

# Team ReBoot.



## Software Testing Plan Document

Version 1.2

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## **1.0 Introduction**

Opioid addiction among pregnant women is a growing issue in the United States that has costly consequences for the mother, child, and for the country. Between 1999 and 2014, the number of women with opioid use disorder at the time of delivery quadrupled, leaving the current rate at 6.5 per 1,000 deliveries<sup>1</sup>. Use of opioids during pregnancy is a particularly serious problem, as it can result in newborns being born with a withdrawal syndrome known as neonatal abstinence syndrome (NAS). Babies born with NAS may experience poor feeding, breathing problems, body shakes, excessive crying, and more<sup>2</sup>. Longer term, NAS can cause cognitive or behavioral impairments<sup>3</sup>. From 2004 to 2014, there was a five-fold increase in the number of babies born with NAS in the United States, which has consequently resulted in a steady increase of the amount of money spent on treating these babies. In 2014, an estimated \$563 million in hospital costs was spent on treating infants with NAS, compared to the \$90.9 million spent in 2004<sup>4</sup>.

To combat the rising rates of opioid addiction, pregnant women with opioid use disorder are enrolled in a treatment program early in their pregnancy. This not only helps decrease the rates of opioid addiction, but also helps minimize the number of infants born with NAS. However, while plenty of women enter treatment programs, the rates of relapse are relatively high: 56% of women who are six months postpartum experience relapse<sup>5</sup>. According to our client, Dr. Emery Eaves, who is a medical anthropologist at Northern Arizona University, high rates of relapse can be attributed to the challenges that traditional treatment programs present. These challenges include:

- **Attending appointments and obligations** - Pregnant women recovering from opioid use disorder usually receive a daily dose of Methadone as part of treatment, which can only be dispensed to them one dose at a time at a Methadone clinic. These daily appointments combined with multiple counseling appointments a week, as well as prenatal care appointments can add up to be nearly impossible to accommodate in a typical woman's schedule.
- **Lack of social support** - If pregnant women in recovery barely have enough time to attend the required appointments and other obligations they have, finding time to make

1 National Institute on Drug Abuse. (2019, January 22). Opioid Overdose Crisis.

2 The Recovery Village. (2019, October 14). Long-Term Effects of Neonatal Abstinence Syndrome.

3 Seattle Children's. (2018). *Neonatal Nursing Education Brief: The Long-Term Outcomes of Infants with Neonatal Abstinence Syndrome*.

4 National Institute on Drug Abuse. (2019, January 22). Dramatic Increases in Maternal Opioid Use and Neonatal Abstinence Syndrome.

5 Goodman, Daisy. *Should Maternity Care and Treatment for Opioid Use Disorder Be Integrated?* [PowerPoint slides].

new friends and socialize can become out of the question. Due to the stigma surrounding pregnant women with opioid addictions, it's especially difficult to find people who are supportive of their recovery process. This can leave these women feeling isolated and unsupported in their recovery.

- **Lack of information access** - Similar to a lack of social support, not having any leisure time makes it more difficult for a pregnant woman in recovery to seek out key health and pregnancy information specific to their recovery. This leads to a lack of knowledge of certain recovery strategies that these women should adhere to, or medical advice that could help make the recovery process easier.

These challenges are amplified if the woman in recovery lives in a rural area far away from clinics or has trouble accessing reliable transportation and makes the recovery process even more difficult.

To aid pregnant women in recovery and help them overcome these challenges, we are developing a mobile application called iMATter that will provide a secure, virtual environment that supports aspects of their recovery process. Key features of iMATter include:

- **Chat Room** - A place that connects pregnant women with opioid use disorder with each other to offer each other advice, speak on shared experiences, and eliminate the lack of social support.
- **Information desk** - A forum where women may ask pregnancy or recovery related questions and receive answers from credible and knowledgeable sources in a timely manner. This will help women easily obtain answers to questions they have throughout pregnancy and recovery.
- **Learning center** - A place that provides learning materials that helps users expand their knowledge of pregnancy and recovery information. This will help improve ease of access to information that pregnant women in recovery might seek out.

Other features include an in-app calendar, surveys, pregnancy updates, a map of recovery and pregnancy resources, and more. This mobile application will be coupled with a web application utilized by administrators, allowing them to create, edit, delete, and otherwise view content being displayed in the mobile application. Administrators will also be able to add or delete users and configure other settings for both applications. Providers will also access this web application, as their role is to answer questions being posted in the information desk forum by pregnant women in recovery.

To ensure that the product we are creating is functioning as expected and provides a secure and user-friendly environment to users, it is necessary to perform testing on the software.

Software testing introduces a series of tests that examine the integrity, quality, and functionality of a piece of software. The purpose of testing is to uncover any unwanted behavior or expose shortcomings in the functionality of a product.

We plan on implementing unit, integration, and usability tests. Unit tests will test individual sections of our code to check that it behaves as intended and no unforeseen issues occur. We will be writing a few unit tests for each module of our mobile and web applications (i.e., chat room, surveys, learning center, etc.). Integration tests will examine how well separate components of our project work together to produce the desired functionality. In our case, this will apply to how well web application data is relayed to the mobile application data through the database, and vice versa. Usability testing will assess how user-friendly our application is, by asking people unfamiliar with our project to navigate our mobile and web applications and complete a variety of tasks. This will also potentially uncover any issues with our user interface and other software components. Usability testing is very important for our project because it ultimately simulates how our end users will be interacting with our product and will give us helpful feedback for improving our product. Given how important it is, our testing plan will focus more heavily on usability testing.

As each team member has been developing their parts of iMATter, we have individually been doing basic informal testing to ensure our parts function as expected. With this, we have established a level of confidence in the functionality of our code but need to test for use cases that were not accounted for during development for the various components of our application. This will expose shortcomings in the overall functionality of our product. Given this and the previously mentioned focus on the end user experience of our applications, we will be most devoted to usability testing.

Now that we have introduced our product and given an overview of the tests, we plan on executing, we can look more closely at the details for unit, integration, and usability testing. To begin, we will discuss our plans for unit testing.

## **2.0 Unit Testing**

Unit testing breaks software down into units to be tested individually. The purpose of unit testing is to ensure that each unit of code is performing the way it is expected. To break down our software, we will be testing the main functions in each page of our applications (Ionic pages being components that act as views, i.e. the chat room in the mobile application). To write our unit tests, Ionic has a built in page (.spec.ts file) that is automatically generated when a new page is generated; this is where we will be writing our unit tests. In these files, we will be utilizing a framework called Jasmine, which provides functions for us to properly implement our unit tests in our spec.ts file.

As our project consists of a web and mobile application, we will be testing these applications separately, including the components that are virtually the same in both applications, to verify that both are working and producing results exactly as they should. To begin, we will discuss the unit testing for our web application.

## 2.1 Web Application

Our web application will only be used by *administrators* (also called *admins*) and *providers*. This application involves admins managing the majority of the data that is viewed and interacted with in the mobile application.

### 2.1.1 Account Management

Admins and providers are expected to be able to login to their existing accounts. New admins or providers should be able to create their accounts after entering a code they were provided. In the table below, we propose unit tests for the components involved in account management.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Admin Login</b>	The login system should only allow those that have a stored account in the database to enter. Valid admin sign in should be brought to the admin web portal.	- A valid email - A valid password: length is $\geq 8$ characters, alphanumeric	- Email <i>Valid:</i> 'bja99@nau.edu' <i>Invalid:</i> 'emailaddress'  - Password <i>Valid:</i> 'Password123' <i>Invalid:</i> 'pass'	- Admin is rejected if login input is not stored in database or password for email entered is incorrect.  - Admin is brought to the admin homepage if email and password are correct.
<b>Provider Login</b>	The login system should only allow those that have a stored account in the database to enter. Valid provider sign in should bring provider to provider web portal.	- A valid email - A valid password: length is $\geq 8$ characters, alphanumeric	- Email: biancaaltman246@gmail.com  - Password: password123	- Provider is rejected if login input is not stored in database or password for email entered is incorrect.  - Provider is brought to provider homepage if email and password are correct.

<b>Creating Base Admin Account</b>	Creating an empty admin account requires an administrator to input a valid email.	<ul style="list-style-type: none"> <li>- A valid email</li> </ul>	<ul style="list-style-type: none"> <li>- Email: bja99@nau.edu</li> </ul>	<ul style="list-style-type: none"> <li>- Form cannot be submitted if all fields have not been filled out or one of the values is not valid.</li> <li>- Form is submitted if all values have been entered and fit in the requirements.</li> </ul>
<b>Creating Base Provider Code</b>	Creating an empty provider account requires an administrator to input the type of provider, the provider's first name, last name, date of birth, and valid email.	<ul style="list-style-type: none"> <li>- Provider type has values for the admin to select from</li> <li>- First and last name are only alphabetic characters</li> <li>- A valid DOB: formatted as mm/dd/yyyy</li> <li>- A valid email</li> </ul>	<ul style="list-style-type: none"> <li>- First Name: Bianca</li> <li>- Last Name: Altman</li> <li>- DOB: <i>Valid:</i> 04/10/1997 <i>Invalid:</i> 04101997</li> <li>- Email: biancaaltman246@gmail.com</li> </ul>	<ul style="list-style-type: none"> <li>- Form cannot be submitted if all fields have not been filled out or one of the values is not valid.</li> <li>- Form is submitted if all values have been entered and fit in the requirements.</li> </ul>
<b>Validate Code Input</b>	A user is required to enter a unique 6 digit code to access account creation page. An existing code should allow access, and depending on the code, user will be brought to either admin or provider signup.	<ul style="list-style-type: none"> <li>- A valid code: 6 characters, alphanumeric</li> </ul>	<ul style="list-style-type: none"> <li>- Code: xA64G3</li> </ul>	<ul style="list-style-type: none"> <li>- An invalid code (not a code stored in database), should not bring user to next page.</li> <li>- If code exists in database, app will navigate to appropriate signup page based on code (admin or provider code).</li> </ul>
<b>Admin Account Creation</b>	Admin creation only requires a username for display and a	<ul style="list-style-type: none"> <li>- A valid username</li> <li>- A valid</li> </ul>	<ul style="list-style-type: none"> <li>- Username: Admin123</li> <li>- Password:</li> </ul>	<ul style="list-style-type: none"> <li>- Account creation is not allowed if one or more of these is</li> </ul>

	password. Usernames input must be unique.	password: length is $\geq 8$ characters, alphanumeric	password123	missing, the username is already in use, or the password does not fit criteria.  - Signup is valid and admin is created if all form values have been filled and fit the criteria, admin is added to database.
<b>Provider Account Creation</b>	Provider creation requires a username for display, a password, and a bio for display. Usernames input must be unique.	- A valid username  - A valid password: length is $\geq 8$ characters, alphanumeric  - A valid bio: Length is $> 0$ characters.	- Username: Provider123  - Password: Password123  - Bio: 'I have worked in a methadone clinic for over 5 years.'	- Account creation is not allowed if one or more of these is missing, the username is already in use, or the password does not fit criteria.  - Signup is valid and provider is created if all form values have been filled and fit the criteria, provider is added to database.

### 2.1.2 Information Desk

The information desk is where all users can go to ask a provider or admin a question. Admins and providers both have the ability to comment on user posted questions; however, admins have the ability to delete questions and comments as well.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Submit a Comment</b>	An admin or provider can enter a comment that will be displayed under a post.	- A valid comment: string with length $\geq 1$	- Comment: 'Hi, I understand and would like to help'	- User cannot submit comment if nothing is in the form.  - If comment is not



				empty, user can submit. Comment will be displayed and is added to database.
<b>Delete Comment (Admin only)</b>	There is an existing comment in the database that is displayed in the information desk.	N/A	Click that calls a function to delete the comment	The comment is deleted from the database.

### 2.1.3 Learning Modules

Learning modules provide an interactive learning experience to pregnant women in recovery. Each learning module contains either a video or PowerPoint, followed by an optional set of quiz questions for the user to answer. Administrators are able to create, edit, and delete learning modules, which are then displayed to mobile application users. As there are many components to a learning module, the following table lists tests that will check that some components are properly updated or calculated as data is edited.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Calculate Learning Module's Total Reward Point Value</b>	Verify a module's total reward point value is the summation of the point values of each quiz question within the module.	- An array of quiz questions that have numeric point values $\geq 0$	- QuestionA <i>Valid:</i> pointsWorth = 3 <i>Invalid:</i> pointsWorth = three  - QuestionB <i>Valid:</i> pointsWorth = 999 <i>Invalid:</i> pointsWorth = -4  - QuestionC pointsWorth = 0	- If each quiz question has a valid value, the module's total reward point value would be 1,002 in the example  - Otherwise, the point value will be set to 0

<b>Add New Quiz Question</b>	<p>Within a given module, new quiz questions can be added successfully and listed in the module. New questions require a question title, the number of points worth, answer selections, and a designated correct answer.</p>	<ul style="list-style-type: none"> <li>- Question title: any string of length &gt; 0</li> <li>- Number of points question is worth: any number &gt;= 0</li> <li>- Answer selections A-D (C and D optional): any string of length &gt; 0</li> <li>- Correct answer selection: a selection of the letter A-D</li> </ul>	<ul style="list-style-type: none"> <li>- Question title: 'Is this correct?'</li> <li>- Number of points worth: <i>Valid:</i> 3 <i>Invalid:</i> three</li> <li>- Answer selection A: yes</li> <li>- Answer selection B: no</li> <li>- Correct answer: A</li> </ul>	<ul style="list-style-type: none"> <li>- If the fields have valid inputs, the new quiz question will be added to the list of quiz questions for this module</li> <li>- Otherwise, the quiz question will be prevented from being added and the user will be alerted of needing to change their input</li> </ul>
<b>Delete Quiz Question</b>	<p>Within a given module, existing quiz questions can be deleted.</p>	<p>N/A</p>	<p>Calling the function to delete a specific quiz question</p>	<p>The selected quiz question is removed from the list of quiz questions for this learning module</p>
<b>Add New Learning Module</b>	<p>A new learning module can be created and will be added to the list of existing learning modules.</p>	<p><b>Required:</b></p> <ul style="list-style-type: none"> <li>- Module is active: a boolean value</li> <li>- Title: any string of length &gt;= 1</li> <li>- Description: any string of length &gt;= 1</li> <li>- Weeks of visibility: a string that contains a comma separated list of numbers</li> <li>- Days before</li> </ul>	<ul style="list-style-type: none"> <li>- Module is active: true</li> <li>-Title: 'Sample Module'</li> <li>- Description: 'here to provide an example'</li> <li>-Weeks of visibility: <i>Valid:</i> 23, 27, 30, 35 <i>Invalid:</i> 23f, forty</li> <li>-Days before expiration: <i>Valid:</i> 5</li> </ul>	<ul style="list-style-type: none"> <li>-If the fields have valid inputs, the new learning module will be added to the list of learning modules</li> <li>- Otherwise, the learning module will be prevented from being added and the user will be alerted of needing to make changes to their input</li> </ul>

		<p>expiration: an integer <math>\geq 0</math></p> <p>- Contents: any string</p> <p><b>Optional:</b></p> <p>- Video ID: any string</p> <p>- Powerpoint URL: any string</p> <p>- Module Quiz: an array of quiz objects</p> <p>- Next module link: any string</p>	<p><i>Invalid:</i> Ten</p> <p>-Contents: 'please enjoy this module'</p> <p>-Video ID: e4YIJ92Bd</p>	
<b>Update Learning Module</b>	An existing learning module's fields can be updated.	Same as above	<p>Same as above, <b>EXCEPT:</b></p> <p>-Contents: 'I'd like to change this'</p>	<p>- If the fields have valid inputs, this learning module will be updated with the newly inputted information</p> <p>- Otherwise, the learning module will be prevented from being updated and the user will be alerted of needing to make changes to their input</p>
<b>Delete Learning Module</b>	An existing learning module may be deleted from the list of learning modules.	N/A	Calling the function to delete a specific learning module	The selected learning module is removed from the list of all learning modules in the database

### 2.1.4 Surveys

Surveys are questionnaires that administrators set up for mobile application users to answer in order to gain insight into users' experiences, feelings, or habits. Administrators may create, delete, and update surveys. Additionally, they can specify the accessibility of a survey, meaning whether they are available to users at certain times or available based on user emotion. Users may also earn points from completing surveys. Every survey has fields that need to be filled in depending on the type that it is, and the following table will test that input for these fields are correct.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Create a Survey</b>	To create a survey, an admin needs to input the URL, type, points worth, expiration, intervals if needed, and description.	<ul style="list-style-type: none"> <li>- A valid URL</li> <li>- Type: Emotion, After Joined, Before Due Date, Inactive</li> <li>- Points: Any integer <math>\geq 0</math></li> <li>- Expiration: Any integer <math>\geq 0</math></li> <li>- Day Intervals: A string that contains a list of comma separated positive numbers, could also be a singular number.</li> </ul>	<ul style="list-style-type: none"> <li>- URL: <i>Valid:</i> http://nau.co1.QUALTRICS.com/jfe/form/SV_d76g7PRuJTImmY5</li> <li><i>Invalid:</i> Example . com</li> <li>- Type <i>Valid:</i> Before Due Date</li> <li><i>Invalid:</i> If nothing is chosen</li> <li>- Points <i>Valid:</i> 5 <i>Invalid:</i> "Five"</li> <li>- Expiration <i>Valid:</i> 5 <i>Invalid:</i> "Five"</li> <li>- Intervals <i>Valid:</i> 5, 10, 15 <i>Invalid:</i> 5 10 15 or "Five Ten Fifteen"</li> </ul>	<ul style="list-style-type: none"> <li>- If the inputs are not inputted correctly, the survey will either not work as expected or not display to the user at all.</li> <li>- If all input is valid, the survey will be stored in the database.</li> </ul>

<b>Update a Survey</b>	The admin can update an existing survey if they feel they made a mistake or are not satisfied with the previous survey.	Same as above	Same as above	The old survey data will now change to the new survey data and be saved in the database
<b>Delete a Survey</b>	Admin will remove a survey and all of its data from the database.	N/A	Delete button is pressed after entering a survey	Survey and all of its data will be completely removed from the database

### 2.1.5 Pregnancy Updates

Pregnancy updates are updates on a user's pregnancy based on what day they are and tell the user about the baby at that point in time. The table below describes tests to use to ensure the update is added to the database properly so it may be displayed to the user.

<b>Unit Test</b>	<b>Description</b>	<b>Boundary Values</b>	<b>Example Input</b>	<b>Expected Response</b>
<b>Create a Pregnancy Update</b>	In order to create a pregnancy update, the admin must input a day, description, and image.	<ul style="list-style-type: none"> <li>- A valid day: an integer within the pregnancy days range (0 - 240)</li> <li>- A valid description: length <math>\geq</math> 1</li> <li>- A valid image: Any file in an image format (JPG, PNG)</li> </ul>	<ul style="list-style-type: none"> <li>- Day <i>Valid:</i> 239 <i>Invalid:</i> Two</li> <li>- Description: 'The baby is currently this large'</li> <li>- Image: <i>Valid:</i> day249.png <i>Invalid:</i> day249.rtf</li> </ul>	<ul style="list-style-type: none"> <li>- Pregnancy update cannot be created if a field is missing, or an invalid input was entered.</li> <li>- If all fields valid, pregnancy update is created and added to database. Image is uploaded to firebase cloud storage.</li> </ul>
<b>Update Pregnancy Update</b>	Admin can edit any field and update the information.	Same as above	Same as above	Pregnancy update is updated in database with new information. If image is changed, old image is removed from cloud storage

				and new image is uploaded.
<b>Delete Pregnancy Update</b>	Admin deletes a pregnancy update.	N/A	Admin clicks button to delete pregnancy update.	Update is deleted from the database and image is deleted from cloud storage.

### 2.1.6 Analytics

Analytics will provide administrators with information on overall user statistics, which include how much time users spend in certain pages, and how often the page is visited. The information collected will visually be represented in a graph. The table below describes tests that will ensure the analytics are added to the database properly and displayed to the administrators correctly.

<b>Unit Test</b>	<b>Description</b>	<b>Boundary Values</b>	<b>Example Input</b>	<b>Expected Response</b>
<b>Average Page Visit</b>	The administrator will click on the page they would like to get the Average Page Visits from that page and they will enter set dates which will show the average visits on that page	- Valid Start Date: Month Day Year  - Valid End Date: Month Day Year	- Valid Date range input: Start: Jan 27 2020 End: Jan 30 2020	- Example of output: Calendar Average Visits: 234  - If dates are invalid it will let the user know that the dates are invalid  - Average calculated by the date range in the database
<b>Average Page Duration</b>	The administrator will click on the page they would like to get the Average Page Duration from that page	Same as above	Same as above	- Example of output: Calendar Average Page Duration(minutes): 5 Minutes  - Average calculated by the date range in the database  - Dates Invalid: will let

				the user know that the dates are invalid
<b>Users Visit by Time</b>	The administrator will click on the page they would like to get the users that visit the page separated by time from that page	Same as above	Same as above	<ul style="list-style-type: none"> <li>- Expected Output: Graph display of correct information based on dates</li> <li>X: How many users</li> <li>Y: What time of Day</li> <li>- If the dates are invalid: will let the user know that the dates are invalid</li> </ul>

### 2.1.7 Resource Location

Resource locations are places such as hospitals or clinics that a user can find on the mobile application and then go to in person. These are locations that administrators have been able to research and determine they are reliable places to attend. Administrators are able to create, edit, and delete resource locations, which are then displayed to mobile application users through Google Maps. As there are many components to a resource location, the following table tests that some components are properly updated or calculated as data is edited.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Add Resource</b>	Administrator is able to add a resource to be displayed to mobile users.	<b>Required:</b> - A valid title: length $\geq 1$ - A valid content description: length $\geq 1$ - A valid longitude: a long number within the range (-180 - 180 ) - A valid latitude: a long number	- Title: <i>"Saint Joseph Hospital"</i> - Description: <i>"St. Joseph's is a 607-bed, not-for-profit hospital that provides a wide range of health, social and support services"</i> - Longitude: <i>Valid:</i>	-If all fields are valid then the following will be displayed "your location has been added" - If one of the fields are invalid the following will be displayed "There was a problem adding your location" - Location Resource cannot be created if a field is missing, or an

		<p>within the range (-85.05112878 - 85.05112878 )</p> <ul style="list-style-type: none"> <li>- A valid street address: length &gt;= 1</li> <li>- A valid phone number: formatted as ###-###-#### Where each # is an integer (0-9)</li> <li>- A valid operation hours Monday-Friday: length &gt;= 1</li> <li>- A valid operation hours Saturday: length &gt;= 1</li> <li>- A valid operation hours Sunday: length &gt;= 1</li> <li>- Type location has values for the admin to select from <ul style="list-style-type: none"> <li>- Hospital</li> <li>- Clinic</li> <li>- Therapy</li> </ul> </li> </ul> <p><b>Optional:</b></p> <ul style="list-style-type: none"> <li>- A valid note: any string</li> </ul>	<p>-111.651321 <i>Invalid:</i> (empty)</p> <p>- Latitude: <i>Valid:</i> -35.198181 <i>Invalid:</i> (empty)</p> <p>- Street Address: "350 W Thomas Rd, Phoenix, AZ 85013"</p> <p>-Phone Number: "602- 406-3000"</p> <p>-Operation Hours Monday - Friday: " 24 Hours"</p> <p>-Operation Hours Saturday: " 24 Hours"</p> <p>-Operation Hours Sunday: " 24 Hours"</p> <p>Type location: Selected "Hospital"</p>	<p>invalid input was entered.</p> <p>- If all fields are valid, location resource is created and added to the database.</p>
<b>Edit Resource</b>	Administrator is able to edit a resource after it	Same as above	Same as Above	-If all fields are valid then the following will be displayed "your



	has already been created			<p>location has been updated”</p> <ul style="list-style-type: none"> <li>- If one of the fields are invalid the following will be displayed “There was a problem updating your location”</li> <li>- Location Resource cannot be updated if a field is missing, or an invalid input was entered.</li> <li>- If all fields are valid, location resource is updated to the database.</li> </ul>
<b>Delete Resource</b>	Administrator is able to delete a resource	N/A	Calling the function to delete a specific resource	<ul style="list-style-type: none"> <li>-The selected resource is deleted from the database</li> <li>- The selected resource is removed from the list of resources</li> </ul>

Similar to our web application, we will also be performing multiple unit tests on our mobile application. We will discuss our plans for this next.

## 2.2 Mobile Application

The mobile application will only be used by pregnant women that are in recovery for opioid use disorder. This is where they will view and access content being added by administrators as well as chat with other pregnant women in recovery, ask questions in the information desk forum, and more.

### 2.2.1 Account Management

To use the mobile application, users need to create a new account or enter login information for an account they already created. The tests listed in the table below are related to users being able to sign up, login, and edit some of their information in the application.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Login</b>	The login system should only allow users that have a pre-existing, stored account in the database to enter.	<ul style="list-style-type: none"> <li>- A valid email</li> <li>- A valid password: length is <math>\geq 8</math> characters, alphanumeric</li> </ul>	<ul style="list-style-type: none"> <li>- Email: <a href="mailto:bj99@nau.edu">bj99@nau.edu</a></li> <li>- Password: password123</li> </ul>	<ul style="list-style-type: none"> <li>- User is rejected if login input is not stored in database or password for email entered is incorrect.</li> <li>- User is brought to homepage if email and password are correct.</li> </ul>
<b>Validate Code Input</b>	A user is required to enter a unique 6 digit code to access account creation page. An existing code should allow access, and depending on the code, user will be brought to either admin or provider signup.	<ul style="list-style-type: none"> <li>- A valid code: 6 characters, alphanumeric</li> </ul>	<ul style="list-style-type: none"> <li>- Code: DSCQwp</li> </ul>	<ul style="list-style-type: none"> <li>- An invalid code (not a code stored in database), should not bring user to next page.</li> <li>- If code exists in database, app will navigate to appropriate signup page based on code (admin or provider code).</li> </ul>
<b>Account Creation</b>	User account creation requires a unique pseudonym, email, password, due date, security question, and security question answer. Optional inputs	<p><b>Required:</b></p> <ul style="list-style-type: none"> <li>- A valid username: unique and length <math>\geq 1</math></li> <li>- A valid email</li> <li>- A valid password: length is <math>\geq 8</math></li> </ul>	<ul style="list-style-type: none"> <li>- Username: pinkUnicorn</li> <li>- Email <i>Valid:</i> <a href="mailto:bj99@nau.edu">bj99@nau.edu</a></li> <li>- Email <i>Invalid:</i> emailaddress</li> <li>- Password: password123</li> </ul>	<ul style="list-style-type: none"> <li>- Account creation is not allowed if one or more of these is missing, the username is already in use, email is invalid, the password does not fit criteria, or zip code is not a zip code.</li> </ul>

	are a location and bio.	characters, alphanumeric - Security question choice - A valid security question answer: string of length $\geq 1$  <b>Optional:</b> - A valid location: zip code format - A bio: any string	- Location: <i>Valid:</i> 86001 <i>Invalid:</i> 339 or 'Flagstaff' - Bio: 'Hi, I am a first time mother.'	- Signup is valid and user account is created if all form values have been filled and fit the criteria, admin is added to database.
<b>Edit Account Information - Email, Password, Bio, Location</b>	Selected user information can be managed by the user in case it changes.	Possible values include: - New email: a valid email - New password: A valid password: length is $\geq 8$ characters, alphanumeric - New bio - New location: A valid location: zip code format	- Email <i>Valid:</i> bja99@nau.edu <i>Invalid:</i> emailaddress - Password: password123 - Bio: 'Hi, I am a first time mother.'	Information is updated in the database if input is valid.

### 2.2.2 Chatroom

When users sign up, they are placed into a cohort based on what month they are expecting to deliver. The chatrooms are based on these cohorts, one for each month. In the chatroom, users will be able to other users that are also in their cohort. The table below shows how we are testing users sending messages in the chatroom.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Send a Chat Message</b>	A user can send a message to their cohort chatroom.	- A valid message: string of length $\geq 1$	- Message: 'Hello everyone'	- User cannot send a message if message is empty.  - If message is not empty, user can send message. The message will be displayed in in the chatroom with their username and profile picture. Message is added to database

### 2.2.3 Calendar

The calendar is a place where users can create reminders for medication consumption, appointments, and other events. The user will receive a notification on their phone for the time they set the reminder to. They will also be able to edit existing events and delete an event.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Add Event</b>	Add event button is clicked, and event information is entered in box. Second "Add Event" button is clicked and the event will now show up on the calendar and schedule a notification.	- Valid event title: string of length $\geq 1$  -Valid event details: string of length $\geq 1$  -Valid start time (chosen with time-picker): 0-23 hours, 0-59 minutes  -Valid end time (chosen with time-picker): 0-	- Title: 'Birthday Party'  - Details: 'My 22nd birthday'  - Start: 3/26/2020 12:00  - End: 3/26/2020 5:00	- Event cannot be created if title or details is missing.  - Event will display on the calendar, notification will appear at the selected time.

		23 hours, 0-59 minutes		
<b>Delete Event</b>	Users will be able to delete an event.	N/A	An event is clicked on which calls a function to delete the specific event.	Event is deleted from local storage, and no longer appears on the calendar. The notification is also deleted.
<b>Edit Event</b>	Users can edit an event, and details about the event are changed.	<ul style="list-style-type: none"> <li>- Valid event title: string of length <math>\geq 1</math></li> <li>-Valid event details: string of length <math>\geq 1</math></li> <li>-Valid start time (chosen with time-picker): 0-23 hours, 0-59 minutes</li> <li>-Valid end time (chosen with time-picker): 0-23 hours, 0-59 minutes</li> </ul>	<ul style="list-style-type: none"> <li>- Title: 'Take Medication'</li> <li>-Details: 'Remember to take medicine now'</li> <li>-Start: 3/27/2020 7:00</li> <li>-End: 3/27/2020 7:05</li> </ul>	<ul style="list-style-type: none"> <li>- Event cannot be created if title or details is missing</li> <li>- Event will display the edited event on the calendar and the old event is replaced, notification will appear at the selected time.</li> </ul>

### 2.2.4 Learning Center

The learning center provides an interactive learning experience to pregnant women in recovery. Each learning module contains either a video or PowerPoint, usually followed by a set of quiz questions for the user to answer. The learning center is where learning modules that were added by the administrator are displayed to users. If the user fits the criteria for a certain learning module (i.e., the weeks of pregnancy that it should be visible to users), then the user will be able to tap into the learning module to watch a video or view a PowerPoint and answer quiz questions.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Quiz Submissions</b>	Once a user taps on the submit button for a quiz, the number of correct quiz questions are correctly calculated and reward points are added to a user's profile.	As all answer selections will be multiple choice, and users can choose to not select them, the submitted answer will be an empty or non-empty string	- Question 1 answer selection: 'choice1'  -Question 2 answer selection: "	The answer selection for each question is checked against the correct answer for that question. If the answer is correct, the number of correct quiz questions is incremented and the reward points for this quiz question should be counted
<b>Reset Recurring Modules</b>	If a learning module is showing up as a new recurrence (e.g., showed up in week 34 for 4 days and is now showing up in week 36), the module shows up as a new module. Quiz attempts are reset.	- Current learning module: A learning module object to check  - Previous user visibility: an array of strings or empty array  - Current user visibility: an array of strings or empty array  - Stored date: a string of a date in MM/DD/YYYY format	- Current learning module: <learning module object>  -Previous user visibility: []  - Current user visibility: ["uV45w", "t9mJi2"]  -Stored date: '04/01/2020'	Using the passed in information, this function will correctly detect whether a learning module is appearing as a new recurrence and accordingly reset local storage associated with this specific learning module, so it appears as a new module.

### 2.2.5 Surveys

Surveys in the mobile application are questionnaires for users to take and provide feedback or input on topics such as their feelings, experiences with recovery and iMATter, or habits. Surveys also allow for the user to earn points upon completion. Users will be taken to a linked Qualtrics survey when they click a button to take the survey, which they will complete and then return to

the iMATter application when pressing the 'x'. The following table will go into more detail about the interaction of the user with the survey on the mobile application.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Take/Submit a Survey</b>	User clicks on take survey button and is submitted on exiting	N/A	- "Take Survey" button is pressed, calls function to direct to Qualtrics link  - "X" or "done" button is pressed after survey is finished, redirected back to iMATter	User is taken to survey web link and after taking the survey, they will exit the page and return to iMATter, receiving points.

### 2.2.6 Information Desk

The information desk is where all users can go to ask a provider or admin a question. They have the ability to ask these anonymously, hiding their pseudonym from everyone. Users can also comment on posts.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Submit a post</b>	A user can start a discussion by creating a question.	- A valid title: string of length $\geq 1$  - A valid question: string of length $\geq 1$	- Title: 'Breastfeeding on Methadone'  - Question: 'Is it okay to breastfeed on methadone?'	- User cannot submit a question if either field is empty.  - If neither are empty, user can submit. Question will be displayed in list of question titles and can also be clicked to see the question. Question is added to

				database.
<b>Submit an Anonymous post</b>	A user can start a discussion by creating a question. Here, a user would have selected anonymous on.	<ul style="list-style-type: none"> <li>- A valid title: string of length <math>\geq 1</math></li> <li>- A valid question: string of length <math>\geq 1</math></li> </ul>	<ul style="list-style-type: none"> <li>- Title: 'Breastfeeding on Methadone'</li> <li>- Question: 'Is it okay to breastfeed on methadone?'</li> </ul>	<ul style="list-style-type: none"> <li>- User cannot submit a question if either field is empty.</li> <li>- If neither are empty, user can submit. Question will be displayed in list of question titles and can also be clicked to see the question. Pseudonym shown will be 'Anonymous'. Question is added to database.</li> </ul>
<b>Submit a Comment</b>	An user can enter a comment that will be displayed under a post.	- A valid comment: string of length $\geq 1$	- Comment: 'Hi, I also am having this issue'	<ul style="list-style-type: none"> <li>- User cannot submit comment if nothing is in the form.</li> <li>- If comment is not empty, user can submit. Comment will be displayed. Comment is added to database.</li> </ul>
<b>Submit an Anonymous Comment</b>	An user can enter an anonymous comment that will be displayed under a post. Here, a user would have selected anonymous on.	- A valid comment: string of length $\geq 1$	- Comment: 'Hi, I also am having this issue'	<ul style="list-style-type: none"> <li>- User cannot submit comment if nothing is in the form.</li> <li>- If comment is not empty, user can submit. Comment will be displayed. Pseudonym shown will be 'Anonymous'. Comment is added to database.</li> </ul>



### 2.2.7 Password Recovery

If a user forgets their password, they will need a way to make a new one so they can log in. These users will receive a recovery code sent to their emails, and they can then use this code to reset their password.

Unit Test	Description	Boundary Values	Example Input	Expected Response
<b>Enter Recovery Email</b>	After the user clicks “forgot password” they are prompted to enter their email.	- Valid email entered.	-email: vml56@nau.edu	- If they enter an invalid email, they cannot continue.  - If an existing email in the database is entered, a randomly generated 9-digit code is created and sent to the email address.
<b>Enter Code and New Password</b>	Once the user enters their email, they are taken to a new page where they will enter the code given to them from email, and also the new password they would like to create.	- Valid code: length = 9  -invalid new password: length >=8	-code: 141516987  -password: Passw0rd1@	- If the code is incorrect, the password will not be changed.  - If it is correct, it will go through the database and find the email attached to the code, then go through the users in the database and find the user attached to the email address and change the old password to the new password. It will also erase the code to prevent duplicates.

Knowing that all these components of our software individually function correctly is integral. However, it is also just as important that the individual components can come together and work with one another. So now that we have discussed how we plan to test our software in individual components, we will discuss how we will test our software as one cohesive component.

### 3.0 Integration Testing

Integration testing is taking the components tested in unit testing and testing them together as one system to see if the components are interacting as expected. One major component our integration testing is going to focus on the communications between our mobile and web applications, as users will be viewing and interacting with data and objects that administrators or providers created. Another significant component we will be testing in this section is mobile application to mobile application communication, as users will be interacting with one another in real-time.

#### 3.1 Information Desk

Mobile application users may have a question that they do not want to ask someone in person or in their cohort, so they can go to the information desk to create a post. This post can then be commented on by providers, admins, or other users. They could also view other users' posted questions and see what answers they got. If they have more questions after seeing it, they can add a comment to the post. All questions and comments are uploaded to the Firebase database.

Integration Test	Description	Expected Response
<b>User Creates a Question Post</b>	A user will go to the information desk on the mobile app and add their question.	<ul style="list-style-type: none"> <li>- An email notification is sent to all providers that a new question has been added to the information desk</li> <li>- Users receive push notification that a question has been added.</li> <li>- The question is viewable to all users, providers, and admins.</li> </ul>
<b>User/Provider/Admin Answer a Question</b>	A user, provider, or admin adds a comment to a question post.	<ul style="list-style-type: none"> <li>- Comment is viewable to all users, admins, and providers.</li> </ul>

### 3.2 Chatroom

Mobile app users will be talking to other users in the same cohort in the chatroom. These chats are to be sending in real-time, so the users can see the chats seconds after the chat is sent.

These chats are all uploaded to the Firebase database.

<b>Integration Test</b>	<b>Description</b>	<b>Expected Response</b>
<b>User Sends Message in Cohort Chatroom</b>	A user goes into the chatroom and sends a message.	<ul style="list-style-type: none"><li>- A push notification is sent to all users in the cohort.</li><li>- The message is viewable by users only in the same cohort.</li><li>- Admin can view the message that was sent.</li></ul>

### 3.3 Pregnancy Updates

Pregnancy updates added by the administrator from the web application should be displayed to users of the mobile application, given that the user fits the criteria for the update based on their day of pregnancy.

<b>Integration Test</b>	<b>Description</b>	<b>Expected Response</b>
<b>Administrator Adds Pregnancy Update</b>	An administrator creates a new pregnancy update	<ul style="list-style-type: none"><li>- Pregnancy update information is added to the database.</li><li>- The correct pregnancy update based on the day of the user's pregnancy is retrieved from the database and is viewable to those users.</li></ul>
<b>Administrator Deletes a Pregnancy Update</b>	An administrator deletes a pregnancy update	<ul style="list-style-type: none"><li>- The pregnancy update is removed from the database and is no longer viewable by mobile application users</li></ul>

### 3.4 Learning Module

Learning modules added by the administrator from the web application and marked as active should be displayed to users of the mobile application, given that the user fits the criteria for a certain learning module (i.e., the weeks of pregnancy that it should be visible to users).

<b>Integration Test</b>	<b>Description</b>	<b>Expected Response</b>
<b>Administrator Adds New Learning Module</b>	An administrator creates a new learning module and marks it as active	<ul style="list-style-type: none"> <li>- At least once a day a server job will run. Once this job runs, a push notification will be sent to users that this new learning module is available (if they fit the visibility criteria)</li> <li>- The learning module is made visible to users who fit the visibility criteria</li> </ul>
<b>Administrator Deletes a Learning Module</b>	An administrator deletes a learning module	<ul style="list-style-type: none"> <li>- The learning module is immediately removed from visibility of all users who were able to view and access it, and is deleted from the database</li> </ul>
<b>Administrator Changes an Active Learning Module to Inactive</b>	An administrator changes an active learning module that is currently visible to some users to inactive	<ul style="list-style-type: none"> <li>- The learning module is immediately removed from visibility of all users who were able to view and access it</li> </ul>

### 3.5 Survey

Surveys added by the administrator from the web application come in different types.

Depending on the type or time that the Administrator chooses for the survey will determine if the user is able to see the survey and take it.

<b>Integration Test</b>	<b>Description</b>	<b>Expected Response</b>
<b>Administrator Adds a New Survey</b>	An administrator creates a new survey in the web app	<ul style="list-style-type: none"> <li>- At least once a day a server job will run. Once this job runs, a push notification will be sent to users that this new survey is available (if they fit the visibility criteria)</li> <li>- Users who meet the survey criteria will be able to view it in their available survey page</li> </ul>
<b>Administrator Deletes a Survey</b>	An administrator deletes a survey from the web app	<ul style="list-style-type: none"> <li>- The survey will be removed from all users' available surveys page; it will also be deleted from the database</li> </ul>

### 3.6 Analytics

Mobile application users' page visits will be recorded and used for research in order to analyze and improve user experience in the mobile application. These recordings will be added as soon as the user completes actions in the mobile app (i.e. goes to the chat room page, spends 10 minutes there, then goes to the learning center). These page recordings will be uploaded to the Firebase database.

Integration Test	Description	Expected Response
<b>User Logs In</b>	A user will log in to the mobile application	- A session storage is created in the database that records the user and the time they log in
<b>User Visits a Page</b>	A user decides to visit any page on the mobile application	- A session is created in the database connected to the session storage, this holds the user information, the time stamp, and the page they have visited

### 3.7 Resource Location

Mobile application users will be able to view pins on a Google Maps page with information that will be entered and updated by an administrator. These pins are recommended resources that users can visit and research.

Integration Test	Description	Expected Response
<b>Administrator Adds or Updates a Resource</b>	An administrator has added or updated a resource location	- A pin containing the information provided by the administrator is updated in Google Maps once a user has entered the map. - Resource location is added and or updated to the database
<b>Administrator Deletes a Resource</b>	An administrator has deleted a resource location	- A pin containing the information provided by the administrator is now unviewable to the Google Maps of the user - Resource location is deleted from the database

Another way to test our software even further is to allow users to test the applications. Having users test our applications will allow for further refinements to the system so we may create a great user experience. Next, we will discuss how we plan to test with users.

## **4.0 Usability Testing**

Usability testing is bringing end users into the testing process. Rather than testing our software with code, such as in the previous sections, we will be testing our software by having people use our software. The goal of usability testing is to get feedback on the user interface of our applications and better understand if our applications are intuitive. With this feedback, we can update our applications to be more user friendly. Usability testing can also expose bugs in our software we did not catch with unit or integration testing, so we can also expose those and get them fixed. For our software, this is a significant testing phase, as the demographic for both of our applications is not necessarily those with a lot of technology experience. We need these applications to be as intuitive as possible to create an easy user experience for any that use them.

For usability testing with our applications, we are planning to have at least two different testing phases, ideally with new participants added for each phase. Our first testing phase will be sessions with our team member's choice of individual participants, which could range from roommates to friends or family members. For the second session we will be working with our client, Dr. Eaves, to gather participants from her classes and student researchers she is working with. Our criteria for our participants is as follows:

- **Never seen the application** - The best feedback we can get for user interface and overall user experience is going to be from participants that have not seen our applications. This way, they have no prior understanding or bias to knowing how the applications' features are to be interacted with. We want to be able to get feedback from participants that are brand new to these applications, so we can create a user-friendly experience from the first time opening the applications.
- **Access to an Android smartphone (for mobile app user testing)** - For testing our mobile application, participants in those sessions will need to be able to download the mobile app; therefore, they will need a smartphone to do so. Due to not having the ability to meet in person, the participant will need to have an Android phone so they may download the APK file.
- **Access to a computer with audio capabilities** - Due to the current pandemic and public safety guidelines that have been put in place for Spring 2020, we are unable to do sessions in person. Therefore, our participants will need to be able to access a computer

that has a built-in or external microphone they can use and a USB cable to connect their phone. This will allow for video meetings with the ability to screen share.

As previously stated, for each session we will provide participants with a user manual, attached to the appendix of this document, that they will follow with different scenarios and tasks. The tasks will be presented vaguely, with just a general description of what they should do, as to not influence any of their decisions. We will have the participants walk through the manual while talking through their decisions out loud. We will have two participants work together in one session, as this will help them feel more comfortable talking about their choices out loud, as well as help us see where major flaws in our design are if both participants cannot understand how to complete a task.

To conduct these sessions, we will be using Zoom, a video conference software. With Zoom, we can allow the participants to share the screen of their phone or computer with us, so we can see how they are interacting, and they can talk us through why they are interacting with the software the way they are.

Now that we have covered the general plan for usability testing, we can go into specifics for the mobile and web applications, as they will slightly differ.

## **4.1 Web Application Testing**

For web testing to provide valuable feedback, ideally, we will have different sets of participants for the administrator portal and the provider portal. Participants will be given a link to the website where our web application is being hosted and will then have access to our web application. The user manual participants receive will be specific to the web application, with specialized instructions for the administrator portal as well as the provider portal.

After finding our participants for web administrator portal testing, we will give those participants a link to the website. We will also send them any necessary information or attachments needed for testing, such as PNG files, survey links, YouTube video IDs, etc. Participants will then follow the relevant instructions in the user manual specific to administrator tasks.

Participants for web provider portal testing will also be provided a link to the website. They will then follow provider-specific tasks as outlined in the user manual.

## **4.2 Mobile Application Testing**

After finding our participants for mobile testing, we will allow those participants access to a Google drive folder where an APK file is stored. We will send them the directions they need to

access and download the APK file, as well as any necessary information they may need. The user manual participants receive will be specific to testing the mobile application.

In addition to our previously discussed formal user testing strategy, we will also try to have a more informal testing group with the help of Dr. Eaves and her class. Dr. Eaves will distribute access codes for iMATter to her students with Android devices and ask them to write their feedback in a shared Google document. While not a formal testing session, this will still give us a broader group of users to test the software and we can get more useful feedback about our user interface.

Our goal with the timeline of these sessions is to have the first formal testing session completed before mid-April, and the second formal testing session completed within two weeks after the first. With this, we will have time between the two sessions to implement changes suggested by testers, and also be able to make final edits after the second session prior to the end of the semester.

The results from our plan for usability testing will complement unit and integration testing to provide us with valuable insight into the quality of our application. Usability testing will conclude our software testing process and allow us to make final changes to our application before handing it over to our client.

## **5.0 Conclusion**

The rising rates of pregnant women with opioid use disorder is an issue with potentially serious consequences, as it can result in newborns suffering from short- and long-term complications, including cognitive and behavioral impairments. The number of babies born with a withdrawal syndrome as a result of their mother using opioids before or during pregnancy has increased drastically over the years in the United States. To help combat this, pregnant women with opioid use disorder who want to start on the path to recovery are immersed in comprehensive treatment programs. However, while many women begin treatment, the intensity of the requirements of traditional treatment programs has caused relapse rates to be relatively high.

Through her research as a medical anthropologist, our client Dr. Emery Eaves has found that the major obstacles that contribute to high relapse rates of pregnant women with opioid use disorder are: the number of weekly appointments and obligations, lack of information access, and lack of social support. To help address these obstacles and improve the recovery process for these women, we have developed an application called iMATter.

iMATter is aimed at revolutionizing opioid treatment by leveraging modern web and mobile technologies to make effective treatment accessible to thousands of women, many of which currently have no practical options. Specifically, pregnant women in opioid recovery who live in



rural areas or who don't have access to reliable transportation have an especially difficult time completing the requirements of treatment programs. Our product will help pregnant women in recovery receive social support, provide them ways to learn about recovery and pregnancy, and give them resources to aid in their recovery. We aim to help these women feel heard and safe, as well as provide a way for them to talk about exactly what they are going through without being judged. In order to ensure that iMATter is a secure, reliable, and functional product, we have set guidelines to test the quality and security of our mobile and web applications.

In this document, we have presented a detailed outline of our plan for performing software testing and have provided in depth examples of tests that we will be implementing. As a team, we broke down the main functionalities of both our mobile and web applications to develop tests to ensure that each unit of code is performing as expected and continues to be reliable. We have planned for three types of testing: unit, integration, and usability testing. Each type of testing has the potential to uncover unexpected behavior or bugs that the other types of testing cannot find as easily. Unit testing ensures that individual pieces of code works as it should, which helps find bugs in separate components. Integration testing ensures components work together and communicate properly, which we are testing by checking components that need to communicate with one another, such as our real-time chatroom and database. Finally, with our usability tests, we will have real users give feedback on aspects of our application that could be improved to better the user experience. Using our results from these three types of testing, we will make changes to improve the quality of our software and user experience.

With our software testing plan, we are confident that we can make improvements to iMATter and create a better experience for users than we currently are. Our team is very optimistic and extremely excited with the progress we have been making in regard to being on track with completing project requirements and creating a mobile application that will provide a revolutionary method of support for the recovery process for many pregnant women with opioid use disorder. After using our test results to enhance the functionality of iMATter, this application will be a powerful tool that will provide pregnant women in recovery with a safe environment, social support, and educational material to help guide them to a successful recovery.

# Appendix

## *User Manuals:*

### **iMATter Mobile Application User Manual:**

Hello, thank you for participating in the iMATter application testing process.

In order to properly test our iMATter mobile application, we have come up with a list of actions for you to perform. We ask that you follow these actions and perform them to the best of your ability. If you are unable to perform the action, please do not worry and just continue to the next task.

#### *Terms to know:*

**Administrator/Admin:** an administrator is someone that has been asked by the owner of the iMATter application to help add users, create new data to be added to the app, answer questions on the information desk, and more.

**Provider:** a provider is someone that has been asked by an administrator to help answer questions in the information desk. These providers will be people that have experience with helping other people with their opioid recovery programs.

To begin, we ask that you put yourself in the following mindset:

*You are a pregnant woman that has been entered into an opioid recovery program for a month. You live in a small town, where the closest clinics and meeting places for counseling are over an hour away. You have to travel to appointments daily on top of trying to keep up with your job. Your social group is small, as you had to disassociate yourself from those around you that were supporting your addiction. One day while leaving the methadone (medication given to people in opioid recovery programs to combat their addiction) clinic, you are given a flyer that describes iMATter, a mobile application that aims to take recovery out of the physical space and into a mobile, virtual environment. You see that they are recruiting women like you to use this application, and as it is currently in a research phase, you can earn points by participating in in-app surveys and completing learning activities to redeem gift cards. You also see a list of key features on the application, including: daily pregnancy updates; a group chat room based on due month; an information desk forum where you can ask providers (i.e. clinic workers, nurses, etc.) questions; a learning center where activities can be taken and points can be earned; surveys to take for points; a way to redeem points for gift cards. You are intrigued and decide that this application could help you significantly. You go home, call the number listed on the flyer where the administrator you have talked to has given you a code to allow access to the app, and download the application.*

With this in mind, we ask you to perform the following based on the information that has been provided before the list of actions:

## **Sign Up and Login:**

### *Sign Up*

You have been given the code \_\_\_\_\_ from the person you talked to on the phone. You open the iMATter application for the first time.

#### Please do the following:

- Find where you are supposed to go to create a new account and go there.
- Follow the instructions on screen to use the code provided.
- Once at the signup page, do the actions you see asked for to sign up for the app.

### *Login*

You have now completed the sign-up process and saw the message that told you your account has been successfully created.

#### Please do the following:

- Enter your information to login to the application.

## **Update Emotion:**

You have successfully logged into the application, you see an area that has a selection of emojis, where above it says 'Currently I am feeling: '.

#### Please do the following:

- Update your current emotion to happy.
- Update your current emotion to sad.

## **Surveys:**

Next you decide to provide some useful information about your current situation and how you have been dealing with things. You decide to take a survey.

#### Please do the following:

- Navigate to the Surveys page
- Enter the "Analyzing Current Situation" survey
- Take the survey and go back to the Home Page

## **Learning Center:**

You recall that one of the features of this application was learning materials that would provide helpful information for your pregnancy and recovery. You decide to see what kind of materials are available.

#### Please do the following:

- Navigate to the Learning Center.
- Enter into the Care for Pregnant Women With Opioid Use Disorder module.
- After viewing the video in this module, take the quiz.
- If you did not get all questions correct, retake the quiz until you receive full points.
- Proceed to the next module. It is not necessary to watch the video or take the quiz here.

- Return to the learning center page.
- Enter into the Rise in Neonatal Abstinence Syndrome module.
- Look through the powerpoint and answer the quiz questions once.

### **Redeem Points:**

As a beginning user of this application, there is a system in place that you can earn points for completing learning modules and surveys in the application. You can redeem these points once you have reached the required amount.

Please do the following:

- While on the home page, find and navigate to the profile page.
- View how many points you currently have - note if you can redeem or not.
- (Here, the person running the session will add enough points to the user's profile so they may redeem.)
- Exit and then enter again.
- Redeem the points.

### **Edit Profile:**

You are still in the profile section of the application. You decide you want to change your password.

Please do the following:

- Perform the action to allow you to change your password.
- Enter the information asked for to change your password.
- Confirm the password change.

### **Chat Room:**

After a long day of appointments and work, you are at home and decide you want to talk to someone to feel better. You go to the chat room in iMATter to talk to your cohort.

Please do the following:

- Note if you can tell if another user is in the chat room or if no one is.
- Send a simple message to your cohort.
- There is a message that can be seen in the chat room that was sent from a different user in your cohort. Go to their profile.
- After viewing their profile, go back to the chat room.

### **Calendar:**

You have some appointments coming up soon, and some medications that you want to set reminders for. You go to the calendar section to add them.

Please do the following:

- Add a new calendar event to remind yourself to take medication for an hour from now.
- Add another event for an appointment tomorrow.
- Delete the appointment event.

- Edit the medication event to remind yourself to take your medication 10 minutes from now.

## **Information Desk:**

It is later in the afternoon after your prenatal care clinic has already closed. You have a question, so you go to the information desk in iMATter.

### *Ask a Question*

You want to ask a question about whether or not methadone can affect your baby. The question is 'How can taking methadone affect my baby?'

#### Please do the following:

- Find where you need to go to create a new post.
- Enter the information needed to create a new post.
- Submit the new post.
- View the post you just submitted.

### *Find Existing Question*

You want to see what other users have already asked about methadone.

#### Please do the following:

- Search for posts where the title contains 'methadone'
- View the post.

### *Add a Comment on a Post*

In the previous step you were asked to find a post related to methadone and view it. On this post you see that an answer has been added, but you have another question about the answer you see. You feel embarrassed asking the clinic worker to elaborate, so you want to comment anonymously.

#### Please do the following:

- Enter the comment 'Could you please explain why?'
- Choose to comment anonymously.
- Submit the comment.

### *View a Provider's Profile*

In the same post where you saw a clinic worker answer, you decide you want to know more about that worker, such as their experience.

#### Please do the following:

- Go to the provider's profile.
- View their information.
- Go back to the post you were viewing.

## **Resources:**

### *Interact with the Map*

You would like to set up an appointment at a Clinic but are not sure which clinics are recommended and friendly. You go to the resource in iMATter to find some resources.

#### Please do the following:

- Select any location
- View the location information
- Zoom out
- Exit location

### *Suggest a Location*

You have recently been to a clinic that you wish would be on the resources in IMATter. You go to the resource in iMATter to suggest a location.

#### Please do the following:

- Follow instructions to suggest a location the following location
  - Arizona Maternity and Women's Clinic
- Submit your location
- Return to the page you were on

## **Settings:**

After having this application for a few days, the notifications begin to get a bit too much for you having them all on. You go to settings to turn off some notifications.

#### Please do the following:

- Turn off information desk notifications.

## **Report a Problem:**

You are going to the information desk, when you notice that for some reason none of the posts are visible to you. Go to report a problem to let administrators know.

#### Please do the following:

- Enter the information required to report a problem.
- Submit the problem.

## **Reset Password:**

You have just opened up the application again, and realize you forgot your password. Now you must reset your password.

#### Please do the following:

- Instead of logging in, navigate to the forgot password section.
- Enter your email address and continue.
- Check your email for the recovery code.
- Enter the recovery code as well as your new password.
- Log into the app with your new password.

## **Web App – Administrator User Manual:**

Hello, thank you for participating in the iMATter application testing process.

In order to properly test our iMATter mobile application, we have come up with a list of actions for you to perform. We ask that you follow these actions and perform them to the best of your ability. If you are unable to perform the action, please do not worry and just continue to the next task.

*Terms to know:*

**Administrator/Admin:** an administrator is someone that has been asked by the owner of the iMATter application to help add users, create new data to be added to the app, answer questions on the information desk, and more.

**Provider:** a provider is someone that has been asked by an administrator to help answer questions in the information desk. These providers will be people that have experience with helping other people with their opioid recovery programs.

To begin, we ask that you put yourself in the following mindset:

*You have been recruited as an administrator for iMATter. With this new position, you know that you will be doing some of the following: adding and managing users, providers, and other administrators; creating content for the mobile app, such as learning modules, surveys, and pregnancy updates; answering questions in the information desk; monitoring chats and information desk posts/comments; manage the information received in the inbox; manage resources; manage general app settings. Another administrator has provided you with a code so that you may sign up for your administrative account.*

With this in mind, we ask you to perform the following based on the information that has been provided before the list of actions:

### **Sign Up and Login:**

*Sign Up*

You have been given the code \_\_\_\_\_ from the administrator. You go to the iMATter website for the first time.

Please do the following:

- Find where you are supposed to go to create a new account and go there.
- Follow the instructions on screen to use the code provided.
- Once at the signup page, do the actions you see asked for to sign up for the app.

*Login*

You have now completed the sign-up process and saw the message that told you your account has been successfully created.

Please do the following:

- Enter your information to login to the application.

## **Manage Users:**

As an admin, you will be able to view all users, providers, and admins.

### *Create New Provider*

A provider was recently asked to help with iMATter. You are given their information and told to create a new provider.

Please do the following:

- Go to the list of providers.
- Add a new provider.
- Input the following required information for the provider:
  - Provider Type: Nurse
  - First Name: Bianca
  - Last Name: Altman
  - Email: biancaaltman246@gmail.com
  - Birth Date: 09/04/1993
- Submit the new provider information.
- Note that you can see the code that should be given to the provider.

## **Pregnancy Updates:**

Every day, mobile app users will have a new pregnancy update that includes a picture and a description.

### *Create New Pregnancy Update*

Your job is to create a new pregnancy update for day \_\_\_\_\_. You have been provided with an image and the description '\_\_\_\_\_'. Go to the page to manage pregnancy updates.

Please do the following:

- Click the button that allows you to create a new pregnancy update.
- Add the required information to create the update.
- Submit the completed update.

### *Update An Existing Pregnancy Update*

Your next job is to update the pregnancy update for day \_\_\_\_\_ with a new description. The description is '\_\_\_\_\_'.  
\_\_\_\_\_

Please do the following:

- Go to the pregnancy update for day\_\_\_\_\_.
- Add the new description.
- Update the pregnancy update.

## **Learning Modules:**

To help the pregnant women in recovery who are using the mobile application learn more about pregnancy and recovery, you want to provide some informational materials for them to look at. To incentivize them to complete these materials, they will receive reward points upon completion.



Please do the following:

- Navigate to Learning Modules.
- Create a new learning module. This learning module will be centered around the contents of the following video:
  - [https://www.youtube.com/watch?v=a262xL9\\_VPI](https://www.youtube.com/watch?v=a262xL9_VPI)
- Fill out the fields with whatever you feel is best suited to this module, with the following guidelines in mind:
  - This module should be visible to women who are 15, 20, 25, and 30 weeks pregnant. It should be available to them for one week before it expires.
  - There should be two quiz questions that are worth 3 points apiece. These questions may ask anything.
  - There does not need to be another module linked to this one.
  - This module must be active.
- Once the fields are filled out, add this new learning module.
- Return to Learning Modules.
- View the contents of the module, Mother with Opioid Use Disorder.
- Make this module active.
- Add the sentence, "The quiz will appear after the video is finished" to the module contents.
- Delete the quiz question for this module.

## **Surveys:**

To obtain feedback from recovering pregnant women using the mobile application, you want to provide a quick questionnaire that asks them some basic questions and helps you learn more about them. To incentivize them to open up, provide them with some reward points that they will receive upon taking the survey.

Please do the following:

- Navigate to Surveys
- Fill out the fields how you would like, but with the following guidelines:
  - The survey should be available to women 7, 14, and 21 days after joining, and it should be available for 5 days before it expires
  - The survey should be worth 5 points
  - Provide the following link:  
[http://nau.co1.qualtrics.com/jfe/form/SV\\_d76g7PRuJTmMmY5](http://nau.co1.qualtrics.com/jfe/form/SV_d76g7PRuJTmMmY5)
- Once filling out the fields, add this survey
- Return to the Survey page
- View the contents of the Survey, "Providing Feedback", update any fields you would like
- Then delete the survey "Providing Feedback"

## **Chat Room:**

In order to ensure no negative social dynamics are forming, one job as an admin is to go through chats in the chat room. Today, you will be going through the 'March' cohort chat room. Go to the chat log page to begin.

Please do the following:

- Go to the chat log for March.
- Search for the term 'hate' in the chat log.
- Delete the chat that comes up.

## **Information Desk:**

You get on iMATter to help users by answering their questions.

*Find A Question to Answer*

You have knowledge on how opioid recovery programs run and you want to help answer questions that involve this topic.

Please do the following:

- Search for posts where the title contains 'program'
- View the post.

*Answer the Question*

In the previous step you were asked to find a post related to the term program and view it. You find that you will be able to answer this question, so you go to add an answer.

Please do the following:

- Add the answer 'Generally, programs can take either 30, 60, or 90 days' to the post.

## **Inbox:**

The inbox allows you to see user submitted problems and location suggestions. You decide to get started on reading these.

*View Problem Report*

A user has reported a problem.

Please do the following:

- View the problem
- Delete the problem from the inbox

*View Location Suggestion*

Users have the option to suggest a resource location that they like for admins to be able to add to a map of trusted resources. A user has submitted a new location that they like.

Please do the following:

- View the location - do not delete, as this can be looked at again for adding a new resource to the map

## **Resources:**

As an admin, you are able to help women using the IMATter find resources they can trust. You recently found a new clinic that you want to let users know about. Navigate to the resource page.

Please do the following:

- Add a new resource with the following exact information:
  - “Arizona Materity and Women's Clinic”
  - “Arizona Maternity and Women's Clinic, is Top Quality Female OB/GYN and Gynecologist in Surprise Arrowhead, Avondale, and Glendale AZ.”
  - 14961 W Bell Rd Ste 175, Surprise, AZ 85374
  - (623) 547-7205
  - Hours:
    - Monday 8AM - 5PM
    - Tuesday 8AM - 5PM
    - Wednesday 8AM - 5PM
    - Thursday 8AM - 5PM
    - Friday 8AM - 5PM
    - Saturday CLOSED
    - Sunday CLOSED
  - You can look up the information for the clinic and follow instructions to add the resource
- Submit your resource
- You realized you spelled something wrong on a resource title, edit the resource to fix it
  - Arizona Maternity and Women's Clinic
- You are looking through the resources and realize you no longer want to have the resource you created as a resource, delete it

## **Settings:**

In the settings, admins can change many different aspects of the mobile app and also the web app. You will be updating a few of these today.

### *Update Email for Gift Card Redemptions*

You need to change the email for the person that is receiving emails about users redeeming points for gift cards.

Please do the following:

- Open the gift card redemption settings
- Open the email for gift card redemptions.
- Update the email to 'biancaaltman246@gmail.com'

### *Add a New Provider Type*

A new provider type has needs to be added to the list of provider types, as a new provider is a volunteer, but this is not on the list.

Please do the following:

- Open the settings for providers.
- Open the settings for provider types.
- Add a new provider with the name 'volunteer' and the provided image named 'green\_star.png'.
- Submit the new provider type.

### **Reset Password:**

You have just opened up the application again, and realize you forgot your password. Now you must reset your password.

Please do the following:

- Instead of logging in, navigate to the forgot password section.
- Enter your email address and continue.
- Check your email for the recovery code.
- Enter the recovery code as well as your new password.
- Log into the app with your new password.

## **Web App – Provider User Manual:**

Hello, thank you for participating in the iMATter application testing process.

In order to properly test our iMATter mobile application, we have come up with a list of actions for you to perform. We ask that you follow these actions and perform them to the best of your ability. If you are unable to perform the action, please do not worry and just continue to the next task.

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**Provider:** a provider is someone that has been asked by an administrator to help answer questions in the information desk. These providers will be people that have experience with helping other people with their opioid recovery programs.

To begin, we ask that you put yourself in the following mindset:

*You are a clinic worker in an opioid recovery clinic, which you have been working at for about 5 years. You have been recruited as a provider for iMATter. With this new position, you know that you will be answering questions in the information desk. An administrator has provided you with a code so that you may sign up for your provider account.*

With this in mind, we ask you to perform the following based on the information that has been provided before the list of actions:

### **Sign Up and Login:**

*Sign Up*

You have been given the code \_\_\_\_\_ from the administrator. You go to the iMATter website for the first time.

Please do the following:

- Find where you are supposed to go to create a new account and go there.
- Follow the instructions on screen to use the code provided.
- Once at the sign up page, do the actions you see asked for to sign up for the app.

*Login*

You have now completed the sign-up process and saw the message that told you your account has been successfully created.

Please do the following:

- Enter your information to login to the application.

## **Information Desk:**

You get on iMATter to help users by answering their questions.

### *Find A Question to Answer*

Your knowledge and experience is in knowing about how methadone can affect a woman's pregnancy. You go to find questions to answer about methadone.

Please do the following:

- Search for posts where the title contains 'methadone'
- View the post.

### *Answer the Question*

In the previous step you were asked to find a post related to methadone and view it. You find that you will be able to answer this question, so you go to add an answer.

Please do the following:

- Add the answer ' \_\_\_\_\_ ' to the post.

## **Reset Password:**

You have just opened up the application again, and realize you forgot your password. Now you must reset your password.

Please do the following:

- Instead of logging in, navigate to the forgot password section.
- Enter your email address and continue.
- Check your email for the recovery code.
- Enter the recovery code as well as your new password.
- Log into the app with your new password.