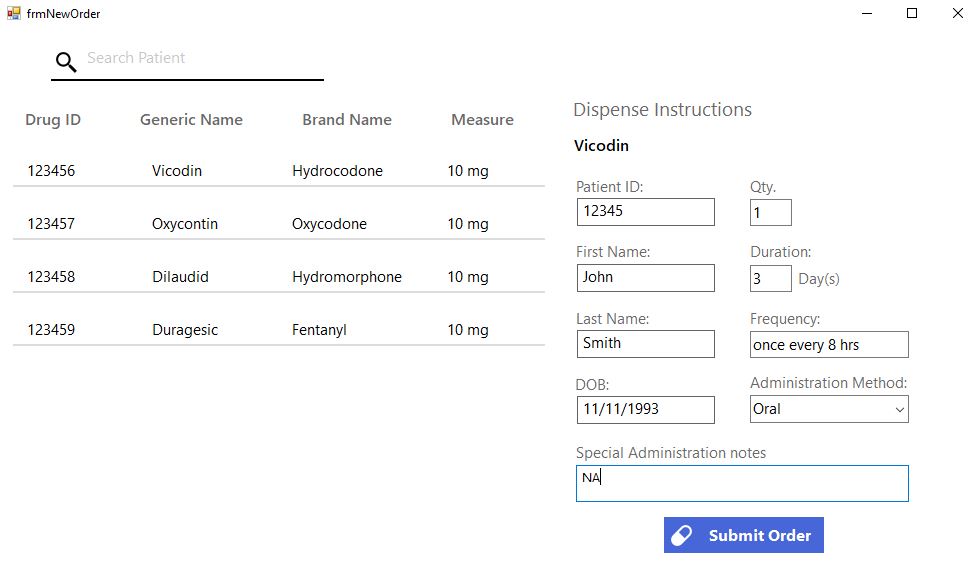
**Importing a Record**

**Medication Dispense History**



**Discrepancies Report**

**Resolve a Discrepancy Form**



**Pharmacy**

**Submitting a Pharmacy order**

**Adding a New User**







# Appendix N: Rainy Day Scenarios

This appendix includes information on rainy day scenarios and possible solutions for them. In other words, it talks about how to approach a particular case of a system failure. Here we describe a list of potential issues that the system may encounter and how they should be handled. These issues can cause performance downgrade or even a complete loss of the system. The items below are a list of possible things that could go wrong and how to fix them.

## Serial Cable Becomes Disconnected

The program will need to be checking the connection to the cart periodically. If the program determines there isn’t a connection, it will prompt the user to open the cart and check the cable. At the time, the user will need to:

1. Check the USB cable that is connected to the laptop. Unplug the cable and plug it back in.
2. Tell the Software to recheck the connection.

If the issue continues:

1. Obtain the key to open that top section of the Medicine cart.
2. Unlock the top section of the medicine cart
3. Lift the top section of the medicine cart
4. Unplug the serial cable and plug it back in.
5. Tell the Software to recheck the connection.

If the issue continues

1. Replace the USB to Serial connection cable.

## The Software doesn’t start/Software become unresponsive/crashes

1. Make sure that the program’s window is not currently minimized somewhere.
2. Ensure that you are trying to run the Software on a Windows 10 operating system and that your Windows is up to date. To check that, you can type in the Windows Search Bar “Update,” and it will show all the current information on the operating system and its updates.
3. Check your CPU usage to ensure no other high-level impact programs running and affecting your CPU or memory. To check that, locate the task manager and select the Performance tab. To remove the task, right-click on it, and then delete the task from the Task Manager.
4. Check if the program’s shortcut has been damaged. If it is, go to the program’s location file and create a new shortcut from the original file.
5. Check if any of the files that are part of the program were deleted.
6. Check with the Virus Scan whether a virus has infected the program.

## The database is missing or corrupted

If you cannot connect to the database, it could be that it has been deleted or corrupted. In this situation, you will need to restore the database from a backup. The backup will have to have been run previously and would be on another drive.

1. Locate the OneDrive folder with the backup on it.
2. Connect the OneDrive folder to the system.
3. Navigate into the Setting menu
4. Go to Backup/Restore Database
5. Click restore database
6. The Software will then connect to the OneDrive
7. Click the copy of the database you want to use to restore.

## Can’t save/modify patient or medication data

1. If you cannot save information, it is likely because you are missing a required piece of information. Check the required fields and ensure that they are all filled. If it still will not save, it is because you have entered invalid data. Ensure that all the information you have entered is valid.
2. If you cannot modify data, ensure that you have permission to finish the previously required steps.
3. Otherwise, other options would be: log out and log back into the system or restart the program.

## Can’t import patient data files to the system

1. Ensure that the file you are importing has the correct format. To check the file’s structure, go to the file’s properties.
2. Ensure that the same file data does not already exist in the system and has a unique name.
3. Ensure that the correct file was selected.

## Can’t print medication/patient report

1. Check if the laptop is connected to the printer through the USB or Web.
2. Check for warning messages associated with printing the report.
3. Make sure that the printer is on.
4. Make sure that the printer has enough paper or ink and that it is not broken.
5. Refer to the printer’s owner’s manual for further troubleshooting.

## Unable to connect to OneDrive

If the Software is not able to connect to OneDrive, attempt the following.

1. Make sure that Windows is connected to the internet either via wireless or ethernet.
2. Make sure that other programs can access the internet.
3. Check to see if OneDrive is having connectivity issues.

## User cannot log in

1. Ensure that you are entering the correct credentials.
2. Attempt to log in with your id.
3. Allow admin to log into the system and modify your credentials. If the admin cannot log in, he/she can log in with the security questions.

# Appendix O: Database Schema



# Appendix P: Data Dictionary

## Patient Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | BedNumberTUID | Type | Integer |
| Aliases | TUID in Bed Table | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | PatientStatus | Type | VarChar |
| Aliases |  | Length | 45 |
| Source Origin | Nurse input | Format | Text |
| Definition/Description | Whether a patient is admitted/discharged | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AdmissionDate | Type | Date |
| Aliases |  | Length |  |
| Source Origin | Nurse input | Format | mm/dd/yyyy |
| Definition/Description | The date that the patient was admitted into the hospital | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | DischargeDate | Type | Date |
| Aliases |  | Length |  |
| Source Origin | Nurse input | Format | mm/dd/yyyy |
| Definition/Description | The date when the patient will be discharged from the hospital | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | DOB | Type | Date |
| Aliases |  | Length |  |
| Source Origin | Nurse input | Format | mm/dd/yyyy |
| Definition/Description | Date of birth | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Height | Type | VarChar |
| Aliases |  | Length | 10 |
| Source Origin | Nurse input | Format |  |
| Definition/Description | The height of the patient | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Weight | Type | VarChar |
| Aliases |  | Length | 10 |
| Source Origin | Nurse input | Format |  |
| Definition/Description | The weight of the patient | | |
| File data item occurs in | Patient Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Notes | Type | VarChar |
| Aliases |  | Length | 400 |
| Source Origin | Nurse input | Format | Text |
| Definition/Description | Any notes from the Physician or Nurses regarding the patient | | |
| File data item occurs in | Patient Table in ADC Database | | |

## Nurse Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Nurse Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | UserTUID | Type | Integer |
| Aliases | TUID in User Table | Length |  |
| Source Origin | It was generated from the User table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Nurse Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | FirstName | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Charge nurse input | Format | Text |
| Definition/Description | This is the first name of the nurse | | |
| File data item occurs in | Nurse table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | LastName | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Charge nurse input | Format | Text |
| Definition/Description | This is the Last Name of the nurse | | |
| File data item occurs in | Nurse table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AccessLevel | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | System Generated | Format |  |
| Definition/Description | This is the access level of the nurse | | |
| File data item occurs in | Nurse table in ADC Database | | |

## Administrator Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Administrator Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | UserTUID | Type | Integer |
| Aliases | TUID in User Table | Length |  |
| Source Origin | It was generated in the User table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Administrator Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | FirstName | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Administrator | Format | Text |
| Definition/Description | The first name of the admin | | |
| File data item occurs in | Administrator table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | LastName | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Administrator | Format | Text |
| Definition/Description | The last name of the admin | | |
| File data item occurs in | Administrator table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AccessLevel | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Administrator | Format |  |
| Definition/Description | The access level of the admin to the system | | |
| File data item occurs in | Administrator table in ADC Database | | |

## Charge Nurse

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Charge Nurse Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | UserTUID | Type | Integer |
| Aliases | TUID in User Table | Length |  |
| Source Origin | It was generated in the User table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Charge Nurse Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | FirstName | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Charge nurse input | Format | Text |
| Definition/Description | The first name of the charge nurse | | |
| File data item occurs in | Charge Nurse table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | LastName | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Charge nurse input | Format | Text |
| Definition/Description | This is the last name of the charge nurse | | |
| File data item occurs in | Charge Nurse table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AccessLevel | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Administrator | Format |  |
| Definition/Description | The access level of the charge nurse | | |
| File data item occurs in | Charge Nurse table in ADC Database | | |

## User Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | UserRole | Type | VarChar |
| Aliases |  | Length | 15 |
| Source Origin | Administrator input | Format |  |
| Definition/Description | The role of the user (nurse, charge nurse, or administrator) | | |
| File data item occurs in | User Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Username | Type | VarChar |
| Aliases |  | Length | 80 |
| Source Origin | Charge nurse input | Format | Text |
| Definition/Description | Username of the user | | |
| File data item occurs in | User Tale in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Password | Type | Varchar |
| Aliases |  | Length | 80 |
| Source Origin | User input. | Format | Text |
| Definition/Description | The password of the user | | |
| File data item occurs in | User Tale in ADC Database | | |

## Drawer Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Drawer Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | DrawerNumber | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Database designer | Format |  |
| Definition/Description | The number connected to the physical drawer | | |
| File data item occurs in | Drawer Table ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | DrawerClassification | Type | VarChar |
| Aliases |  | Length | 50 |
| Source Origin | Charge nurse input | Format |  |
| Definition/Description | The classification for the drawer. It will either be Narcotic or Non-Narcotic | | |
| File data item occurs in | Drawer Table in ADC Database | | |

## Drawer Inventory Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | DrawerInventory table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | DrawerTUID | Type | Integer |
| Aliases | TUID in Drawer Table | Length |  |
| Source Origin | Generated in the Drawer Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | DrawerInventory table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases | TUID in Medication Table | Length |  |
| Source Origin | Generated in the Medication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | DrawerInventory table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Quantity | Type | Integer |
| Aliases |  | Length | 200 |
| Source Origin | Charge nurse input | Format |  |
| Definition/Description | Quantity of the medication in the drawer | | |
| File data item occurs in | DrawerInventory table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Measure | Type | varchar |
| Aliases |  | Length | 15 |
| Source Origin | Charge nurse input | Format |  |
| Definition/Description | How many grams are in the medication that is in the drawer | | |
| File data item occurs in | DrawerInventory table in ADC Database | | |

## Room Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Room Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | RoomNumber | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Instructor | Format |  |
| Definition/Description | This is the physical room number in the hospital | | |
| File data item occurs in | Room table in ADC Database | | |

## Bed Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Bed table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | RoomTUID | Type | Integer |
| Aliases | TUID in Room Table | Length |  |
| Source Origin | Generated in Room Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Bed table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Bed | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Instructor | Format |  |
| Definition/Description | This is going to be the physical bed number in the hospital | | |
| File data item occurs in | Bed Table in ADC Database | | |

## Medication Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Medication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Classification | Type | VarChar |
| Aliases |  | Length | 30 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | Classifies the medication as a Narcotic or a Non-Narcotic | | |
| File data item occurs in | Medication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | GenericName | Type | VarChar |
| Aliases |  | Length | 80 |
| Source Origin | Charge Nurse | Format | Text |
| Definition/Description | The generic name of the medication | | |
| File data item occurs in | Medication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | BrandName | Type | VarChar |
| Aliases |  | Length | 80 |
| Source Origin | Charge Nurse | Format | Text |
| Definition/Description | The brand name of the medication | | |
| File data item occurs in | Medication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Dosage | Type | VarChar |
| Aliases |  | Length | 80 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | The dosage of the medication | | |
| File data item occurs in | Medication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Frequency | Type | VarChar |
| Aliases |  | Length | 80 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | Identifies how often the medication will be dispensed | | |
| File data item occurs in | Medication table in ADC Database | | |

## Patient Medication Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Medication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | PatientTUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Generated in Patient table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | PatientMedication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Generated in Medication table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | PatientMedication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AssignedMedicationTUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Generated in AssignedMedication table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | PatientMedication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AllergenTUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Generated in allergen table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | PatientMedication table in ADC Database | | |

## Administered Medication Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | AdministeredMedication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases | TUID in the Medication Table | Length |  |
| Source Origin | Generated in the Medication table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | AdministeredMedication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | PatientTUID | Type | Integer |
| Aliases | TUID in the Patient Table | Length |  |
| Source Origin | Generated in the Patient Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | AdministeredMedication table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | NurseTUID | Type | Integer |
| Aliases | TUID in the Nurse Table | Length |  |
| Source Origin | Generated in the Nurse Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | AdministeredMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TimeAdministered | Type | Time |
| Aliases |  | Length |  |
| Source Origin | Nurse input | Format | hh:mm:ss |
| Definition/Description | The time when the medication was administered | | |
| File data item occurs in | AdministeedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | DayAdministered | Type | Date |
| Aliases |  | Length |  |
| Source Origin | Nurse input | Format | mm/dd/yyyy |
| Definition/Description | The date that the medication was administered | | |
| File data item occurs in | AdministeredMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Quantity | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Nurse Input | Format |  |
| Definition/Description | Quantity of the dispensed medication | | |
| File data item occurs in | AdministeredMedication Table in ADC Database | | |

## Assigned Medication Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | AssignedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases | TUID in the Medication Table | Length |  |
| Source Origin | Generated in the Medication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | AssignedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Quantity | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | The quantity of medication assigned to the patient | | |
| File data item occurs in | AssignedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Measure | Type | VarChar |
| Aliases |  | Length | 10 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | Dosage of the assigned medication | | |
| File data item occurs in | AssignedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Method | Type | VarChar |
| Aliases |  | Length | 50 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | Describes the method by which the patient needs to take medication | | |
| File data item occurs in | AssignedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | SpecialNotes | Type | VarChar |
| Aliases |  | Length | 255 |
| Source Origin | Charge Nurse | Format | Text |
| Definition/Description | Contains notes that need to be taken into account about the medication | | |
| File data item occurs in | AssignedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Date | Type | Date |
| Aliases |  | Length |  |
| Source Origin | Charge Nurse | Format | mm/dd/yyyy |
| Definition/Description | The date that the medication was assigned | | |
| File data item occurs in | AssignedMedication ADC Database | | |

## Wasted Medication Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | WastedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AdministeredMedicationTUID | Type | Integer |
| Aliases | TUID in AdministeredMedication Table | Length |  |
| Source Origin | Generated in AdministeredMedication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | WastedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | ReasonForWaste | Type | VarChar |
| Aliases |  | Length | 255 |
| Source Origin | Nurse | Format | Text |
| Definition/Description | This is the justification for why the medication was wasted | | |
| File data item occurs in | WastedMedication Table in ADC Database | | |

## Returned Medication Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | ReturnedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | AdministeredMedicationTUID | Type | Integer |
| Aliases | TUID in AdministeredMedication Table | Length |  |
| Source Origin | Generated in AdministeredMedication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | ReturnedMedication Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | ReasonForReturn | Type | VarChar |
| Aliases |  | Length | 255 |
| Source Origin | Nurse | Format | Text |
| Definition/Description | Justification as to why the medication was returned to the drawer | | |
| File data item occurs in | ReturnedMedication Table in ADC Database | | |

## Drug Interaction Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | DrugInteraction Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases | TUID in the Medication Table | Length |  |
| Source Origin | Generated in Medication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | DrugInteraction Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Medication2TUID | Type | Integer |
| Aliases | TUID in the Medication Table | Length |  |
| Source Origin | Generated in Medication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | DrugInteraction Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | InteractionDiscription | Type | VarChar |
| Aliases |  | Length |  |
| Source Origin | Generated by the System | Format |  |
| Definition/Description | A detailed description of how the two medication interact | | |
| File data item occurs in | DrugInteraction Table in ADC Database | | |

## Allergen Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs. | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Allergen Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases | TUID in the Medication Table | Length |  |
| Source Origin | Generated in Medication Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Allergen Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | PatientTUID | Type | Integer |
| Aliases | TUID in Patient Table | Length |  |
| Source Origin | Generated in Patient Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Allergen Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Classification | Type | VarChar |
| Aliases |  | Length | 20 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | The classification that tells if the medication is a narcotic or not | | |
| File data item occurs in | Allergen Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Name | Type | VarChar |
| Aliases |  | Length | 80 |
| Source Origin | Charge Nurse | Format |  |
| Definition/Description | The name of the allergen | | |
| File data item occurs in | Allergen Table in ADC Database | | |

## Discrepancies Table

|  |  |  |  |
| --- | --- | --- | --- |
| Name | TUID | Type | Integer |
| Aliases |  | Length |  |
| Source Origin | It is generated by the system when a new data field occurs | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Discrepancies Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | NurseTUID | Type | Integer |
| Aliases | TUID in the Nurse Table | Length |  |
| Source Origin | Generated bIn the Nurse Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Discrepancies Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | MedicationTUID | Type | Integer |
| Aliases | TUID in the Medication Table | Length |  |
| Source Origin | Generated in the Medication table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Discrepancies Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | PatientTUID | Type | Integer |
| Aliases | TUID in the Patient Table | Length |  |
| Source Origin | Generated in the Patient Table | Format |  |
| Definition/Description | Unique identifier | | |
| File data item occurs in | Discrepancies Table in ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | QuantityOff | Type | Integer |
| Aliases |  | Length | 50 |
| Source Origin | Generated by the System | Format |  |
| Definition/Description | This is the quantity the inventory is off—generated by the system when there is a discrepancy in the drawer | | |
| File data item occurs in | Discrepancies ADC Database | | |

|  |  |  |  |
| --- | --- | --- | --- |
| Name | Date | Type | Date |
| Aliases |  | Length |  |
| Source Origin | Generated by the System | Format | mm/dd/yyyy |
| Definition/Description | This is the date that the discrepancy has happened | | |
| File data item occurs in | Discrepancies Table in ADC Database | | |

# Appendix Q: Hardware Recommendation



1.

2.

3.

1. 2020 Dell Inspiron 15 3000 3583 Flagship Laptop
   * **Microprocessor:** Intel Dual-Core Celeron 4205U, (1.8GHz Processor Base Frequency, 2 MB Intel Smart Cache, 2 Threads)
   * **Memory:** 8GB DDR4
   * **Storage:** 256GB SSD
   * **Operating System:** Microsoft Windows 10
   * **Graphics & Video:** 15.6-inch HD (1366 x 768 resolution), Anti-Glare LED-Backlit Display Integrated Intel UHD Graphics 610
   * **Key Features:** 
     1. Wi-Fi: Yes
     2. Bluetooth: Yes
     3. Webcam: Yes
     4. Multi-format SD media card reader: Yes
     5. Bang & Olufsen Audio: No
   * **Ports:** 1 x SD Card Reader, 1 x USB 2.0, 1 x Wedge-Shaped Lock Slot, 1 x Power, 1 x HDMI, 2 x USB 3.1, 1 x headphone/microphone combo
   * **Additional Information:** Dimension: 14.96" x 10.16" x 0.89" Weight: 4.83 lbs.
   * **Accessory:** iCarp Wireless Mouse
2. Tera Barcode Scanner Wireless 1D 2D 2-in-1
   * **2.4G Wireless + USB 2.0 Wired Connection:** Plug and play with a simple plug-in USB cable or USB receiver/dongle (Wireless transmission distance reaches up to 328ft under barrier-free environment.)
   * **Fast Accurate Reading Speed:** 32Bit CPU super decoding ability that the speed can up to 500/sec. Two working modes: Instant upload mode/storage mode. Scan and store barcodes and then update the data to your device.
   * **Anti-Shock Silicone:** The orange silicone protective cover can avoid scratches and friction while falling from a height of 6.56 feet; the technology of IP54 protects the wireless barcode scanner from dust and moisture.
   * **Auto Continuous Scan:** Set up continuous scan mode switch to automatic mode for quick scanning without pressing any buttons following the instructions with scanner stand included, which provides the ability to be hands-free.
   * **Supported Both Digital and Printed 1D 2D QR Bar Code Symbology:** 1D: UPC-A, UPC-E, EAN-8, EAN-13, Code 128, Code 39, Code 93, Code 11, Interleaved 2 of 5, Matrix 2 of 5, Standard 2 of 5, Coda bar, MSI Plessey, RSS, etc. 2D: QR Code, Data Matrix, PDF417, Aztec code, Maxicode, etc.
3. MonMount Laptop Locking Security Mount LAP1405
   * Works with Laptops 11” to 17”
   * Made from durable metal
   * Includes hardware to mount onto desk or display case
   * Hole in the back of the arms for cable management
   * Keep your laptop safe and secure and on display!
4. Woods 992555 12-Gauge Extra Heavy Duty 100 ft Yellow 3 Prong Outdoor Extension Cord
   * Perfect extension cord for general indoor/outdoor use
   * REINFORCED BLADES add durability that protects prongs from bending or breaking
   * WATER RESISTANT: Flexible vinyl jacket protects the cord against moisture, abrasion, and sunlight
   * The HIGHLY VISIBLE yellow jacket provides extra safety as well as preventing loss and theft on job sites
   * UL Listed, CUL, and ETL Listed
   * 12/3 SJTW extension cord, rated for 125-volts, 15 amps
   * Equipped with a handy cord clip when storing

# Appendix R: Final Database Diagram



# Appendix S: Barcode ID Badge Template

**Barcode ID Badge Template**

To make an ID badge, you will need the barcode information from the User and some basic identifiable information like First Name, Last Initial or Last Name, First Name, and Middle Initial. If it is a generic badge, then something like Student #12 would be sufficient.

Medication Cart ID:

<Identity>

Unauthorized use is prohibited.

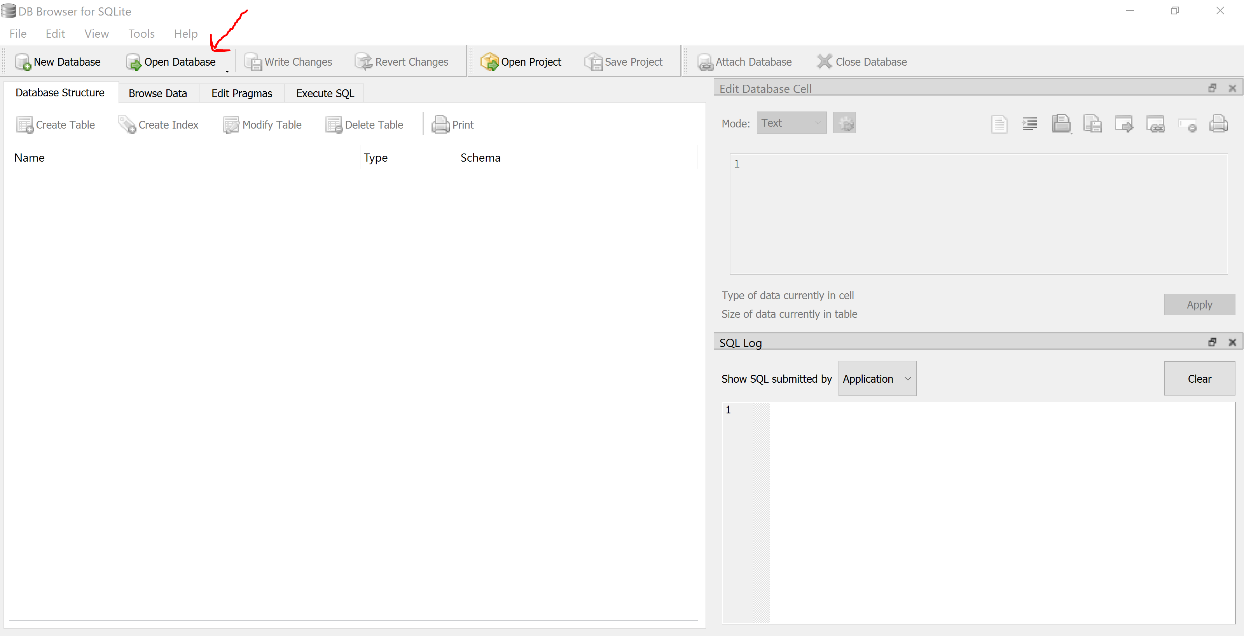
<Barcode/QR Code>

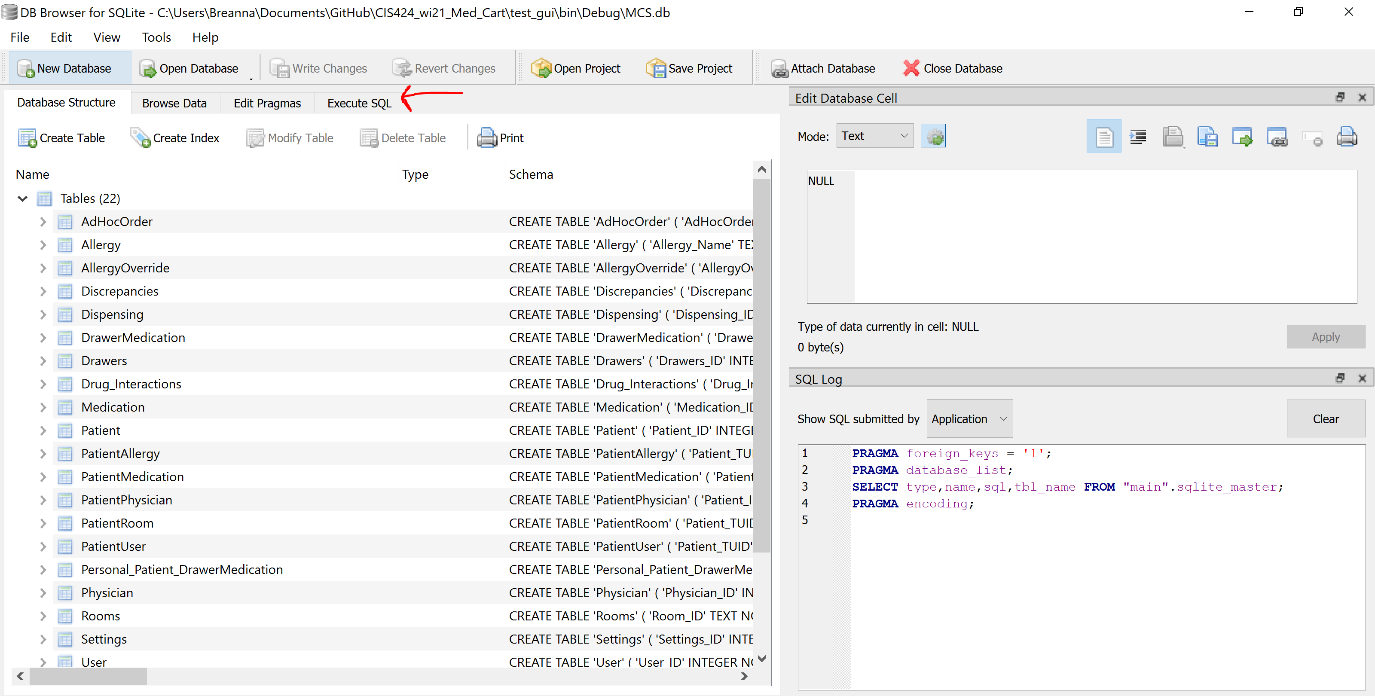
SVSU CIS Med Cart

Examples:

# Appendix T: Preliminary Database Documentation

1. To get the database code to work on your computer
   1. Install "System.Data.SQLite" extension in Visual Studio
      1. 1. Make sure you are in the solution (i.e: test\_gui.sln). You go to Tools > NuGet Package Manager > Manage NuGet Packages for Solution >Browse > Type in "System.Data.SQLite" and install the software.
2. To interact with SQLite database with a user interface (GUI) install DB Browser
3. Importing SQL files to populate the database with sample data:
   1. Open DB Browser
   2. Select “Open Database”



* 1. Navigate to where the database is stored in File Explorer
  2. Select the database desired and select “Open”
  3. Select “Execute SQL”
  4. Select the “Open SQL file(s)” button 
  5. Navigate to the folder housing the desired imported SQL file
     1. If you have the GitHub repo stored on your device, the correct SQL files are stored at this location
  6. Select all the SQL files and select “Open”
     1. Five files will be opened
        1. Allergy
        2. Patient
        3. Physician
        4. Rooms
        5. User
     2. Once opened, five tabs will show on DB Browser
  7. Select the tab of the data you want to import in the following order and select the “Execute all/selected SQL button
     1. Physician
     2. Rooms
     3. Patient
     4. Allergy
     5. User
  8. Now the database has sample data in the five tables listed above.