



VIRTUAL HEALTH COMPANION FOR DAILY LIVING

STAGE 1 – THE BID

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PULSE**

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HEALTHEASE TECHNOLOGIES

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1.0 Introduction

1.1 Purpose and Scope

The purpose of the system is to deliver a smart, secure, and easy-to-use virtual health monitoring platform that allows users to monitor and evaluate their health biomarkers in real-time. By combining data from various wearable and medical devices, the system enables users to make informed health choices, share their health data with healthcare providers, and receive prompt alerts or suggestions for maintaining optimal health. It acts as a connection between patients, healthcare providers, and technology to encourage proactive health oversight and the early identification of issues.

Scope

This system focuses on creating and developing a cross-platform Progressive Web Application (PWA) that captures, displays, and oversees health-related information from manual entries and linked devices.

The system features three primary user roles:

- **Patients** can track their biomarkers, receive notifications, access reports, and share data with healthcare providers.
- **Healthcare providers** who can obtain approved patient information, review reports, and offer suggestions.
- **Administrators** responsible for overseeing user accounts, access rights, and system settings.

The system will encompass functionalities like real-time data syncing, detection of anomalies, notifications for key biomarker thresholds, engaging visual representations, chatbot support, and progress monitoring with motivational rewards. It will also guarantee secure data management by utilizing encryption and adhering to healthcare data protection regulations (HIPAA/GDPR).

1.3 Aim and Objectives

The main aim of the project is to develop an integrated health monitoring platform that enhances user engagement, supports informed medical decisions, and ensures the secure management of health data through responsive design, data visualization, and smart automation.

1. **Health Data Integration:** Enable connection and synchronization of data from various wearables and medical devices such as smartwatches, glucose monitors, and blood pressure monitors.
2. **Data Recording and Visualization:** Record, validate, and display health biomarkers, including heart rate, glucose level, blood pressure, sleep, steps, using dynamic dashboards, graphs, and summaries.
3. **Anomaly Detection and Alerts:** Automatically detect abnormal readings, notify users of warning or critical thresholds, and facilitate emergency contact alerts when required.
4. **User Management and Access Control:** Implement multi-level access (patient, healthcare professional, admin) with authentication, permissions, and secure data sharing between users.
5. **Data Analysis and Reporting:** Generate customizable reports for selected biomarkers over specific timeframes (e.g., 30/90 days) in downloadable formats such as PDF and CSV.
6. **Virtual Companion Integration:** Provide a chatbot or virtual assistant capable of answering user queries, offering reminders, and suggesting personalized health recommendations.
7. **User Engagement and Motivation:** Include gamified features such as badges, streaks, and goal-tracking avatars to encourage consistent healthy behavior and long-term user engagement.
8. **Accessibility and Usability:** Ensure that the system is responsive, accessible, and easy to navigate for all users, including those using assistive technologies.
9. **Security and Compliance:** Protect all user data through encryption, secure storage, and compliance with healthcare privacy regulations.
10. **System Reliability and Performance:** Maintain consistent operation, support multiple concurrent users, and ensure real-time dashboard updates without system crashes or lag.

2.0 Requirements Specification

2.1 Overview

This section outlines the system's functional and non-functional requirements from both the user and system perspectives. It also includes the use case diagrams, detailed use case specifications, and supporting UML sequence and activity diagrams to illustrate system behavior and interactions.

2.2 Functional Requirements

2.2.1 User Functional Requirements

Table 1 documents the function requirements from the user's side.

Table 1. User Functional Requirements

ID	Description	Priority	Source
U-FR-1	User Authentication and Account Management		
U-FR-1-1	User Registration <ul style="list-style-type: none"> Email address as username Password requirements: minimum 8 characters, one uppercase, one number Email verification required before account activation 	must	Industry Standard
U-FR-1-2	Users must be able to log in to an existing account.	must	Industry Standard
U-FR-1-3	Users should be able to change their password if forgotten.	should	Industry Standard
U-FR-1-4	User Profile Management Users shall maintain basic profile information: <ul style="list-style-type: none"> Full name Date of birth Height and weight Health goals (weight loss, fitness, general wellness) Emergency contact information Account type (Patient or Healthcare Provider) Medical license number (Healthcare Providers only) 	should	Team
U-FR-1-5	Session Management The system shall handle user sessions securely: <ul style="list-style-type: none"> Automatic logout after 24 hours of inactivity Remember login option for 30 days Secure token storage and validation 	should	Industry Standard
U-FR-1-6	Users could be able to ask for help or call a number if they have any issues within the system.	could	Team
U-FR-2	Access Levels	must	Team
U-FR-2-1	Users (Healthcare professionals) must only access biomarker data of patients who have explicitly granted them permission.	must	Project Outline

U-FR-2-2	Users (Patients) must be able to view, manage, download and export all of their own health data.	must	Project Outline
U-FR-2-3	Users (Patients) must be able to grant or revoke access to healthcare professionals for all biomarkers.	must	Project Outline
U-FR-2-4	Admins should have a separate dashboard to manage system configuration, user accounts, and permissions	should	Team
U-FR-2-5	Admins won't have direct access to raw health data of the users.	won't	Industry Standard
U-FR-2-6	Admins must be able to manually add, delete or edit user accounts.	must	Team
U-FR-2-7	Admin must be able to verify medical licenses submitted by the healthcare professionals.	must	Team
U-FR-2-8	Admin actions on the system could be auditable (logs must record who did what and when).	could	Industry Standard
U-FR-3	Notifications and updates		
U-FR-3-1	Users should receive recommendations about their health and activity and also about device usage(e.g., a good time to exercise would be at time as your normal gym is quiet; device X is still in cycling mode, should it be turned off?).	should	Project Outline
U-FR-3-2	Users must receive a maximum of two reminders a day about their chosen habit that they want to improve.	must	Team
U-FR-3-3	Users must receive push notifications for warning alerts if biomarkers cross their respective warning threshold.	must	Project Outline
U-FR-3-4	Emergency Contact System The system should notify emergency contacts if biomarkers cross their respective critical threshold: <ul style="list-style-type: none"> • SMS Alerts: Send text messages to up to 3 emergency contacts and to the healthcare provider, if the user has one. • Email Notifications: Send detailed health alert with recent data 	should	Team
U-FR-3-5	Users should be able to view all notifications on the notification page	should	Team
U-FR-3-6	Healthcare Provider Notifications <ul style="list-style-type: none"> • Providers must receive notifications when new patient connection requests arrive • Patients must receive notifications when providers accept/decline their requests • Providers must receive alerts when patient biomarkers cross critical thresholds • Providers should receive weekly summary notifications of patient progress 	should	Team
U-FR-3-7	Providers should be able to customize which types of alerts they receive	should	Team
U-FR-3-8	Users should be able to customize the type of alerts they receive or turn them all off.	should	Team
U-FR-3-9	Users should be notified for invalid readings by connected devices (detect anomalies)	should	Team

U-FR-4	Connected Devices		
U-FR-4-1	Users must be able to connect smartwatches and fitness bands and external devices including Glucose Monitor and Blood Pressure Monitor from the list of devices possible (simulated data)	must	Project Outline
U-FR-4-2	Users should be able to disconnect and remove devices from the list of connected devices.	should	team
U-FR-4-3	Users must be able to view the same data across different connected devices.	must	Team
U-FR-4-4	Users should be able to activate or deactivate the connected devices.	should	team
U-FR-5	Data Analysis and Reports		
U-FR-5-1	Users should be able to filter data by an available fixed date range (e.g., last week, last 3 months).	should	Project Outline
U-FR-5-2	Users could be able to select specific biomarkers (e.g., heart rate, glucose level, blood pressure, sleep, steps) for focused analysis.	could	Team
U-FR-5-3	Users should be able to view graphical representations such as line charts or bar graphs to see trends over time.	should	Project Outline
U-FR-5-4	Users could be able to view whether they have followed a recommendation and track how these actions influence their habits and health progress over time.	could	Team
U-FR-6	Virtual Companion / Chatbot		
U-FR-6-1	Users must be able to chat with the virtual assistant in natural language for health-related questions and general wellness advice.	must	Project Outline
U-FR-6-2	The chatbot should be capable of retrieving and displaying user-specific health data upon request. <ul style="list-style-type: none"> ● Example queries: <ul style="list-style-type: none"> ○ “Show my average steps last week.” ○ “What was my highest heart rate yesterday?” ○ “How has my glucose level changed this month?” 	should	Team
U-FR-6-3	The chatbot could be able to schedule reminders for medication or activity.	could	Team
U-FR-7	Incentivising user behaviour features : Goal Setting and Tracking		
U-FR-7-1	Users must be able to set, modify, or remove daily and weekly health goals, such as water intake, step count, sleep duration, or exercise time.	must	Team
U-FR-7-2	Users must be able to track their progress in real time through visual indicators such as progress bars or percentage completion.	must	Team
U-FR-8	Professional Dashboard		
U-FR-8-1	Healthcare Provider Account Access Healthcare providers should have separate account types:	must	Team

	<ul style="list-style-type: none"> • Registration requires medical license verification • Access to multiple patient accounts with permission 		
U-FR-8-2	<p>Patient Connection Management</p> <ul style="list-style-type: none"> • Providers must be able to view pending patient connection requests • Providers must be able to accept or decline patient connection requests • Providers should see patient basic information (name, age, health goals) when reviewing requests • Providers should be able to view all their connected patients in a list • Providers should be able to disconnect from patients if needed 	should	Team
U-FR-8-3	<p>Patient Data Overview</p> <p>Providers must see patient health summaries:</p> <ul style="list-style-type: none"> • List of all patients with current health status indicators • Alert flags for patients with concerning biomarker trends • Last data update timestamps • Quick access to detailed patient health records including historical trends and latest readings 	must	Project Outline
U-FR-8-4	Professionals must be able to add notes or recommendations to a patient's record.	must	Team
U-FR-8-5	Professionals should be able to filter or search patients by name or condition	should	Team
U-FR-8-6	Professionals could be able to set alert thresholds for their patients.	could	Team
U-FR-8-7	Professionals could be able to send feedback or recommendations directly to the patient via notification.	could	Team
U-FR-9	User Dashboard		
U-FR-9-1	<p>User and Healthcare Professional Connection</p> <p>When a user creates a new account, the user must be provided with an option to choose whether they want to connect with a healthcare professional or continue using the app independently.</p> <ul style="list-style-type: none"> • If the user chooses to connect with a healthcare professional, they can browse verified healthcare provider directory • Patients can filter providers by specialty, location, ratings • Patients can send connection requests to providers • If the user grants permission, all relevant health and biomarker data will be visible to the assigned healthcare professional through their professional dashboard. • If the user denies permission, no data will be shared, and the user will continue using the app independently. • The user must be able to modify these sharing preferences later through account or privacy setting 	must	Team
U-FR-9-2	<p>The main screen must display a daily summary card highlighting key health metrics such as:</p> <ul style="list-style-type: none"> • Heart Rate (e.g., "72 bpm") • Sleep Duration (e.g., "6h 45m") • Steps Taken (e.g., "8,400 steps") 	must	Project Outline

	<ul style="list-style-type: none"> • Water Intake (e.g., “6 / 8 glasses”) • Blood Pressure (e.g., “120/80 mmHg”) 		
U-FR-9-3	Users should be able to pin selected metrics (e.g., glucose level or step count) to the top of the dashboard for easier tracking of active goals.	should	Team
U-FR-9-4	Users must be able to expand the summarised key health metrics to view detailed analytics about the respective biomarkers, such as : <ul style="list-style-type: none"> • Historical graphs (daily, weekly, monthly trends). • Minimum, maximum, and average readings. • Device source and date/time of measurement. • Comparison against healthy ranges or user-defined targets. 	must	Team
U-FR-9-5	Analytics should be displayed through interactive visualizations such as progress rings, line graphs, or bar charts.	should	Project Outline
U-FR-9-6	Users should receive alerts or updates when new professional notes or recommendations are added.	should	Team
U-FR-9-7	The dashboard must include a “” section summarizing ongoing goals (e.g., hydration, sleep, activity).	must	Team
U-FR-9-8	Users could be able to switch between daily, weekly, and monthly views for the summary section.	could	Project Outline
U-FR-9-9	Users won’t be sharing information with multiple healthcare providers. Each user will only have one healthcare provider.	won’t	Team
U-FR-10	Sharing data		
U-FR-10-1	Users must be able to share statistics via social media	must	Project Outline
U-FR-10-2	Users must be able to download reports for past 30/90-day summaries for selected biomarkers.	must	Team
U-FR-10-3	Users must be able to download reports in CSV or PDF format	must	Industry Standard
U-FR-11	Voice Agent	could	
U-FR-11-1	User must be able to call voice agent within our platform	could	Team
U-FR-11-2	Voice agent will have the context of user’s data, and it can converse naturally with user and give recommendations or simply explain their data based on user’s questions	could	Team
U-FR-11-3	Users can upload their images of reports or scans such as x-ray, MRI, and our voice agent could explain that in easy terms	could	Team

2.2.2 System Functional Requirements

Table 2 documents the function requirements from the system's side.

Table 2. System Functional Requirements

ID	Description	Priority	Source
S-FR-1	Database Management		
S-FR-1-1	The system must store all user information, including profile details, authentication credentials, and permissions, in a secure database.	must	Industry Standard
S-FR-1-2	The system must store biomarker data (e.g., heart rate, sleep, glucose levels) with accurate timestamps and source.	must	Project Outline
S-FR-1-3	The system should support retrieval of data for specific time periods (e.g., “past 7 days” or “last month”) for visualization and reporting.	should	Project Outline
S-FR-1-4	The system must allow healthcare professionals to query patient data only for patients who have granted access.	must	Project Outline
S-FR-1-5	The system must ensure data consistency when updates occur from multiple devices or sessions.	must	Industry Standard
S-FR-1-6	For existing users, the system should validate their credentials against the credentials stored in the database with a list of emails and associated passwords.	should	Industry Standard
S-FR-1-7	The system should allow the user to reset their password if their username exists in the database but their credentials are invalid.	should	Industry Standard
S-FR-1-8	The system must allow the user to sign up if their username does not exist in the database	must	Industry Standard
S-FR-2	Data Entry and Visualisation		
S-FR-2-1	The system must allow for manual data entry by the user	must	Team
S-FR-2-2	The system should display graphs for each biomarker summary when expanded, which show trends for week-over-week, month-over-month and past 6 months.	should	Project Outline
S-FR-2-3	The system could have a filter for the device (smartphone, smartwatch, glucose monitor, blood pressure monitor) and show only the relevant data / data collected from that device when it is selected.	could	Team
S-FR-2-4	The system should periodically refresh the dashboard data to reflect the most recent readings from connected devices.	should	Industry Standard
S-FR-2-5	A color-coded scheme (e.g., green = normal, yellow = borderline, red = critical) could indicate data health status for each metric.	could	Team
S-FR-3	Daily Summary and Reporting System		
S-FR-3-1	Daily Summary Reports The system shall generate daily health summaries: <ul style="list-style-type: none"> • Morning Briefing: Email/notification sent at 7 AM with yesterday's achievements and today's goals • Evening Summary: Push notification at 9 PM showing day's progress and missed goals 	must	Team

S-FR-3-2	<p>Weekly and Monthly Reports</p> <p>The system shall create longer-term analysis reports:</p> <ul style="list-style-type: none"> • Weekly Progress Email: Sunday evening report with charts and trend analysis • Monthly Health Report: PDF document suitable for doctor appointments • Quarterly Trend Analysis: 90-day overview highlighting patterns and improvements • Annual Health Summary: Yearly report showing all biomarker trends and achievements 	could	Team
S-FR-3-3	<p>Healthcare Provider Reports</p> <p>The system shall generate clinical reports for medical professionals:</p> <ul style="list-style-type: none"> • Summary: 30-day health data export in PDF format • Emergency Health Card: Critical health information printable for wallet • Medication Adherence Report: Track medication reminder responses and timing • Trend Alert Report: Flag concerning patterns for healthcare provider review 	could	Team
S-FR-4	Incentivising user behaviour features : Goal Setting and Tracking		
S-FR-4-1	Each goal must have a target value (e.g., 8 glasses of water per day) and be measurable based on synced data or manual input.	must	Team
S-FR-4-2	<p>Goal Reminders and Logging :</p> <p>4-2-1 The app should send one reminder in the morning prompting the user to track their daily goals (e.g., “Remember to log your water intake throughout the day”).</p> <p>4-2-2 Users should be able to log progress incrementally by tapping a “+” icon whenever they complete part of a goal.</p> <p>4-2-3 The app should also send one end-of-day reminder before the daily summary, prompting the user to review and finalize their goal logs for the day.</p>	should	Team
S-FR-4-3	All goals should be displayed in the My Goals section of the main dashboard and should show a visual progress bar or ring indicating completion percentage.	should	Team
S-FR-4-4	Completed goals could trigger positive feedback (e.g., confetti animation, message like “Goal achieved!”)	could	Team
S-FR-4-5	Missed goals could display gentle motivational prompts (e.g., “Almost there! Just one more glass to reach your hydration goal.”)	could	Team
S-FR-5	Incentivising user behaviour features : Virtual Pet (Digital Twin) Companion System		
S-FR-5-1	<p>Health Score Calculation Algorithm</p> <p>The system shall calculate a daily health score from 0-100 based on the five biomarkers:</p> <ul style="list-style-type: none"> • Heart Rate (20 points): 60-80 bpm = 20 points, 81-100 bpm = 15 points, outside range = 5 points • Blood Pressure (20 points): 110-130/70-85 = 20 points, 131-140/86-90 = 15 points, outside range = 5 points • Daily Steps (20 points): 8000+ steps = 20 points, 5000-7999 = 15 points, 2000-4999 = 10 points, under 2000 = 5 points • Sleep Hours (20 points): 7-9 hours = 20 points, 6-7 or 9-10 hours = 15 points, outside range = 5 points • Blood Glucose (20 points): 70-100 mg/dL = 20 points, 101-140 = 15 points, outside range = 5 points 	should	Team

S-FR-5-2	<p>Pet Selection and Characteristics :</p> <p>Users shall select one virtual pet from 5 available types during account setup. The pet will visually reflect the user's health progress and daily habits. Each pet type has different visual appearance and personality traits but responds to the same health data:</p> <ul style="list-style-type: none"> • Dog: Loyal companion, tail wagging animations, energetic movements • Cat: Independent personality, purring sounds, calm movements • Bird: Colorful parrot, chirping sounds, flying animations • Fish: Swimming in bowl, bubble effects, peaceful movements • Hamster: Running on wheel, quick movements, playful animations 	should	Team
S-FR-5-3	<p>Pet Emotional States and Visual Display</p> <p>The pet's emotional state shall be determined by the daily health score:</p> <ul style="list-style-type: none"> • Excellent (90-100 points): Pet shows excited animations, bright colors, happy sounds, bouncing movements • Good (70-89 points): Pet appears content, normal colors, gentle movements, occasional happy sounds • Fair (50-69 points): Pet looks neutral, slightly muted colors, slower movements, quiet behavior • Poor (30-49 points): Pet appears sad, darker colors, sluggish movements, occasional worried sounds • Critical (0-29 points): Pet looks very concerned, gray/dark colors, minimal movement, shows illness indicators 	should	Team
S-FR-5-4	<p>Pet Customization Options</p> <p>Users shall be able to customize their pet appearance:</p> <ul style="list-style-type: none"> • Pet Name: User enters custom name up to 15 characters, no special characters allowed • Color Options: 3 color variations per pet type (light, medium, dark shades) • Accessories: Unlock hat, bow tie, or collar after achieving 7-day health goal streak • Background: Choose from 5 environments (park, home, beach, garden, space) 	could	Team
S-FR-5-5	The pet's state should reset or update daily based on new goals and performance data	should	Team
S-FR-5-6	The app could send interactive notifications that connect user actions to the pet's state (e.g., "Your pet is feeling thirsty - have you had your 2 glasses of water?").	could	Team
S-FR-6	Incentivising user behaviour features : Motivation and Rewards		
S-FR-6-1	The app could include gamified incentives such as badges, points, or streaks for maintaining consistent goal completion.	could	Team
S-FR-6-2	Reaching milestones (e.g., "7-day hydration streak") could unlock pet accessories, themes, or animations as rewards.	could	Team
S-FR-7	Environmental and Contextual Data Integration		
S-FR-7-1	<p>Weather Data Integration</p> <p>The system could incorporate weather conditions:</p> <ul style="list-style-type: none"> • Temperature Impact Analysis: Note "High temperature may affect blood pressure reading" • Air Quality Warnings: Alert "Poor air quality today, consider indoor exercise" • Humidity Effects: Explain how humidity affects heart rate during exercise • Seasonal Adjustments: Modify activity recommendations based on season 	could	Team

S-FR-7-2	<p>Location-Based Services</p> <p>The system could use location data for health recommendations:</p> <ul style="list-style-type: none"> • Nearby Facilities: Show walking distance to nearest gym, pharmacy, or hospital • Exercise Location Tracking: Record where different activities were performed • Emergency Location Sharing: Send GPS coordinates to emergency contacts when critical alert triggered 	could	Team
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2.3. Non-Functional Requirements

2.3.1. User Non-Functional Requirements

Table 3 documents the non-functional requirements from the user's side.

Table 3. User Non-Functional Requirements

ID	Description	Priority	Source
U-NFR-1	Usability		
U-NFR-1-1	Users should be able to easily navigate through the system with a well-designed layout and intuitive visualizations.	should	Industry Standard
U-NFR-1-2	Users should be able to select their preferred measurement units for health metrics, such as centimeters or meters for height, kilograms or pounds for weight.	should	Team
U-NFR-1-3	Error messages shall be clear and suggest how to fix problems.	should	Industry Standard
U-NFR-1-4	Text shall be large enough to read comfortably (minimum 14px font size).	should	Industry Standard
U-NFR-2	Compatibility		
U-NFR-2-1	Users must be able to use the app easily across browsers (Chrome, Firefox, Safari, Edge) and devices (desktop, tablet, mobile).	must	Project Outline
U-NFR-2-2	Users must experience a responsive Progressive Web App (PWA) interface that adapts seamlessly to different screen sizes and resolutions.	must	Industry Standard
U-NFR-3	Users Security		
U-NFR-3-1	Users' passwords and sensitive profile and biomarker data must be hidden using encryption	must	Industry Standard

2.3.2. User Non-Functional Requirements

Table 4 documents the non-functional requirements from the system's side.

Table 4. System Non-Functional Requirements

ID	Description	Priority	Source
S-NFR-1	Usability (System Perspective)		
S-NFR-1-1	The system must ensure interface consistency , with uniform color schemes, typography, and navigation patterns across all pages and modules.	must	Industry Standard
S-NFR-1-2	The system should provide clear error messages and guidance for both users and administrators.	should	Industry Standard
S-NFR-1-3	The system should provide responsive performance feedback , such as loading indicators or confirmation messages, when users perform actions (e.g., saving settings).	should	Industry Standard
S-NFR-2	Chatbot Interaction		
S-NFR-2-1	All chatbot interactions and data responses shall comply with privacy and security standards (e.g., encrypted communication, no third-party data sharing without consent).	could	Industry Standard
S-NFR-2-2	The chatbot should greet users by name and adapt its tone to be friendly and supportive.	should	Team
S-NFR-2-3	The chatbot must clarify queries it cannot answer and suggest alternatives (e.g., “I can show your recent data or set a reminder instead.”)	should	Team
S-NFR-3	Security and Privacy		
S-NFR-3-1	The system must implement encryption for all user health data during both storage and transmission.	must	Industry Standard
S-NFR-3-2	Privacy settings should allow users to control what data is shared (e.g., hide certain goals, limit visibility to friends only).	should	Team
S-NFR-3-3	Users should have control over who can access their data, e.g., sharing with healthcare professionals or friends	should	Team
S-NFR-3-4	HTTPS shall be used for all web communications.	should	Industry Standard
S-NFR-3-5	User sessions shall timeout after 24 hours of inactivity.	should	Industry Standard
S-NFR-4	Compliance		
S-NFR-4-1	The system must comply with healthcare data regulations such as HIPAA and GDPR.	must	Industry Standard
S-NFR-5	Performance		
S-NFR-5-1	The system shall support up to 100 concurrent users.	could	
S-NFR-5-2	The pet companion shall update its emotional state within 30 seconds of new health data.	could	
S-NFR-6	Data		
S-NFR-6-1	The system must validate all health data entries to ensure reasonable values.	must	Project Outline
S-NFR-6-2	The system shall store 90 days of health data per user.	could	Team

S-NFR-7	Emergency and Safety		
S-NFR-7-1	Emergency alerts shall be sent within 2 minutes of critical health reading detection.	should	Team
S-NFR-7-2	Emergency contact notifications shall retry 3 times if initial delivery fails.	could	Team
S-NFR-8	Reporting and Analytics		
S-NFR-8-1	Daily summary emails shall be delivered within 15 minutes of scheduled time.	should	Team
S-NFR-8-2	Weekly summary reports shall calculate trends for all 5 biomarkers.	should	Team

2.4 Use Case Diagram

2.4.1 System Overview

Figure 1 *High-Level Use Case Diagram of the Virtual Health Assistant System (VHC)*.

This diagram provides a broad overview of all actors and functionalities in the system, offering a snapshot of the entire software architecture.

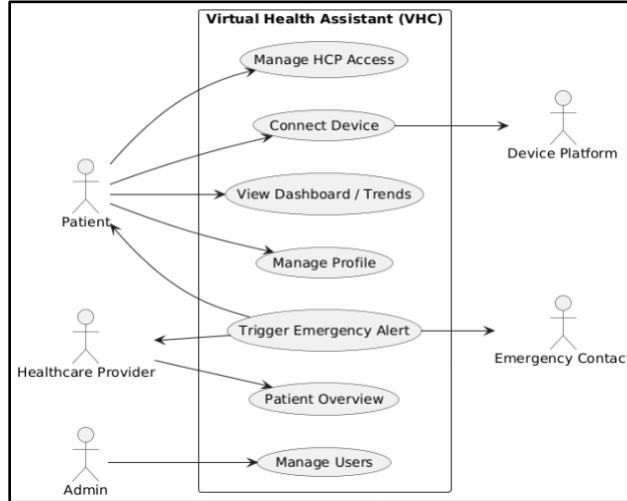


Figure 1. High-Level Use Case Diagram

Refer to [Appendix B1](#) for the Highly Detailed System Use Case (with all roles)

2.4.2 Role-Based Use Cases

Figure 2 *Use Case Diagram for Patient Interactions with the Virtual Health Assistant (VHC)*.

Highlights the specific functionalities available to patients.

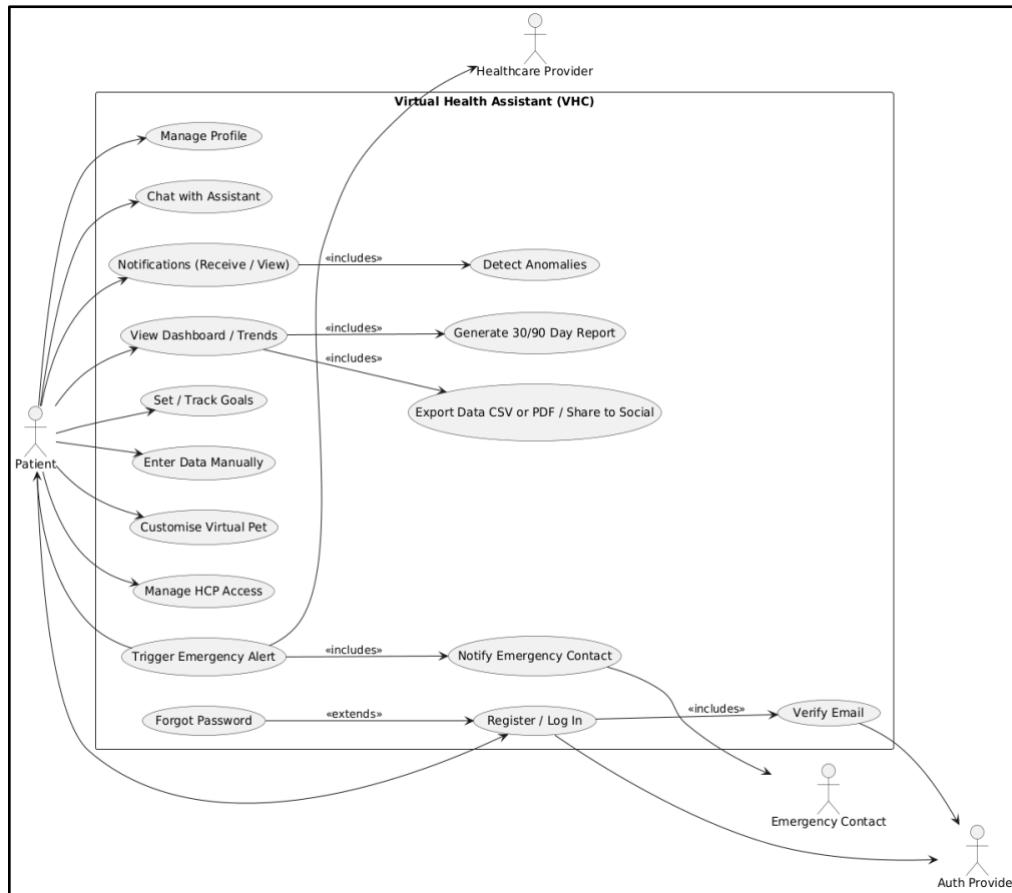


Figure 2. Use Case Diagram for Patient Interactions

Figure 3 Use Case Diagram for Healthcare Provider Interactions with the Virtual Health Assistant

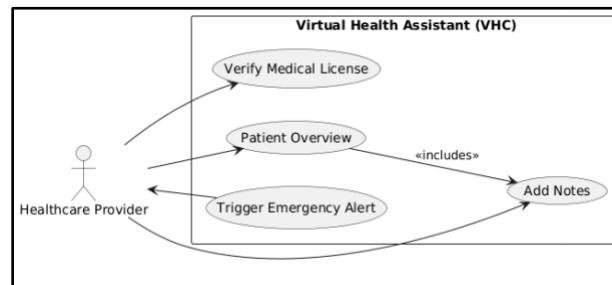


Figure 3. Use Case Diagram for HCP Interactions

Figure 4 Use Case Diagram for Admin Interactions with the Virtual Health Assistant

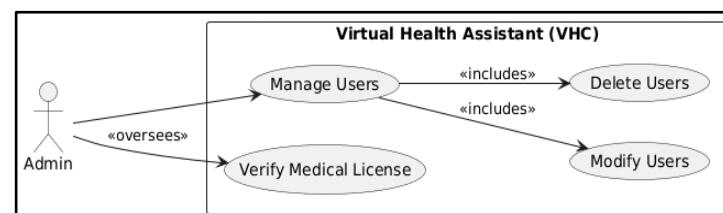


Figure 4. Use Case Diagram for Admin Interactions

2.5 Use Case Specifications

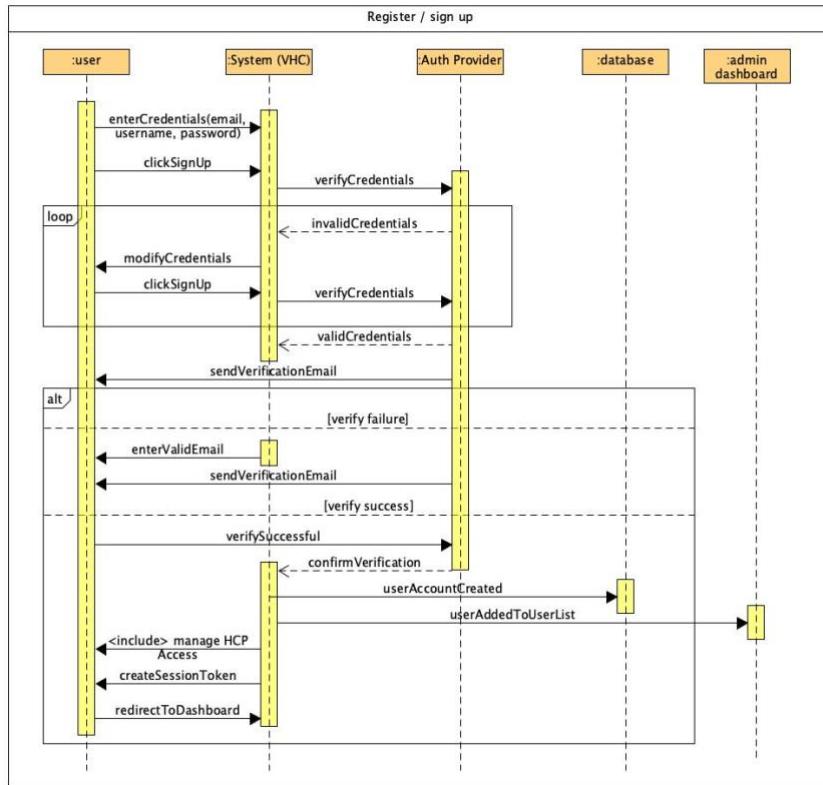
The following use case specifications describe each scenario in the diagrams, defining the actors and outlining the main and alternative flows to cover all relevant interactions.

- 2.4.1 Use Case : Manage Profile (Refer to [appendix C Patient Use Cases : Use Case C1.1](#))
- 2.4.2 Use Case : Chat with Assistant (Refer to [appendix C Patient Use Cases : Use Case C1.2](#))
- 2.4.3 Use Case : Notifications (Refer to [appendix C Patient Use Cases : Use Case C1.3](#))
- 2.4.4 Use Case : Detect Anomalies (Refer to [appendix C Patient Use Cases : Use Case C1.4](#))

Refer to [Appendix C](#) for all the use case specifications for the three roles : Patient ([C1](#)) , Healthcare Provider ([C2](#)) , Admin ([C3](#))

2.6 UML Diagrams

2.6.1 Register Flow – Sequence Diagram



Refer to [Appendix C4](#) for All UML Diagrams

2.7 Requirements Specification Summary

To summarize, our system protects health data and gives access based on clear roles: patients, healthcare professionals, and admins. It pulls in biomarker data from different wearables, shows trends using graphs and charts, and lets users chat with an AI-powered assistant for personalized health tips. Fun features, like earning rewards and caring for a virtual pet that mirrors the user's health, help users stay motivated. All health information is handled securely and follows rules like HIPAA and GDPR. The app works smoothly across devices and browsers so anyone can use it easily.

3.0 Risk Analysis

3.1 Introduction and Approach

This section details the critical risks our team might face during the project. Our strategy addresses the unique challenges of a student, emphasizing team interactions, technical hurdles, and scheduling issues influenced by the academic year and our project timeline.

Risk management is a four-stage process:

1. **Identification:** Pinpointing and categorizing potential risks.
2. **Analysis:** Evaluating the probability and potential consequences of each risk.
3. **Planning:** Developing both proactive strategies to minimize risk occurrence and reactive contingency plans for when risks materialize.
4. **Monitoring:** Continuously tracking risks throughout the project lifecycle.

For analysis, we will utilize the following scales:

- **Likelihood:** The chance of a risk happening (Low, Medium, High).
- **Impact:** The severity of the risk's effect on project timeline, quality, or final grade (Low, Medium, High).

3.2 Risk Identification

The table below presents a summary of the identified risks, including their category, assessed likelihood, and potential impact.

High Likelihood and High Impact risks:

Below are 3 risks that we have come across but also eliminated using the following mitigation strategies:

1. Uneven workloads: Addressed through weekly team sessions to ensure tasks are distributed fairly based on each member's capacity.
- 2.Unclear Requirements Leading to Rework: all requirements should be documented and clarified by each team member.
- 3.Data Integrity and Security: encrypt all sensitive data both in transit and at rest. Implement user authentication to ensure only authorized users access health data.

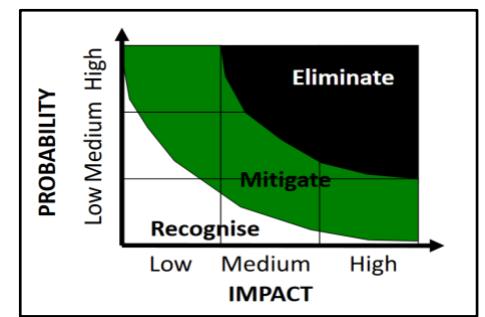


Figure 5. Risk Probability vs. Impact.

Table 5. Risk Identification

ID	Description	Category	Likelihood	Impact
R1	Some team members may lack technical expertise in APIs for database encryption, or chatbot AI. This would slow down progress.	Technical	Medium	High
R2	Scheduling conflicts due to other courseworks, exams and holidays may delay testing of key aspects such as the dashboard or health reports.	Planning		Medium
R3	Poor communication or disagreements on project decisions like dashboard UI, or data visualisation style could lead to inconsistent interfaces or duplicated work.	Team Dynamics	Medium	Medium
R4	Code Integration failure when connecting APIs with the dashboard near submission date could break the build and delay delivery	Technical	Medium	High
R5	A key team member responsible for UI design or authentication may become unavailable due to illness or travel, causing delays.	Team Dynamics	Low	Medium
R6	The team may fail to fully implement all the critical requirements such as authentication, biomarker tracking, or the professional dashboard due to time constraints.	Requirements/ Planning	Medium	High

R7	The team could face difficulty finding actual healthcare professionals or users with wearable devices that could assist in testing.	Evaluation	Medium	Medium
R8	Using friends or family as participants that provide overly positive or unhelpful feedback that fails to highlight usability or functionality issues.	Evaluation		Medium
R9	A data breach exposing sensitive user health information or login details could damage trust and violate laws.	Security	Medium	High
R10	Costs for APIs, cloud database storage, or third-party integration could exceed the project's available budget.	Financial	Medium	Medium
R11	Failure to comply with healthcare data standards during development could result in project rejection or ethical non-compliance.	Technical/legal	Medium	High

3.3 Risk Planning

A “Risk Plan” is defined as how we will:

- **Prevent** the risk from happening (Mitigation)
- **Respond** if the risk does happen (Contingency)

For each of the risk, we will choose from the category mentioned below:

- **Mitigate** - Take steps to reduce the likelihood and impact of the risk.
- **Avoid** - Find a way to eliminate the risk entirely.
- **Accept** - Accepting and acknowledging the risk and deciding to do nothing for low priority risks.

Table 6. Risk Planning

ID	Mitigation Strategy (Proactive)	Contingency Strategy (Reactive)
R1	Group members will train for weaker areas and document technical process	Reassign complex tasks to experienced members; simplify features if deadlines are at risk.
R2	Use a sharing calendar to show members when each are free and set internal deadlines	Record the meetings to allow the members to watch it; extend working sessions after exam periods
R3	Create a clear communication plan and assign a decision lead to finalize team choices	Hold a team meeting to realign decisions and document all changes to prevent repeat confusion.
R4	Implement continuous integration to catch errors early; perform regular merge testing	Rollback changes to revert the code before the implementation
R5	Have at least 2 members working on the same part	Redistribute their unfinished work and prioritize critical features
R6	All “must have” features have to be completed	Arrange meeting with the client to discuss which “must have” has the lowest priority and move those to the back
R7	Start recruiting participants early via online or university platforms	Use team members, friends and family as a last resort

R8	Screen the participants for bias, use structured evaluation forms to gather objective feedback	Cross-validate with a neutral reviewer, conduct a follow-up with less bias participants
R9	Implement encryption, secure APIs, and use environment variables for credentials (encrypt data)	Shut down the servers and meet with the client to assess the situation
R10	Verify hosting and tool costs before implementation, use free or student licenses	Optimize time to find ways to use cheaper database tiers or remove any high cost “could have” features
R11	Dedicate researcher to research and document all the technical requirements for compliance	If a compliance gap is found, the development should stop and find a way to fill in the gap before proceeding

3.4 Risk Monitoring:

Risk monitoring involves keeping track of ongoing issues and checking for new ones throughout the project. This helps the team spot potential problems early, reduce disruptions, and keep everything on schedule.

Table 7. Risk Monitoring

ID	Warning Signings (What could go wrong)	Monitoring Method (How we will keep an eye on it)
R1	Tasks involving complex software take longer to finish or show repeated errors.	Track development speed and identify areas where members may need extra support or training.
R2	Deadlines clash with exam weeks or holidays, leading to late or missed submissions.	Compare project milestones with the academic calendar and adjust timelines before busy periods.
R3	Misunderstandings or disagreements during meetings result in duplicated or incorrect work.	Record and share meeting notes after each discussion to make sure everyone agrees on decisions.
R4	Integration or code merging fails close to submission, delaying testing and delivery.	Run integration checks regularly and keep backup versions to detect problems early.
R5	A member stops responding or contributing due to illness or personal reasons.	Monitor attendance and communication weekly; follow up privately if someone becomes inactive.
R6	Key project features or “must-have” parts remain incomplete as deadlines approach.	Track completion of all requirements weekly and mark unfinished items in the task list.
R7	Testing is delayed because no participants are available.	Plan testing early and track recruitment progress to make sure participants are confirmed.
R8	Feedback from testers is overly positive or lacks useful criticism.	Review all test results to confirm feedback is specific and comes from a mix of participants.
R9	Suspicious login attempts or missing project files are noticed.	Regularly check file access history and keep backups of important documents.

R10	Extra or unexpected costs arise, such as new tools or software.	Review spending logs regularly and compare them against the planned project budget.
R11	The project fails to meet university or ethical requirements.	Go over the project rules before submission and make sure everything needed is included.

3.4 Risk Analysis Summary

This risk analysis section identified key risks that could impact project success, such as technical skill gaps, scheduling conflicts, data breaches, biased participant feedback, budget overruns, and compliance failures. Each risk was evaluated for likelihood and impact, with practical mitigation strategies including team training, use of secure APIs, proactive cost planning, and adherence to data standards. The analysis emphasizes continuous monitoring and contingency planning, ensuring early detection of issues and adaptive responses, which helps safeguard project delivery, legal compliance, and data security.

4.0 Project Decisions and Plan

4.1 Project Decision

4.1.1 Choice of Language and Software

Our team selected technologies based on project requirements, team expertise, and suitability for healthcare applications.

Communication & Collaboration:

- Microsoft Teams - Provides integrated communication and file sharing and will be our main source of communication
- GitHub - Essential for version control and collaborative development with our team

Development Stack:

- Python, JavaScript, TypeScript - Python offers robust data processing capabilities for health analytics, while TypeScript provides type safety for our complex frontend interactions
- NextJS (Frontend) - Chosen for its server-side rendering and performance optimization, which are important for responsive health dashboards
- FastAPI (Backend) - As stated on FastAPI's website, "*FastAPI is a modern, fast (high-performance), web framework for building APIs with Python based on standard Python type hints*", we selected this backend framework and as it based on python, we could use widely used data analysis libraries like pandas numpy, and other libraries for our biometrics analysis and predictions, and as it's easy to implement plus scalable, for us as a startup would be helpful to create scalable backend within the time frame, we also researched a bit and found, most YC-funded startups in the last 2-3 years had this as their backend in their tech stack

Data Management:

- PostgreSQL - Provides reliable relational data storage suitable for structured health information and user relationships
- AWS S3 - Offers secure, scalable cloud storage for health reports and documents

Security & Authentication:

- AWS Cognito - Implements healthcare-grade authentication and user management
- Snyk - Provides automated security vulnerability scanning for our codebase

Development Tools:

- Figma - Enables collaborative UI/UX design for accessible health interfaces
- Vercel - Offers streamlined deployment with good NextJS integration
- Linear - Provides clean project management suitable for agile development
- Sentry - Delivers real-time error monitoring for production stability

AI & Intelligence:

- Gemini - Powers our AI-driven health insights and predictive analytics capabilities

Analytics & Monitoring:

- Amplitude - Tracks user engagement patterns to optimize health feature adoption
- Google Analytics - Monitors overall platform performance and user acquisition
- Google Tag Manager - Manages tracking implementations efficiently
- Google Search Console - Optimizes discoverability for health information seekers

Testing & Quality Assurance:

- JMeter - Ensures platform reliability under high user loads, critical for healthcare applications

4.1.2 Software Processes

Our project will follow the Scrum methodology, which is an agile framework focusing on iterative development. We chose Scrum because it works well for software projects where requirements might change and we need to get feedback regularly.

How We'll Use Scrum

Sprint Setup: We'll run **14 1-week sprints** within our 14-week timeline.

Team Roles

- **Product Owner:** Decides what features to build first and makes sure we're meeting the healthcare requirements
- **Scrum Master:** Keeps us on track with the process and helps remove any blockers
- **Development Team:** All of us working on coding, testing, and building the app

Sprint Activities

Sprint Planning (Every 2 weeks)

- We'll meet for about 2 hours to plan what we want to accomplish in the next sprint
- Pick user stories from our backlog and break them down into tasks
- Estimate how long things will take

Daily Standups

- Quick 15-minute check-ins during weekdays
- Everyone shares what they did yesterday, what they're doing today, and if they're stuck on anything
- Since we're working with different parts (frontend, backend, database), this helps us stay coordinated

Sprint Review (End of each sprint)

- Demo what we built to get feedback
- Show working features like the patient dashboard or device connections
- See if we're on track with our requirements

Sprint Retrospective (End of each sprint)

- Talk about what went well and what we can improve
- Discuss any healthcare-specific challenges we ran into
- Plan how to do better next sprint

4.1.3 Managing Our Work

User Stories: We'll write requirements as user stories like: "As a patient, I want to connect my smartwatch so that my health data gets tracked automatically"

Priorities

- Must-have features: Emergency alerts, security, basic user accounts
- Core features: Dashboards, device integration, health data processing
- AI features: Virtual companion, health insights
- Nice-to-have: Advanced reporting, social features

Definition of Done

Before we consider something finished:

- Feature works as expected
- Code is reviewed by someone else
- Tests are written and passing
- Works across different browsers
- Meets security requirements for health data

Measuring Success

We'll track:

- How much work we complete each sprint
- Number of bugs we find
- Whether features meet our healthcare requirements
- System performance and uptime

4.1.4 Assessment / Evaluation Plan

- **Performance Testing** - JMeter will be used to simulate user load and to evaluate the system performance under stress.

- **Acceptance and Correctness Testing** -

User Acceptance Testing (UAT) : Demo users (such as friends and family) will test the system to ensure that the system meets user needs and expectations.

Unit Testing : Individual components or functions of the code will be tested to verify correctness.

Cross-Browser Testing : Compatibility between major browsers will be tested(Safari, Chrome, Edge, Firefox)

- **Evaluation Testing** -

Functionality Testing: Verification that the software meets all of the functional requirements mentioned.

Usability Testing : Evaluation of the user experience , ease of navigation and overall interaction design.

4.2 Individual Contributions and Team Roles

Table 8. Team Roles

Name	Stage 1 Role	Stage 2 Role
Huzaifa Abdul Safeem	Project Designing and Plan	Backend Developer
Kamo Peacock	Risk Analysis	Researcher
Krishna Bhandari	Prototype	UI/UX Designer
Patrick Abella	Prototype	UI/UX Designer
Rhea Menezes	Project Manager	Project Manager
Simon Getachew Girma	Risk Analysis	Frontend Developer
Tehan Ranuk Miskin	Project Costing	Frontend Developer
Zeeshan Khan	UML	Cybersecurity Engineer

4.2.2 Collaboration

Our group intends to collaborate using the tools and methods mentioned below:

- **Version control and Code sharing** - GitHub will be the main software we use to manage code versions.
- **Communication** - Microsoft Teams will serve as our primary platform for team communication.
- **Project Management** - Either Linear or Jira will be used to track tasks and progress.
- **Team Meetings** - Weekly 2-hour meetings on Mondays will cover progress, challenges, and next steps.
- **Sub Group Meetings** - Sub groups will meet daily to review completed and pending tasks.
- **Manager Meetings** - Weekly 1-hour meetings with our line manager on Thursdays provide guidance and review.

Refer to [Appendix E Section E1](#) for Stage 1 Gantt Chart

Sprint 1



Figure 6. Stage 2 - Sprint 1

Sprint 2

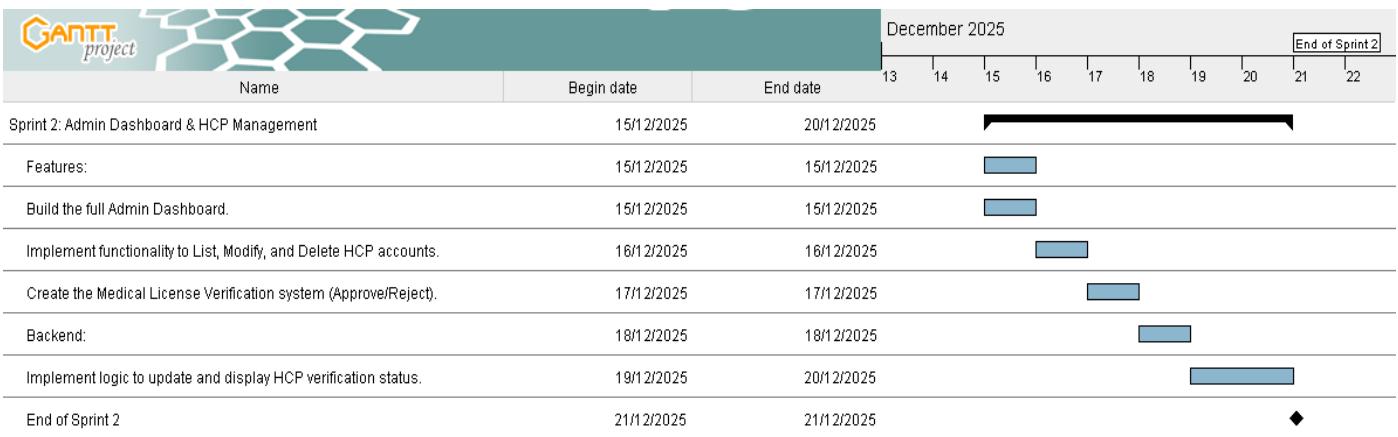


Figure 7. Stage 2 - Sprint 2

Sprint 3



Figure 8. Stage 2 - Sprint 3

Refer to [Appendix E2 Stage 2 Project Plan](#) for Stage 2 Gantt Chart

Refer to [Appendix E3](#) for High Level Deployment Diagram

5.0 Project Costing

5.1 Introduction

This part of the report shows the cost plan for the Virtual Health Companion for Daily Living prototype. It explains how much money will be spent on staff, hardware, software, hosting, testing, maintenance, and deployment. The prices are based on real market rates and average salaries found online.

5.2 Costing Breakdown

The costs for this project will fall into the categories mentioned below:

- 2.1: People (Staff and Working Hours)
- 2.2: Administration Cost
- 2.3: Hardware (Wearables and Testing devices)
- 2.4: Software and Hosting (Cloud, APIs, Licenses)
- 2.5: Deployment (Hosting and App Store/Google Play Store fees)
- 2.6: Maintenance (Future Costs)
- 2.7: Evaluation (User Testing and Accessibility Traits)

(Refer to [Appendix F Figure F1](#) for a diagrammatical breakdown of expenses considered)

5.3 Cost analysis

5.3.1 People (Core Development Team):

The biggest part of the budget is the staff. **Roles:**

- **Project Manager-** They oversee the progress of the project , manage communication between members and ensure that the deadlines are met.
- **Backend Developer-** Develops APIs, manage biomarker data integration as well as ensure secure data flow.
- **Frontend Developer-** Builds the web application and UI, graphs and accessibility features.
- **UI/UX Designer-** Will design wireframes, prototypes and user flows.
- **Quality Assurance and Testing Lead-** Designs testing situations, runs usability scenarios and ensures cross platform integration and support.
- **Research-** Handles all the research on wearables and checks compliance with health standards.
- **Cybersecurity engineer:** Implement securities measures, protects user data, and ensures compliance with privacy regulations.
- **DevOps engineer:** Manages deployment pipelines, maintains cloud infrastructure, and automates development workflows

Hourly wages are calculated by converting average monthly salaries (sourced from NaukriGulf and Indeed) into a daily rate based on a 22-day month, then dividing by a 4-hour workday. The project duration is 20 weeks based on a 5-day work week and 4-hour workday.

Table 9. Role-Based Wage Allocation Across Project Team Members

Role	Team Member	Contribution	Hours Worked	Hourly Wage	Total Wage
Project Manager	Rhea	70%	280	AED 132	36,960 AED
	Krishna	10%	40	AED 132	5,280 AED
Frontend Developer	Simon	70%	280	AED 50	14,000 AED
	Tehan	70%	280	AED 50	14,000 AED
	Zeeshan	20%	80	AED 50	4,000 AED
Backend Developer	Huzaifa	70%	280	AED 44	12,320 AED
	Zeeshan	50%	200	AED 44	8,800 AED
	Rhea	20%	80	AED 44	3,520 AED
Quality Assurance	Krishna	30%	120	AED 96	11,520 AED
	Kamo	50%	200	AED 96	19,200 AED
UI/UX Designer	Patrick	70%	280	AED 29	8,120 AED
	Krishna	60%	240	AED 29	6,960 AED
	Rhea	10%	40	AED 29	1,160 AED
Cybersecurity Engineer	Zeeshan	30%	120	AED 68	8,160 AED
	Tehan	30%	120	AED 68	8,160 AED
	Huzaifa	30%	120	AED 68	8,160 AED

	DevOps engineer	Patrick	30%	120	AED 45	5,400 AED
		Kamo	20%	80	AED 45	3,600 AED
	Researcher	Simon	30%	120	AED 64	7,680 AED
		Kamo	30%	120	AED 64	7,680 AED
Total				3200		194,680 AED

5.3.2 Administration Costs:

Table 10. Administration Costs

	Item	Price
	Office Rent (Jumeirah Lake Towers- 2 Years)	100,000 AED
	Dewa Chargers (small office)	5,229 AED
	Visa (8 People - 2 Years)	56,000 AED
	Medical Insurance (8 People - 2 Years)	8,000 AED
Total		169,229 AED

5.3.3 Hardware (Wearables and Testing devices)

Table 11. Hardware Costs

	Hardware	No. of Units	Price per unit	Total Price
	Smartwatch(Apple- Series 11)	3	1,600 AED	4,800 AED
	Smartwatch (Samsung Galaxy Watch 8)	3	1,399 AED	4,197 AED
	Workstation (Mac Studio- Max Configuration)	1	58,919 AED	58,919 AED
Total		9		67,916 AED

5.3.4 Software and Hosting (Cloud, Apis, Licenses)

Table 12. Software and Hosting Costs

	Software	Price
	Cloud Hosting(AWS for 1 year)	1,446.71 AED
	API licensing(Apple HealthKit)	363.33 AED
	Figma(Dev Seat 129 AED * 4 Months)	516 AED
	Github (Enterprise Plan x 8 people x 12 months)	7,398.72 AED
Total		9,724.76 AED

5.3.5 Deployment (Hosting and App Store/Google Play Store fees):

Table 13. Deployment Costs

	Item	Price
	App Store Publishing (Google Play)	92 AED
	App Store Publishing (Apple App Store)	364 AED
	Domain Registration (.com)	200 AED
Total:		656 AED

5.3.6 Maintenance (Future Costs):

Table 14. Future Maintenance Costs

	Item	Price
	Developer Training (Health Data Compliance x 8 People)	55,636.96 AED
	Maintenance(1,835 AED for 12 months)	22,020 AED
Total		77,656.96 AED

5.3.7 Evaluation (User Testing and Accessibility Traits):

Table 15. Testing Costs

	Items	No. of units	Price per unit	Total Price
	Volunteer rewards	8	100	800 AED
	Location: University	0	0	Free
Total:				800 AED

5.3.8 Total Cost Summary

Table 16. Total Cost Summary

	Item	Price
	People	194,680 AED
	Administration Costs	169,229 AED
	Hardware	67,916 AED
	Software and Hosting	9,725 AED
	Deployment	656 AED
	Training and Maintenance	77,657 AED

	Testing and Evaluation	800 AED
Sub Total		520,663 AED
	20% Contingency Costs	104,133 AED
Grand Total		624,796 AED

In Summary, the total estimated cost of the project is 624,796 AED.

Refer to [Appendix F Section F2](#) for a list of references for costing

6.0 Usability Evaluation of Mock-Ups

6.1 Introduction

This section presents a detailed plan for conducting a usability evaluation of Pulse, our Virtual Health Companion App. The primary objective of this evaluation is to determine how effectively users can navigate and interact with the prototype to manage daily health-related activities such as goal tracking, doctors managing patients, and viewing health analytics.

All insights collected will inform improvements to interface design, accessibility, and overall user experience for the final version of the system.

6.2 Test Plan

6.2.1 Objectives

The purpose of the usability test is to measure how intuitively users can complete common health-related tasks within the app without external assistance.

The specific aims are:

- Evaluate the clarity and efficiency of the interface.
- Assess navigation flow and information presentation.
- Collect user feedback regarding ease of use, satisfaction, and accessibility.
- Identify functional or visual barriers that may affect user engagement.

6.2.2 Methodology

The way we are going to run these tests is using a group of users from different age groups and health backgrounds to test the Virtual Health Companion App. During the evaluation, user behaviour will be observed to identify how intuitively they can navigate the interface and complete assigned health-related tasks such as interacting with the AI assistant, setting goal reminders, and viewing health reports. After completing the test, participants will be asked to fill out a questionnaire to provide feedback on the app's usability, functionality, and overall user experience. The collected observations and responses will then be analysed to identify areas that may require improvement in future versions of the system.

6.2.3 Participants

A total of 10 participants over the age of 18 will take part in this evaluation. Participants were selected from various backgrounds to ensure a diverse range of feedback, including individuals with different levels of experience using health or fitness applications. This diversity allows for more balanced and meaningful insights into the app's usability and accessibility.

6.2.4 Test Scenario

Each test focuses on the main things a user does so we can check if the app is easy to use, clear, and works.

Table 17. Test Scenarios for Test Protocol Questions

Questions	Test Scenario
1	U-FR-1-1 - Users must be able to sign up. U-FR-1-2 - Users must be able to log in with their username and password.
2	U-FR-9-2 - Users must be able to view the summary dashboard displaying daily health metrics. U-FR-1-4 - Users must be able to view their personal info, like height, weight, goals, and emergency contact.
3	U-FR-7-1 - Users must be able to set, modify, or remove daily and weekly health goals
4	U-FR-4-1 - Users must be able to connect a fitness device. U-FR-4-2 - Users must be able to disconnect a fitness device.
5	U-FR-8-1 - Doctor should be able to sign up and submit document for verification
6	U-FR-8-2 - Doctor should be able to review new patient requests U-FR-8-3 - Doctor should be able to view their list of patients and their reports U-FR-8-4 - Doctor should be able to view their reports and add notes
7.	U-FR-2-6 - Admin should be able to delete user accounts. U-FR-2-7 - Admin should be able to verify doctor license

Each test scenario will be monitored to measure how efficiently users can complete the task without external assistance. The results will be categorized as:

Completed – Task completed independently without errors.

Completed with guidance – Task completed with minimal guidance.

Not Completed – Task not completed even with help.

We will check if each feature works by seeing if users can successfully finish the required test steps. Then, a simple questionnaire will ask users about how easy the app was to use and understand.

Refer to [Appendix G1](#) for the Consent Form

6.3 Test Protocol

Refer to [Appendix G2](#) for the entire Test Protocol with Questions.

6.4 Test and Usability Findings

6.4.1 Test Subject Demographics

Gender Demographic:

Gender	
Males	5
Females	5

Table 18. Gender Table

Age Demographic:

Age	
18-20	10
21-25	0
26-30	0
30-35	0

Table 19. Age Table

Occupation Demographic:

Occupation	
University Students	10
Employed (Full-time/Part-time)	0
Unemployed	0
Retired	0

Table 20. Occupation Table

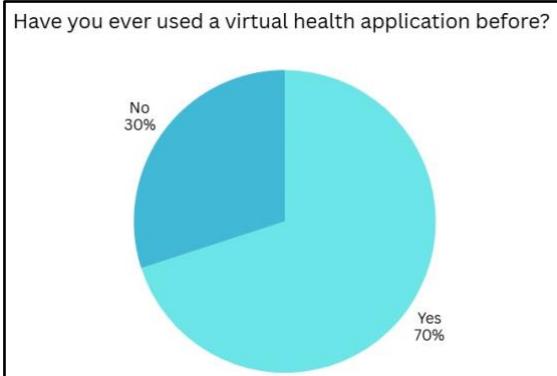


Figure 10. Pie Chart

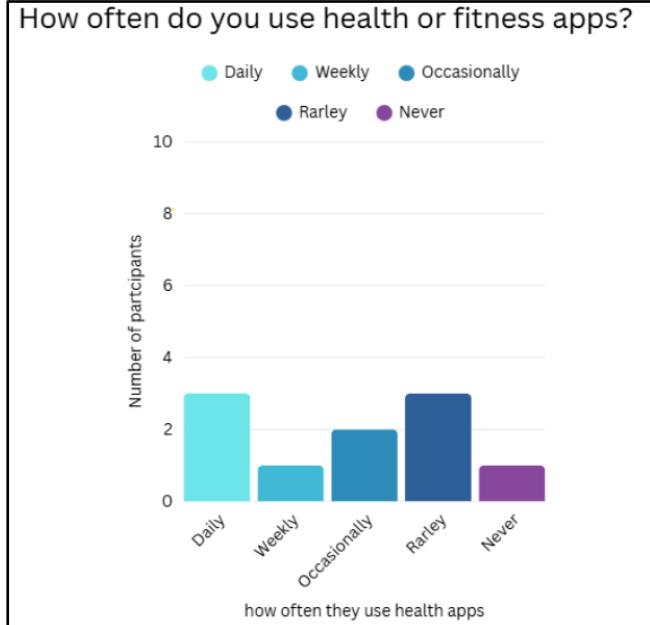


Figure 9. Bar Chart

6.4.2 Usability Results

6.4.2.1 Independent User - Sign up and Login page

User Evaluation

Participants reported that the sign-up workflow was clear and straightforward, with 80% successfully completing the process without assistance. Several users expected the “Sign Up” confirmation action to redirect them back to the login page or directly to the dashboard, depending on the system design. Users also mentioned that when incorrect or incomplete information was entered, they expected inline error indicators positioned directly within or below the affected input field in the final product.

Users interpreted the “Goals” input section as a regular text field because the plus/minus icons appeared visually similar to standard input controls, making the intended interaction unclear. All participants found the login process intuitive, minimal, and easy to complete, with no usability obstacles reported.

Suggested Changes Based on Feedback

- 1.Implement Two-Factor Authentication (2FA)
- 2.Enable immediate inline error feedback to reduce form submission errors

Task : Registration

All participants successfully completed the Registration flow.

Completed	Completed with guidance	Not completed
8	2	0

6.4.2.2 User Dashboard Page

User Evaluation

Participants reported that health metric visibility and comprehension were strong, with 90% finding each metric easy to locate and understand. However, several users noted that the biomarker cards should include the full metric name alongside the icon, as the prototype only displayed symbols. Navigation within the dashboard was efficient for most users, with 80% finding it easy to move between sections. However, 20% felt that the overall data presentation was overwhelming. Additionally, 10% found the Health Restrictions and Goals section confusing to use. For doctor notes, 10% of participants suggested replacing the label “pending” with “in progress” for better clarity. Furthermore, 20% misinterpreted the page as supporting multiple doctors due to the absence of identifiable doctor details. Feedback on the chatbot highlighted that the icon did not clearly communicate its function. One participant recommended including the chatbot as a tab option in addition to the icon. On the User Profile screen, 20% of users felt that the term “Inventory” did not make sense and suggested renaming it to “Customize Buddy.” Another 20% reported that the screen felt cluttered and should focus only on essential personal settings, with features like goals, streaks, badges, and buddy information relocated to a separate section.

Suggested Changes Based on Feedback

- 1.Include the full biomarker name alongside each icon on biomarker cards.
- 2.Replace the “pending” label for doctor notes with “in progress.”
- 3.Add doctor identification details on the doctor notes page.
- 4.Declutter the User Profile screen by limiting it to core personal settings and moving goals, streaks, badges, and buddy features to a separate screen.

Task : User Dashboard Navigation

Most participants were able to locate the health metric they were searching for without difficulty. However, one participant required supervisor assistance to identify the “Steps” metric, as it was represented only by an icon and not labeled explicitly.

Completed	Completed with guidance	Not completed
9	1	0

6.4.2.3 My Goals Page

User Evaluation

Most participants (70%) found the process of setting a new goal straightforward. However, 10% were unsure of the term “category” and asked whether it referred to a biometric type, indicating ambiguity in the labeling. Progress tracking was well received, with 70% reporting that the visualization and status indicators were clear and easy to interpret. All participants were able to edit and delete goals without difficulty.

Suggested Changes Based on Feedback

1. Replace the term “Category” with “Biometric” when creating a new goal to improve clarity.
2. Enhance progress-tracking visualizations for more intuitive and informative feedback.

Task : Create, Edit and Remove a Goal

Most participants completed the task successfully without any difficulty. One participant experienced confusion regarding the term “Category” in the goals section.

Completed	Completed with guidance	Not completed
9	1	0

6.4.2.4 Devices Page

User Evaluation

All participants found it easy and intuitive to connect and disconnect a device from the list of available devices, and all completed the task successfully. Users were satisfied with how the system displayed currently connected devices. A small portion (10%) suggested adding pop-up notifications to provide immediate feedback when a device is connected or disconnected. Another 10% recommended that the “All Devices” section include not only the full list of compatible devices but also indicate which biometric data each device collects to support informed selection.

Suggested Changes Based on Feedback

1. Display the specific biometric data measured by each device in the “All Devices” section.
2. Add immediate pop-up or inline feedback when devices are connected or disconnected.
3. Consider grouping devices by biometric category (e.g., heart rate, sleep, activity) to improve clarity and browsing efficiency.

Task : Connect/Disconnect a Device

All participants successfully connected and disconnected devices and were able to view the list of connected devices.

Completed	Completed with guidance	Not completed
10	0	0

6.4.2.5 Doctor - Sign up Page

User Evaluation

Most participants (75%) found the sign-up process for the doctor role clear and easy to complete. A majority (80%) viewed the medical license upload requirement as a good and essential feature. A small portion (10%) indicated that the system should provide feedback on the verification process after document submission. In the prototype, users were redirected to the dashboard immediately, which does not reflect the expected flow where admin verification must occur first. Participants expected a clear indication of what happens between submission and approval but did not require any additional information before ultimately accessing the dashboard.

Suggested Changes Based on Feedback

1. Define and implement a clear user flow for the waiting period before admin verification, including status updates or confirmation messages.
2. Provide explicit feedback (e.g., “Verification Pending”) after document submission to avoid confusion.

Task : Register as Doctor

All participants successfully completed doctor sign up and navigated to the doctor dashboard.

Completed	Completed with guidance	Not completed
10	0	0

6.4.2.5 Doctor - Dashboard

User Evaluation

1. My Patients Page

Participants clearly understood the purpose of the My Patients page - to view patient details, reports, notes, and to remove patients if needed. They found it easy to locate and access patient profiles, and reported that adding and editing notes was straightforward. Several participants observed that having separate “Details” and “Reports” buttons created redundancy. They recommended consolidating these functions into a single entry point. Overall, the layout of patient information was described as clear, readable, and sufficiently detailed for reviewing a patient’s profile from a doctor’s perspective.

2. Requests for New Patients Page

Participants found it easy to identify new patient requests and felt that the accept/decline actions were intuitive, clearly labeled, and easy to execute. They also agreed that the patient information provided was adequate for making an informed decision about accepting a request.

Suggested Changes Based on Feedback

1. Reduce redundancy by combining the “Details” and “Reports” buttons into a single, unified patient information view.
2. Ensure consistency in how patient information is presented across both pages to maintain clarity and ease of use.

Task : View Patients List

Most participants successfully navigated the patient list, accessed patient profiles and reports, and correctly demonstrated how to add notes. However, two participants were unclear about the distinction between the “**Details**” and “**Reports**” popups.

Completed	Completed with guidance	Not completed
8	2	0

6.4.2.5 Admin – Dashboard

User Evaluation

Participants found it easy to locate and review system data on the admin interface. They noted that the doctor and admin dashboards appeared visually similar, which made the role distinction unclear. Despite this, users had no difficulty navigating between admin functions and were able to interpret the dashboard content accurately, recognising it as a list of all patient and doctor accounts. Participants also understood that the license list represented pending doctor verifications, and that these items required administrative review. Some users observed redundancy, with certain action buttons appearing both on the list item and within the popup, making the interface feel repetitive. All participants were able to clearly distinguish the “**Requests**” and “**Current**” tabs, identifying “**Current**” as the list of existing doctors in the system and “**Requests**” as doctors awaiting approval.

Suggested Changes Based on Feedback

- 1.Remove redundant buttons from popups and retain actions only within the main list items.
- 2.Make the visual and functional differences between the doctor and admin dashboards more distinct.
- 3.Consolidate user logs into a single Logs tab rather than displaying logs within each user popup.

Task : Navigate Admin Dashboard

Most participants successfully navigated the admin dashboard, viewed patient and doctor accounts, deleted accounts, and verified doctor licenses. However, two participants were confused by the presence of the “**Remove**” button both on the list item and within the popup, perceiving it as redundant. Additionally, one participant expressed confusion distinguishing between the **Doctor** and **Admin** dashboards.

Completed	Completed with guidance	Not completed
7	3	0

6.4.3 Questionnaire Results

The scale below was used to evaluate how participants felt about the system, allowing us to measure their overall attitude and level of satisfaction:

1	2	3	4	5
Strongly disagree	Disagree	Neither agree nor disagree	Agree	Strongly agree

Table 21. Questionnaire Results

Questions	1 (Strongly disagree)	2 (Disagree)	3 (Neither agree nor disagree)	4 (Agree)	5 (Strongly Agree)
The app felt straightforward and intuitive to use.	0	0	2	2	6
I encountered confusing or difficult parts while using the app.	1	3	2	2	2
It was easy to locate the features or options I needed.	0	2	1	2	5
I would need help from someone to use this app properly.	5	0	2	2	1
The app's functions worked well together without issues.	1	1	2	0	6
The layout and design made navigation easy.	1	1	0	2	6
The health information and data presented were clear and meaningful.	0	0	3	1	6
I felt confident using the app for monitoring my health without additional guidance.	0	2	0	1	7
I would consider using this app regularly to help achieve my health goals.	2	1	1	1	5
Connecting external devices using this app was easy.	1	0	1	2	6

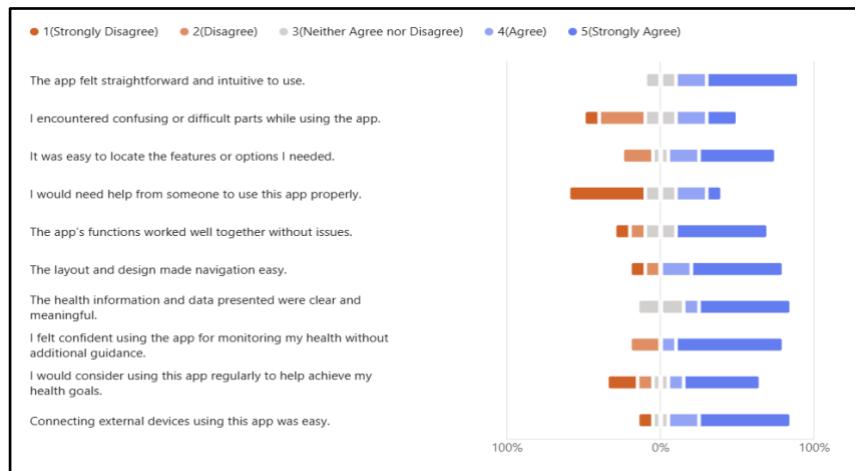


Table 21. Questionnaire Statistics

Observation:

The overall results showed positive feedback about the app's usability and design. Most participants found the app easy to navigate, clear in layout and effective for completing essential tasks.

- App's Usability:

Users found the dashboard, device link, and primary features easy to understand and use. Most users found it easy to access all health metrics and were comfortable operating the app without guidance. A few respondents got tripped up on some headers like "Category," "Inventory" and "Pending" and suggested to add more clear text alongside icons.

- Guidance and Clarity:

Certain pages were a bit cluttered for some users, especially the section where patient profile and goals are present. A couple of users had

trouble determining what was clickable or felt confused as to where they could find certain things (i.e., doctor notes, untracked health data). A few noted inconsistent design features or suggested minor visual enhancements like shadows or that items stay within their containers.

-Feature expectations and functionality:

Some participants recommended making the difference between doctor and user accounts clearer and suggested improving the charts used in the app. Some thought the interface was not professional enough. One user described the design as too playful, while another wanted clearer confirmation when connecting a device.

- Likelihood of Daily Use:

Most users suggested they would use the app daily as it was easy to go through and motivating, plus, all the doctor's recommendations found in one app made it accessible enough to use each day. A few users suggested they would not use the app daily as it was a bit overwhelming on screen). Overall, the responses to the questionnaire indicate a usable application and positive user experience but also demonstrate a few instances of feedback - clarity, organization of layout, visual consistency - that could be improved.

6.4.4 Improved Prototype (Included in [Appendix H](#))

Based on the feedback received, we improved our prototype. We enhanced the overall theme and visual design, removed redundant features, and made the interface clearer, more intuitive, and easier to navigate. We also distinctly separated the three dashboards for each user role, decluttered both the dashboard and patient profile layouts, and ensured consistency throughout the system.

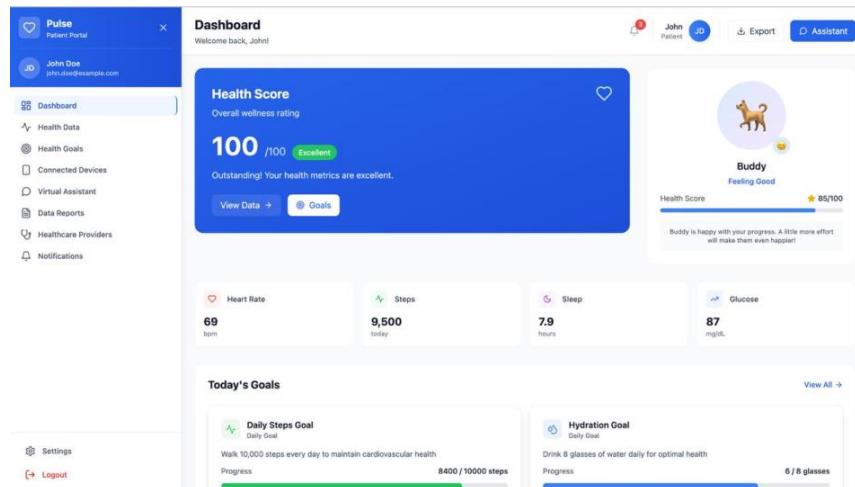


Figure 11 Improved User Dashboard

Refer to [Appendix H](#) for the ALL System Mockups After conducting the Usability Study.

7.0 Conclusion

In conclusion, this report summarizes the development of the Virtual Health Companion App by outlining the project's goals, scope, and intended users. The system's functional and non-functional requirements were defined through detailed analysis, supported by use case diagrams and specifications. Key project risks were also identified along with suitable mitigation strategies.

In addition, hardware and software requirements for the completion of the project have been recognized as well as team member assignments and responsibilities with a tentative timeline noted through a Gantt chart for reference. Also, a budget has been compared to typical costs of a project like this one app

Finally, a final interactive prototype created in Figma was tested through usability testing which includes pre/post questionnaires and tasks given to users who offered qualitative and quantitative evaluations of effectiveness of system design and functionality. This feedback will support any adjustments moving forward to ensure ongoing usability, effectiveness and continued goal achievement

Appendix

Appendix A: Requirements Definitions

A.1 Priority Definitions

- Must : This is a critical requirement without these the system can't be considered either complete nor successful.
- Should : This is a high priority requirement that is important however not crucial. The system should be able to function without this requirement.
- Could : A low priority “nice to have” feature which will only be included if there is sufficient time remaining.
- Won’t : A requirement that is outside the scope of the project.

A.2 Source Definitions

- Industry Standard : A requirement that aligns with best practices for any contemporary application (e.g., Data Security).
- Project Outline : A necessary feature taken from the project specifications
- Team : A requirement considered by the team during the development stage.

Appendix B: Use Case Diagrams

B1 High-Level System Use Case (with all roles)



Figure 1212. High Level Use Case (All Roles)

Appendix C: Use Case Specifications And UML Diagrams

C1 Patient Use Case

C1.1

Table C1.1 Patient Use Case - Manage Profile

Use Case: Manage Profile	
ID: UC-MP-1	
Goal: Allow users to view and update their personal profile information.	
Primary actor: Patient	
Secondary actor(s): System (VHC)	
Preconditions:	<ol style="list-style-type: none"> 1. Patient is logged in. 2. Patient profile exists and is active.
Postconditions:	<ol style="list-style-type: none"> 1. Profile information is updated and stored securely. 2. Changes are reflected across connected modules (e.g., emergency contact, health goals).
Main flow:	<ol style="list-style-type: none"> 1. The patient navigates to “Profile” section. 2. The system displays current profile details. 3. Patient edits fields (e.g., name, DOB, height, weight, health goals, emergency contact). 4. The patient saves changes. 5. The system validates input and updates the database. 6. A confirmation message is shown.
Alternative flows:	<p>4a. User cancels</p> <ol style="list-style-type: none"> 1. Patient cancels before saving. 2. The system does not store anything. <p>5a. Invalid input</p> <ol style="list-style-type: none"> 1. The system detects invalid format (e.g., non-numeric weight). 2. System prompts correction with error message.

C1.2

Table C1.2 Patient Use Case – Chat With Assistant

Use Case: Chat with Assistant
ID: UC-CA-2
Goal: Enable users to interact with a virtual assistant for health-related queries.
Primary actor: Patient
Secondary actor(s): System (Chatbot)
Preconditions:
<ol style="list-style-type: none"> 1. Patient is logged in. 2. Chatbot service is online.
Postconditions:
<ol style="list-style-type: none"> 1. The patient receives relevant responses or actions (e.g., data display, reminders). 2. Chat history is optionally stored for context.
Main flow:
<ol style="list-style-type: none"> 1. Patient opens “Chat Assistant.” 2. Patient types a query (e.g., “Show my average steps last week”). 3. System parses query and retrieves relevant data. 4. The system responds with a formatted answer. 5. The patient may ask follow-up or schedule reminders. 6. The system confirms actions or provides alternatives.
Alternative flows:
<p>3a. Unrecognized query</p> <ol style="list-style-type: none"> 1. The chatbot cannot interpret the request. 2. The system responds with clarification or fallback options. <p>4a. Data unavailable</p> <ol style="list-style-type: none"> 1. Requested data is missing. 2. System informs the user and suggests next steps.

C1.3

Table C1.3 Patient Use Case - Notifications

Use Case: Notifications
ID: UC-NOTIF-3
Goal: Deliver timely health alerts, reminders, and updates to users.

Primary actor: Patient

Secondary actor(s): System

Preconditions:

1. The patient is logged in.
2. Notification preferences are configured.

Postconditions:

1. Notifications are delivered via app, email, or SMS.
2. Alerts are logged and viewable in the notification center.

Main flow:

1. System evaluates notification triggers based on:
 - Biomarker thresholds (warning/critical)
 - Habit reminder schedule
 - Device usage patterns
 - Patient-provider interactions
2. Health and activity recommendations are generated based on contextual information (location, weather).
3. Habit reminders are scheduled:
 - The system checks the user's selected habit.
 - Send two reminders, once in the morning and once at the end of day.
4. Biomarker warning alerts:
 - If a biomarker crosses the warning threshold, the system sends a push notification to the patient.
5. Biomarker critical alerts:
 - If biomarker crosses critical threshold:
 - The system sends SMS to up to 3 emergency contacts, as set by the user and healthcare provider (if assigned).
 - The system sends email with detailed health alerts and recent data.
6. *Include <Detect Anomaly>*
7. Provider notifications:
 - Provider receives alert for new patient connection requests.
 - Patient receives notification if provider accepts/declines connection request.
 - Provider receives notification for Patient's critical biomarker alert .
 - Provider receives a notification for weekly summary of patient progress.

Alternative flows:

- 1a. Patient disables notifications
 1. At step 1, system detects disabled settings.
 2. No notifications are sent.
- 5a. SMS/Email delivery fails
 1. System retries up to 3 times.

C1.4

Table C1.4 Patient Use Case – Detect Anomalies

Use Case: Detect Anomalies
ID: UC-DA-4
Goal: <i>Automatically identify and flag faulty readings from connected smart devices.</i>
Primary actor: System
Secondary actor(s): Patient, Healthcare Provider
Preconditions: <ol style="list-style-type: none"> Patient is connected to one or more smart devices. System receives continuous or periodic data streams.
Postconditions: <ol style="list-style-type: none"> Implausible readings are flagged and excluded from summaries. Patient is notified.
Main flow : <ol style="list-style-type: none"> System receives readings from connected devices (e.g., steps, heart rate, glucose). System checks values against physiological plausibility thresholds (e.g., 1,000,000 steps/day). If anomaly is detected, system flags the reading. User is notified of the faulty reading. Reading is excluded from dashboards, trends, and summaries
Alternative flows:

C1.5

Table C1.5 Patient Use Case – View Dashboard/Trends

Use Case: View Dashboard/Trends
ID: UC-VDT-05
Goal: Enable the patient to see their daily summaries, view, explore, and interpret health and activity trends.
Primary actor: Patient
Secondary actor(s): System (VHC), Healthcare Provider
Preconditions: <ul style="list-style-type: none"> User is logged in. Valid health data available.
Postconditions: <ul style="list-style-type: none"> Dashboard visualises up-to-date health metrics.

- User may export or filter data.

Main flow:

1. Patient accesses “Dashboard.”
2. System retrieves metrics (biomarkers, goals, trends).
3. Data visualised in charts.
4. Patient filters by date or biomarker.

Includes: Filter by Date/Biomarker.

Alternative flows:

A1. No Data:

- System displays message “No recent data available.”

C1.6

Use Case: Filter by Date/Bioamarker

ID: UC-FBD-06

Goal: Allow user to refine dashboard view by specific date range or biomarker type.

Primary actor: Patient

Secondary actor(s): System (VHC)

Preconditions:

- User has accessed dashboard.
- Valid health data available.

Postconditions:

- Dashboard visualises up-to-date health metrics with the new filtered data view

Main flow:

1. Patient chooses filter criteria.
2. System applies filters.
3. Updated results displayed dynamically.

Alternative flows:

A1. Insufficient Data:

- System notifies user and suggests alternative period.

C1.7

Use Case: Generate 30/90 day report

ID: UC-GRP-07

Goal: Generate a comprehensive health report for the past 30 or 90 days.

Primary actor: Patient

Secondary actor(s): System (VHC) — compiles, formats, and exports data.

Preconditions:

- Valid health data available for selected period

Postconditions:

- Report generated and available for download or sharing.

Main flow:

1. Patient selects “Generate 30/90 Day Report.”
2. System retrieves and processes historical data.
3. Formats report for readability.
4. Provides download/export options.
Includes: View Dashboard/Trends.

Alternative flows:

A1. Insufficient Data:

- System notifies user and suggests alternative period.

C1.8

Use Case: Export Data CSV or PDF / Share to Social

ID: UC-EXP-08

Goal: Allow user to export health data or share summaries via social platforms.

Primary actor: Patient

Secondary actor(s): System (VHC)

Preconditions:

- User logged in.
- Dashboard data exists.

Postconditions:

- File exported or shared.
- Confirmation displayed.

Main flow:

1. User selects export/share option.
2. System prepares data in chosen format (CSV/PDF).
3. User selects destination (download or share).
4. System confirms successful action.
Includes: View Dashboard/Trends.

Alternative flows:**A1. Export Failure:**

- Network error or file permission issue.
- System retries or provides retry prompt.

C1.9**Use Case: Reset Password****ID:** UC-RPA-09**Goal:** Enable user to securely reset a forgotten password.**Primary actor:** Patient**Secondary actor(s):** Auth Provider, System (VHC)**Preconditions:**

- User account exists.

Postconditions:

- New password saved and verified.

Main flow:

1. User selects "Forgot Password."
2. System requests verification via email or OTP.
3. Auth Provider validates link or code.
4. User creates new password.
5. System confirms update and logs event.

Alternative flows:

A1. Expired Link:

- System prompts to resend reset link.

C1.10**Use Case: Register/ Signup****ID:** UC-RLG-10**Goal:** Enable users to register new accounts or log in securely.**Primary actor:** Patient**Secondary actor(s):** Auth Provider, System (VHC)**Preconditions:**

- User not currently authenticated.

Postconditions:

- Session created and dashboard accessible.

Main flow:

1. User enters email.
2. User enters username.
3. User enters password and confirms password.
4. User clicks on sign up
5. Auth Provider verifies credentials.
6. Include <Verify Email>
7. Include <Manage HCP Access>
8. System creates session token.
9. User redirected to home/dashboard.

Alternative flows:**5a. Invalid Credentials:**

1. System shows error and prompts retry.

6a. Email verification failed

1. User is asked to enter a valid email.

C1.11**Use Case: Verify Email****ID:** UC-VEM-11**Goal:** Verify user email during registration or password reset.**Primary actor:** Auth Provider**Secondary actor(s):** Patient, System (VHC)**Preconditions:**

- Registration or reset flow initiated.

Postconditions:

- Account verified.

Main flow:

1. Auth Provider sends link/code.
2. User opens verification link.
3. System marks email as verified and activates account.

Alternative flows:**A1. Invalid Token:**

- System rejects and requests re-verification.

C1.12**Use Case: Manage Sessions****ID:** UC-MNS-12**Goal:** Maintain secure user sessions including timeouts, remember-me, and logouts.**Primary actor:** System (VHC)**Secondary actor(s):** Patient

Preconditions:

- Active user session exists.

Postconditions:

- Session remains valid, expires, or is terminated as appropriate.

Main flow:

1. System issues token upon login.
2. Tracks active session duration.
3. Enforces auto-logout after inactivity.
4. Refreshes session if remember-me enabled.
5. Logs session events.

Alternative flows:**A1. Forced Logout:**

- Admin or security event invalidates session.
- System terminates all active tokens.

C1.13**Use Case: Set/Track Goals****ID:** UC-STG-13**Goal:** Allow users to set and monitor health goals, such as weight, activity, or sleep.**Primary actor:** Patient**Secondary actor(s):** System (VHC)**Preconditions:**

- Profile and baseline metrics available.

Postconditions:

- Goals tracked and displayed in dashboard.

Main flow:

1. User sets health goals.
2. System validates and stores them.
3. Progress updates periodically based on input data.
4. User views achievements and receives reminders.

Alternative flows:**A1. Invalid Goal Range:**

- System prompts to adjust unrealistic targets.

C1.14**Use Case: Connect Device****ID:** UC-CDV-14**Goal:** Let the patient connect a wearable/medical device (e.g. smartwatch, glucose monitor, BP monitor) to the system.**Primary actor:** Patient**Secondary actor(s):**

- Device Platform (e.g. Fitbit API, glucose monitor API)
- System (VHC)

Preconditions:

- Patient is logged in.
- Device integration is supported by the platform.
- Patient has access/authorization to that device.

Postconditions:

- Device is linked to the patient account.
- Future readings sync automatically and appear in dashboard.

Main flow:

1. Patient opens “Connect Device.”
2. System lists supported devices.
3. Patient selects their device.
4. System redirects to the device platform or pairing flow (e.g. OAuth, code scan).
5. Patient authorises data sharing.
6. Device Platform confirms connection
7. System pulls recent readings.
8. Dashboard updates with synced values (labelled by device source).

Alternative flows:

5a. Authorization denied

1. Patient refuses device permissions.
2. Device Platform cancels connection
3. System returns to list.

6a. Device error

1. Device platform is unreachable or returns invalid data.
2. System shows "Connection failed, please retry."

C1.15**Use Case: Notify Emergency Contact****ID:** UC-NEC-15**Goal:** Alert the patient's emergency contact(s) when a critical event occurs.**Primary actor:** System (VHC)**Secondary actor(s):**

- Emergency Contact
- Patient

Preconditions:

- Trigger Emergency Alert (UC-TEA-14) reached confirmation.
- Patient has at least one emergency contact (SMS/email).
- Contact consent is stored.

Postconditions:

- Emergency contact(s) and HCP receive SMS/email.
- Delivery attempts are logged (success/fail).

Main flow:

System builds alert message with condition, timestamp, last known vitals, and (optional) location.

System sends SMS/email to Contact 1.

System records success/failure.

System repeats for Contact 2 and Contact 3 if configured.

System marks alert as "sent."

Alternative flows:

A1. First contact unreachable

At step 3, sending fails.

System retries or escalates to next contact.

Failure is logged.

A2. No contacts configured

System cannot find any contact.

System flags the event for any assigned healthcare provider and stores it in the audit log.

C1.16**Use Case: Manage HCP Access****ID:** UC-MHA-16**Goal:** Allow the patient to grant or revoke a healthcare provider's access to their data.**Primary actor:** Patient**Secondary actor(s):**

- Healthcare Professional
- System (VHC)

Preconditions:

- Patient is logged in.
- A healthcare provider account exists (verified license).
- Patient has the legal right to share their data.

Postconditions:

- Access permissions are updated (granted or revoked).
- Patient is added to the HCP's list of patients (if they granted access)

Main flow:

1. User is prompted to "Find a Healthcare Professional" or "Continue as an Independent User."
2. If the user chooses to connect with an HCP, the system requests consent to share health data.
3. Upon consent, the system automatically selects a random verified HCP from the available directory pool.
4. The assigned HCP is notified of the new patient assignment.
5. Patient receives confirmation showing the HCP's name, specialization, and contact details.
6. System updates data-sharing permissions, granting the assigned HCP access to the patient's health records (data visibility, biomarker scope).
7. Patient's profile is linked to the assigned HCP's dashboard.

Alternative flows:

- 1a. User continues as an Independent user
 1. User data is not shared
 2. System directs the user to the dashboard
 - 2a. User denies access to health data
 1. Continues with path 1a
- *a. Provider removed
 1. User revokes an existing HCP.
 2. System immediately blocks that HCP's access to biomarker data.
 3. System switches the user to an independent user.

C1.17

Use Case: Customise Virtual Pet

ID: UC-CVP-17

Goal: Encourage engagement and motivation by allowing the patient to personalise a virtual pet that reflects their health progress.

Primary actor: Patient

Secondary actor(s): System (VHC)

Preconditions:

- Patient is logged in.
- Profile data exists and is active.

Postconditions:

- Customisation saved to the user profile.
- Pet appearance dynamically changes with goal completion or activity level.

Main flow:

1. Patient selects "Virtual Pet."
2. System displays the current pet design.
3. Patient chooses customisation options (e.g., color, style, accessories).
4. Patient saves changes.
5. System validates and stores configuration.
6. Dashboard updates with the customised pet reflecting user progress.

Alternative flows:

A1. Cancel Customisation:

- Patient exits without saving.
- System retains previous pet appearance.

C2 Healthcare Professional Use Case

C2.1

Use Case: Verify Medical License

ID: UC-VML-18

Goal: Verify that a healthcare provider is legitimate before granting access to patient data.

Primary actor:

- System (VHC)
- Admin (for manual review if needed)

Secondary actor(s):

- HCP

Preconditions:

- Provider is creating or updating an HCP account.

Postconditions:

- HCP account is marked as verified OR pending/manual review.
- Only verified HCPs can access patient data.

Main flow:

1. Provider enters license details (license number, Image of license) during registration or onboarding.
2. Details get sent to the Admin
3. Admin validates format
4. If valid, Admin marks the account as verified.
5. Provider can now request access to patients (see UC-MHA-05).

Alternative flows:

3a. License rejected

1. Entered license is invalid.
2. Admin denies verification.
3. HCP given an option to continue as an independent user.

C2.2

Use Case: Patient Overview

ID: UC-POV-19

Goal: Give the healthcare provider an overview of a patient's health status and trends.

Primary actor: Healthcare Provider

Secondary actor(s):

- System (VHC)

Preconditions:

- Provider is logged in as a verified HCP.
- Patient has granted access.
- Patient data (biomarkers, goals, alerts) exists.

Postconditions:

- Provider sees the patient's latest metrics, trends, alerts, and goals.
- Provider can move to Add Notes (UC-ADD-18).

Main flow:

1. Provider opens dashboard and selects a patient from their list.
2. System shows key stats: vitals, recent alerts, goal progress, last update timestamp.
3. System highlights any warning/critical ranges (e.g. red/yellow).
4. Provider may view trends (daily/weekly/monthly, 30/90-day).
5. Provider chooses "Add Notes" if they want to document guidance.

Alternative flows:

2a. No recent data

1. There is no recent reading.
2. System shows "No recent data" and last known timestamp.

C2.3

Use Case: Add Notes

ID: UC-ADD-20

Goal: Let the healthcare provider add clinical notes or recommendations to a patient's record.

Primary actor: Healthcare Provider

Secondary actor(s):

- Patient (Receiver of Notes/Feedback)
- System (VHC)

Preconditions:

- Provider is logged in and verified.
- Provider has access to that patient (see UC-MHA-16).
- Patient Overview (UC-POV-17) is available.

Postconditions:

- Note is stored on the patient's record with timestamp and author.
- Patient is notified of new recommendations.

Main flow:

1. Provider selects a patient and chooses "Add Notes."
2. Provider writes guidance, concerns, or next steps.
3. System timestamps and stores the note, linked to the provider ID.
4. System notifies the patient that a new note/recommendation is available.

Alternative flows:

2a. Provider cancels

1. At Provider cancels entry.
2. No note is stored.

2b. Invalid content

1. At step 2, note is missing required fields (e.g. empty).
2. System asks the provider to complete it.

C2.4

Use Case: Trigger Emergency Alert

ID: UC-TEA-21

Goal: Let the patient trigger an emergency alert when they feel unsafe or unwell.

Primary actor: Patient

Secondary actor(s): System (VHC)

Preconditions:

- Patient is logged in.
- Emergency contacts are configured OR provider access exists.
- Critical event logic is active (e.g. high-risk vitals OR manual trigger).

Postconditions:

- Emergency alert is automatically triggered.
- Notifications are sent simultaneously to all emergency contacts and healthcare professional.
- Alert is logged for audit and review.

Main flow:

Main flow:

1. System monitors patient's biomarker data in real time.
2. System compares readings against the configured critical thresholds.
3. When a critical threshold is breached, the system automatically triggers the emergency alert.
4. System prepares the alert payload
5. System calls "Notify Emergency Contacts and HCP" (UC-NEC-15).
6. Alert event is recorded in the audit log with full details.

Alternative flows:

A1. False positive detected

- If subsequent validation flags the reading as an anomaly (see UC-DA-4), the alert is cancelled and marked as invalidated.

A2. Monitoring service unavailable

- If system cannot retrieve live readings, alert evaluation is deferred until connection resumes.

C3 Admin Use Case

C3.1

Use Case: Manage Users

ID: UC-MUS-22

Goal: Let the admin create, edit, disable, or delete user accounts.

Primary actor: Admin

Secondary actor(s): System (VHC)

Preconditions:

- Admin is logged in with admin role.

- Admin has governance permission (not clinical access).

Postconditions:

- User accounts are updated.

Main flow:

1. Admin opens “Manage Users”
2. System displays a list of users (patients, providers, admins).
3. Admin selects a user.
4. Include <Modify users> and Admin can resets password, enables/disables account, or deletes the account.
5. System applies the change and writes an audit entry (who, what, when).

Alternative flows:

4a. Undo delete (soft delete)

1. If admin deletes an account, it is marked inactive instead of hard-deleted (for traceability).
2. Admin can later reactivate.

C3.2**Use Case: Modify Users****ID:** UC-MUS-23**Goal:** Enable the Admin to update user account details, access levels, and permissions in order to maintain compliance, correct data, and manage role-based access across the system.**Primary actor:** Admin**Secondary actor(s):**

- System (VHC)
- Patient

Preconditions:

- Admin is authenticated with elevated privileges.
- Target user account exists in the system.
- Admin has permission to modify the selected user type (patient, provider, or staff).

Postconditions:

- User information and permissions are successfully updated.
- System generates a log entry and notifies relevant services

Main flow:

1. Admin selects “Manage Users”
2. System displays a list of all registered users.
3. Admin searches for a specific user and opens their profile.
4. Admin modifies relevant fields (e.g., email, access level, or status).
5. System validates input fields and permissions.
6. Admin confirms the change.
7. System saves updates to the user directory.
8. System records the transaction in the audit log with timestamp and admin ID.

Alternative flows:

5a. Invalid Input

1. Admin enters invalid data format (e.g., email missing domain).
2. System rejects modification and displays validation message.

C3.3

Use Case: Delete Users

ID: UC-DUS-24

Goal: Allow the Admin to deactivate or permanently delete user accounts to maintain data hygiene, security compliance, and user lifecycle governance.

Primary actor: Admin

Secondary actor(s): System (VHC)

Preconditions:

- Admin is authenticated and authorised for deletion privileges.
- Target user exists.

Postconditions:

- Account is permanently deleted.
- Audit log entry created for compliance review.

Main flow:

1. Admin selects “Manage Users.”
2. System displays all users and their account statuses.
3. Admin locates target user and clicks “Delete.”
4. System requests confirmation.
5. Admin confirms deletion.
6. System checks for no conflicts.
7. System performs the deletion:
 - a. Revokes all access tokens.

- b. Terminates all active sessions.
 - c. Removes user credentials from directory.
8. System generates a “User Deletion Log” entry with admin ID, timestamp, and reason.
 9. Confirmation message shown to Admin.

Alternative flows:**4a. Deletion Aborted**

1. Admin cancels during confirmation.
2. System retains user account.

C4 UML Diagrams

C4.1 Traceability Matrix

Table 22. Traceability Matrix

Requirement ID	Description	Relates To (Other Requirements)
U-FR-1	User Authentication and Account Management	U-FR-9-1
U-FR-2	Access Levels	U-FR-8-1, U-FR-9-1
U-FR-3	Notifications and updates	U-FR-8-3, U-FR-9-6
U-FR-4	Connected Devices	U-FR-9-4
U-FR-5	Data Analysis and Reports	U-FR-9-4, U-FR-9-5
U-FR-6	Virtual Companion / Chatbot	
U-FR-7	Incentivising user behaviour features: Goal Setting and Tracking	U-FR-9-7
U-FR-8	Professional Dashboard	U-FR-2, U-FR-9-1
U-FR-9	User Dashboard	U-FR-7
U-FR-10	Sharing data	U-FR-2-2
U-FR-11	Voice Agent	U-FR-6
S-FR-1	Database Management	U-FR-1, U-FR-2, U-FR-8-1
S-FR-2	Data Entry and Visualisation	U-FR-4, U-FR-5, U-FR-9
S-FR-3	Daily Summary and Reporting System	U-FR-3, U-FR-8-3
S-FR-4	Incentivising user behaviour features: Goal Setting and Tracking	U-FR-7
S-FR-5	Incentivising user behaviour features: Virtual Pet (Digital Twin) Companion System	U-FR-6, U-FR-7
S-FR-6	Incentivising user behaviour features: Motivation and Rewards	U-FR-7
S-FR-7	Environmental and Contextual Data Integration	U-FR-3
S-NFR-1	Usability (System Perspective)	U-FR-9
S-NFR-2	Chatbot Interaction	U-FR-6, U-FR-11
S-NFR-3	Security and Privacy	U-FR-1, U-FR-2, U-FR-10
S-NFR-4	Compliance	U-FR-2, U-FR-8
S-NFR-5	Performance	S-FR-5
S-NFR-6	Data	U-FR-4
S-NFR-7	Emergency and Safety	U-FR-3-4
S-NFR-8	Reporting and Analytics	S-FR-3
U-NFR-1	Usability	U-FR-9
U-NFR-2	Compatibility	
U-NFR-3	Users Security	U-FR-1

C4.2 Sequence Diagrams

C4.2.1 Verify Medical License

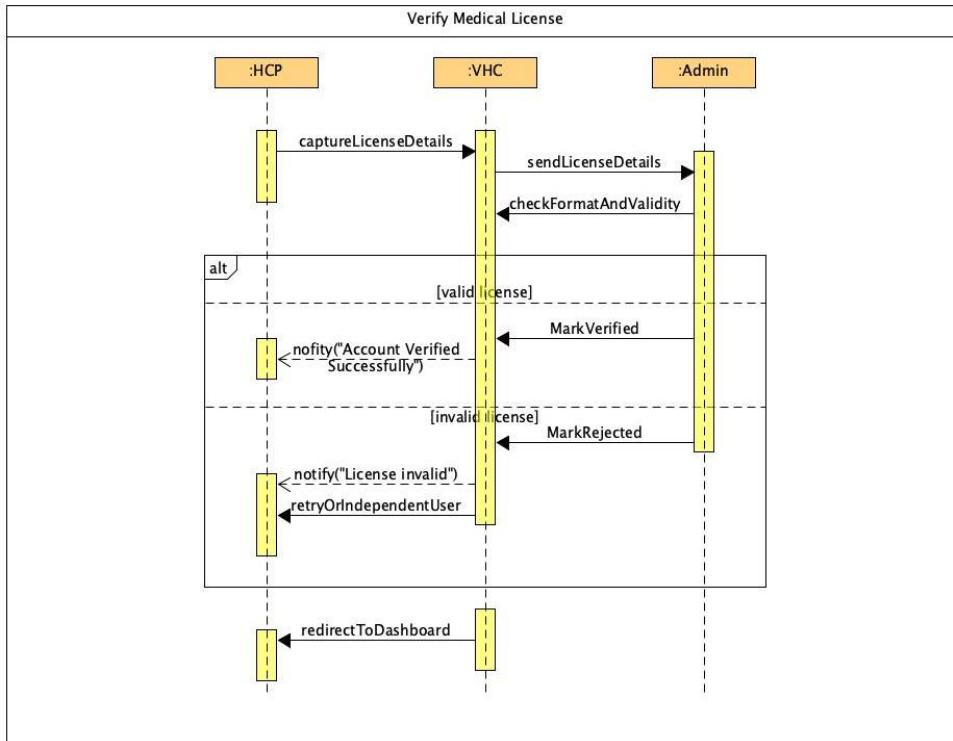


Figure 13. Sequence Diagram - Verify Medical License

C4.2.2 Connect Devices

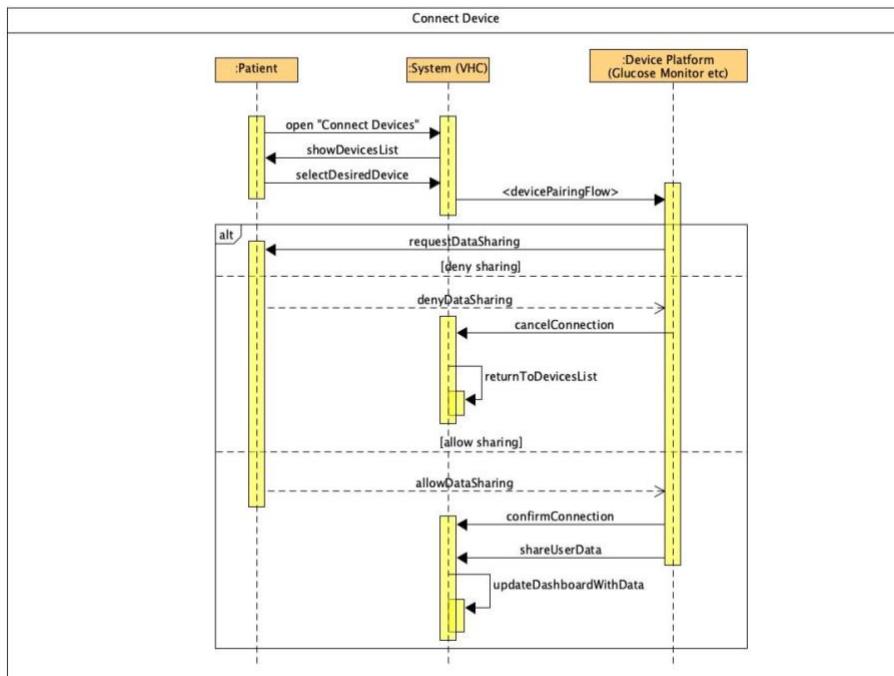


Figure 14. Sequence Diagram - Connect Devices

C4.2.3 Detect Anomalies

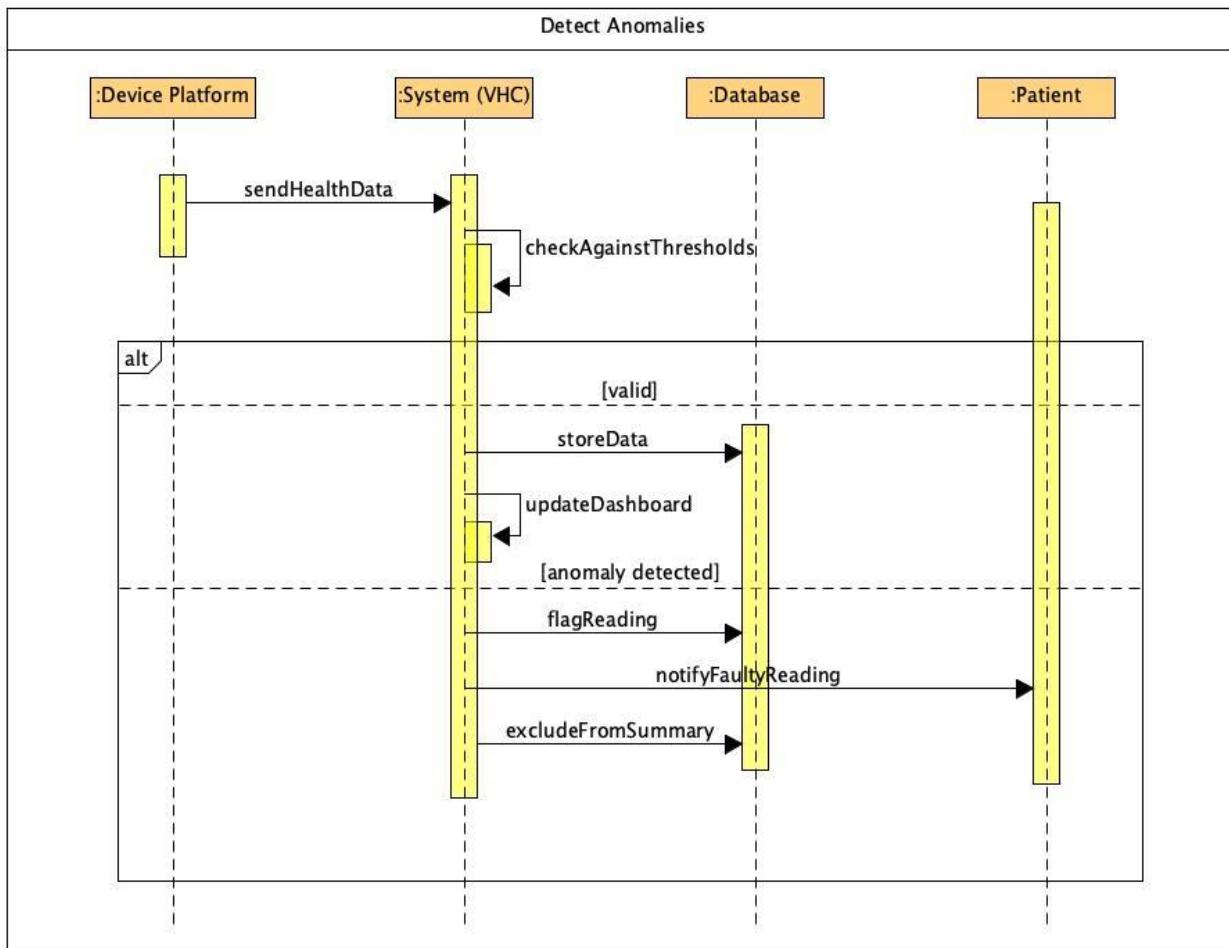


Figure 15. Sequence Diagram - Detect Anomalies

C4.3 Activity Diagrams

C4.3.1 Manage HCP Access

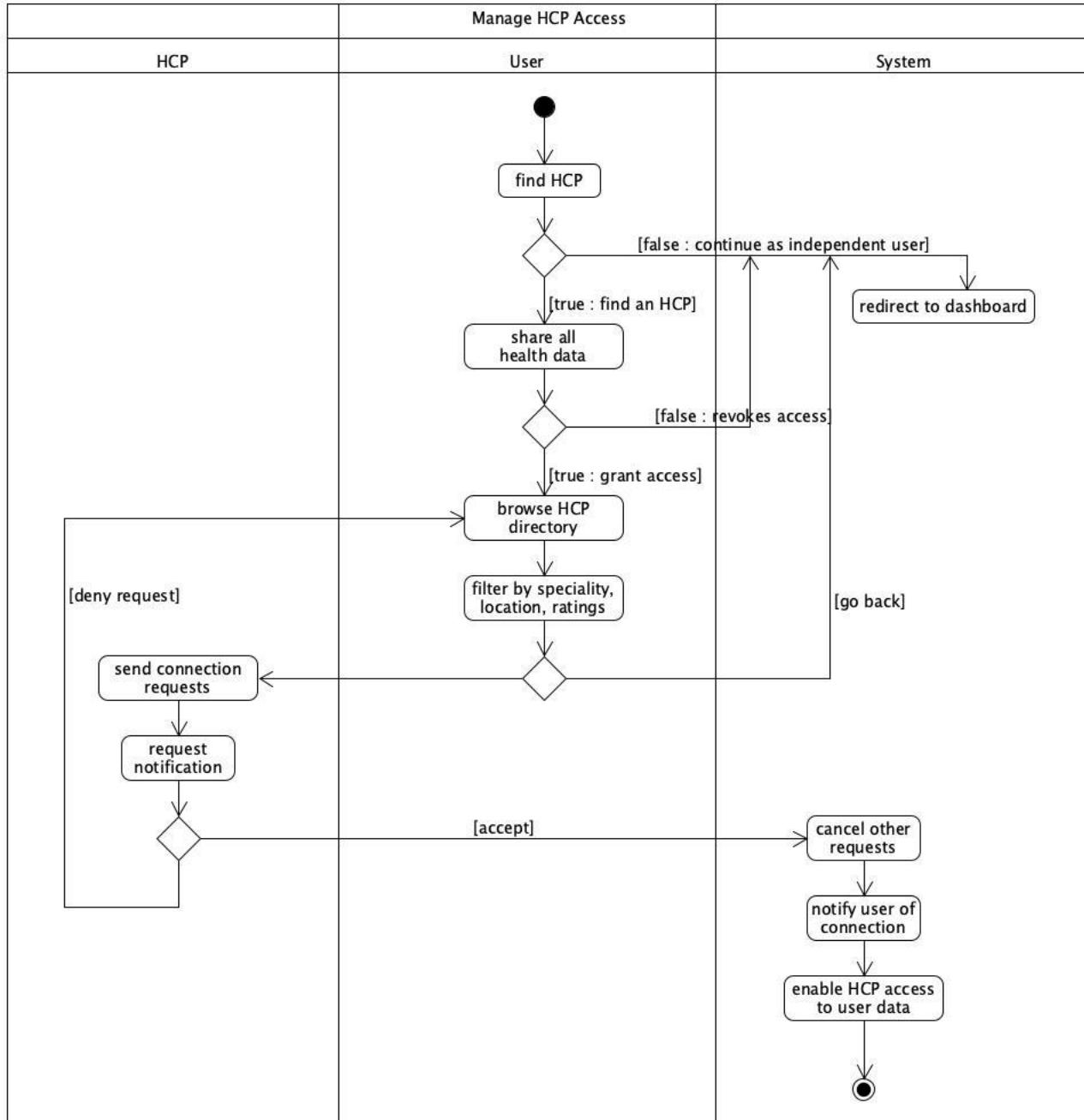


Figure 16. Activity Diagram - Manage HCP Access

C4.3.2 Modify Users

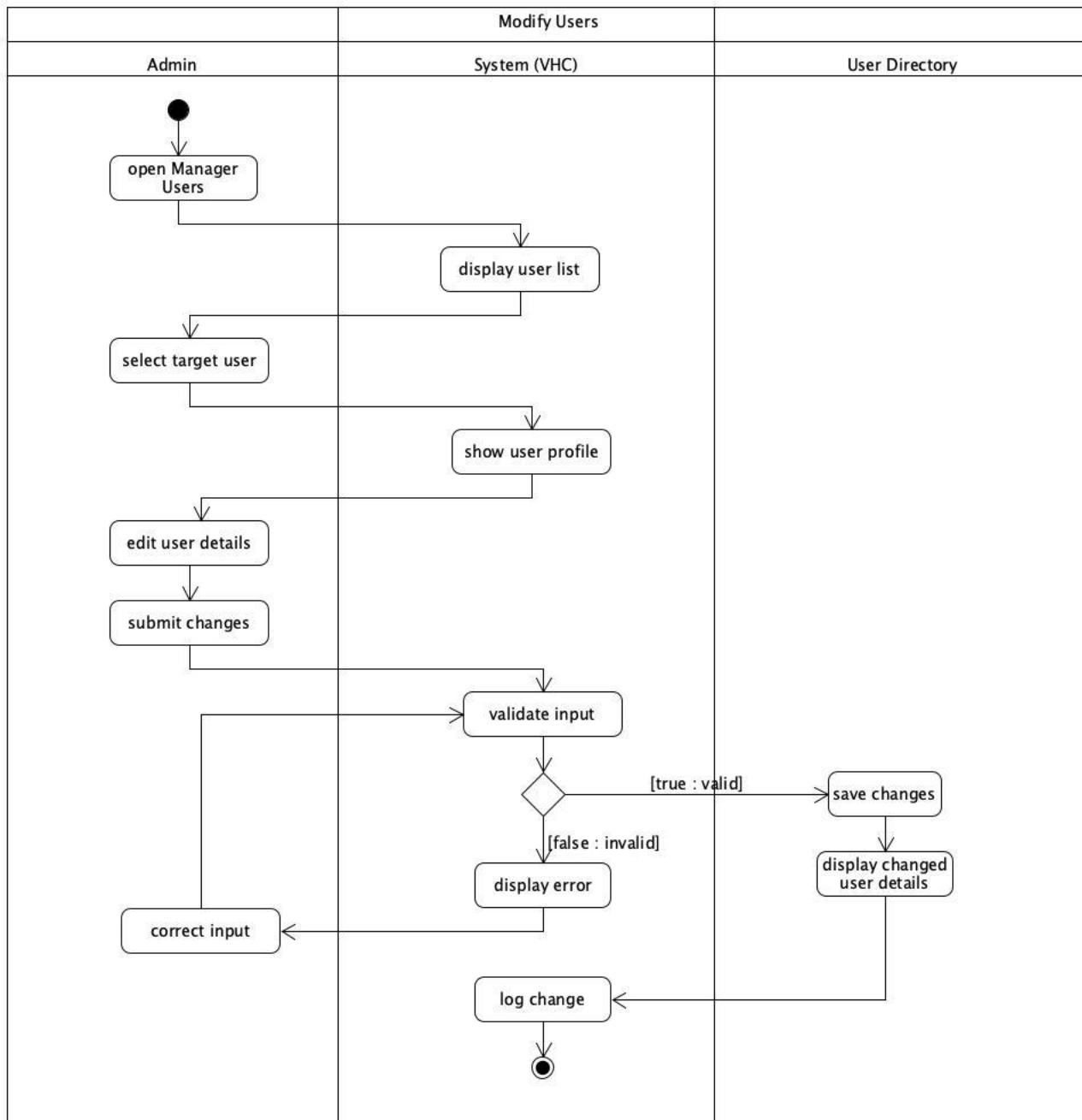


Figure 17. Activity Diagram - Modify Users

C4.3.3 Delete User

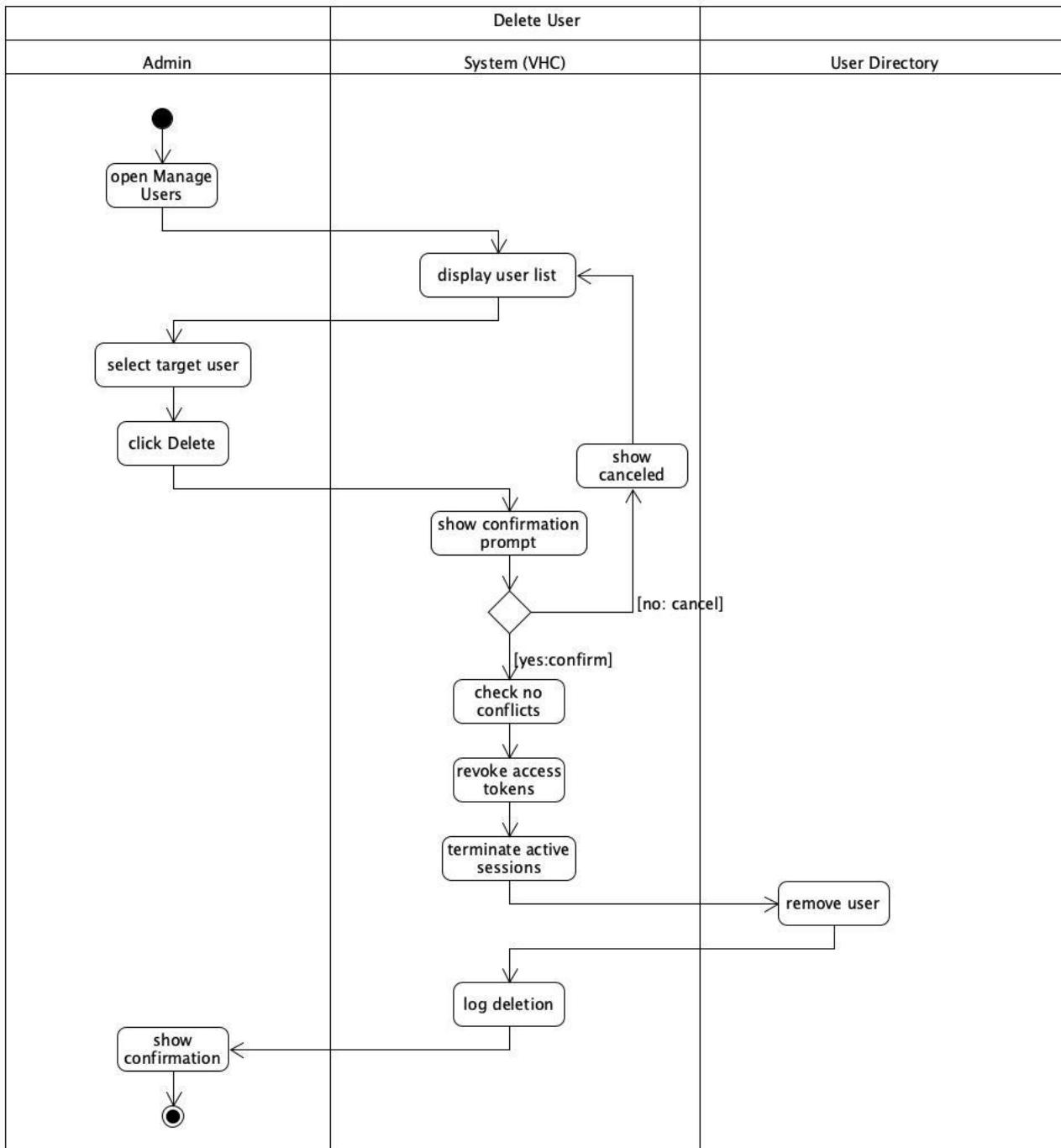


Figure 18. Activity Diagram - Delete Users

Appendix D: Risk Analysis Definitions

Table D.1: Risk Likelihood Criteria

Level	Description
Low	Unlikely to occur
Medium	Has a reasonable chance to occur
High	Almost certain to happen during the lifecycle of the project

Table D.2: Risk Impact Criteria

Level	Description
Low	Might be an inconvenience but can probably be managed with little disruption
Medium	Might cause minor delays and could impact quality
High	Would cause major delays which will significantly impact the final product

Appendix E: Project Plan (Gantt Charts)

E1 Stage 1 Project Plan

E1.1 Daily View

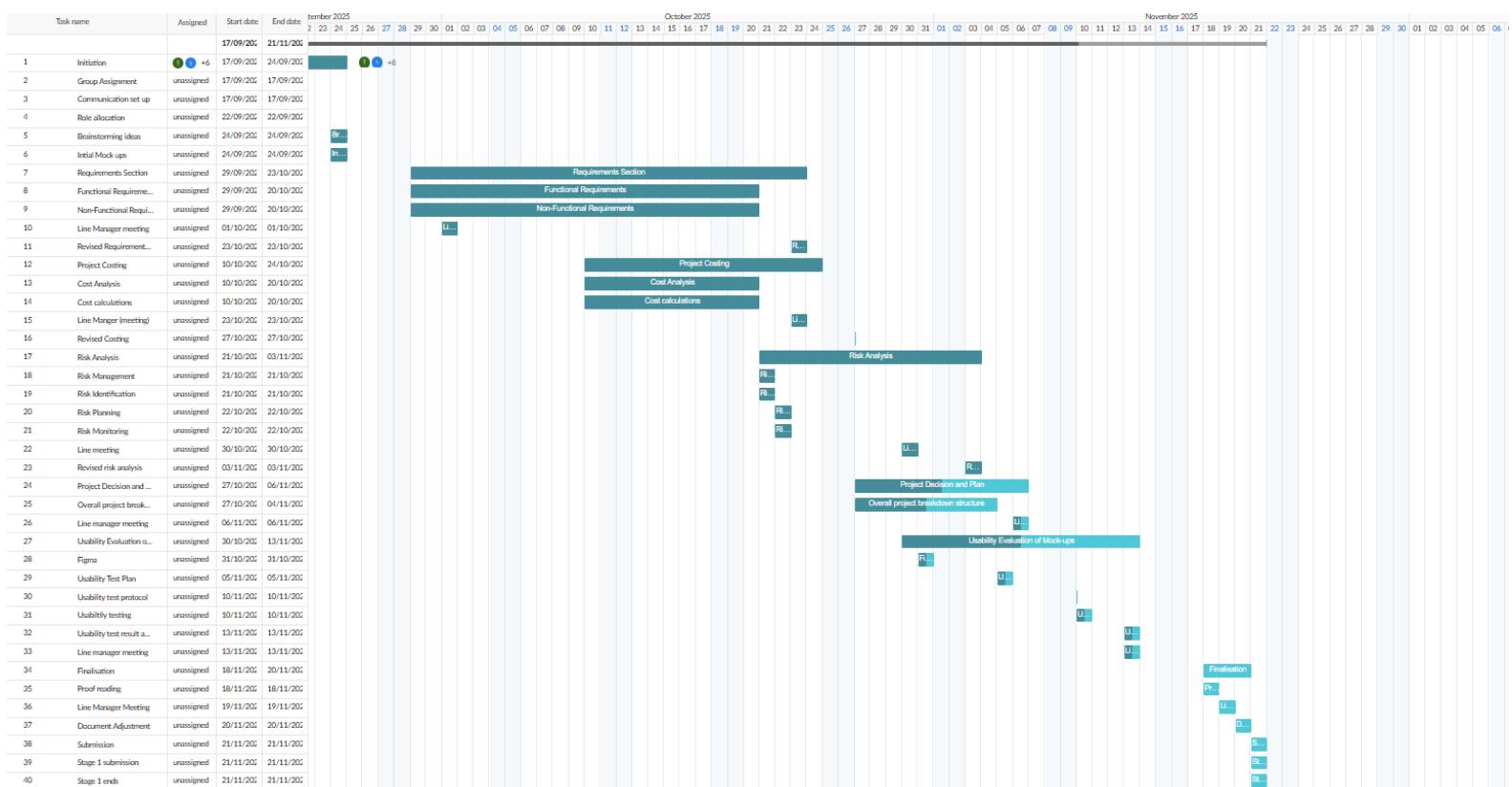


Figure 19. Stage 1 - Gantt Chart (Daily View)

E1.2 Monthly View



Figure 20 Stage 1- Gantt Chart (Monthly View)

E2 Stage 2 Project Plan (Sprints)

E2.1 Sprint 4



Figure 21.Sprint 4

E2.2 Sprint 5



Figure 22.Sprint 5

E2.3 Sprint 6



Figure 23.Sprint 6

E2.4 Sprint 7



Figure 24.Sprint 7

E2.5 Sprint 8



Figure 25.Sprint 8

E2.6 Sprint 9



Figure 26.Sprint 9

E2.7 Sprint 10

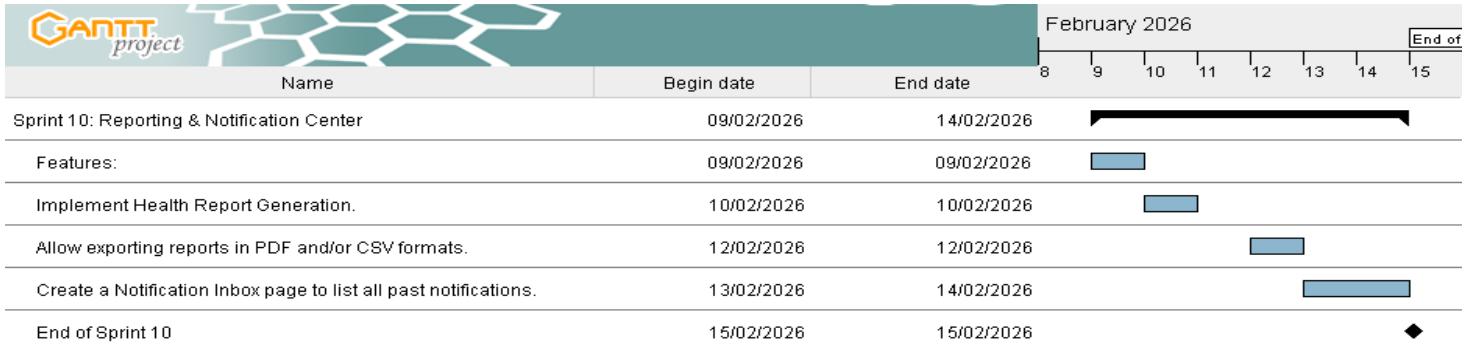


Figure 27.Sprint 10

E2.8 Sprint 11

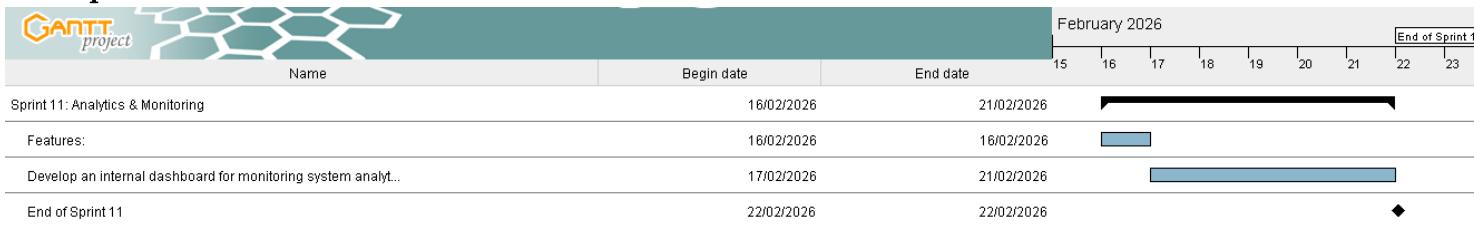


Figure 28.Sprint 11

E2.9 Sprint 12

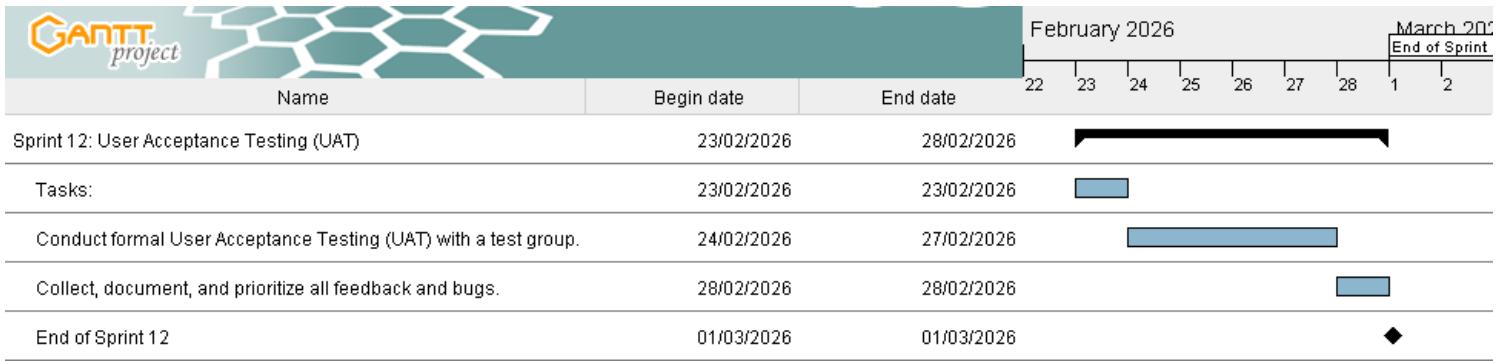


Figure 29. Sprint 12

E2.10 Sprint 13



Figure 30. Sprint 13

E2.11 Sprint 14



Figure 31. Sprint 14

E3 High Level Deployment Diagram

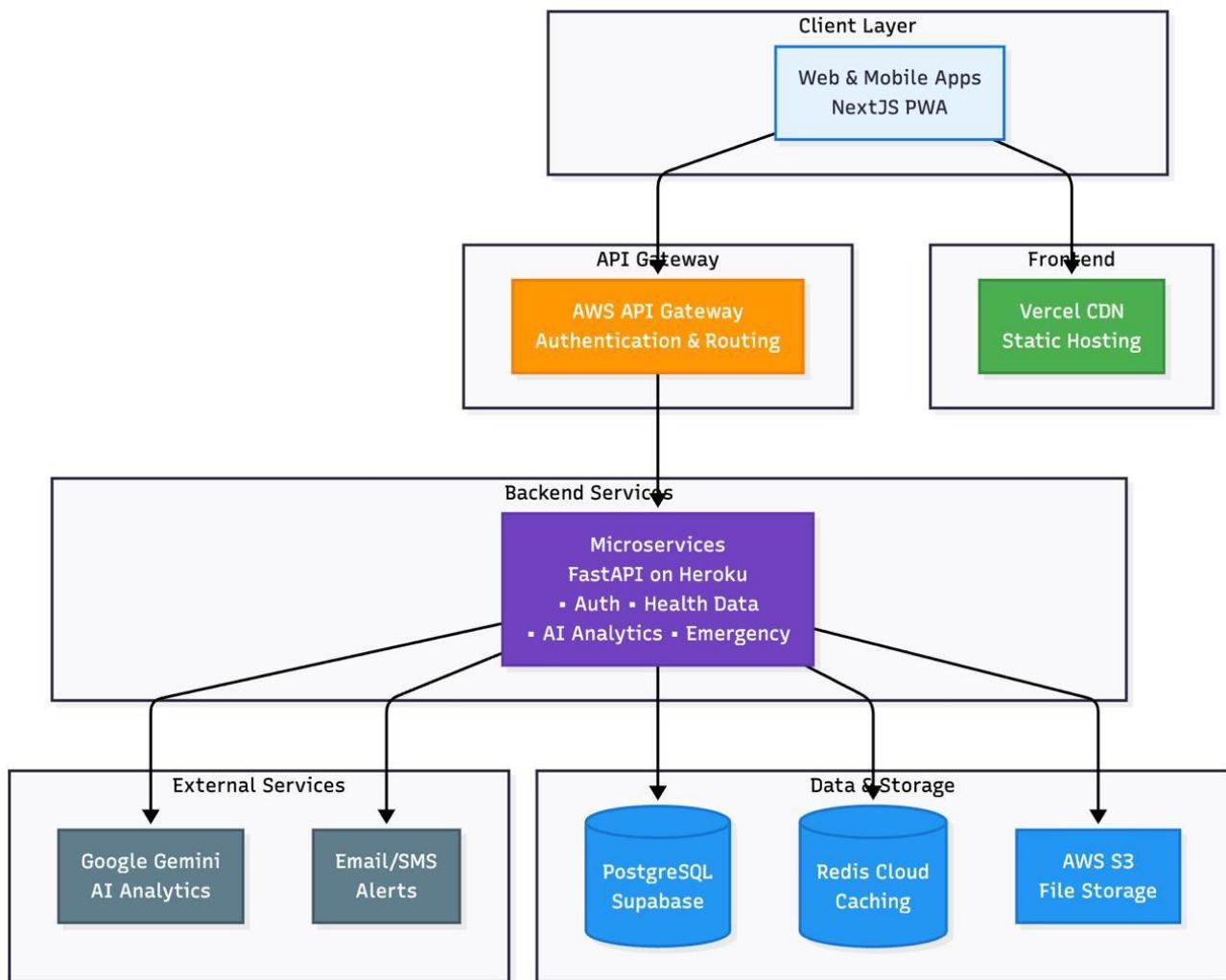


Figure 32.High Level Deployment Diagram

Appendix F: Project Costing Details

F1 Cost Breakdown Diagram

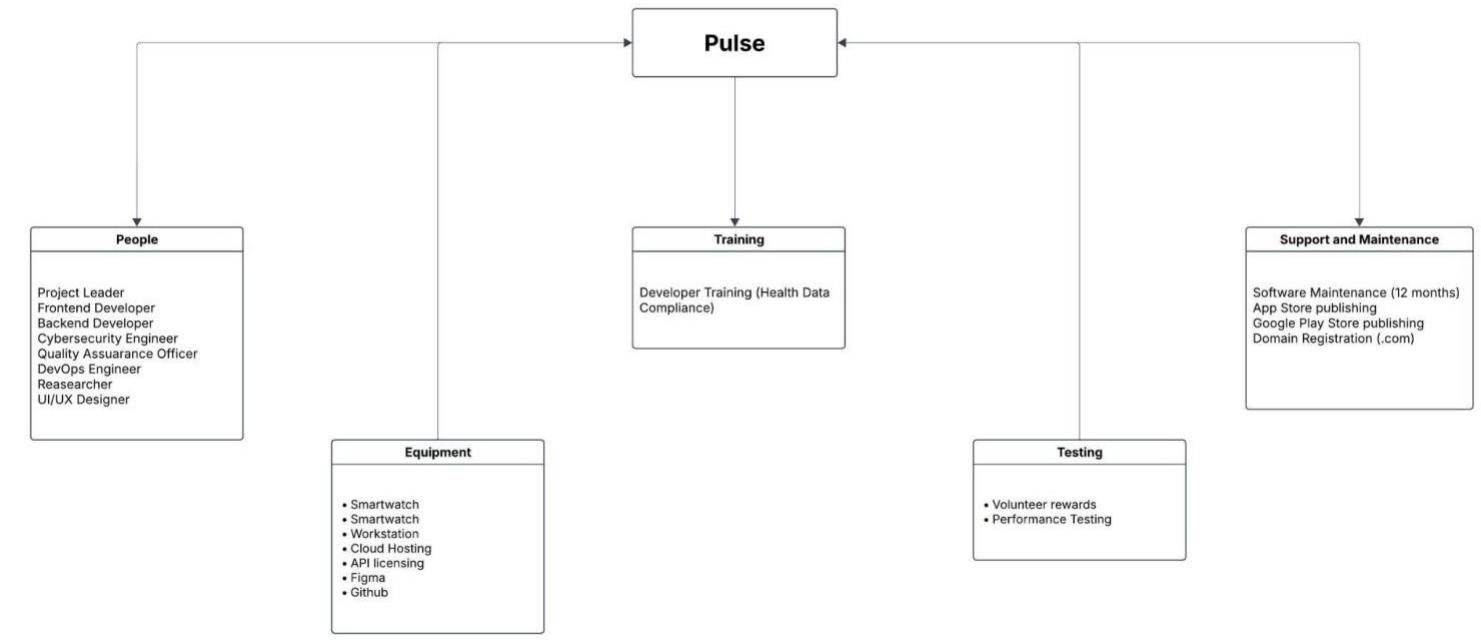


Figure 33. Cost Breakdown Diagram

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Appendix G: Usability Evaluation Materials

G1 Participant Consent Form

Participant Consent Form

Project Title: Virtual Health Company for Daily Living – Usability Evaluation of Mock-ups

Module: F29SO Software Engineering Group Project

Institution: Heriot-Watt University

Principal Investigator(s):

Huzaifa Abdul Safeem

Kamo Peacock

Krishna Bhandari

Patrick Abella

Rhea Menezes

Simon Girma

Tehan Miskin

Zeeshan Khan

1. Purpose of the Study

The purpose of this study is to evaluate the usability of our software project's interface mock-ups. We are conducting this evaluation as part of our Stage 1 "Bid" for the F29SO Software Engineering Group Project. Participants will be shown screenshots, hand-drawn screens, or interactive mock-ups of the system. You will be asked to complete an initial questionnaire about your demographics (e.g., age, computer experience) and an exit questionnaire to gather your subjective feedback. This feedback may include open-ended questions and questions on rating scales. The goal is to identify design improvements and recommend changes for the final product.

- **Duration:** 10 to 15 minutes
- **Setting:** On campus (Face to Face)

2. Voluntary Participation

Participation in this study is entirely voluntary. You are free to decline to participate or to withdraw at any time without explanation or consequence. Refusal to participate will not affect your academic standing or your relationship with the university in any way.

In accordance with the project's ethical guidelines, participants must be 18 years of age or older and must not be considered part of a vulnerable population.

3. Confidentiality

All data collected will be anonymized. Your name or any other identifying information will not appear in any reports or results. Data will be identified only by a participant number. Any master sheet linking names to participant numbers will be kept securely by one group member.

All personal information will be stored securely (e.g., in password-protected computer directories) in accordance with GDPR requirements and will be used for academic purposes only.

4. Potential Risks and Benefits

There are no known risks associated with participating in this study. You will not be actively deceived during your participation.

Your feedback is highly valuable and will directly contribute to improving the usability and user experience of our project prototype.

5. Contact Information

For any questions about this study, please contact the student investigators or the module coordinator:

- **Talal Shaikh**
- **Huzaifa Abdul Safeem** - m-4003@hw.ac.uk
- **Kamo Peacock** - kp2039@hw.ac.uk
- **Krishna Bhandari** - kb2057@hw.ac.uk
- **Patrick Abella** - pdla2000@hw.ac.uk
- **Rhea Menezes** - rm2184@hw.ac.uk
- **Simon Girma** - sgg2002@hw.ac.uk
- **Tehan Miskin** - tr2080@hw.ac.uk
- **Zeeshan Khan** - mak4002@hw.ac.uk
- School of Mathematical and Computer Sciences
- Heriot-Watt University

Consent Statement

Please tick each box to confirm your understanding and agreement.

- I have read and understood the participant information above.
- I understand that my participation is voluntary and that I may withdraw at any time without consequence.
- I confirm that I am 18 years of age or older.
- I consent to participate in this usability testing session.
- I consent to my anonymized responses being used for academic purposes only.
- I understand that my data will remain confidential and be stored securely.

Participant Name : _____

Participant Signature : _____

Date : _____

G2 Test Protocol

Tester: _____

Date: _____

Time: _____

Location: _____

Participants: _____

Aim:

The aim of this test is to see how users interact with the Virtual Health Companion App while completing simple health-related tasks. The goal is to check if users can easily move through the app, understand its layout, and complete actions like logging in, setting reminders, and viewing their health data. This test will help identify any areas that may be confusing or difficult to use so the app can be improved to provide a more user-friendly experience.

Introduction:

In this test, you will be asked to explore different screens of the Virtual Health Companion App and describe what you see. You'll also be asked to complete a few simple health-related tasks, such as checking your daily stats or setting reminders. During the session, your actions and feedback will be observed and noted anonymously. After finishing all the tasks, you will complete a short questionnaire to share your thoughts about the app. There are no right or wrong answers. Your opinions will help us improve the design and make the app easier to use for everyone.

Task and Questions:

1. Independent User - Sign up and Login page :

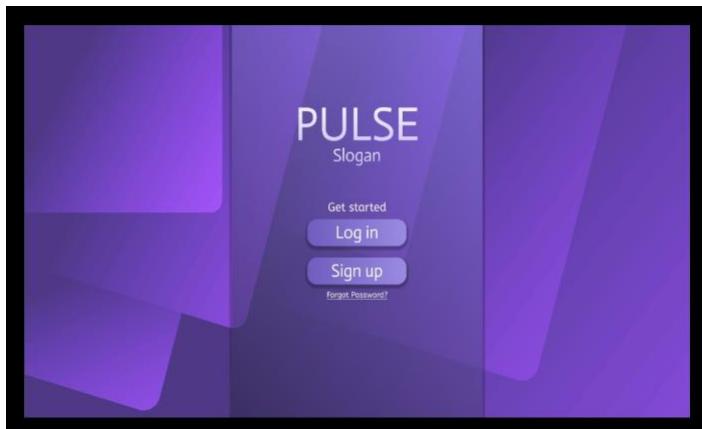


Figure 34. Login/Signup Page

This is the landing page of our app. The user will be given 2 options “Log In” and “Sign Up”.

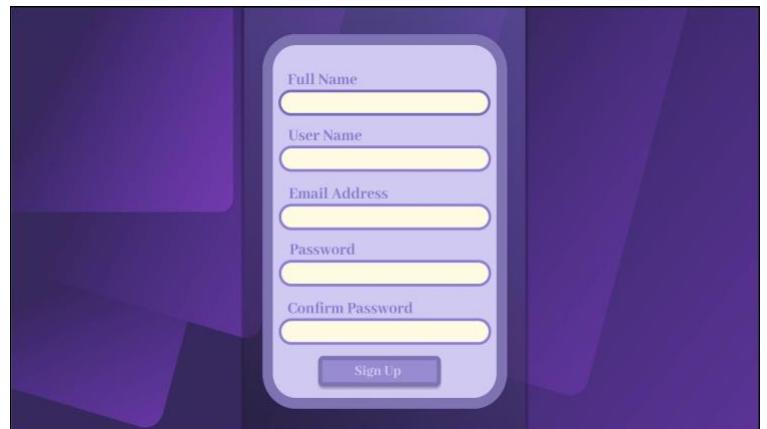


Figure 35. Registration Details Screen

A screen asking for the users information such as full name, username, email address, etc appears.



Figure 36. Health Details Screen

Task: Create a new account by entering your email, setting a secure password, and completing basic profile details (name, date of birth, and health goal). Log in to access the user dashboard.

Questions:

- 1) What do you expect to happen after clicking “Sign Up”?
- 2) If you made a mistake in one of the fields, how would you expect the system to respond?
- 3) What would you do if you forgot your password during login?
- 4) Is there anything missing that you expected to see during the onboarding process?

1) Completed 2) Completed with guidance 3) Not completed

2. User Dashboard :

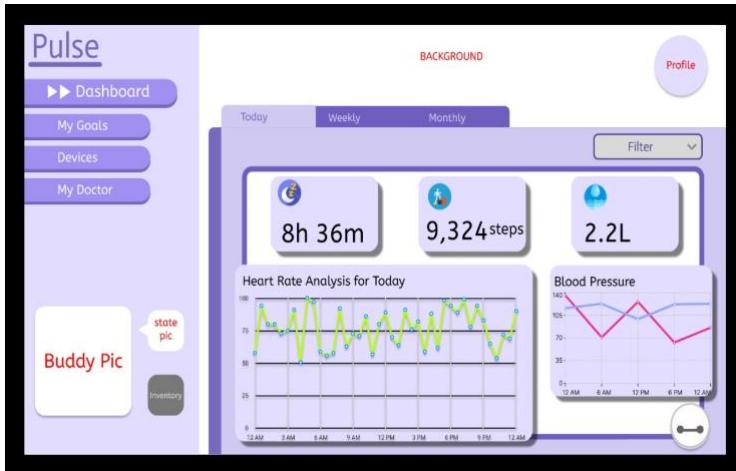


Figure 37. Patient Main Dashboard

This is the patient’s dashboard where it shows a summary view of key health metrics.

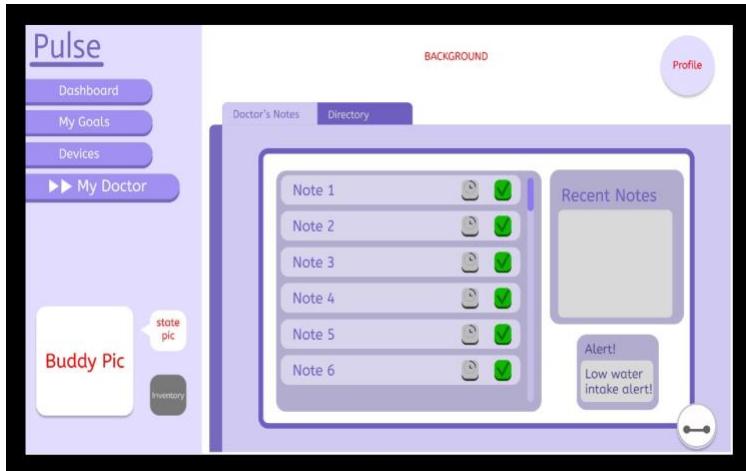


Figure 38. Doctor Notes Page

The “Doctor Notes” page lets the user view notes and recommendations provided by their chosen doctor.

Task: Navigate the dashboard to view daily health summaries such as heart rate, sleep, hydration, and step count. Navigate to check the steps for the current month.

Questions:

- 1) Was it easy to locate and understand each health metric?
- 2) Was the layout visually clear and organized?
- 3) Did you find it simple to move between sections on the dashboard?
- 4) Did any data feel overwhelming or cluttered?
- 5) Do you have any suggestions for improvement?

Rating:

- 1) Completed 2) Completed with guidance 3) Not complete

3. My Goals Page:

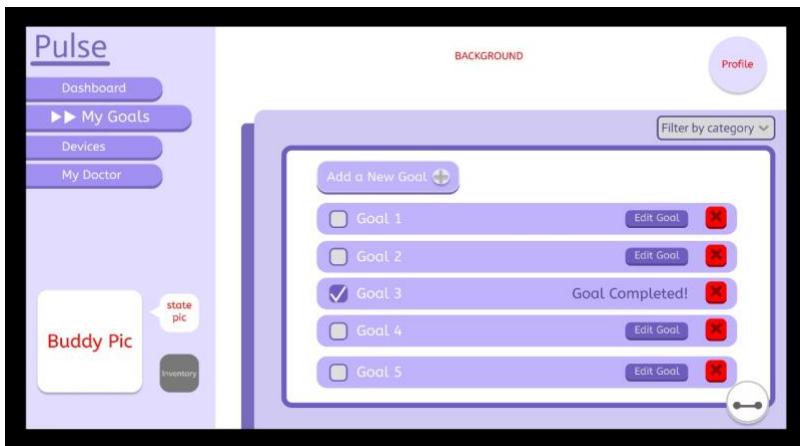


Figure 39. My Goals Page

The “My Goals” interface allows the user to set new goals, mark them as completed or remove them entirely.

Task: Creates a new health goal (e.g., “walk 8,000 steps per day”), track progress, and edit or remove the goal.

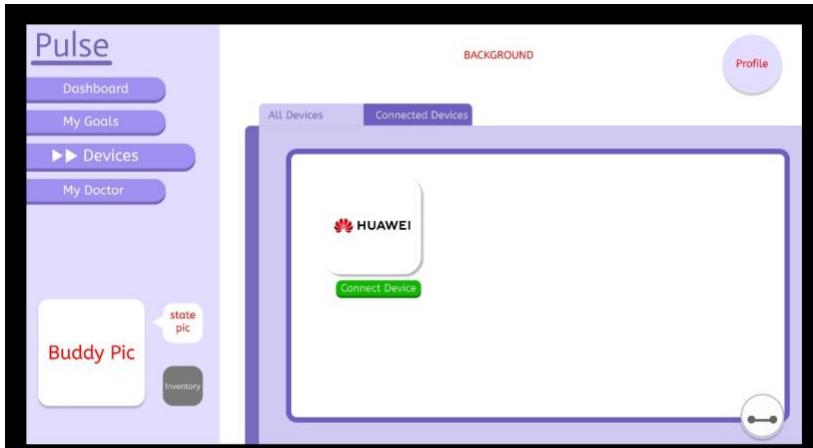
Questions:

- 1) Was setting a new goal straightforward?
- 2) Was the progress tracking clear and easy to understand?
- 3) Was it simple to edit or delete a goal?

Rating:

- 1) Completed 2) Completed with guidance 3) Not completed

4. Devices Page:



The “Devices” pages shows available devices which can be connected.

Figure 40. Devices Page

Task: Connect a new device, view connected devices, and then disconnect one device.

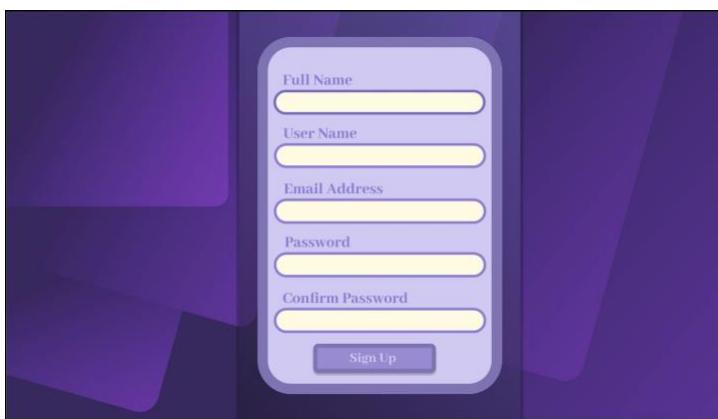
Questions:

- 1) Was it easy to find the option to connect a new device?
- 2) Did the system show connected devices correctly?
- 3) Was disconnecting a device simple to complete?
- 4) Any suggestions for improvement on this page?

Rating:

- 1) Completed 2) Completed with guidance 3) Not completed

5. Doctor - Sign up Page :



The screenshot shows a mobile application interface for doctor sign-up. It features a purple header bar at the top. Below the header, there is a light blue rectangular form containing six input fields: 'Full Name' (with a yellow placeholder bar), 'User Name' (with a yellow placeholder bar), 'Email Address' (with a yellow placeholder bar), 'Password' (with a yellow placeholder bar), 'Confirm Password' (with a yellow placeholder bar), and a 'Sign Up' button at the bottom.

Figure 41. Doctor Signup Page

The screen for a potential HCP to sign up, requiring various details.

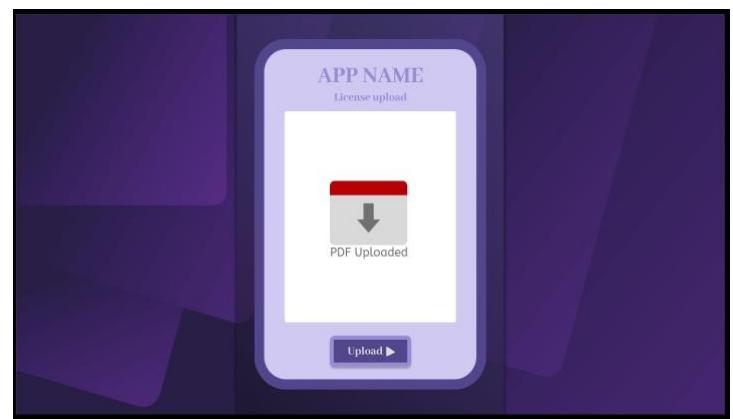


Figure 42. Medical License Verification Page

A screen for uploading the HCP's medical license for verification.

Task: Sign up as a new doctor by using their email, setting a secure password and completing basic profile details(name, verifying medical license)

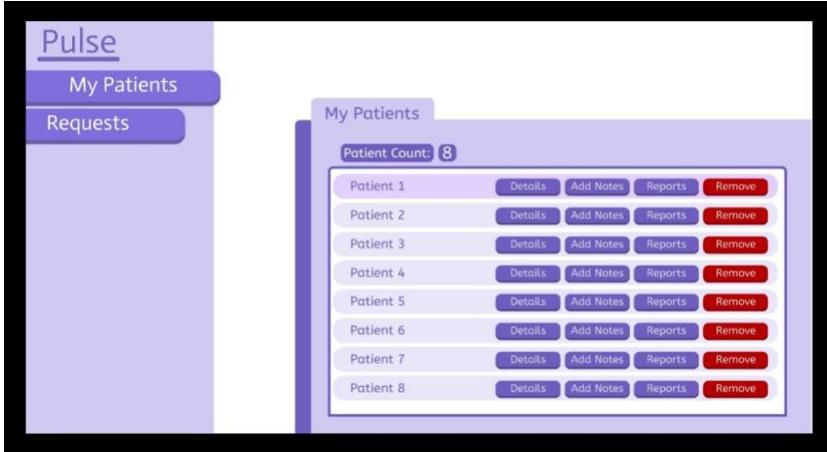
Questions:

- 2) How do you feel about the medical license requirement? Do you have any suggestions for improvement?
- 3) Was there any information or onboarding you expected before entering the dashboard?

- 1) Completed 2) Completed with guidance 3) Not completed

6. Doctors Dashboard:

1. My Patients page :



The screenshot shows the "My Patients" page. At the top left is the "Pulse" logo. Below it are two purple buttons: "My Patients" and "Requests". The main area is titled "My Patients" with "Patient Count: 8" displayed. A table lists 8 patients, each with four buttons: "Details", "Add Notes", "Reports", and "Remove".

Patient	Action	Action	Action
Patient 1	Details	Add Notes	Reports
Patient 2	Details	Add Notes	Reports
Patient 3	Details	Add Notes	Reports
Patient 4	Details	Add Notes	Reports
Patient 5	Details	Add Notes	Reports
Patient 6	Details	Add Notes	Reports
Patient 7	Details	Add Notes	Reports
Patient 8	Details	Add Notes	Reports

Figure 43. HCP Patient List

Task: View your list of patients, access their profiles and reports, and add notes for each patient.

Question:

- 1) Describe what you see on this page and what you understand from this page.
- 2) Was it easy to find and open patient profiles?
- 3) Was adding or editing notes straightforward?
- 4) Is there any additional information you would find helpful when reviewing a patient's profile?

Rating:

- 1) Completed 2) Completed with guidance 3) Not completed

2.Requests for New Patients Page:



The screenshot shows the "Requests" page. At the top left is the "Pulse" logo. Below it are two purple buttons: "My Patients" and "Requests". The main area is titled "Requests" with "Patient Count: 8" displayed. A table lists 8 patient requests, each with three buttons: "Details", "Accept", and "Remove".

Patient	Action	Action
Patient 1	Details	Accept
Patient 2	Details	Accept
Patient 3	Details	Accept
Patient 4	Details	Accept
Patient 5	Details	Accept
Patient 6	Details	Accept
Patient 7	Details	Accept
Patient 8	Details	Accept

Figure 44. HCP Patient Request List

Task: Review new patient requests and decide to either accept or decline them.

Questions:

- 1) Was it easy to locate new patient requests?
- 2) Was the process of accepting or declining requests clear?
- 3) Was there any patient detail you wished was available before making a decision?

The “My Patients” page displays all their current patients where they can add notes, view reports and even remove the patients.

The “Patient Requests” page shows the HCP all the users wanting to connect. Doctors can view their details and decide whether to accept or decline.

Rating:

- 1) Completed
- 2) Completed with guidance
- 3) Not completed

7.Admin - Dashboard Page:

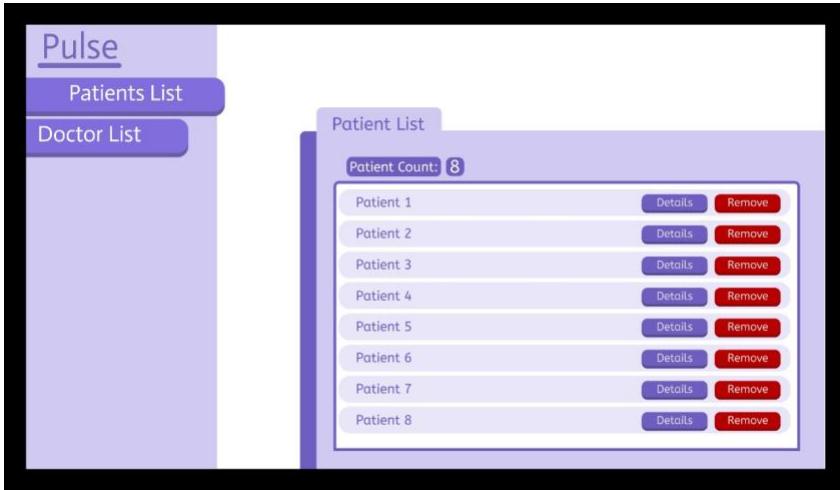


Figure 45. Admin Patient List

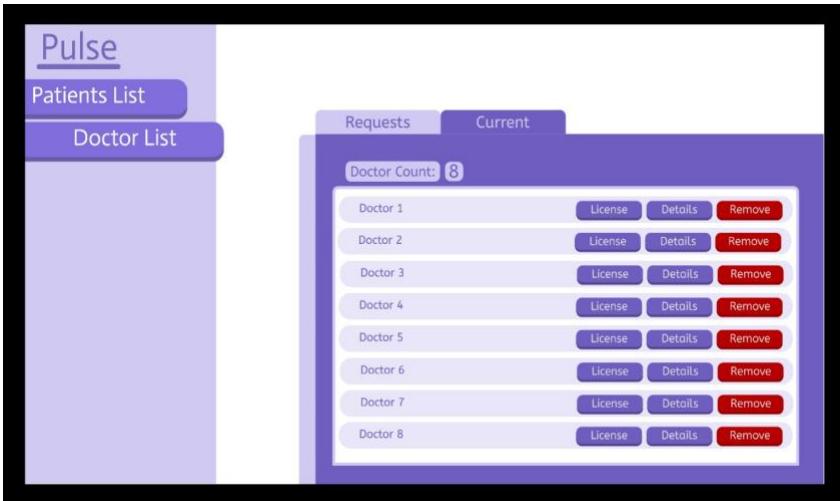


Figure 46. Admin Doctor List

Task : Access the dashboard for account management (doctors and patients) and verify doctor license
Questions:

- 1) Was it easy to locate and review system data?
- 2) Was navigating between admin functions simple?
- 3) Could you quickly understand and interpret the information presented on the dashboard?
- 4) Could you understand the difference between “Requests” and “Current” tabs?

Rating:

- 1) Completed
- 2) Completed with guidance
- 3) Not completed

Thank you for completing the quick test. We would like to hear your overall feedback about the website through a short survey. Your input will help us make the software more user-friendly and enjoyable for all users. The survey should only take 5–10 minutes, and we really appreciate you taking the time to share your thoughts.

This page allows admins to see the list of patients using their app with also having the options of viewing their profiles and the ability to remove them from the app.

This page allows admins to view their current doctors with actions such as verify medical license and manage accounts.

Appendix H: System Mockups After (Figma)

H.1 Onboarding (Login and Registration)

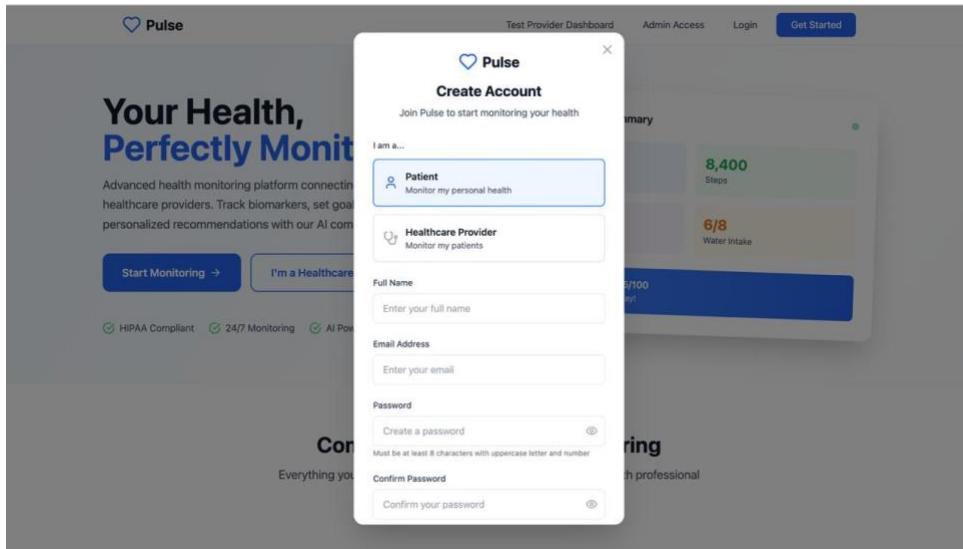


Figure 47. Improved Signup Screen

Figure 47 & Figure 48 - The design was shifted to a more modern and centered overlay which provides a cleaner look.

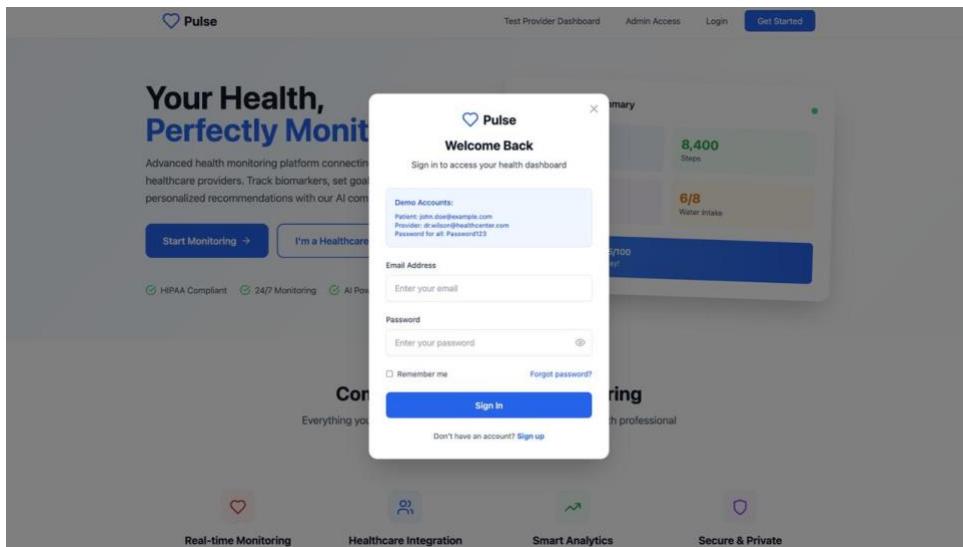


Figure 48. Improved Login Screen

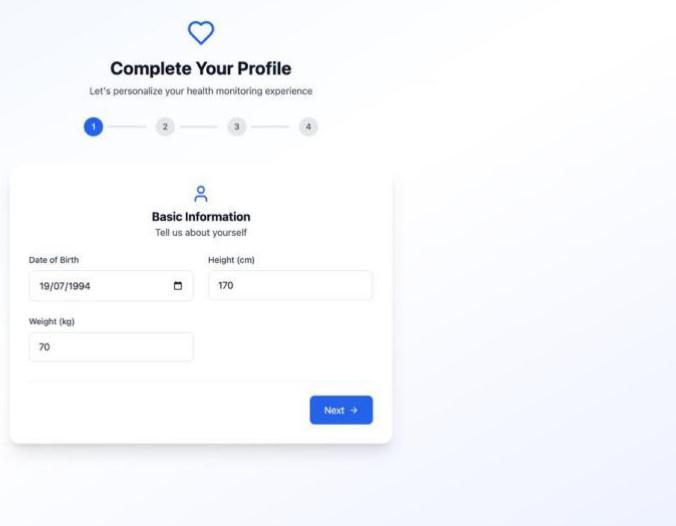


Figure 49. Improved Personal Details Screen

Figure 49 & Figure 50 - The flow for selecting health goals uses clearer and more distinct buttons instead of simple text. Decluttering was removed by separating the primary setup from non-essential tracking features.

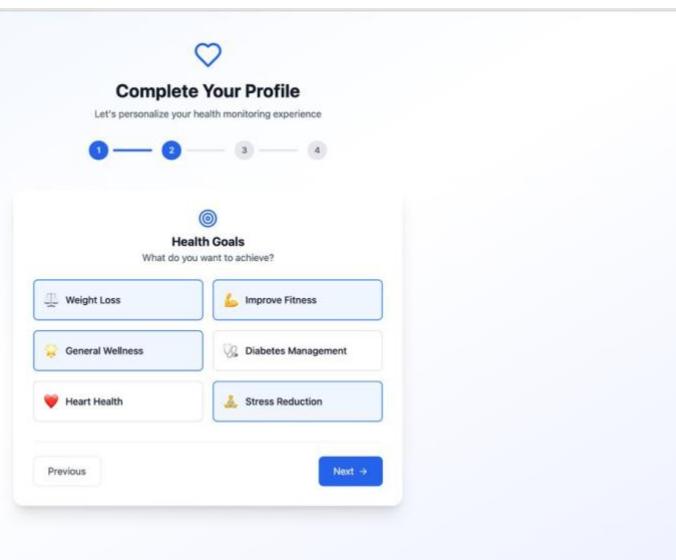


Figure 50. Improved Health Details Screen

H.2 Patient Dashboard

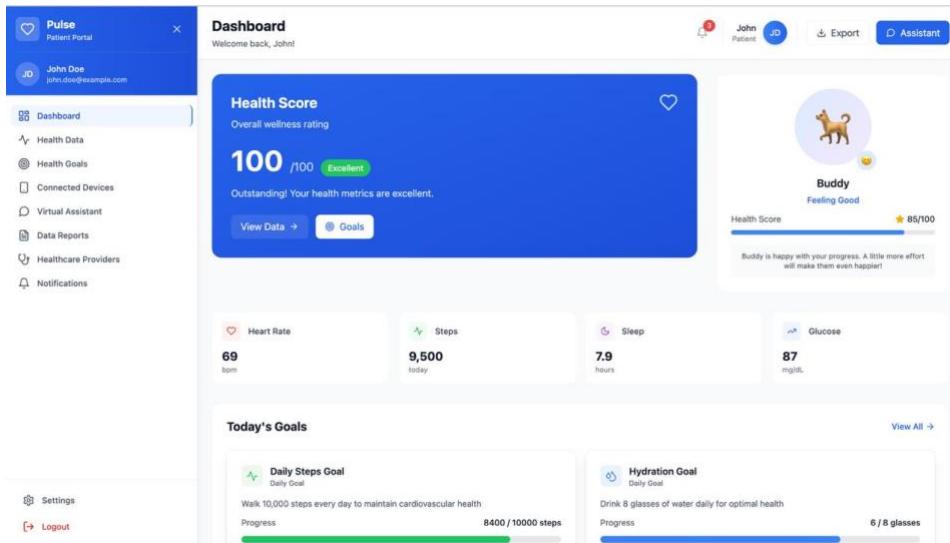


Figure 51. Improved Patient Main Dashboard

Figure 51 – Shows the new dashboard which displays a Health Score card to provide immediate summary. Now the key metrics are being displayed in a smaller, clearly labeled cards.

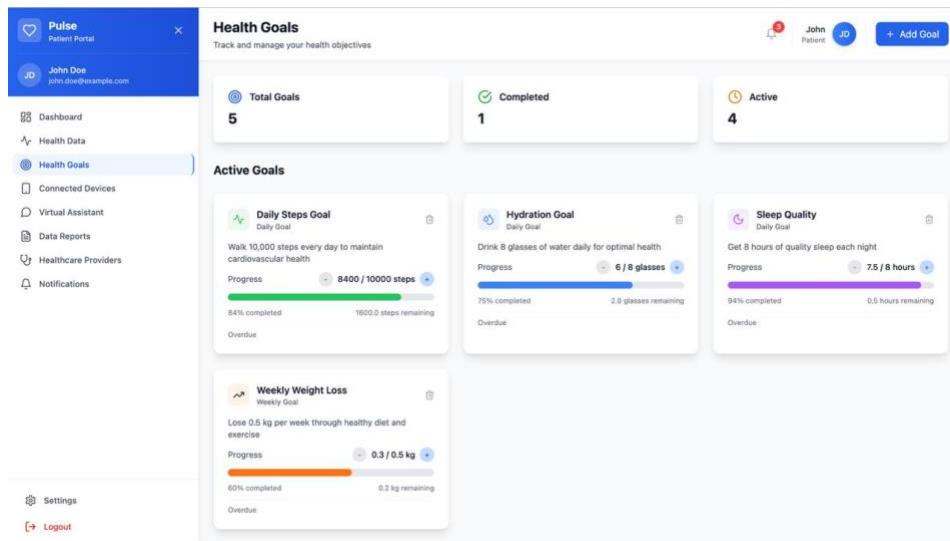


Figure 52. Improved My Goals Page

Figure 52 - The “My Goals” page was refined to clearly organize goals by Biometric or goal type.



The screenshot shows the 'Device Management' section of the Pulse Patient Portal. It lists two connected devices: 'Apple Watch Series 9 Smartwatch' (status: Connected, battery: 85%, last sync: 373d ago) and 'Freestyle Libre 3 Glucose Monitor' (status: Connected, battery: 92%, last sync: 373d ago). Below these, there are summary boxes: '2 Connected Devices' (Sync Now, Disconnect), '0 Recently Synced' (Sync Now, Disconnect), and '0 Low Battery'.

Figure 53. Improved Devices Page

Figure 53 - The “Device” page now explicitly lists all the Biometrics collected by each device

The screenshot shows the 'Healthcare Providers' section of the Pulse Patient Portal. It displays a list of providers: 'Dr. Emily Wilson' (General Medicine, Downtown Medical Center, 22 years, Board-certified family physician) and 'Dr. Michael Brown' (Cardiology, Heart & Vascular Institute, 9 years, Interventional cardiologist specializing in heart disease prevention and treatment). Each provider entry includes 'View Notes' and 'Connect' buttons. A sidebar on the left shows the navigation menu.

Figure 54. Improved Doctor Notes Page

Figure 54 - The “Doctor Notes” page was integrated into a larger Healthcare providers management view, which allows users to view the providers name and manage access.

H.3 Health Care Provider Dashboard

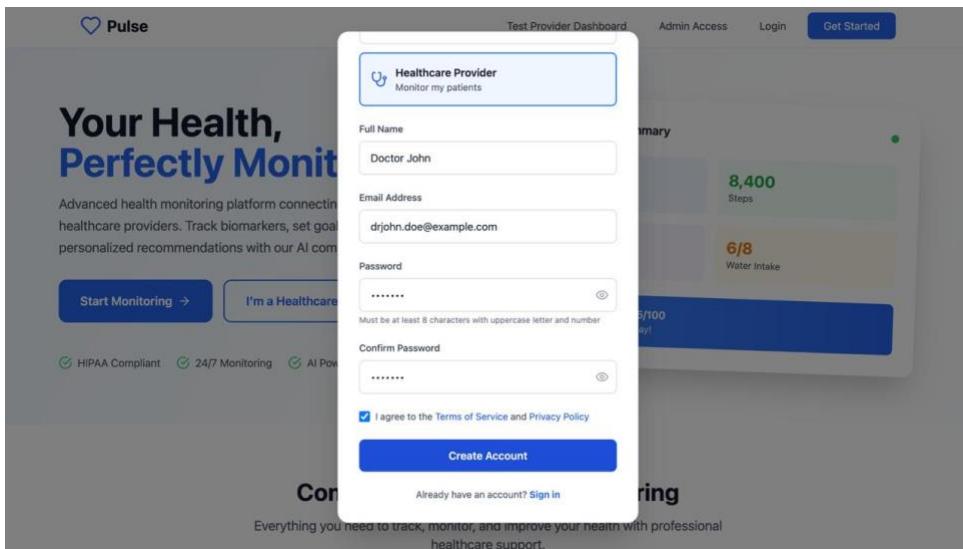
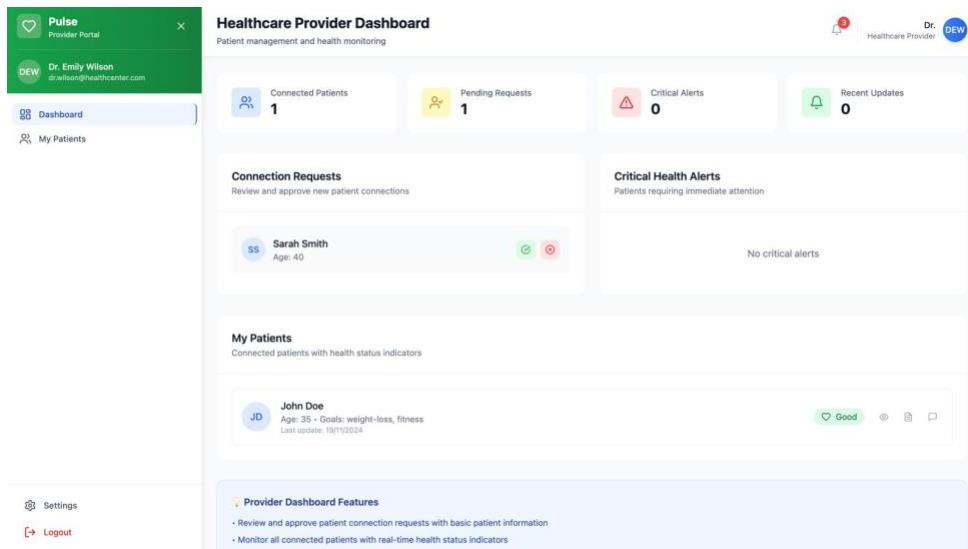


Figure 55. Improved Doctor Sign Up Page

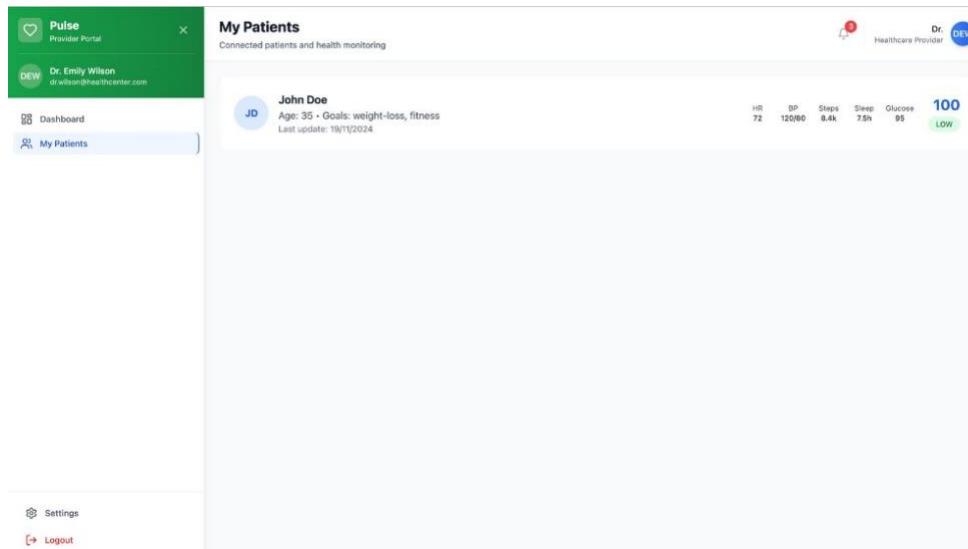
Figure 55 and Figure 56 - The sign-up flow has been redesigned as a multi-step form so it's easier to navigate.

Figure 56. Improved Medical License Verification Page



The screenshot shows the Healthcare Provider Dashboard. At the top, there's a header bar with the HealthEase logo, the title "Healthcare Provider Dashboard", and a sub-header "Patient management and health monitoring". On the left, a sidebar includes links for "Pulse Provider Portal", "Dr. Emily Wilson dr.wilson@healthcenter.com", "Dashboard", and "My Patients". The main content area has several sections: "Connected Patients" (1), "Pending Requests" (1), "Critical Alerts" (0), and "Recent Updates" (0). Below these are "Connection Requests" (Sarah Smith, Age: 40) and "Critical Health Alerts" (No critical alerts). A large section for "My Patients" shows a card for "John Doe" (Age: 35, Goals: weight-loss, fitness, Last update: 19/11/2024) with a "Good" status indicator. At the bottom, there are "Provider Dashboard Features" (Review and approve patient connection requests with basic patient information; Monitor all connected patients with real-time health status indicators), "Settings", and "Logout" buttons.

Figure 57. Improved HCP Dashboard

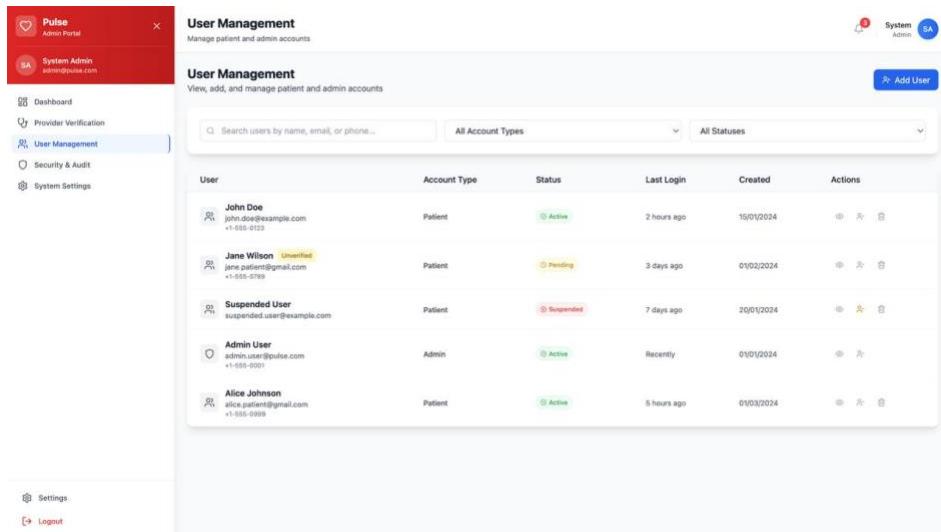


The screenshot shows the "My Patients" section of the dashboard. It has a header "My Patients" and a sub-header "Connected patients and health monitoring". The main content area displays a patient card for "John Doe" (Age: 35, Goals: weight-loss, fitness, Last update: 19/11/2024). To the right of the card are real-time health status indicators: HR 72, BP 120/80, Steps 8.4k, Sleep 7.5h, Glucose 85, and a prominent "100" with a "LOW" label below it. At the bottom, there are "Settings" and "Logout" buttons.

Figure 58. Improved HCP Patient List

Figure 57 and Figure 58 - Shows the new HCP dashboard and although the patient list itself isn't fully detailed here, the visual design has been updated for a clearer and more professional look.

H.4 Admin Dashboard

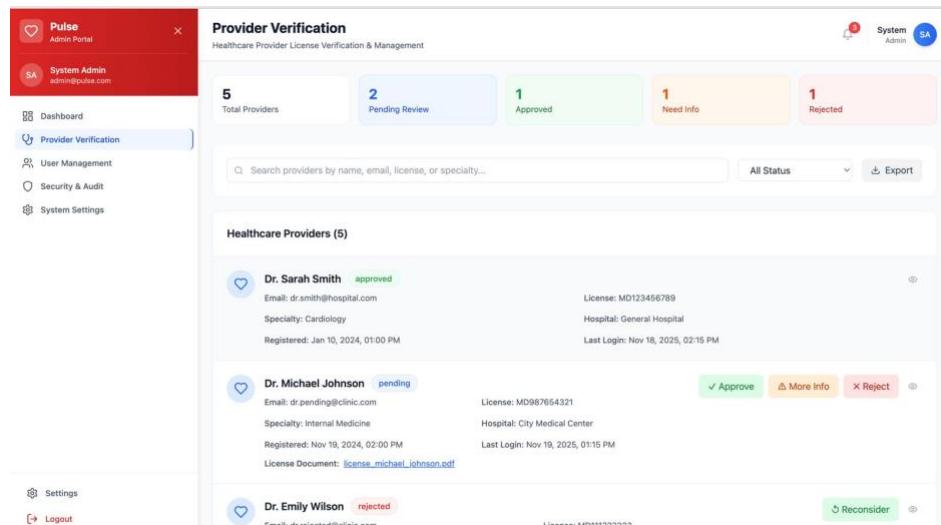


The screenshot shows the 'User Management' page under the 'Admin Portal'. The sidebar on the left is red and labeled 'System Admin'. The main area has a white background with a blue header bar. It displays a table of users with the following data:

User	Account Type	Status	Last Login	Created	Actions
John Doe john.doe@example.com +1-555-0123	Patient	Active	2 hours ago	15/01/2024	
Jane Wilson Jane.patient@gmail.com +1-555-0789	Patient	Pending	3 days ago	01/02/2024	
Suspended User suspended.user@example.com	Patient	Suspended	7 days ago	20/01/2024	
Admin User admin.user@pulse.com +1-555-0981	Admin	Active	Recently	01/01/2024	
Alice Johnson alice.patient@gmail.com +1-555-0999	Patient	Active	5 hours ago	01/03/2024	

Figure 59. Improved Admin Patient List

Figure 59 - The admin interface now uses a distinct, red-themed sidebar and accent colors which visually separates it from the blue theme used by the Patients and Doctors. This page was redefined to allow system admins to view, search and filter all user accounts.



The screenshot shows the 'Provider Verification' page under the 'Admin Portal'. The sidebar on the left is red and labeled 'System Admin'. The main area has a white background with a blue header bar. It displays a table of healthcare providers with the following data:

Healthcare Providers (5)		Total Providers	Pending Review	Approved	Need Info	Rejected
Dr. Sarah Smith Email: dr.smith@hospital.com Specialty: Cardiology Registered: Jan 10, 2024, 01:00 PM		5	2	1 Approved	1 Need Info	1 Rejected
Dr. Michael Johnson Email: dr.pending@clinic.com Specialty: Internal Medicine Registered: Nov 19, 2024, 02:00 PM License Document: license_michael_johnson.pdf						
Dr. Emily Wilson Email: dr.rejected@clinic.com						

Figure 60. Improved Admin Doctor List

Figure 60 - The Provider interface was redesigned, and a new option was added named "More Info", just in case the admin needs more info before approving the provider application.