Deliverable #1 Template: Software Requirement Specification (SRS)

SE 3A04: Software Design III – Large System Design

Tutorial Number: T03
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1   Introduction

1.1   Purpose

The purpose of the SRS is to have a description and identification of the software to create *PolyCare* successfully [1]. The intended audience for the SRS would be the developers and relevant stakeholders.

1.2   Scope

Our solution, *PolyCare,* consists of three main software components working together to provide an early indication of Polycystic Ovary Syndrome (PCOS). First, there's a Symptom Chat Expert (powered by a large language model) that walks users through questions about their symptoms and provides a preliminary probability score. Second, the Blood Test Analyzer collects blood work results (ex. hormone levels) to estimate PCOS likelihood. Lastly, the Ultrasound Scan Visual Model processes ultrasound images to detect cysts and returns its own probability of PCOS.

While these three pieces combine to give a user-friendly probability estimate, it's important to note that our software does not replace professional healthcare advice or run lab tests itself—it only evaluates the data or images that users provide. Our main goal is to help women gain an earlier indication of whether they may be experiencing PCOS so they can decide if a visit to their doctor is necessary. By offering a quick, user-friendly assessment tool, we hope to raise awareness, speed up self-screening, and ultimately encourage more informed discussions between patients and medical professionals.

1.3   Definitions, Acronyms, and Abbreviations

- *AI:* **artificial intelligence** - It is technology that simulates human learning and cognition and performs tasks accordingly [10].
- *Androgen*: A hormone that is involved in developing male sex organs [2].
- *BAT:* **Testosterone bioavailable** - the total free and albumin-bound testosterone that is available to act on tissues and is present in the bloodstream [5].
- *BE:* Business event
- *DHEA sulfate test:* **Dehydroepiandrosterone sulfate test** - A blood test that measures the levels of DHEA sulfate in your bloodstream. DHEA sulfate is a steroid hormone produced by the adrenal glands in both sexes [8].
- *Glc:* **Glucose** - A type of carbohydrate that is necessary for cellular function [7].
- *HbA1c test:* **Haemoglobin A1c test** - A blood test used to measure the average blood glucose levels over the past 90 days [6].
- *HIP*: Health insurance and healthcare provider [16].
- *IR:* **insulin resistance** - It is a phenomenon where cells in your body become unresponsive to the effects of insulin and as a result, the target cells fail to take up free glucose in the bloodstream [9].
- *LLM:* **large language model** - An AI model that can understand and generate human language [12].
- *MINC:* **Medical Identification Number Canada** - An identifier assigned to doctors in Canada [15].
- *ML:* **machine learning** - A subfield of artificial intelligence where machines use data to continuously improve without being explicitly programmed [11].
- *NP:* **nurse practitioner** - registered nurses who have additional training which allows them to diagnose and treat illnesses [14].
- *ONE ID*: An identifier used by healthcare service providers.
- *OS:* **operating system -** a software that acts as an interface between a machine and user and manages the machine's resources [13].
- *PCOS:* **Polycystic Ovary Syndrome** - A hormonal disorder that affects women of childbearing age where androgen is in excess and there may be ovarian dysfunction [3].

- *TST:* **Testosterone** - Male sex hormone responsible that plays a major role in development of male sexual characteristics and organs. Women produce testosterone as well and it is necessary for ovarian function, bone strength and libido [4].
- *US:* Ultrasound
- *HCN:* Health card number
- *Govt:* government

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1.5 Overview

This SRS consists of 5 other sections, in addition to this introductory one. Section 2 focuses on the overall description of the product, with specific focus on the product's perspective with other related products, the product's functions, general characteristics of the intended users, product constraints, assumptions/dependencies, and the apportioning of requirements.

Section 3 has a Use Case Diagram that discusses the various use cases of our system.

Section 4 covers our primary business events and viewpoints, combining them into a global scenario and providing overall highlights of our system's functional requirements.

Section 5 contains the system's non-functional requirements, as well as their respective rationale, from the following categories: Look and Feel, Usability and Humanity, Performance, Operational and Environmental, Maintainability and Support, Security, Cultural and Political, and Legal.

The final Division of Labour section breaks down each group member's contributions to this deliverable.

2   Overall Product Description

2.1   Product Perspective

Polycystic ovarian syndrome (PCOS) is a prevalent hormonal disorder affecting around 8-13% of women in their reproductive years [17]. *PolyCare* is an android mobile health app that is primarily for females of reproductive age who are experiencing PCOS symptoms but have not yet been diagnosed. *PolyCare* falls under the category of women's health apps, such as *Flo* and *Clue*. While these existing apps provide ways to monitor female menstrual cycles and to gain insights into their reproductive health, they don't specifically target PCOS and its countless symptoms that are related to menstrual cycles, such as insulin resistance and metabolic disturbances. However, *PolyCare* focuses on helping females identify PCOS symptoms. The product will require users to insert their hormonal symptoms they are feeling daily, like that of existing apps, such as *Flo* and *Clue*. Additionally, the product will allow users to create, edit, update, and remove existing profiles to be able to utilize the app and customize it to their liking. This is like how other women's health apps create customized online identities.

Unlike existing applications, the product will calculate the likelihood of PCOS by conducting a blood test analysis, in which users are prompted to upload their blood test results to identify elevated levels of glucose, testosterone, and bile salt biomarkers. Additionally, the product will have a ML model assess ultrasound results, which are uploaded by the user, to detect multiple cysts within the ovaries. *PolyCare* will use a combination of the above to estimate the likelihood of PCOS.

The product also functions by creating partnerships with healthcare practitioners, making it unique on the market.

Data Layer:
- Central database with a table for accounts, associated with each result item (in its own table).

Business Logic:
- Using the various agents, including blood test analysis, LLM interaction and a ML image classifier.
- The final forum consolidates the three agents' results to display a result to the user.

External API:
- There is one external API which is utilized for the LLM agent using an *OpenAI* model.

User Interface:
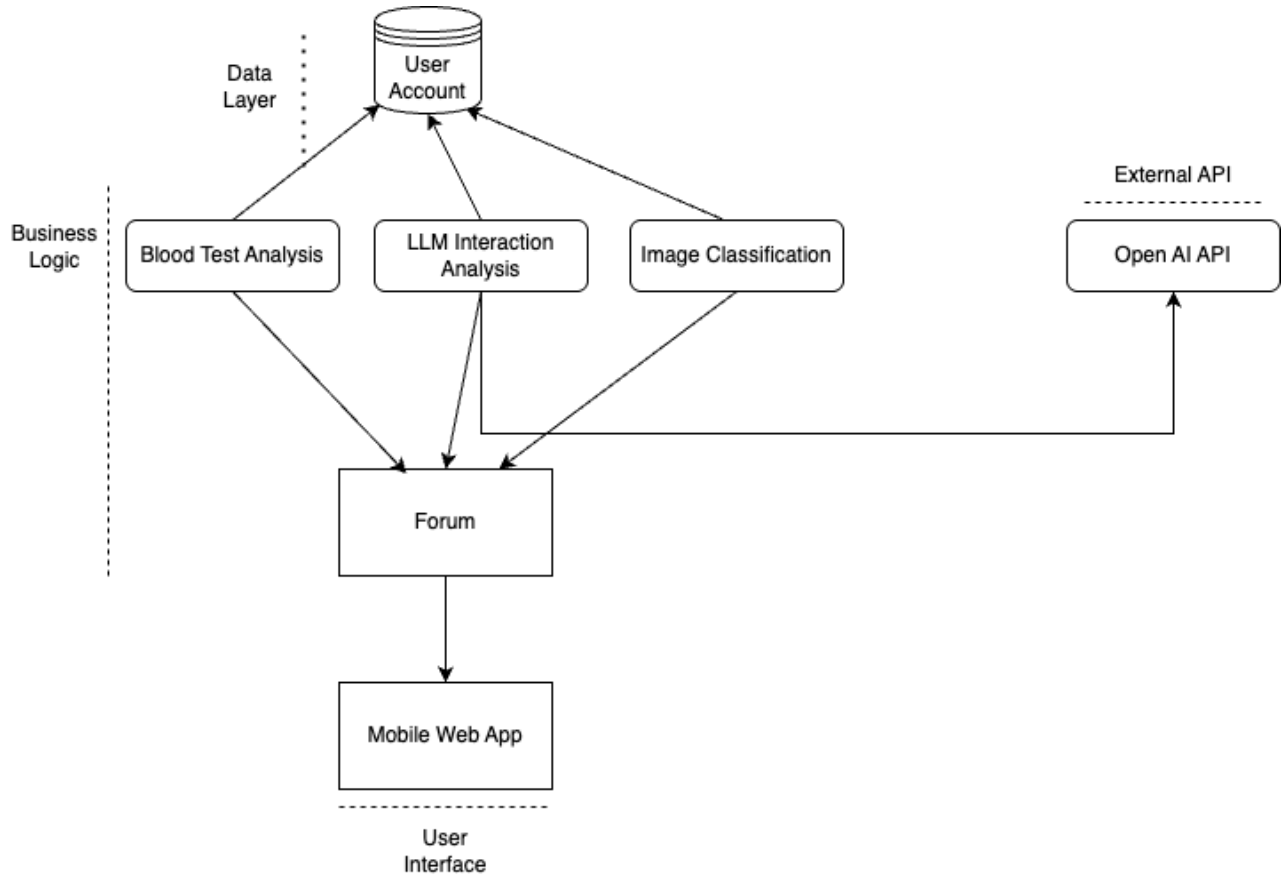- The final forum decision is then presented to the user on the UI of the app.

Figure 1. System Diagram.

2.2 Product Functions

In this project, there will be 4 main modules, which are: Account Management Service, Symptom & Result Upload System, PCOS Likelihood Calculation Service, and Result Viewer Service. For the Account Management Service, the primary functionalities will include creating, logging into, updating, and deleting a user account. Within the Symptom & Result Upload System, the main functions are discussing symptoms experienced, entering blood test results, and uploading ultrasound images. Regarding the PCOS Likelihood Service, the major functionalities are calculating the likelihood percentages from discussed symptoms, blood test results, ultrasound images, and then calculating the overall PCOS likelihood. The Results Viewer Service functions are viewing the calculated overall likelihood of PCOS as well as the individually calculated likelihoods (symptoms, blood test, ultrasounds), recommendations to see a physician, lifestyle recommendations for managing symptoms, saving results, and exporting results.

Our system's innovative feature is providing lifestyle recommendations for managing PCOS symptoms. Since PCOS has no treatment, and information can sometimes be conflicting/difficult to ascertain from sources like the internet, having clear information on how to manage PCOS can help them take positive steps towards mitigating their symptoms, improving their overall quality of life.

| Module	Functions
Account Management Service	- Create Account - Users can create a new account. - Login To Account - Users can login and logout of their existing account. - Update Account - Users can update information about their existing account (ex. Change password). - Delete Account - Users can delete their existing account, with the option to save/export their results prior to deletion.
Symptom & Result Upload System	- Discuss Symptoms - Users can discuss experienced symptoms. - Enter Blood Test Results - Users can enter relevant data from the results of their blood test. - Upload Ultrasound Images - Users can upload images of their ultrasound.
PCOS Likelihood Calculation Service	- Calculating Likelihood Percentage (Symptoms) - Calculates likelihood of PCOS from discussed symptoms. - Calculating Likelihood Percentage (Blood Test) - Calculates likelihood of PCOS from analysis of biomarkers in blood test results. - Calculating Likelihood Percentage (Ultrasound) - Calculates likelihood of PCOS from analysis of ultrasound images. - Calculating Overall PCOS Likelihood - Calculates overall percent likelihood of PCOS from the three previous likelihood percentages.
Result Viewer Service	- Viewing Calculated Likelihood of PCOS - Users can view the calculated overall likelihood of PCOS, as well as the three standalone likelihood percentages. - Recommendation to See a Physician - Users will receive a recommendation to see a physician. - Lifestyle Recommendations for Managing Symptoms (Innovative Feature) - Users will receive recommendations for managing PCOS symptoms they are experiencing. - Saving Results - Users will be able to save their results locally. - Exporting Results - Users will be able to send their results to a trusted third-party (e.g. physician, health insurance provider).
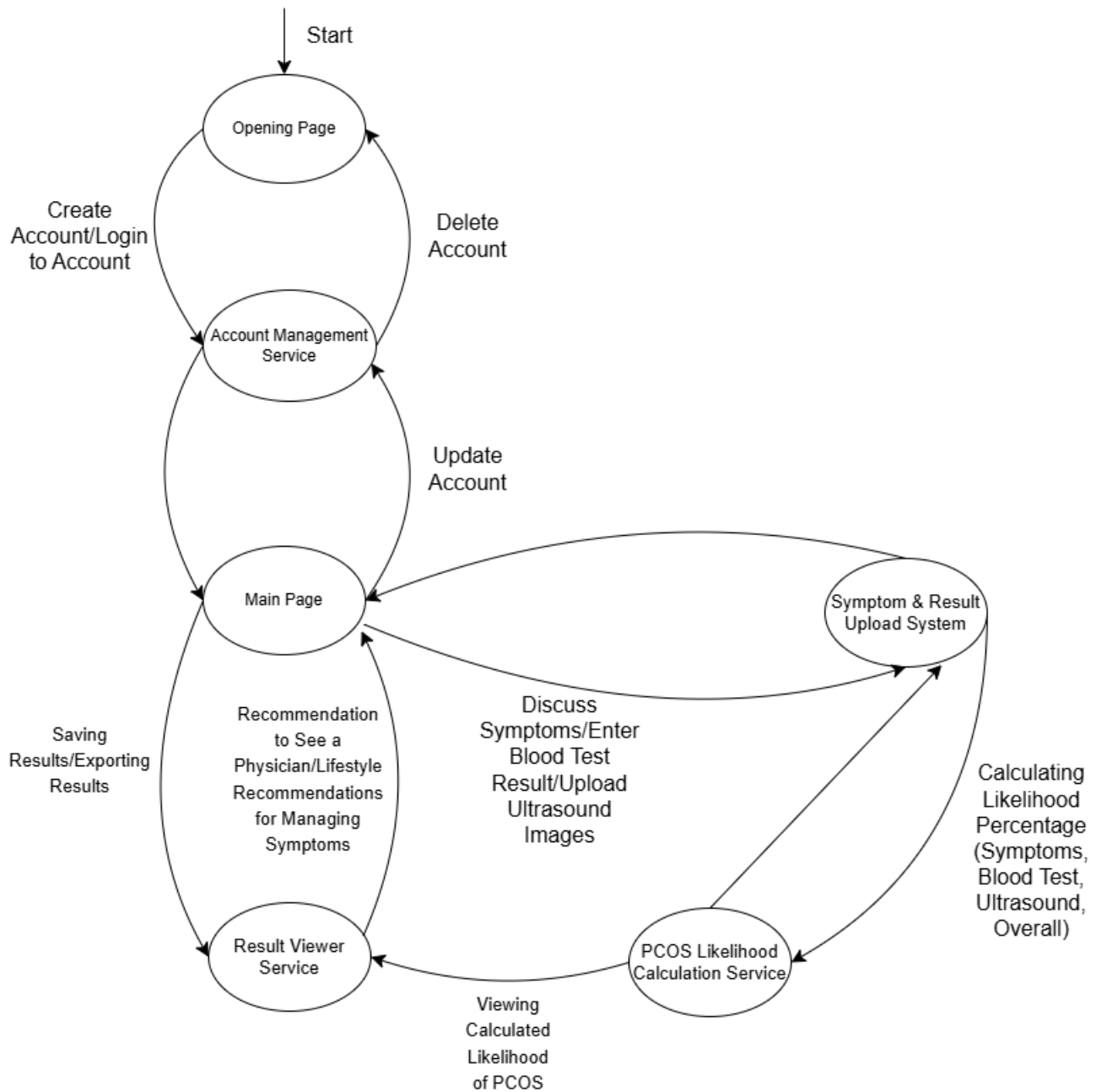
Figure 2. State Diagram.

2.3 User Characteristics

Our primary audience includes women of reproductive age from diverse backgrounds who are interested in understanding their risk for PCOS. Most users will likely have at least a high school education but may not possess any specialized medical knowledge. To account for different levels of familiarity with health and technology, we've identified two main user types:

1. **Base User**

The base users would be individuals who suspect they may have PCOS based on personal symptoms or test results. They typically have basic to moderate computer literacy and would prefer clear, straightforward instructions.

Rationale: This group represents the bulk of our users, so our design and language should remain simple and jargon-free.

2. Health Professional or Caregiver

Users who may have a slightly higher interest or background in health topics, such as nursing students, caregivers, or those who have researched PCOS extensively. They might be more comfortable interpreting data and understanding medical terms.

Rationale: Providing detailed explanations and optional advanced insights serves users who want a deeper look at their results without overwhelming more casual users.

Beyond our primary end-users, two additional user types who may interact with specific parts of our system:

1. Physician

A practicing doctor might use the app to review probability outcomes, helping them decide if further diagnostic steps or referrals are necessary.

Rationale: Physicians need quick access to clear summaries of test results, so our design must include a concise, medically relevant overview without unnecessary technical jargon.

2. Health Insurance Representative

Insurance personnel may request access to summary data to process claims or determine coverage.

Rationale: They require standardized, secure documentation to verify medical necessity and handle administrative procedures, so we must ensure data formats and privacy measures align with industry guidelines.

2.4 Constraints

- Healthcare related-software is limited by how up to-date the research it relies on is. There are continuous developments in the field of endocrinology and women's health, and as a result, the information provided by the app has the potential of being out of date. Updates will be made to the software, however, there are no strict deadlines for those updates.
- Any recommendations made by the app are **not** concrete diagnoses. Consultation with the relevant healthcare provider is needed to diagnose any conditions.
- A sufficiently large dataset is required for some functionalities to operate correctly. For example, a sufficiently large dataset is required to determine the bounds of testosterone levels necessary for a diagnosis. The ML/AI component also requires a sufficiently large data set to be trained for its accuracy.
- The resulting prototype of the app will be dependent on time constraints. Money constraints will not play a role because our team will be using open-source packages and will not be making any purchases. The budget is 0 dollars.
- This requirements document may need to be updated as new information and functionalities are added to the project.
- There is no guarantee that all physicians or HIPs are on the app.

2.5 Assumptions and Dependencies

- It is assumed the operating system that the software will be running on is an Android device. The SRS will assume this android device will be able to use the app.
- It is assumed that the android device being used has a display on the screen, as the application being developed will have a GUI that requires physical navigation. It is also assumed the user will be using the app via touchscreen.
- It is also assumed while the user will be using the application, they are connected to the internet. As many business events require an interaction to third party servers or even the database we maintain, Wi-Fi is needed.

- The app is dependent on an *OpenAI* model.
- The user has done the required blood test to formulate a probability result with their biometric values.
- It is assumed that the user may have accessibility needs that are already addressed by Android devices and there will not be any innovative accessible functionality needed.
- It is assumed that the user is experiencing at least one or more PCOS symptoms.
- It is assumed that the user has recently obtained an ultrasound of their ovaries and that the image has been uploaded by the user to the system.
- It is assumed that the app will only be available and run in Ontario, Canada, and does not breach any privacy laws.
- It is assumed that the app has the access to any 'saved passwords' on the device it is running on (for saving login credentials).
- All functionalities in the app are free to use.
- The app will not integrate in-app advertising for any purpose (e.g. generating revenue).
- It is assumed that users have a valid Ontario health card.
- If the user deletes their record on the app, it does not affect their health records present at hospitals or the Ministry of Health.
- It is assumed that the relevant government organization will provide all identifiers needed for verification purposes within the app (Health Card Number, MINC, ONE ID).
- It is assumed that communication with any external services or apps is secure.

2.6 Apportioning of Requirements

1. App Availability
   - The app will only be available for Android devices for the first version of the system. The app may be available for iOS devices for future versions.
   - The app will be developed incrementally to stay up to date with the newest Android devices.

2. Additional Medical Consultation
   - The app may include an option for users to have scheduled one-on-one virtual medical consultations with nurse practitioners. This will be done by partnering with local clinics to provide telehealth services. A user can request a consultation only once during their subscription.

3. Medication Tracking
   - The app may partner with pharmacy services to track prescription use and refills, reminding users when to take medication associated with PCOS symptoms
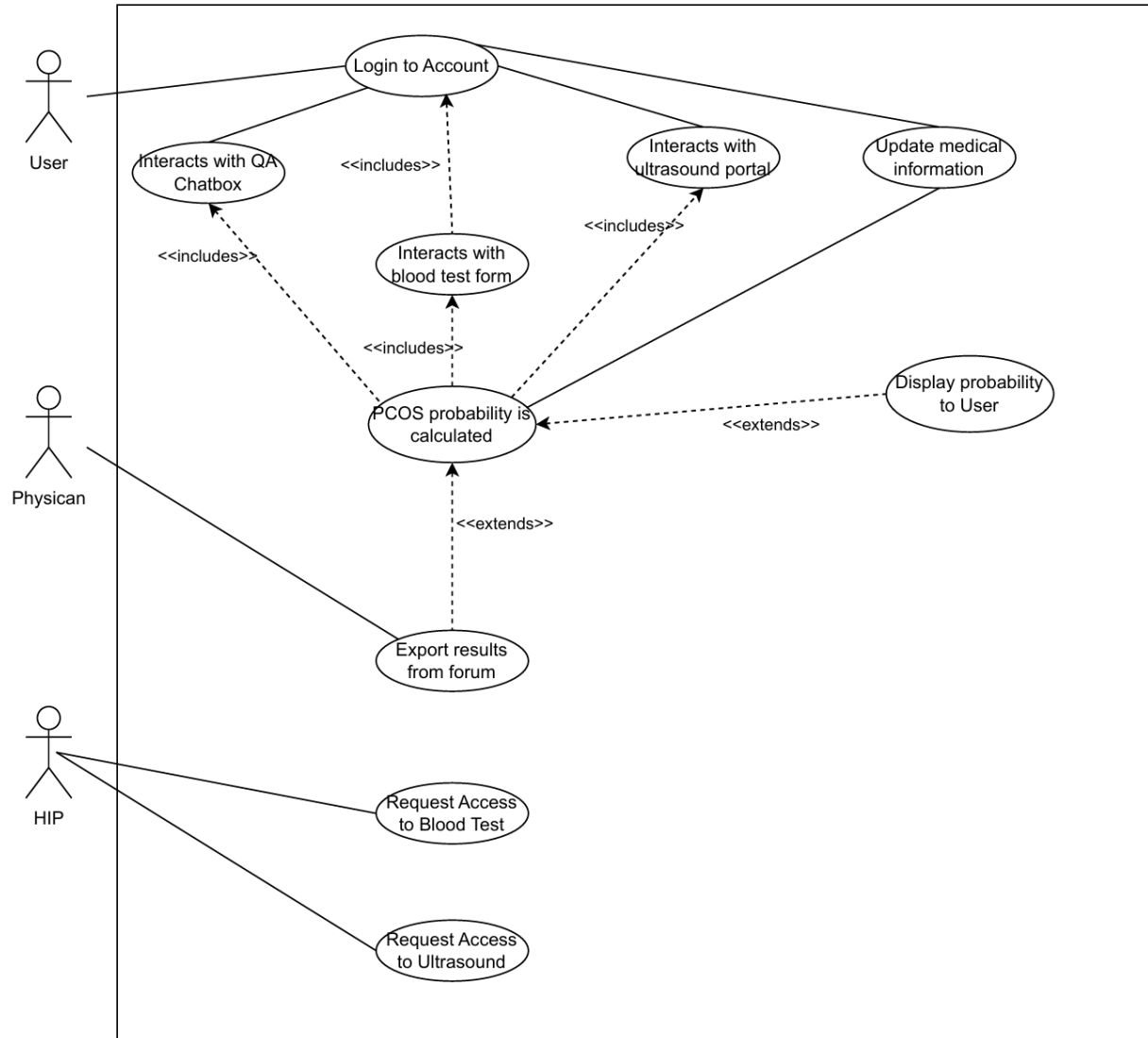
3 Use Case Diagram

Figure 3. Use Case Diagram.

4   Highlights of Functional Requirements

BE1: User (patient) wants to create an account on the app.

Pre-condition: The user has downloaded and opened the app on their Android device.

VP 1: Patient #1

Main Success Scenario:
1. The user clicks on the 'sign up as patient' button on the app.
2. The user is redirected to the app sign up page where user information is entered.
3. The user types in their information into the app sign up page.
4. The system checks whether the user already has an account on the app or not, using their health card ID, and redirects accordingly.
5. The user does not have an account corresponding to the health card ID number in the system and proceeds to the account creation screen.
6. The system verifies whether the user's birthday, and name match the official records corresponding to the health card ID.
7. The system successfully completes all verification.
8. See BE1.VP4.1-2.
9. The user is redirected to the homepage of the app with a 'Account successfully created' message at the top of the page.

Secondary Scenario:

4i) System finds an account that is already on the database.

> 4i.1) The app informs user that 'account already exists'

> 4i.2) The app asks the user whether they forgot their login ID, or they want to reset their password.

> 4i.3)

>> 4i.3.1i) The user selects '**forgot login ID**'.

>> 4i.3.1ii) The app prompts the user to enter their email.

>> 4i.3.1.iii) The app displays the message, 'If there is an account associated with that email, you will receive your login ID in your email. If you have not received it in the next 2 hours, please contact app support'.

>> 4i.3.1. iv) The system checks whether the email entered is in the database or not.

>>> 4i.3.1.iv.1) The user clicks on 'Contact app support' on the app startup page because they have not received their login ID.

>> 4i.3.2.i) The user selects '**reset password**'.

>> 4i.3.2.ii) The app requests the user to enter their email address.

>> 4i.3.2.iii) The app displays 'if there is an account associated with that email, a link will be sent to reset your password'

>> 4i.3.2.iv) The user receives the 'reset password' link in their email and successfully changes their password.

6i) The health card ID number is invalid or does not exist.

> 6i.1) The app displays 'The health card ID number is invalid or does not exist'.

7i) System fails to verify credentials and displays 'Contact app support'.

8i) See BE1.VP4.1i-2i

VP2: Family Physician #2

NA

VP3: HIP #3

NA

VP4: Privacy #4

Main Success Scenario:
1. At the end of the account creation by the user, a pop up will be displayed on the screen: 'Please accept the terms and conditions and Privacy Policy'.
2. The user accepts the privacy policy and terms and conditions.

Secondary Scenario:

1i) The user clicks on the hyperlink which redirects to a page with the privacy policy and terms and conditions.

    1i.1) The user clicks 'Back' to return to the privacy policy acceptance request page.

2i) The user does not accept the privacy policy or terms and conditions.

Global scenario:

Pre-condition: The user has downloaded and opened the app on their Android device.

Main Success Scenario:
1. The user clicks on the 'sign up as patient' button on the app.
2. The user is redirected to the app sign up page where user information is entered.
3. The user types in their information into the app sign up page.
4. The system checks whether the user already has an account on the app or not, using their health card ID, and redirects accordingly.
5. The system does not have an account corresponding to the health card ID number and proceeds to the account creation screen.
6. The system verifies whether the user's birthday, and name match the official records corresponding to the health card ID.
7. The system successfully completes all verification.
8. At the end of the account creation by the user, a pop up will be displayed on the screen: 'Please accept the terms and conditions and Privacy Policy'.
9. The user accepts the privacy policy and terms and conditions
10. The user is redirected to the homepage of the app with a 'Account successfully created' message at the top of the page.

Secondary Scenario:

4i) System finds an account that is already on the database (which is the cause of the account signup failing).

    4i.1) The app informs user that 'account already exists'

    4i.2) The app asks the user whether they forgot their login ID or they want to reset their password.

    4i.3)

        4i.3.1i) The user selects 'forgot login ID'.

        4i.3.1ii) The app prompts the user to enter their email.

        4i.3.1.iii) The app displays the message 'If there is an account associated with that email, you will receive your login ID in your email. If you have not received it in the next 2 hours, please contact app support'.

        4i.3.1. iv) The system checks whether the email entered is in the database or not.

            4i.3.1.iv.1) The user clicks on 'Contact app support' on the app startup page because they have not received their login ID.

        4i.3.2.i) The user selects 'reset password'.

        4i.3.2. ii) The app requests the user to enter their email address.

4i.3.2.iii) The app displays 'if there is an account associated with that email, a link will be sent to reset your password'

4i.3.2. iv) The user receives the 'reset password' link in their email and successfully changes their password.

6i) The health card ID number is invalid or does not exist.

6i.1) The app displays 'The health card ID number is invalid or does not exist'.

7i) System fails to verify credentials and displays 'Contact app support'.

9i) See BE1.VP4.1i-2i

BE2: Family physician creates an account.

Pre-condition: The user (physician) has downloaded and opened the app on their Android device.

VP1: Patient #1
NA

VP2: Family Physician #2
Main Success Scenario:
1. Physicians click on 'sign up as a doctor'.
2. Physicians enter their name, date of birth and MINC in the 'MINC' field.
3. System successfully verifies their MINC.
4. User is redirected to the homepage of the app with a 'Account successfully created' message at the top of the page.
5. Physicians are now able to view the patients' who have registered relevant records on the app.

Secondary Scenario:
3i) System unable to verify MINC.
4i) See BE1.VP1.4i

VP 3: HIP #3
NA

VP4: Privacy #4
See BE1:VP4

Global Scenario:
Pre-condition: The user has downloaded and opened the app on their Android device.
Main Success Scenario
1. Physicians click on 'sign up as a doctor'.
2. Physicians enter their name, date of birth and MINC in the 'MINC' field.
3. System successfully verifies their MINC.
4. The user accepts the privacy policy and terms and conditions.
5. The user is redirected to the homepage of the app with a 'Account successfully created' message at the top of the page.
6. Physicians are now able to view the patients' who have registered relevant records on the app.

Secondary Scenario
3i) System unable to verify MINC.
4i) See BE1:VP4: 2i
5i) See BE1: VP1: 4i

BE3: Health insurance/healthcare provider (HIP) creates an account.

Pre-condition: The user (Health insurance/healthcare Provider) has downloaded and opened the app on their Android device.

VP1: Patient #1
NA

VP2: Family Physician #2
NA

VP 3: HIP #3
Main Success Scenario:
1. The providers click on 'sign up as a Health insurance/healthcare Provider'.
2. The providers enter their name and ONE ID in the 'ONE ID' field.
3. The system successfully verifies their ONE ID.
4. Provider is redirected to the homepage of the app with a 'Account successfully created' message at the top of the page.

Secondary Scenario:
3i) System unable to verify ONE ID.
4i) See BE1.VP1.4i

VP4: Privacy #4
See BE1.VP4

Global Scenario:

Pre-condition: The user has downloaded and opened the app on their Android device.
Main Success Scenario
1. The providers click on 'sign up as a HIP'.
2. The providers enter their name and ONE ID in the 'ONE ID' field.
3. The system successfully verifies their ONE ID.
4. The providers accept the privacy policy and terms and conditions.
5. Provider is redirected to the homepage of the app with a 'Account successfully created' message at the top of the page.

Secondary Scenario
3i) System unable to verify ONE ID.
4i) See BE1.VP4.2i
5i) See BE1: VP1: 4i

BE4: User (patient/family physician/healthcare provider) updates their account.
Pre-condition: User should have an account on the app and have accessed it successfully. The user is currently using the app on their Android device.

VP1: Patient #1
Main Success Scenario
1. The user navigates to the 'Settings' page.
2. The user clicks on the 'edit info' button on the current page.
3. The editable information is displayed in a text box with a flashing cursor.
4. Once the user has added or changed their information, they can click the 'save' button.
5. The modified page is displayed.

Secondary Scenario
4i) The system is unable to save the information entered by the user.

VP2: Family physician #2
If a physician is accessing the app as a user: see VP1.
Else: NA

VP3: HIP #3
If the provider is accessing the app as a user: see VP1.
Else: NA

VP4: Privacy #4
NA

Global Scenario
Pre-condition: User should have an account on the app and have accessed it successfully. The user is currently using the app on their Android device.

Main Success Scenario
1. The user navigates to the 'Settings' page.
2. The user clicks on the 'edit info' button on the current page.
3. The editable information is displayed in a text box with a flashing cursor.
4. Once the user has added or changed their information, they can click the 'save' button.
5. The modified page is displayed.

Secondary Scenario
4i) The system is unable to save the information entered by the user.

BE5: User (patient/family physician/HIP) changes password. For this scenario, the 'patient' is the user.
Pre-condition: User has an account on the app and is currently using the app.

VP1: Patient #1
Main Success Scenario
1. The user clicks on the 'change password' option on the startup page of the app.
2. The app asks the user to input their old password followed by 2 other fields to input their new password.
3. The user clicks on 'change password'.
4. A pop-up that has the message 'password changed' is displayed on the screen.
5. System accesses the user's entry in the database and changes the 'password' field.

Secondary Scenario
1i) The user navigates to the 'Settings' tab when they are already logged in and clicks on the 'change password' option on the page.
3i) The old password that the user typed in is incorrect.
      3i.1) The app redirects the user to a screen with a message that says, 'Click here if you forgot your password'.
      3i.2) The app asks the user to enter their name, date of birth and email.
      3i.3 - 3i.4) See BE 1.VP 1.4i.3.1.iii - 4i.3.1. iv.
      3i.5) The user clicks on 'Contact app support'
5i.1) The system fails to authenticate the entered information.
5i.2) The app displays "Account does not exist. Contact app support."

VP2: Family Physician #2
If a physician is accessing the app as a user: see BE5.VP1.
Else: NA

VP3: HIP #3
If the provider is accessing the app as a user: see BE5.VP1
Else: NA

VP4: Privacy #4
NA

Global Scenario
Main Success Scenario
1. The user clicks on the 'change password' option on the startup page of the app

2. The app asks the user to input their old password followed by 2 other fields to input their new password.
3. The user clicks on 'change password'.
4. A pop-up that has the message 'password changed' is displayed on the screen.
5. System accesses the user's entry in the database and changes the 'password' field.

Secondary Scenario:
1i) The user navigates to the 'Settings' tab when they are already logged in and clicks on the 'change password' option on the page.
3i) The old password that the user typed in is incorrect.
       3i.1) The app redirects the user to a screen with a message that says 'Click here if you forgot your password'.
       3i.2) The app asks the user to enter their name, date of birth and email.
       3i.3 - 3i.4) See BE 1. VP 1. 4i.3.1.iii - 4i.3.1. iv.
       3i.5) The user clicks on 'Contact app support'
5i.1) The system fails to authenticate the entered information.
5i.2) The app displays "Account does not exist. Contact app support."

BE6: The user (patient) deletes account from the system.
Pre-condition: The user has an account on the app and is currently using the app on their Android device.

VP1: Patient #1
Main Success Scenario
1. The user navigates and clicks on the 'Settings' button from the app's homepage.
2. The user clicks on their profile icon and is redirected to their personal information.
3. The user then scrolls down the page and clicks on the 'Delete account' button.
4. The app displays the message 'Are you sure?'.
5. Once the user clicks 'Yes' to the message above, they are redirected to the login page.
6. The user's profile with all the relevant information is deleted from the database.

Secondary Scenario
6i) The account is not deleted (network/technical issue).

VP2: Family Physician #2
Main Success Scenario
1. The physician logs into the app with their credentials (loginID and password).
2. The physician navigates to the search bar and clicks on the 'Search' button.
3. System requests physician to verify MINC.
4. System successfully verifies all credentials.
5. The physician navigates to the 'Search' button and types in the patient's name.
6. There is no record of the patient present.

Secondary Scenario:
3i) System fails to verify physician credentials.
       3i.1) Physician has input an incorrect value in one of the fields.
       3i.2) Physician's MINC is invalid.

VP3: HIP #3
See BE6. VP2. Replace 'MINC' with 'ONE ID' and 'family physician' with 'HIP'.

VP4: Privacy #4
NA

Global Scenario
Pre-condition: The user has an account on the app and is currently using the app on their Android device.

Main Success Scenario
1. The user navigates and clicks on the 'Settings' button from the app's homepage.

2. The user clicks on their profile icon and is redirected to their personal information.
3. The user then scrolls down the page and clicks on the 'Delete account' button
4. The app displays the message 'Are you sure?'
5. Once the user clicks 'Yes' to the message above, they are redirected to the login page.
6. The user's profile with all the relevant information is deleted from the database.
7. The family physician or HIP logs into the app with their credentials (loginID and password)
8. The physician or HIP navigates to the search bar and they click on the 'Search' button.
9. The family physician or HIP enters their MINC/ONE ID for verification.
10. System successfully verifies the credentials.
11. The physician or HIP navigates to the 'search' toolbar and types in the patient's name or health card number.
12. There is no record of the patient present.

Secondary Scenario
6i) The account is not deleted (network/technical issue).
9i) System fails to verify physician or HIP status.
       9i.1) The physician or HIP has input an incorrect value in one of the fields.
       9i.2) The physician's MINC or HIP's ONE ID is invalid.

BE7. The family physician deletes their account on the app.
Pre-condition: The family physician has an account on the app and is currently using the app on their Android device.

VP1: Patient #1
Main Success Scenario
1. The patient logs in using the app with their login ID and password.
2. The patient navigates to the 'search' bar and clicks on the 'Search' button.
3. The system requests the patient to verify their health card number.
4. The patient types in the name of the physician they are looking for.
5. The page displays the message 'No results found'.

Secondary Scenario
1i) The patient's credentials are invalid.
3i) See BE7.VP1.1i
5i) The physician's account is not deleted and the system displays a result.

VP2: Family physician #2
Main Success Scenario
1. The user (physician) navigates and clicks on the 'Settings' button from the app's homepage.
2. The user clicks on their profile icon and is redirected to their personal information.
3. The user then scrolls down the page and clicks on the 'Delete account' button.
4. The app displays the message 'Are you sure?'.
5. Once the user clicks 'Yes' to the message above, they are redirected to the login page.
6. The user's profile with all the relevant information is deleted from the database.

Secondary Scenario
6i) The account is not deleted (network/technical issue).

VP3: HIP #3
See BE7.VP1 (substitute 'health card number' with 'ONE ID' and 'patient' with 'HIP')

VP4: Privacy #4
NA

Global Scenario
Pre-condition: User has an account on the app and is currently using the app on their Android device.

Main Success Scenario
1. The user (physician) navigates and clicks on the 'Settings' button from the app's homepage.
2. The user clicks on their profile icon and is redirected to their personal information.
3. The user then scrolls down the page and clicks on the 'Delete account' button
4. The app displays the message 'Are you sure?.'
5. Once the user clicks 'Yes' to the message above, they are redirected to the login page.
6. The user's profile with all the relevant information is deleted from the database.
7. The patient or HIP logs using the app with their login ID and password.
8. The patient or HIP navigates to the 'search' bar and clicks on the 'Search button'.
9. The system requests to verify their health card number/ONE ID.
10. The patient or HIP type in the name of the physician they are looking for.
11. The page displays the message 'No results found'.

Secondary Scenario
6i) The account is not deleted (network/technical issue).
7i) The patient's or HIP's credentials are invalid.
9i) See BE7.VP1 ('health card number/ONE ID' and 'patient'/HIP')

BE8. The HIP deletes their account on the app.
Pre-condition: User (HIP) has an account on the app and is currently using the app on their Android device.

VP1: Patient #1
Main Success Scenario
1. The patient logs using the app with their login ID and password.
2. The patient navigates to the 'search' bar and clicks on the 'Search' button.
3. The system requests the patient to verify their health card number.
4. The patient types in the name of the insurance/provider that they are looking for.
5. The page displays the message 'No results found'.

Secondary Scenario
1i) The patient's credentials are invalid.
3i) See BE8.VP1.1i
5i) The provider's account is not deleted and displays results.

VP2: Family physician #2
See BE8.VP1 (substitute the stakeholder 'patient' with 'family physician')

VP3: HIP #3
See BE7.VP2 (substitute the stakeholder 'family physician' with 'HIP')

VP4: Privacy #4
NA

Global Scenario
Pre-condition: User (HIP) has an account on the app and is currently using the app on their Android device.

Main Success Scenario
1. The user (HIP) navigates and clicks on the 'Settings' button from the app's homepage.
2. The user clicks on their profile icon and is redirected to their personal information.
3. The user then scrolls down the page and clicks on the 'Delete account' button
4. The app displays the message 'Are you sure?'
5. Once the user clicks 'Yes' to the message above, they are redirected to the login page.
6. The user's profile with all the relevant information is deleted from the database.
7. The patient or family physician logs using the app with their login ID and password.
8. The system requests the user to verify health card number/MINC.
9. The patient or family physician goes to the 'search' bar and types in the name of the HIP they are looking for.
10. The page displays the message 'No results found'.

Secondary Scenario
6i) The account is not deleted (network/technical issue).
7i-8i) The patient's or physician's credentials are invalid.

BE9. Blood Test Result form interaction.
Pre-Condition: The user has their blood test results available. Blood test results have necessary glucose, testosterone, and bile salt biomarker levels ready. The user is already logged into their personalized account.

VP1. Patient #1

Main Success Scenario:
1. User clicks on the 'Blood Test Analysis' button on the app.
2. User is redirected to the Blood Test Analysis page where blood test information is to be entered.
3. User types in their glucose, testosterone, and bile salt levels in their respective section of the blood test form by referencing their blood test results. Users can enter some fields that are optional, such as Hemoglobin A1C, etc.
4. System verifies the user's identity by prompting them for their health card number.
5. The user's health card number matches the one in the user profile database.
6. System records the values and saves them into the account database.
7. User has successfully input their blood test levels into the Blood Test Analysis section of the app.
8. User is redirected to the homepage of the app with a 'Blood test results have successfully been submitted' message at the top of the page.

Secondary Scenario:

3i. User attempts to enter blood test information after already doing so.

 3i.1 The app informs the user that 'Blood test results have been submitted'.

 3i.2 The app informs the user the most recent submission date.

 3i.3 The app asks the user if their blood test results have changed or not.

 3i.4 **User selects 'Change of blood test results.'**

  3i.4.i System verifies the user's identity by prompting them for their health card number.

  3i.4.ii The app prompts the user to select which biomarker has changed.

  3i.4.iii The user inputs the selected biomarker and changes the value accordingly.

  3i.4.iv The system saves the new results into the account database.

  3i.4.v The app displays 'Changes saved successfully' and redirects to the home page.

5i. Health card ID number is invalid or does not exist.

 5i.1 The system displays 'The health card ID number is invalid or does not exist'.

VP2. Family Physician #2

Main Success Scenario:
1. The family physician on record has been sent the user's blood test probability on request.
2. The family physician receives the results.
3. The family physician makes an informed decision based on the blood test probability on whether the user should be referred to a specialist.

Secondary Scenario:

1i. No record of family physician on file.

 1i.1 System does not send out blood test probability.

VP3. HIP #3

Main Success Scenario:
1. Request to see user blood test probability to provide insurance.
2. Access to the user blood test probability has been granted.

Secondary Scenario:

2i. Access to the user blood test probability has been denied.

      2i.1 The system informs the user that 'Health Insurance has been denied access to blood test results.'

      2i.2 The system re-directs the user to the application's home page.

VP4. Privacy #4

At the end of uploading the blood test results by the user (before clicking 'Submit'), see BE1.VP4.

Global Scenario:

Pre-Condition: The user has their blood test results available. Blood test results have necessary glucose, testosterone, and bile salt biomarker levels ready. The user is already logged into their personalized account.

Main Success Scenario:
1. User clicks on the 'Blood Test Analysis' button on the app.
2. User is redirected to the Blood Test Analysis page where blood test information is to be entered.
3. User types in their glucose, testosterone, and bile salt levels in their respective section of the blood test form by referencing their blood test results. Users can enter some fields that are optional, such as Hemoglobin A1C, etc.
4. System verifies the user's identity by prompting them for their health card number.
5. The user's health card number matches the one in the user profile database.
6. System records the values and saves them into the account database.
7. User has successfully input their blood test levels into the Blood Test Analysis section of the app.
8. User is redirected to the homepage of the app with a 'Blood test results have successfully been submitted' message at the top of the page.
9. The family Physician on record has been sent the user's blood test probability on request.
10. The family physician receives the results.
11. The family physician makes an informed decision based on the blood test probability on whether the user should be referred to a specialist.
12. Request to see user blood test probability to provide insurance.
13. Access to the user blood test probability has been granted.

Secondary Scenario:

3i. User attempts to enter blood test information after already doing so.

      3i.1 The app informs the user that 'Blood test results have been submitted'.

      3i.2 The app informs the user the most recent submission date.

      3i.3 The app asks the user if their blood test results have changed or not.

      3i.4 **User selects 'Change of blood test results.'**

            3i.4.i System verifies the user's identity by prompting them for their health card number.

            3i.4.ii The app prompts the user to select which biomarker has changed.

            3i.4.iii The user inputs the selected biomarker and changes the value accordingly.

            3i.4.iv The system saves the new results into the account database.

            3i.4.v The app displays 'Changes saved successfully' and redirects to the home page.

5i. Health card ID number is invalid or does not exist.

      5i.1 The system displays 'The health card ID number is invalid or does not exist'.

9i. No record of family physician on file.

       9i.1 System does not send out blood test probability.

13i. Access to the user blood test probability has been denied.

       13i.1 The system informs the user that 'Health Insurance has been denied access to blood test results.'

       13i.2 The system re-directs the user to the application's home page.

BE10. Ultrasound Portal form interaction.
Pre-Condition: The user has their ultrasound results available. The user is already logged into their personalized account.

VP1. Patient #1

Main Success Scenario:
1. User clicks on the 'Upload Ultrasound' button on the app.
2. User is redirected to the Upload Ultrasound page where a scanned image of the ultrasound is to be uploaded.
3. The User uploads a scanned image of their ultrasound.
4. System verifies the user's identity by prompting them for their health card number.
5. The user's health card number matches the one in the user profile database.
6. System records the image and saves it into the account database.
7. User has successfully uploaded their ultrasound image into the Upload Ultrasound section of the app.
8. User is redirected to the homepage of the app with a 'Ultrasound has successfully been submitted.' message at the top of the page.

Secondary Scenario:

3i. User attempts to upload their ultrasound after already doing so previously.

       3i.1 The app informs the user that 'Ultrasound results have already been submitted'.

       3i.2 The app informs the user of the most recent submission date.

       3i.3 The app asks the user whether their ultrasound has changed or not.

       3i.4 **User selects 'Change of Ultrasound/Ultrasound Update.'**

              3i.4.i – 3i.4.v. See BE9.VP1. 3i.4.i – 3i.4.v (Substitute 'blood test results' with 'ultrasound')

5i. Return to BE9.VP1.5i

VP2. Family Physician #2

NA

VP3. Health Insurance/Healthcare Provider #3

Main Success Scenario:
1. A request submitted to see patient ultrasound to decide whether to provide insurance.
2. Access to the patient ultrasound have been granted.

Secondary Scenario:

2i. See BE9.VP3.2i (substitute 'blood test results' with 'ultrasound').

VP4. Privacy #4

Main Success Scenario:

At the end of uploading the ultrasound by the user (before clicking on 'Submit'), see BE1.VP4.

Global Scenario:

Pre-Condition: The user has their ultrasound results available. The user is already logged into their personalized account.

Main Success Scenario:
1. The user clicks on the 'Upload Ultrasound' button on the app.
2. The user is redirected to the Upload Ultrasound page where a scanned image of the ultrasound is to be uploaded.
3. The user uploads a scanned image of their ultrasound.
4. System verifies the user's identity by prompting them for their health card number.
5. The user's health card number matches the one in the user profile database.
6. System records the image and saves it into the account database.
7. User has successfully uploaded their ultrasound image into the Upload Ultrasound section of the app.
8. User is redirected to the homepage of the app with a 'Ultrasound has successfully been submitted.' message at the top of the page.
9. A request may be submitted to see patient ultrasound to decide whether to provide insurance.
10. Access to the patient ultrasound have been granted.

Secondary Scenario:

3i. User attempts to upload their ultrasound after already doing so.

    3i.1 The app informs the user that 'Ultrasound results have already been submitted'.

    3i.2 The app informs the user the most recent submission date.

    3i.3 The app asks the user if their ultrasound has changed or not.

    3i.4 **User selects 'Change of Ultrasound/Ultrasound Update.'**

        3i.4.i – 3i.4.v. See BE9.VP1. 3i.4.i – 3i.4.v (Substitute 'blood test results' with 'ultrasound')

5i. Return to BE9.VP1.5i

10i. See BE9.VP3.2i (substitute 'blood test results' with 'ultrasound').

BE.11: User (patient) interacts with Symptom Chat agent
Pre-condition: The user has symptoms of not feeling well and able to answer some questions based on that. The user is already logged into their personalized account.

VP 1: Patient #1
Main Success Scenario:
1. User clicks on the 'Symptom Chat Agent' button on the app.
2. User is redirected to the Symptom Chat Agent.
3. User answers the series of questions from the questionnaire.
4. System records the answers and saves them into the account database.
5. User is redirected to the homepage of the app with a 'Symptom answers have successfully been answered.' message at the top of the page.

Secondary Scenario:
1i) User attempts to answer the questionnaire after already doing so.
    1i.1) The app informs the user that 'Symptom answers have successfully been answered.'.
    1i.2) The app informs the user the most recent date they have inputted their answers.
    1i.3) The app asks the user if their symptoms have changed or not (only after 48 hours)
    1i.4)
        1i.4.1i) User selects 'redo symptom questionnaire'.
    1i.4.1ii) System outputs the questionnaire to be answered by user again

VP2: Family Physician #2
Main Success Scenario:

1. Family Physician on record has been sent the questionnaire answers.
2. The family physician receives the results.
3. The family physician uses the answers from the Symptom Chat Agent to help understand the patient's likelihood of PCOS.

Secondary Scenario:

2i) No record of family physician.
      2i.1) System is not able to send out questionnaire answers.

VP3: HIP #3
NA

VP4: Privacy #4
NA

Global Scenario:
Pre-condition: The user has symptoms of not feeling well and able to answer some questions based on that. The user is already logged into their personalized account.

Main Success Scenario:
1. User clicks on the 'Symptom Chat Agent' button on the app.
2. User is redirected to the Symptom Chat Agent.
3. User answers the series of questions from the questionnaire.
4. System records the answers and saves them into the account database.
5. User is redirected to the homepage of the app with a 'Symptom answers have successfully been answered.' message at the top of the page
6. Family Physician on record has been sent the questionnaire answers.
7. The family physician receives the results.
8. The family physician uses the answers from the Symptom Chat Agent to help understand the patient's likelihood of PCOS.

Secondary Scenario:

1i) User attempts to answer the questionnaire after already doing so.
      1i.1) The app informs the user that 'Symptom answers have successfully been answered.'.
      1i.2) The app informs the user the most recent date they have inputted their answers.
      1i.3) The app asks the user if their symptoms have changed or not (only after 48 hours)
      1i.4)
            1i.4.1i) User selects 'redo symptom questionnaire'.
      1i.4.1ii) System outputs the questionnaire to be answered by user again
2i) No record of Family Physician.
      2i.1) System can not send out questionnaire answers.

BE12. Exporting the results from the forum #12
Pre-condition: The user (patient) has interacted with all three experts and there is a calculated PCOS likelihood associated with their account.

VP1. Patient #1
Main Success Scenario:
1. The user opens the *PolyCare* application on their phone.
2. The system prompts the user to log in and presents the fields to do so.
3. The user enters their username and password.
4. The system verifies the user's credentials.
5. The user selects the "View Results" option.

6. The system opens the Results Viewer page.
7. The user selects the "Share with trusted third-party" option.
8. The system notifies the user of the sharing process.
9. The user selects the "Continue" button presented in the notification.
10. The system prompts the user to select which form of communication they want to send the results over.
11. The user selects to send it by email.
12. The system creates a file attachment for the results and attaches it to a draft email in the default mail app on the user's device.

Secondary Scenario:
4i. The system fails to verify the user.
      4i.1 Exporting results fails.

9i. The user presses the "Cancel" button presented in the notification.
      9i.1 Exporting results fails.

10i. The user exits the exporting page before selecting a form of communication.
      10i.1 Exporting results fails.

11i. The user elects to send it by text message instead of email.
      11i.1 The system creates a text message attachment and creates a new text message in the default messaging app on the user's device.

11ii. The user elects to send it directly to their physician.
      11ii.1 The user enters their physician's MINC number.
      11ii.2 The system verifies the validity of the MINC.
      11ii.3 The system establishes a secure connection to the physician's account.
      11ii.4 The user's results are forwarded to their physician's account.

11iii. The user elects to send it directly to their health insurance/healthcare provider.
      11iii.1 The user enters their provider's ONE ID number.
      11iii.2 The system verifies the validity of the ONE ID.
      11iii.3 The system establishes a secure connection to the provider's account.
      11iii.4 The user's results are forwarded to their provider's account.

12i. The user cancels the email.
      12i.1 Exporting results fails.

VP2. Family Physician #2
11ii. The physician receives a notification on their account page indicating the user's results have been forwarded to their account.

VP3. HIP #3
11iii. The provider receives a notification on their account page indicating the user's results have been forwarded to their account.

VP4. Privacy #4
8. The system presents a notification, reminding the user to consider carefully who to share the results with, and that any specific identifiers will be anonymized.
9. The system logs that consent to share has been given.
12. The system removes any identifiers from the results before creating the file attachment.
10i. The system logs that consent to share has been revoked.
12i. The system deletes the file attachment.
12i. The system logs that consent to share has been revoked.

Global Scenario:

Pre-condition: The user has interacted with all three experts and there is a calculated PCOS likelihood associated with their account.

Main Success Scenario:
1. The user opens the *PolyCare* application on their phone.
2. The system prompts the user to log in and presents the fields to do so.
3. The user enters their username and password.
4. The system verifies the user's credentials.
5. The user selects the "View Results" option.
6. The system opens the Results Viewer page.
7. The user selects the "Share with trusted third-party" option.
8. The system presents a notification, reminding the user to consider carefully who to share the results with, and that any specific identifiers will be anonymized.
9. The user selects the "Continue" button presented in the notification, and the system logs that consent to share has been given.
10. The system prompts the user to select which form of communication they want to send the results over.
11. The user elects to send it by email.
12. The system creates a file attachment for the results, removing any identifiers from the results, and attaches it to a draft email in the default mail app on the user's device.

Secondary Scenario:
4i. The system fails to verify the user.
> 4i.1 Exporting results fails.

9i. The user presses the "Cancel" button presented in the notification.
> 9i.1 Exporting results fails.

10i. The user exits the exporting page before selecting a form of communication.
> 10i.1 The system logs that consent to share has been revoked.
> 10i.2 Exporting results fails.

11i. The user elects to send it by text message instead of email.
> 11i.1 The system creates a text message attachment and creates a new text message in the default messaging app on the user's device.

11ii. The user elects to send it directly to their physician.
> 11ii.1 The user enters their physician's MINC number.
> 11ii.2 The system verifies the validity of the MINC.
> 11ii.3 The system establishes a secure connection to the physician's account.
> 11ii.4 The user's results are forwarded to their physician's account.
> 11ii.5 The physician receives a notification on their account page indicating the user's results have been forwarded to their account.

11iii. The user elects to send it directly to their health insurance/healthcare provider.
> 11iii.1 The user enters their provider's ONE ID number.
> 11iii.2 The system verifies the validity of the ONE ID.
> 11iii.3 The system establishes a secure connection to the provider's account.
> 11iii.4 The user's results are forwarded to their provider's account.
> 11iii.5 The provider receives a notification on their account page indicating the user's results have been forwarded to their account.

12i. The user cancels the email.
> 12i.1 The system deletes the file attachment.
> 12i.2 The system logs that consent to share has been revoked.
> 12i.3 Exporting results fails.

BE13. Saving results from the forum

Pre-condition: The user has interacted with all three experts and there is a calculated likelihood associated with their account.

VP1. Patient #1
Main Success Scenario:
1. The user opens the *PolyCare* application on their phone.
2. The system prompts the user to log in and presents the fields to do so.
3. The user enters their username and password.
4. The system verifies the user's credentials.
5. The user selects the "View Results" option.
6. The system opens the Results Viewer page.
7. The user selects the "Save Results on My Device" option.
8. The system notifies the user of the saving process.
9. The user selects the "Continue" button presented in the notification.
10. The system commences the download process.

Secondary Scenario:
4i. The system fails to verify the user.
      4i.1 Saving results fails.

9i. The user presses the "Cancel" button presented in the notification.
      9i.1 Saving results fails.

10i. The user closes the app before the download finishes.
      10i.1 The system cancels the download.
      10i.2 Saving results fails.

VP2. Family Physician #2
NA

VP3. Health Insurance/Healthcare Provider #3
NA

VP4. Privacy #4
8. The system informs the user the file will be downloaded, reminding the user to consider carefully who to share the results with, and that any specific identifiers will be anonymized.
9. The system logs that consent to download has been given.
10. The system removes any identifiers from the results before creating the download.
10i. The system logs that consent to download has been revoked.
10i. The system deletes the downloadable file.

Global Scenario:
Pre-condition: The user has interacted with all three experts and there is a calculated likelihood associated with their account.

Main Success Scenario:
1. The user opens the *PolyCare* application on their phone.
2. The system prompts the user to log in and presents the fields to do so.
3. The user enters their username and password.
4. The system verifies the user's credentials.
5. The user selects the "View Results" option.
6. The system opens the Results Viewer page.
7. The user selects the "Save Results on My Device" option.
8. The system informs the user the file will be downloaded, reminding the user to consider carefully who to share the results with, and that any specific identifiers will be anonymized.
9. The user selects the "Continue" button presented in the notification, and the system logs that consent to download has been given.

10. The system removes any identifiers from the results and commences the download process.

Secondary Scenario:
4i. The system fails to verify the user.
     4i.1 Saving results fails.

9i. The user presses the "Cancel" button presented in the notification.
     9i.1 Saving results fails.

10i. The user closes the app before the download finishes.
     10i.1 The system cancels the download.
     10i.2 The system deletes the downloadable file.
     10i.3 The system logs that consent to download has been revoked.
     10i.4 Saving results fails.

BE14. User views results from the forum
Pre-condition: The user has already interacted with the three experts and the Forum has generated an overall PCOS likelihood.

VP1. Patient
Main Success Scenario:

1. The user opens the PolyCare app on their Android device.
2. The app prompts the user to log in; the user enters valid credentials.
3. The system verifies the user's identity and displays the home page.
4. The user selects the "View Results" option.
5. The system retrieves the combined probabilities from the Forum (which aggregated the results from all three experts).
6. The system displays a summary of the symptom likelihood percentage, the blood test likelihood percentage, the ultrasound likelihood percentage, and the overall aggregated PCOS likelihood.
7. The system provides tailored recommendations (e.g., "Consult a Physician," "Lifestyle Tips," etc.).
8. The user reads the results and is satisfied with the displayed information.

Secondary Scenario

2i. The system cannot verify the user's credentials.
2i.1 The system displays "Incorrect login. Please try again or reset your password."
2i.2 The user chooses to reset the password (see relevant account recovery steps in BE5.VP1).
5i. The system fails to retrieve aggregated results due to a network error.
5i.1 The app displays "Network error. Please check your connection and try again."
5i.2 The user taps "Retry," and the system attempts to fetch the results again.

VP2: Family Physician
NA

VP3: Health Insurance/Healthcare Provider
NA

VP4: Privacy
NA

Global Scenario:
Pre-condition: The user has already interacted with the three experts and the forum has generated an overall PCOS likelihood.

Main Success Scenario:

1. The user opens the PolyCare app on their Android device.

2. The app prompts the user to log in; the user enters valid credentials.
3. The system verifies the user's identity and displays the home page.
4. The user selects the "View Results" option.
5. The system retrieves the combined probabilities from the Forum (which aggregated the results from all three experts).
6. The system displays a summary of the symptom likelihood percentage, the blood test likelihood percentage, the ultrasound likelihood percentage, and the overall aggregated PCOS likelihood.
7. The system provides tailored recommendations (e.g., "Consult a Physician," "Lifestyle Tips," etc.).
8. The user reads the results and is satisfied with the displayed information.

Secondary Scenario

2i. The system cannot verify the user's credentials.

2i.1 The system displays "Incorrect login. Please try again or reset your password."

2i.2 The user chooses to reset the password (see relevant account recovery steps in BE5.VP1).

5i. The system fails to retrieve aggregated results due to a network error.

5i.1 The app displays "Network error. Please check your connection and try again."

5i.2 The user taps "Retry," and the system attempts to fetch the results again.

5   Non-Functional Requirements

5.1   Look and Feel Requirements

5.1.1   Appearance Requirements

LF-A1. The system shall maintain a consistent font and layout.

Rationale: Maintaining a consistent font (ex. Roboto), consistent spacing between functional buttons, and intuitive icon choices for buttons (ex. Using a calendar icon for accessing dates) will make the system's layout easy and simple to follow, ensuring that users are able to intuitively navigate their way through the application.

LF-A2. The system shall use a simple and uniform colour scheme, involving different shades of pink, red, purple, and cream.

Rationale: The system will utilize very distinct, yet similar colours to existing women's health apps, to intuitively remind users that this is a women's health app. Additionally, the choice of distinct shades of the colours chosen will make the app's appearance very distinguishable; that this is the *PolyCare* app. Also, the use of a simple and constant colour scheme will accommodate users with visual impairments, preventing them from having to strain their eyesight.

LF-A3.   The system shall give users the option to choose between a dark mode, light mode, or automatic mode.

Rationale: The system will give this option for users with specific preferences. To make this application better accessible to the public, a dark mode option will be useful to users who have trouble focusing with bright backgrounds (ex. Light mode). This is also to ensure that users with visual impairments can access the app without having to strain their eyesight.

LF-A4.   The system shall implement contrast between elements of the app's user interface.

Rationale: The background must be a different contrast when compared to the buttons on the page. This is to ensure that users can clearly identify and use basic features of the app, such as accessing buttons.

LF-A5.   The system shall have a universally distinct and professional logo.

Rationale: The logo must pop up when a user first opens the app. This is to remind the user they are accessing *PolyCare* application.

5.1.2   Style Requirements

LF-S1. The system shall display the user's probability of PCOS and the date at the top of the page.

Rationale: This is to remind the user of their probability, which is the main function of the app.

LF-S2. The system must show the 'Upload Ultrasound', 'Upload Blood Test Results', and 'Symptom Chat Agent' buttons on the homepage.

Rationale: The user will be able to access the most important parts of the application by viewing the homepage, in which they will be redirected to most often.

LF-S3. The system must follow a minimalistic design.

Rationale: The UI shall follow an uncluttered layout and design, with no more than 8 actions that can be done per screen display.

LF-S4. The system must allow users to customize and personalize their user interface.

Rationale: The user may change the text font (ex. Switching from Roboto to Times New Roman) for readability, re-arrange their widgets to prioritize certain information over others, and more.

5.2   Usability and Humanity Requirements

5.2.1   Ease of Use Requirements

UH-EOU1. The system shall have unambiguous prompts when asking the user to submit information.

Rationale: Since users are using the application to gain clarity regarding a possible condition, any confusion caused by instructions could cause or further frustration the users have and make them less inclined to use it.

UH-EOU2. The system shall prevent them from uploading the wrong type of document(s).

Rationale: Uploading the wrong document to the ultrasound or blood test results section could cause an erroneous calculation to be performed and potentially be problematic from a security perspective.

5.2.2 Personalization and Internationalization Requirements

UH-PI1. The system must allow users to be able to set the text size on the application as they see fit.

Rationale: It is important to ensure that users can clearly see and interact with the interface, as well as allow for the possibility of minimizing eye strain (from an overall user comfort perspective).

UH-PI2. The system must allow users to select their preferred language for using the application.

Rationale: To ensure that users can get the most accurate result possible, it is imperative that they understand the instructions on how to utilize the app. The usability of the application can be increased, and the potential user base could be widened by expanding language support.

5.2.3 Learning Requirements

UH-L1. The user should be able to learn how to use the application within 10 minutes.

Rationale: Through a straightforward user interface, simple instructions, and clear ways to get assistance if needed, the user should be able to understand the process followed by the app and how to use it in a limited amount of time.

5.2.4 Understandability and Politeness Requirements

UH-UP1. The system shall use symbols that are universally recognized, and when this is not possible, the symbol is labelled with a properly descriptive name.

Rationale: To keep the user interface simply and not overwhelming for the user, universally recognized symbols should be used to give a clear indication of what that certain icon will do. When this is not possible, a label that properly conveys the functionality of an icon will minimize possible user confusion and annoyance.

5.2.5 Accessibility Requirements

UH-A1. The system shall be compatible with screen readers.

Rationale: It is possible that a potential user may have vision impairment and utilize a screen reader. To maximize the accessibility of the application, and to ensure that no portion of the user base feels like they are unable to utilize it, proper development procedures should be followed to support screen reader compatibility.

UH-A2. The system must allow users to use their voice to answer questions regarding symptoms, as an alternative to typing.

Rationale: Some users may not have full range of motion in their fingers/hands, and thus typing out answers of varying detail could be difficult for them. Thus, to accommodate this and minimize overall frustration, a speech-to-text option should be available for such users. Additionally, users who do not have fine motor disabilities may also find added convenience from this option.

5.3 Performance Requirements

5.3.1 Speed and Latency Requirements

PR-SL1. The system must read, process, and store user blood test results within 3 seconds after submission.

Rationale: The system will need this information to calculate the probability of the user having PCOS. Making the time required to process the blood test results less than 3 seconds will ensure the time it takes to process the user's overall probability of PCOS within less than 10 seconds.

PR-SL2. The system must read, process, and store user ultrasound results within 3 seconds after submission.

Rationale: The system will need this information to calculate the probability of the user having PCOS. Making the time required to process the ultrasound result less than 3 seconds will ensure the time it takes to process the user's overall probability of PCOS within a maximum of 10 seconds.

PR-SL3. The system shall re-direct the user to the homepage when requested within 1 second.

Rationale: A quick and responsive system will prevent users from losing patience and thus being frustrated with the application's user interface.

PR-Sl4. The system shall update the user within 2 seconds of sending an in-app notification.

Rationale: The user will be updated immediately to prevent any crashes or delays within the app. This will enhance user engagement and prevent any confusion on behalf of the user (ex. sending all notifications after a delay).

5.3.2 Safety-Critical Requirements
NA

5.3.3 Precision or Accuracy Requirements
PR-PA1. The blood test will require up to 4 decimal places for requested biomarkers.

Rationale: This is to ensure that the most accurate blood analysis is performed when calculating the probability of PCOS.

PR-PA2. The forum must calculate the probability of PCOS with 98% accuracy.

Rationale: With such high accuracy, this will enhance user trust and prevent misdiagnosis.

5.3.4 Reliability and Availability Requirements
PR-RA1. The system must be made available to users 24 hours a day, 7 times a week under normal internet connectivity.

Rationale: This is to ensure that users can access an important health app when needed, enhancing reliability.

PR-RA2. All user data must be backed up after each probability calculation and should be recoverable.

Rationale: The system will save the user's health information in case of any network failures, unexpected app closure, or even unexpected failure. This is also to ensure that the user can always access the primary function of the app.

5.3.5 Robustness or Fault-Tolerance Requirements
PR-RFT1. The user must be able to restore the most recent entry of their health data due to the application being offline or is encountering an unexpected high traffic of users.

Rationale: This is to prevent loss of data due to server-side issues. Additionally, this will ensure that users will not have to repeat steps that may be deemed tedious, which will once again enhance user experience.

5.3.6 Capacity Requirements
PR-C1. The system must be able to accommodate at least 900 users who are accessing the application simultaneously.

Rationale: The system will thereby function as it should under conditions when various users are accessing *PolyCare*.

5.3.7 Scalability or Extensibility Requirements

PR-SE1. The program shall be developed and designed in such a way that the code is maintainable and readable.

Rationale: Ensuring that the code is maintainable and readable will allow for easier future modifications, debugging faults within code, and more. This will ultimately make the software developer's job easier, while always ensuring the success of the app.

5.3.8 Longevity Requirements
NA

5.4 Operational and Environmental Requirements

5.4.1 Expected Physical Environment

NA

5.4.2 Requirements for Interfacing with Adjacent Systems

OE-IA1. The system shall securely integrate with third-party AI services and local device features.
Rationale: Our app depends on external AI APIs to analyze user symptom data and uses device storage for uploading medical images. Proper interfacing ensures better data flow and a consistent user experience [18].

5.4.3 Productization Requirements

OE-P1. The app must comply with Google Play Store guidelines for release, including meeting performance, privacy, and design best practices [19].
Rationale: Publishing on the Play Store is the primary distribution method. Compliance is essential for visibility and user trust, and it helps ensure a secure, polished product.

5.4.4 Release Requirements

OE-R1. The final version of the app must be tested on at least the two most recent major Android OS versions prior to launch.
Rationale: Android users run various OS releases; testing on multiple recent versions guarantees compatibility, stability, and a positive user experience.

5.5 Maintainability and Support Requirements

5.5.1 Maintenance Requirements

MS-M1. The system must provide a way for users to report bugs.

Rationale: Bugs need to be able to be reported by users directly to the development team, so that they can be alerted of such issues quickly and begin patching them, maintaining the quality of service provided by the application.

MS-M2. The system must receive bug patches within a maximum of three days after it is discovered/reported.

Rationale: To ensure that the system continues to operate as expected, in turn maintaining a strong level of service to the users, bugs discovered by the development team or reported by the user as in MS-M1 need to be patched in short order.

5.5.2 Supportability Requirements

MS-S1. The system must provide a simple tutorial regarding application use for first time users.

Rationale: To support the achievement of requirement UH-L1, the user should have simple instructions in the form of a tutorial to help guide them through how to use the application. This helps minimize confusion and keeps the time to learn the app within the threshold specified by UH-L1.

MS-S2. The system must allow the simple tutorial to be replayed by users whenever they need assistance.

Rationale: Users may not interact with all the features of the application after opening it for the first time. Thus, they may return to the application unsure of how to operate. Therefore, it is imperative that the simple tutorial discussed in MS-S1 is easily accessible and replayed by any user after their first time opening the app.

MS-S3. The user must have access to a Frequently Asked Questions page within the application.

Rationale: Users may have questions about the app beyond how to interact with it (e.g. how the user's sensitive information is handled, or how likelihood percentages are calculated). Thus, an in-application Frequently Asked Questions page would be a straightforward way for users to quickly find answers, alleviating concerns or confusion that may be present.

MS-S4. The system must have an internal issue logging functionality.

Rationale: To assist the development team in understanding and fixing bugs that may appear, the system should have a logging feature that can be easily accessed internally. The more straightforward it is for issues to be diagnosed, the better the overall quality of the application will be.

5.5.3 Adaptability Requirements

MS-A1. The system must comply with regulation that would allow it to operate in the Ontario, Canada market.

Rationale: The initial goal of the system is to have it operate in the Canadian market. To ensure that regulations regarding the handling of medical information are met, but to avoid high complexity by going cross-jurisdiction, the focus will be to meet all regulations specific to Ontario.

MS-A2. The system must run on the Android operating system.

Rationale: The application will be developed for Android devices; thus, it must be able to be used on that mobile operating system.

5.6 Security Requirements

5.6.1 Access Requirements

SR-AC1. Only requested information can be accessed by each stakeholder.

Rationale: Access is granted based on user permissions so that data cannot be tampered with.

5.6.2 Integrity Requirements

SR-INT1. Profile information and settings can only be altered by individuals whose profile it belongs to.

Rationale: Other users should not be able to alter other user's information.

SR-INT2. All data provided to and contained in the app must always be encrypted unless accessed by the verified user themselves or users that have been granted permission.

Rationale: The information needs to be stored using methods that restrict tampering with the data.

5.6.3 Privacy Requirements

SR-P1. The app must require the user's permission to store and use their data [20].

Rationale: This is part of the Google Play Developer Distribution Agreement.

SR-P2. The app must be forthcoming in sharing their privacy policy.

Rationale: This is part of the Google Play Developer Agreement.

5.6.4 Audit Requirements

SR-AR1. The app must store relevant data to enable audits checks to assess Compliance and Standards [20].

Rationale: This is to assess that the data is being handled correctly.

5.6.5 Immunity Requirements

SR-IM1. The app must implement sufficient protection for the user's data.

Rationale: The information stored is very sensitive and needs to be protected.

5.7 Cultural and Political Requirements

5.7.1 Cultural Requirements

CP-C1. The system shall avoid using language, imagery, or symbols that could be interpreted as culturally offensive or insensitive in any region where the app is distributed.
Rationale: A respectful, inclusive user interface fosters trust and comfort among a diverse user base which is of the utmost importance in a product that deals with intimate/sensitive data. Avoiding offensive elements helps maintain a positive reputation and broadens the app's accessibility.

5.7.2 Political Requirements

CP-P1. The system shall remain neutral and shall not display or promote any political stance, affiliation, or ideology.
Rationale: Because the primary goal is to assist with healthcare decisions, maintaining political neutrality keeps the focus on delivering unbiased medical information and encourages trust among all users.

5.8 Legal Requirements

5.8.1 Compliance Requirements

- LR-COMP1. Any inputted information from user and data sent to third party APIs such as OpenAI, must be secured. **Rationale:** PIPEDA Principle 1 – Accountability [21]

- LR-COMP2. Any inputted information from user and data sent to third party APIs such as OpenAI, must be identified. **Rationale:** PIPEDA Principle 2 – Identifying purposes [21]

- LR-COMP3. Any inputted information from user and data sent to third party APIs such as OpenAI, must have user consent to understand their information will be collected for examination purposes
Rationale: PIPEDA Principle 3 – Consent [21]

- LR-COMP4. Only collect minimum information from user and data to be sent to third party APIs such as OpenAI. Unnecessary user information will not be asked.
Rationale: PIPEDA Principle 4 – Limiting Collection [21]

5.8.2 Standards Requirements

- LR-STD1. The mobile app should not be using notifications for purposes other than updating user information or PCOS updates. This includes not to promote/advertise other products [22].
Rationale: Standard app quality in terms of privacy and security aspect by Google

- LR-STD2. The mobile app should store sensitive data only in the internal storage.
Rationale: Standard app quality in terms of privacy and security aspect by Google [22].

6   Innovative Feature

The innovative feature that will be implemented in the system is providing lifestyle recommendations for managing PCOS symptoms. Since PCOS has no treatment, and information can sometimes be conflicting/difficult to ascertain from sources like the internet, having clear information on how to manage PCOS can help them take positive steps towards mitigating their symptoms, improving their overall quality of life.

Other innovative features that we brainstormed include:

- Additional Medical Consultation: Including an option for users to have scheduled one-on-one virtual medical consultations with nurse practitioners.
- Medication Tracking: The app, through partnerships with pharmacy services, would track prescription use and refills, reminding users when to take medication associated with PCOS symptoms.

*Changes from D1 Feedback:

Feedback: I could clearly tell there is an innovative feature, but probably your group forgot to put into a paragraph. On your next iteration, simply state your previous brainstorming and you current innovation idea.

Changes: Included a section clearly outlining the innovative feature we chose, as well as other brainstormed ideas.

A Division of Labour

Hamid, Amal:

- 1.4 References in IEEE format

- 2.1 Product Perspective Description

- 2.6 Apportioning of Requirements

- 3 Use Case Diagram (designed on my laptop)

- BE9 and BE10, and their respective global scenarios

- 5.1 Look and Feel Requirements (Non-Functional Requirement)

- 5.3 Performance Requirements (Non-Functional Requirement)

- Formatted the word document to ensure consistency in font and typography

- Edited typos and grammatical errors within the document and final document

Beach, Jackson:

- Brainstorming

- 1.5 Overview

- 2.2 Product Functions

- 3 Use Case Diagram (contributed to design along with other group members)

- BE12 (with Zayed) and BE13, with their respective global scenarios

- 5.2 Usability and Humanity Requirements

- 5.5 Maintainability and Support Requirements

- Editing final document

Siddiqui, Maham:

- Brainstorming

- 1.3 – Abbreviations and definitions

- 2.4 – Constraints

- 2.5 – Assumptions and Dependencies (with Saad Salman)

- 3 – Use case diagram – as a group

- 4 – B1-8 (complete)

- 5.6 – Security requirements

- Formatted the word document to ensure consistency in font and typography

- Editing final version of document

Maham Siddiqui

Salman, Saad:

- Brainstorming

- 1.1 – Purpose

- 2.1 Product Description (Diagram and Description)

- 2.5 – Assumptions and Dependencies

- 3 – Use case diagram – as a group

- 4 – BE- 11 (complete)

- 5.8 – Legal requirements

- Editing final document

Umer, Zayed:

- Brainstorming

- 1.2 Scope

- 2.3 User Characteristics

- 3 Use Case Diagram (as a group)

- BE12 (with Jackson) and BE14

- 5.4 Operational and Environmental Requirements

- 5.7 Cultural and Political Requirements