Medical Cart Test Plan

Quality Assurance

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# Revisions

|  |  |  |  |
| --- | --- | --- | --- |
| **Release No.** | **Date** | **Name** | **Revision Description** |
| V 0.0.1 | 2/8 | Chris | Initial creation |
| V 0.0.2 | 2/18 | Chris | Updated Roles and added notes column with things to consider when testing |
| V 1.0.0 | 3/21 | Chris | Updated Glossary, Related Documents, Project Tools, Project Meetings, and Test Plan Definition |
| V 2.0.0 | 4/22 | Chris | Added Test Scripts and Final Formatting |

# Project Overview

## Purpose

*Medicine Dispensing Cart with Laptop attached, which contains Management software. This software will manage the patients, physicians, nurses, medication and control the software's interactions with the cart's drawers.*

## Scope

*There are four central systems/parts to this project that will require testing.*

*The database that will hold all the data for the users, medication, and patients*

*The GUI that the users will interact with to gain access to and manage the usage of the medication*

*The hardware which contains the laptop and the cart itself*

*The API system will import data from an outside source which will provide current data on the medications.*

## Related Documents

1. *GitHub repository*
2. *Group Task Sheets*
3. *Evaluation Procedures for Project Issues*

## Glossary

|  |  |
| --- | --- |
| **Word/Phrase/Acronym** | **Meaning** |
| API | **Application Programming Interface** |
| GUI | **Graphical user interface** |
| Form | **A Visual Studio screen used to show the GUI.** |
| Barcode | **A 12-24 long character string used in place of a username/password or medication information.** |
| Divider | **They are used to split a drawer into multiple compartments.** |
| Textbox | **A place where a user can enter data into the system.** |
| Dropdown field | **It can display many pieces of data that a user can select from a list.** |
| Button | **It is pressed to start or stop an action.** |
| Bin | **Each compartment inside a drawer** |
| Baud rate | **The rate at which information is transferred in a communication channel.** |
| Com Port | **The name of the serial** **port interface on PC-compatible computers. It can refer not only to physical ports but also to emulated ports, such as ports created by Bluetooth or USB adapters** |
| Database | **A structured set of data held in a computer, especially one that is accessible in various ways.** |
| Screenshot | **an image of the data displayed on the screen of a computer or mobile device.** |
| Simulation Mode | **the input and output signals of the controller are linked with the process model instead of the actual cart** |

# 

# Project Test Communication Approach

## Team Members/Roles

|  |  |  |
| --- | --- | --- |
| **Name** | **Role** | **Notes** |
| Majed | Inventory | Does the cart match up with the Inventory? How does an Ad-hoc order reflect in the Inventory? Screen look and feel suggestions? |
| Polina | Database | When we make a user or order, does it fully reflect in the database? |
| Jordan | Patient | Does all the information for a patient make sense? Is it editable, and does it save edits? Screen look and feel suggestions? |
| Cody | Settings | Can we create/edit a user? Who has permission to do this? What information is necessary on each screen? Screen look and feel suggestions? |
| Matthew | Pharmacy | How does the Pharmacy interact with the database? How does a regular patient order work? What about an ad-hoc order? Screen look and feel suggestions? |
| Chris | Hardware/Reports/login screen | How does this software interact with the cart? Will it work after the cart has been unplugged and replugged? What look do the reports have? What data is required? Are they customizable? |
| All | End-to-end scenarios for all permission types. | We need to test what a nurse should have access to in the system (vs. what do they have?) The same goes for a supervisor and admin. Can each role complete the task they should be able to complete? (Also, can they carry out a task they should not be able to?) |

## Project Tools

XUnit - Used for Unit Testing

GitHub - To store and collaborate as a team.

Visual Studio - To edit and test the program.

GitHub Desktop - To Pull and Push any changes to the project so all can view and use them.

DB Browser (SQ Lite) - To view the database.

Microsoft Teams – used to collaborate.

## Project Meetings

*We will have a meeting every Monday at 8 pm with varying topics depending on what has happened that week.*

*We also have ad-hoc meetings to test in groups, allowing more than one person to see the issue and replicate it.*

## Issue Tracking/Resolution

Define the tools used for tracking issues, the communication plan related to assigning responsibility, and the resolution plan.

We will be documenting issues in the QA (Quality Assurance) column inside of our Three Team Board in GitHub. We will also be submitting issues to the GitHub page assigning them to Eric, labeling them "from QA" as well as "to dev" or "to doc." We will also attach them to the Three Team Board.

# Test Plan Definition

## Integration Testing

Testing in which software components, hardware components, or both are combined and tested to evaluate the interaction between them. This type of testing will be done when the software is installed on the laptop and connected to the cart. We will test how everything functions.

## Technical Testing

This technique is applied to determine that the individual units of an application function as expected when combined. The purpose of this level of testing is to determine whether a unit correctly and completely implement its project specifications

## Vendor Acceptance Testing

Testing should be conducted on software assets acquired from a third party, where the level of quality is not assured. (Test the quality of the API as it sends in data)

## System Testing

Our team will conduct testing on a complete, integrated system to evaluate its compliance with its specifications.

## Regression Testing

Selective retesting of a system or component to verify that modifications have not caused unintended effects and that the system or component still complies with its specified requirements.

This technique will retest all issues we submit to ensure the system works with the issue fixed.

## Stress Testing

This technique will be applied to determine how the system would respond to extreme volumes of work. Our team will use stress testing by adding enormous amounts of data to a textbox or the database itself and checking how well the program runs afterward.

## User Acceptance Testing

Validate application functionality (per requirements document) and have the College of Nursing sign off on it.

# Test Environment

## Hardware Requirements

Determine high-level hardware requirements necessary to test.

## The hardware shall have at least one gigahertz or faster processor installed.

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

1. The hardware shall have at least 2 GB of RAM on a 64-bit processor.
2. The hardware shall have a graphics card that is compatible with DirectX 9 or later with the WDDM 1.0 driver
3. The hardware shall have at least an 800x600 display or better
4. The hardware shall include the medical cart with a drawer system
5. The hardware shall include a scanner with the ability to scan barcodes and QR codes.

## Software Requirements

## The software shall run in a Windows 10 environment.

## The environment shall have .Net framework 4.7 or higher installed

## The environment shall have internet connectivity

# Risk and Contingency Plan

## Risks and Mitigation

*This section defines all other risk events, their likelihood, impact, and mitigation plan.*

|  |  |  |  |
| --- | --- | --- | --- |
| **Risk** | **Likelihood** | **Impact** | **Mitigation Plan** |
| Power outage | Not likely | School-wide | Using an electrically rating power cord |
| Data storage space full | Possible | Database and user experience | Export the database to an external location and check for possible unneeded files |
| Network connection issues | Possible | Connection to API | Store locally on the database and the CSIS (Computer Science and Information Systems) server |

# Requirements

## Functional Requirements to be Tested

|  |  |  |
| --- | --- | --- |
| R1 | Concerning Patient Creation | Test whole experience of adding patients from First, Middle, and Last names. MRN, Height(cm) and weight(kg), Room and Bed number, DOB, admission date, sex, phone number, address, and email. Also, the primary physician, their prescribed medications, and allergies, |
| R2 | Concerning Patient Searching | Patients will be allowed to be searched by first or last name. As well as by Patient ID, admission date, |
| R3 | Concerning Patient Modification | Patients will be able to be modified only by an authorized user |
| R4 | Concerning Medication Creation | Medication can be allowed to be used in an ad-hoc order only by an authorized user |
| R5 | Concerning Medication Showing | Medication information shall be retrieved from the database and displayed on the GUI and patient medical history, and the last time a nurse administered a medication. It will also show the drugs with which it will interact. |
| R6 | Concerning Medication Modification | An authorized user will be able to edit an ad-hoc order |
| R7 | Concerning Medication Dispensing | Date/Time, Nurse ID number, update database records for dispensed med, second nurse required for narcotic, display warning for allergy, medication conflicts. Only one drawer with sufficient med shall open, correct dosage |
| R8 | Concerning Medication Waste | Two users are required to authorize medication waste, and they must provide a valid reason |
| R9 | Concerning User Creation | Authorized users are the only ones who can create users. The username for a user must be unique, have a max character length of 40, Have Upper and Lowercase letters. The setting required for a password are letters, numbers, special characters, 12 characters minimum, 64 character maximum, Upper and Lowercase letters. Once a user profile is created, they can opt to use a barcode/QR code to log in. The system will set the default user access to a nurse. |
| R10 | Concerning User Modification | An authorized user is the only one who can modify user information. |
| R11 | Concerning Physician Creation | Authorized users are the only ones who can create a supervisor user. The supervisor must have a first, middle, and last name. They will also have a phone number and address, a fax number, and an email address. They are required to have credentials to log in to the system. |
| R12 | Concerning Physician Modification | An authorized user is the only one who can modify physician information. |
| R13 | Concerning Allergy Creation | Authorized users are the only ones who can create an allergy. It is required to have a name, type, and severity. |
| R14 | Concerning Allergy Modification | An authorized user is the only one who can modify allergy information. |
| R15 | Concerning System Authorization | An authorized user is the only one who can access the system. They can do this via a barcode/QR code or by entering their username and password. |
| R16 | Concerning Drawer Operation | The software will tell the drawers to open. It will open the drawer that holds enough medicine of the correct medication to dispense. The GUI shall display whether a drawer is full or empty. |
| R17 | Concerning Importing Patient Information | An authorized user is the only one who can import patient data. |
| R18 | Concerning Importing Allergy Information | An authorized user is the only one who can import allergy information. |
| R19 | Concerning Importing Physician Information | An authorized user is the only one who can import physician information |
| R20 | Concerning Reporting & Analysis | An authorized user is the only one who can review a report and export it to a word document. |

## Non-Functional Requirements to be Tested

| **Req#** | **Title** | **Technical Notes** |
| --- | --- | --- |
| R1 | Color scheme | The colors match from screen to screen. |
| R2 | The font scheme | The font matches from screen to screen |
| R3 | The buttons format | The button will look and feel the same, and if they are on two screens, they will be in the exact location on both. |
| R4 | Overall look and feel | The overall look and feel should be consistent throughout the system |
| R5 | Spelling and grammar | There should not be any spelling or grammatical errors in the system |

# Test Approach

Please make notes of any issue you find along the way. Feel free to use this as a template and try things the staff/student would need to do. There are plenty of issues still to find. Make sure you are using the most up-to-date fetch, and you have built a new exe before running this and any script. It will make sure any issue is current and valid

## Test Script 1:

1. Please sign in to the application with the supplied barcode.

**yx3hb24b09c0zmkx8Z**

* 1. You should be logged in as Sarah Ryan (supervisor role). Please verify this,

1. From the main page, please add a new patient. The information that you will need is :
   1. Mary Little Lambson
   2. email: [mhallamb@outlook.com](mailto:mhallamb@outlook.com)
   3. sex: female
   4. DOB 6/1/1985
   5. Height 140 cm
   6. Weight 86.3 kg
   7. Pick any empty room and bed
   8. Address: 123 Here Ct. Baltimore, MD 27654
   9. phone: (213) 954-5151
   10. physician: David Davis
2. Go to My Patients and add Mary Lambson to your patients
3. Select Settings then Edit Room and Bed
4. Create a new room and bed (H112 Far Left)
5. Change Mary Lambsons room/bed to H112 Far left.
6. Select the patient with the MRN 20838078.
   1. Change the last name to Smith.
   2. Save the changes.
7. Now, select the inventory category and then configure Inventory.
   1. Select drawer 12. Then add to the drawer.
   2. Verify that it won't let you with the current amount of dividers
   3. Change divider amount to 1 and save changes
   4. Click add to drawer again
   5. Search for Claritin.
   6. Select the first option that appears in the list.
   7. Then type in the type: Oral Tablet.
   8. Barcode: 97563435421
   9. expiration date: 2025/05/30
   10. The drawer should be automatically selected as 12.
   11. Select bin two and enter a quantity of 50.
   12. Select Patient Personal Medication "No."
   13. Enter the amount of container and units
   14. Click Save.
   15. Verify the tab order of the screen.
   16. If you receive a pop-up, read it, and when ready, click "Ok." If there are errors, attempt to correct them.
8. After the drawer opens, verify that it is the correct drawer and close it
9. When finished, click back. Verify that the medication has been added to the drawer

## Test Script 2:

1. Please sign in to the application with the supplied username and password

|  |  |
| --- | --- |
| CWright | gmm0b4cqoO01234! |

1. You should be logged in as Carl Wright(student role)
2. Verify what menus and sun menus that are available and make sure they are not supervisor or admin options
3. Find Patient: Stuart Arthur and add him to "My Patients."
4. Select edit patient and don't change anything, select save changes
5. Make sure that the system did not update any fields.
6. This has been an issue with formatting.
7. Select Edit patient again and change
8. the Physician to Evelyn Gray
9. The room and bed numbers to A64 and A2. Go ahead and select save changes
10. Verify that the changes are showing on the form still
11. Select Ad-Hoc Order located under Pharmacy
12. Select the Claritin that is located in Drawer 17 bin 1
13. Select Stuart Arthur as the patient.
14. Verify that his room and bed were updated from our change
15. Select 100 mg as the ordered amount and press submit order
16. On the next screen, select seven as the amount to remove and press 'dispense medication.'
17. This will open the drawer \*\*Make sure the drawer is the same as what you selected earlier\*\*
18. There is a current issue on this not working
19. The screen should update to the amount to administer this would be the prescribed amount: 100
20. There is a current issue on this not working
21. The next screen is the waste screen; we will need to enter the amount that is leftover from dispensing 100 out of a possible 105, so it should be 5
22. Select excess amount and press submit
23. Select the Reports tab
24. Generate an Ad-Hoc Orders report
25. Verify the ad-hoc order placed is on the report
26. Press export to Excel
27. Verify it is formatted correctly
28. Close Excel and don't save
29. Open the inventory tab and select Waste
30. Select Stuart Arthur
31. Select Claritin drawer 17 bin 1
32. Input 5 mg in Amount Wasted
33. Select a reason for Waste
34. Press Submit
35. Press ok on the message that pops up
36. Go back to reports
37. Select Wasted Medication
38. Verify the Waste you just made is on the report
39. Select Add Patient
40. First Name: Jim-bo
41. Middle Name: \*empty\*
42. Last Name: S'bouyo
43. Room: G255
44. Bed: Window
45. Sex: Male
46. DOB: 1996/04/09
47. Height: 120
48. Weight: 130
49. Street Address: 6257 Bay Road
50. City: Bay City State: MI
51. Zip Code: 48732
52. Email: [jimbo1996@netscape.com](mailto:jimbo1996@netscape.com)
53. Phone: 9898391796
54. Primary Physician: Vincent Williams
55. Press Save
56. Go to All Patient and verify Jim-bo is in there and trying sorting the different fields to see it stays in order.
57. Add Jim-bo to My Patients being selecting all patients and pressing the plus sign next to his information
58. Add Three other existing patients to My patients by using the plus sign.
59. Please verify that the headers can sort it.
60. Press log out and make sure no credentials are still on the barcode or username password screens. Then press the "X" to close the program. Press yes when prompted for "Are you sure?"
61. Please feel free to change this to test different ideas. And ask questions if you are unsure of something

## Test Script 3:

1. Please Log in as. Ellia Johnson.

|  |  |
| --- | --- |
| EJohnson | 3ucyrrkcgtT1234! |

1. Verify what menus and sub-menus are available
2. Then go in and change HBailey (Heather Bailey) to active.
3. Change her password
4. Log out.
5. Then log in as Heather Bailey using the new password.
6. Go into Configure inventory
7. Add Serine to drawer 4 bin 4
8. Type: Oral Tablet
9. Barcode:  123abc456def789ghi
10. Expiration date: 2050/05/30
11. Quantity: 50
12. Personal Med: NO
13. Amount per container 7.1 mg/ml
14. Press save
15. Click on restock Inventory.
16. Click on All Medication inside the Report Type.
17. Find Serine (it will be located at the bottom)
18. Add a new amount to the count and flag it.
19. Press update inventory
20. Check the count of the drawer on the configure inventory screen to make sure it updated
21. Remove Serine from the drawer by pressing the trash can
22. Check to make sure it does not show on the Restock Inventory All medication report
23. Open Reports and find the "End of Shift Count" (Issue pending to rename this report to Restock Inventory)
24. Check to see if Serine shows up in the report. (it should not since it is not in the cart)
25. Go to restock Inventory and change the count of

|  |  |  |  |
| --- | --- | --- | --- |
| Drug Name | Drawer | Drawer Bin | System Count |
| ibuprofen 50 MG Chewable Tablet [Advil] | 1 | 1 | 82 |

to 550

1. Check to make sure it updated the same in Configure Inventory for the same drawer and bin
2. Go to physician Settings and edit the name of Sam Reed to Sam Smith
3. Then go to Alina Abigail and check if the Physician name has updated
4. Go to Edit Rooms/Beds and add a new room and bed (Narnia – Wardrobe)
5. Go to Alina's file and change her bed to the newly created one.
6. Please feel free to change this to test different ideas. And ask questions if you are unsure of something

## Entry Criteria

*What are the criteria or what must be in place for testing to begin?*

Database/GUI and connections to each other

## Pass/Fail Criteria

*What are the criteria that determine whether an item in the test script has passed or failed?*

*Micro Test – Each item on the screen is the correct spelling/font/same look and feel as the rest on the form.*

*Macro Test (patient)– As a patient from creation through discharge*

*Macro Test (user role)- As a nurse/physician/admin, the privileges and screen they can have access to*

*Unit Testing – the logic from the subroutines/functions/statement is sound, and the actual meet the expected result*

## Exit Criteria

We will know when to stop testing when all the system bugs are resolved and all forms collect and transfer data to the database correctly.