

Woundification Project Process Document



Prepared by
Team Esagono, Projects II
Master of Digital Media
Centre for Digital Media



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Executive Summary

Providence Health is one of the largest Catholic healthcare organizations in British Columbia, Canada. It operates 7 facilities including hospitals, care centers, and residences, offering a wide range of health services to the community. The non-profit organization strongly focuses on community engagement and strives to positively impact the health and well-being of the communities it serves.

Providence Research, the research partner of Providence Health Care, has been established for over 15 years and integrates teaching, knowledge creation, and translation to discover and deliver disease prevention and dramatically improve care. In September 2022, it hosted the second annual hackathon event catalyzing medical innovation around pain. On that occasion, a creative team produced the **Woundification** idea, a mobile wound care application, designed to be practical and educational, and won the hackathon.

At the beginning of 2023, this talented idea was chosen as the first inspiration for further design and development by a group of students (**Team Esagono**) at The Centre for Digital Media. From that point to April 2023, Esagono would devote their best efforts, knowledge, and skills to assisting in fleshing out promising market value and product prototypes in close collaboration with Woundification.

Project Overview

Purpose

The client of the project, Providence Research, is pursuing this project to explore and build a detailed understanding of the Woundification app. The client aims to understand the feasibility of the idea and how it can be a platform to create awareness and knowledge about wound care. The client hopes to achieve this by developing the idea into a mid-fidelity prototype that can identify wounds and help users with the healing progress with knowledge.

Current wound identification applications available in the market are not designed to be used by general consumers. Some form of medical expertise is needed to use these apps. This project aims to explore whether it is possible to bring similar functionality within reach of the general population.

This project is also aimed at developing the idea to a point where it is mature enough to be pitched to other partners or investors. Some of the project deliverables are specifically designed to support further pitching of the application.

Goals and Objectives

Goals

The goal of the project is to research and develop a mobile application that enables **non-medical people to understand and learn about wound conditions and learn how to seek the right intervention or treatment.**

Objectives

- Explore the features of the wound identification app conceptualized by the Woundification team.
- Explore existing digital wound identification in the market
- Understand user needs when it involves understanding a wound through market research
- Iteratively design, prototype, and test solutions to find an optimum user experience for wound identification
- Develop a holistic understanding of the app so the concept can be solidified and pitched to other parties, such as investors and industry partners.

Scope

Project At a Glance

Team Esagono is researching, iteratively prototyping, and developing a mobile health application through which wound patients can learn about identifying wounds. The app's concept comes from the Woundification team and is being explored based on that initial concept.

The project is meant to research and explore different user experiences for wound identification and provide the client with an understanding of how this app can be developed further.

The project is not meant to develop the app for a final release or to be deployed in any manner to the general public. Creating a working and accurate image recognition algorithm based on large datasets of wound images is also not under the scope of this project.

Type of Wounds

In the initial research, our team identified 8 different open wounds that can be identified through the app. They are punctures, thermal/chemical/electrical burns, bites and stings, abrasions, lacerations, contusions, blisters, and ulcers. The identification process and assessment parameters for different types of wounds vary greatly. For the sake of simplicity, scope and constraints of this project, we are not considering exploring all types of wounds and how they can be identified.

Deliverables

1. **Functioning digital prototype (MVP):** A mid-fidelity prototype of the Woundification app needs to be developed. The app needs to incorporate designs informed by prototypes and research insights.
2. **Market Research Report:** The research findings regarding wound care applications need to be delivered as a separate document (PDF).
3. **Pitch Slide:** An editable slide deck highlighting the developed prototype and all the project's learnings must be provided which will be used for pitching to different parties.
4. **Weekly Progress:** Weekly updates on the project's progress must be presented to the client team.

Delivery	Feedback & Approval Window
Weekly Updates	2 business days
Design files	5 business days
Live application files	5 business days
Documentation and decks	3 business days

Constraints

Timeline

[illegible]

Resource Availability

The core function (identification) of the app is dependent on the availability of a large dataset of labelled wound images or a pre-trained image recognition model that can detect wounds. However, within the project's scope and resources, the team is only exploring databases available for academic projects. No business/enterprise-level products or resources will be explored.

Assumptions

To make the research and development of Woundification streamlined, the team is making some assumptions. These assumptions are meant to remove unwanted and non-critical variables from the scope of the project. Here are the assumptions of the project:

- The users mobile devices and internet connectivity are capable enough to run the application smoothly irrespective of the operating system, hardware, and software specs.
- The users of the application are residents of Canada, are capable of clearly communicating in English, and have access to standard healthcare facilities.

Risk Assessment

Risks	Impact	Plan
The image identification algorithm, which uses colour ranges, for wounds is not analyzing correctly	The core feature of the solution will not be realized as intended	Design and test alternate ways of identification that do not involve image recognition by devices (e.g., manually classify images)
Lack of labelled wound image database for wound classification and measurement to create a working machine learning model	The accuracy of the image recognition algorithm would be compromised	Design and test alternate methods of gathering information about different parameters of the wounds Explore other sources of labelled wound image databases and broadly

		estimate the resources required to access those.
Not enough users with acute or chronic wound experience to test the prototypes with	The research and test findings will not reflect the accurate experience of wound patients.	Coordinate with the medical experts on the client team to gain a better understanding of the wound-healing process. Simulate different symptoms and observe how test users react in similar situations to gain a better understanding of user behaviours.
Users consider the suggestions given by the app as medical diagnoses and advice.	Users run the risk of not getting the appropriate medical care. The Woundification team runs the risk of facing legal compliance issues	Design and test UX elements in the app, ensuring users understand the type of information they will be receiving in the app.

Team

Stakeholders

Name	Roles
Providence Research/Woundification	<ul style="list-style-type: none"> Provides information and guidance regarding the direction of the project Provides feedback on the designs and prototype over the course of the project
Team Esagono	<ul style="list-style-type: none"> Conducts research, creates design solutions, creates prototypes, and test them out with users Supports the vision of the product and builds on it to create functional prototypes
Faculty Supervisor	<ul style="list-style-type: none"> Provide guidance and feedback on the project process Provide advice on how to solve critical problems Approving academic requirements of the project
The CDM	<ul style="list-style-type: none"> Provides administrative support Approves academic requirements of the project

Project Team and Roles

Name	Roles
Alice Kong	UX/UI designer, graphic designer, and user researcher
Dong Sun	Project manager, market, and user researcher
Linh Truong	Software Developer
WenXin Yu	UX researcher, UI designer, graphic designer
Walid Khan	Primary project manager and UX Designer
Shivani Reddy	UI/UX Designer and Developer

Communication and Work Tools

Purpose	Platform
Meeting Platform	Zoom & In-person
Internal Team Communication	Discord
External Communication with Clients	Email, Slack
Documentation	Notion
Prototyping	Figma, ProtoPie

Methodology

The Esagono adopted **Agile Methodology** for this project. It consists in understanding the problem, defining the target and approach, ideating the solutions, and scoping. In sprint cycles, prioritizing features, prototyping, testing, iterating, and developing the final product.

The team worked on weekly sprint schedules to meet the project timeline. During the last day of each sprint week, a sprint review and planning meeting was held where the progress of the ongoing sprint and plans for the upcoming week were discussed.

Research

Team Esagono conducted a thorough research allowed within the scope of the project to understand the market, users and technology affecting Woundification. The research findings have been compiled into a separate document as per the client's requirements. A summary of the research is provided here.

Wound Research

To holistically comprehend the concept of wound care, we started by probing into several basic wound knowledge, which includes the definition of the wound, wound care wound healing process, wound types, and the general wound assessment process. The following are the topics we researched to understand more about wounds:

- Wound and wound care
- Wound healing process
- Types of wounds (based on wound condition)
- Types of wounds (based on wound duration)
- Wound healing process
- Wound assessment process

Market Research

To understand the potential of the market and the players in this industry secondary research on the market was conducted. Here is the list of the topics covered:

- Market potential
- PESTEL analysis
- Competitor research
 - The Telewound Canada Project
 - Swift Skin and Wounds
 - Swift Ray 1
 - Pin An Health
 - Net Health (formerly Wound Expert)
 - WoundRounds
 - Wound Care Advisor
 - Wound Care App

User Research

To better understand the needs of users, we conducted two surveys to figure out how people treat their new and old wounds. They are aimed at answering questions below:

- Do any of my users have impairments or disabilities—whether temporary, situational, or permanent—that I need to consider?

- How familiar are my users with technology?
- How are my users accessing the product or service?
- Where and when are my users accessing the product or service?
- Have I considered all potential users?

Technical Research

Tech Explorations

The project team did an extensive research and exploration to understand all the available technologies that can be utilized in this application. A detailed report of the findings is available in the 'Research Finding' document. Here is a short summary of all the technologies we explored:

- **Wound Classification with Machine Learning**
Exploring research papers and articles that can aid wound classification with machine learning algorithms.
- **Wound Identification with OpenCV and HSV Color Scale Analysis**
Exploring method to identify whether an image is a wound through algorithm which analyzes the colours of an image. This method converts an image from its original BGR (blue, green, red) colour space to an HSV (hue, saturation, value) colour space
- **Colour Patch Method for Automatically Calculating Wound sizes**
Exploring research papers to colour patch method that scans and image and calculates the wound size.
- **Wound Depth Perception**
Exploring the Tensorflow, PyTorch, Keras, MXNet and other libraries to implement wound depth perception technologies.

Technical Limitations

- **Camera Quality** A wide variety of smartphone cameras exist in today's market making it difficult to have consistent photos for matching.
- **Measurement Inconsistency** Without an easy to understand reference, the app/system may not measure the wounds properly.
- **Skin Color** Variation in skin colour may make it difficult for the app/system to recognize the state and type of wounds.
- **Downloading Heavy App** Having a dedicated app on a mobile device may not be a feasible option for many users.
- **Wound Image Database** Available and usable image database of wounds may not be enough to create a good identifying solution.

Image Database Exploration

The Providence Research team provided an external database, established by the Silesian University of Technology in Poland, in hopes that it would aid in the creation of a machine learning model to identify wounds. A large, labeled, and accurate database is required to design an algorithm that accurately detects wounds. The images would be used to train the model on how to accurately categorize wounds.

- Polish University: <https://chronicwounddatabase.eu/>
- <https://www.ncbi.nlm.nih.gov/pmc/articles/PMC5029888/>

The Concept

Problem Statement

Currently, most wound care management applications in the market are aimed at professionals, and users have the self-monitoring needs at personal spaces like home.

Based on our research and interviews, when it comes to individual wound management, we find out that in general, people understand that proper wound care is important for preventing infection and promoting healing. However, they are not familiar with the specific techniques and products used in old wound care when their wound fails to be cured in the expected time.

Target Audience

- People who are suffering from chronic/slow healing wounds.
- People who experience minor/acute wounds on a day-to-day basis.
- Specific communities with special wound care needs.

Our Solution

- **Identification:** Provide wound identification function that helps patients know the type of wounds and their severity.
- **Self-treatment suggestion:** Provide tailored non-medical wound care suggestions that help user handle old minor wounds appropriately and improve user's daily activities.
- **Medical reminder:** Suggest nearby locations of clinics and hospitals especially if the wound becomes terrible or in other unpredictable conditions.
- **Wound tracking reminder:** Assist in tracking user's wound progress and remind them to address the old wound on a daily basis.

Agile Statement

For	people who are suffering from slow healing or chronic wounds
Who	would like to learn more about the condition of their wound and possible treatment options
Woundificaiton	is an easy-to-use mobile application
Which	uses a series of assessment questions to understand the condition and classification of wounds
Unlike	Swift Skin and Wounds and Swift Ray 1 which are focused more toward healthcare professionals
Our Product	focuses on enabling everyday users to gain easy-to-understand medical knowledge about wound condition

Design Solution

User Personas

Based on the research we've collected, we came up with three personas as our target users to design our features and dig out pain points so as to conduct the following design.

Name: Rachel

Age: 40s

Area: East Vancouver

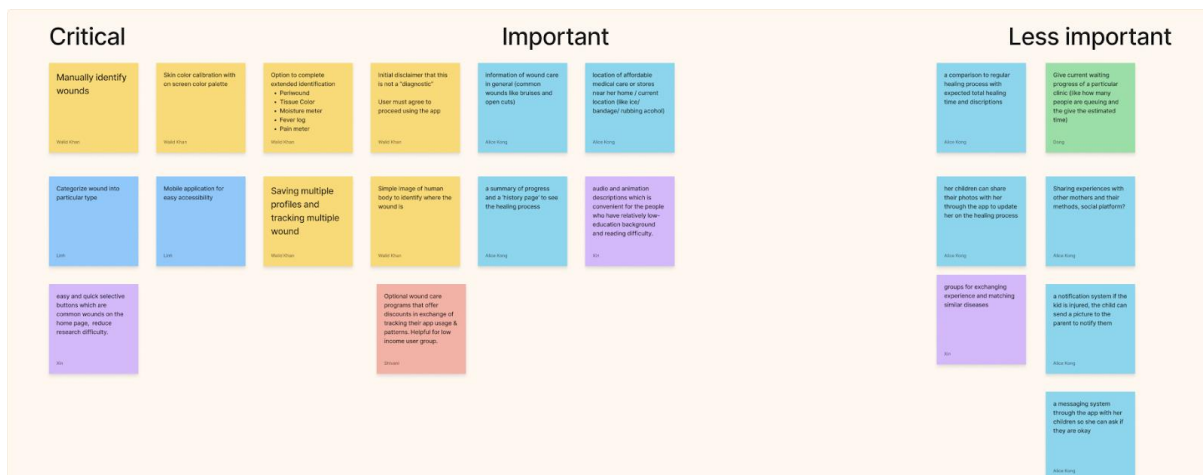
Income: Low-income

Profession: Social worker

Activities: Playing with child, book club, hiking

Pain points:

Rachel is a single parent in her 40s with one child. She lives a very busy life, and oftentimes struggles with time management. She works 9-5, while also managing to care for her child. Due to the fact that Rachel is so busy, she's not able to make doctors' appointments because they are so time-consuming. Instead, she uses Google to self-diagnose her symptoms.



Name: Aiden

Age: 30

Location: Downtown, Vancouver

Profession: Business analyst

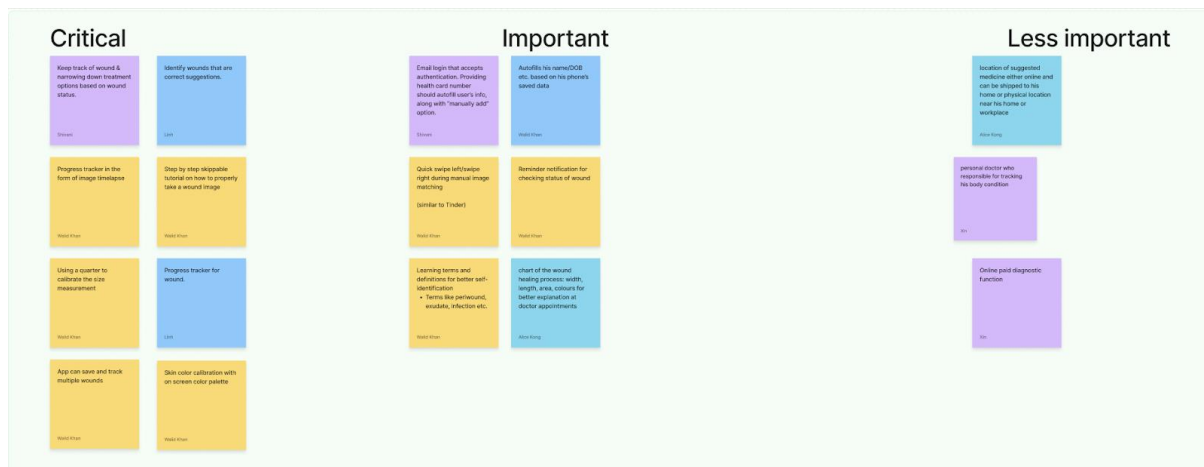
Activities: Indoor activities like reading books

Pain points: He must report working every day, and his schedule is pretty tight

He has no time to visit wound care centers and keep up with them

He had bad experiences using google for accessing wound care info due to prior misleading encounters

He wants to narrow down treatment options based on his wound status



Name: Jennie

Profession: cashier

Age: 50+

Income: below the middle

Family: 2 kids, husband

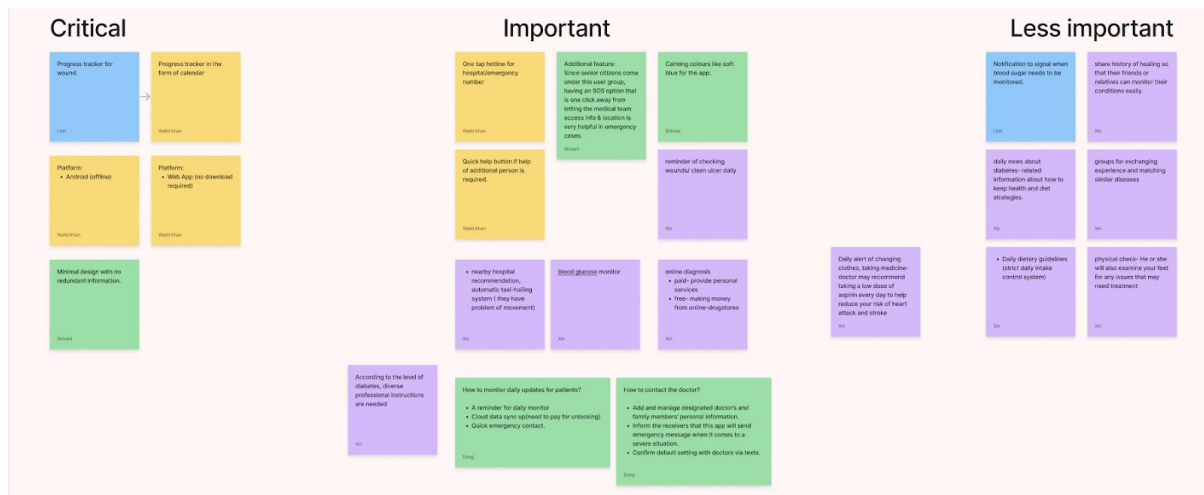
Location: rural area, have no access to hospital

Educational level: high school

Activities: Hang out with friends, enjoy food

Pain Points:

- Under long-term pressure, she releases her stress by overeating, which results in severe diabetes.
- she is a 50 years old diabetic (type 1 + type 2 diagnosed + type 2 undiagnosed) and prediabetes combined, who suffer from long-term wound infection, but she lives in a rural area so that she can't go to hospital frequently to treat her wound and receive professional instructions. she has no idea how severe her condition is, because of the location, work, taking care of kids and financial condition, she can't receive appropriate treatment and always forget to monitor her blood glucose.
- She tries to go online to search for her illness because her reading difficulty and low educational level make it harder for her to understand professional information.
- Because of that, her wound deteriorate severe gradually and facing the fact of losing her feet. she has difficulty moving around now.



User Flow

User Stories

For understanding the users' needs completely, we created their one-day lives by using the way of displaying their activities. We combined Adien with Rachel into one user story that represents normal people. And Jennie represents the people who have chronic diseases.

Persona 1: Rachel

40 years old

Mother

Version 1

- Wakes up at 7:00 am, gets children ready for school/daycare
- While kids brush their teeth and clean up, and prepares breakfast. Lunch was already prepared for the day prior
- As she prepares breakfast, kids running around and making a mess of the house. She's stressed because she's not sure if she'll make it to work on time.
- After speedily packing everything (lunch, school bags, work bags). They all transit to the kid's school at 8:30 am.
- She drops them off at 8:40, slightly late, and she briskly walks to work. It typically takes her 30 minutes, so she thinks she'll be late.
- She gets to work at 9:05, settles into her desk, and starts working on her first social work case. The job is very stressful and she often takes homework.
- Rachel doesn't have time to eat when 12:00 pm rolls around, she gets fast food nearby and goes back to work.

- Work day is over, she has two more cases to look at. Is stressed and hungry go to pick up the kids. Leaves work at 5:20 pm.
- She gets to school/daycare and the kids are a mess. One child looks like they've fallen hard, and another child is just soiled with dirt. The teacher has stated they've cleaned would, but will need monitoring.
- Without thinking much of injuries, she goes home with the kids via transit and prepares dinner. Dinner is a microwavable meal.
- As the night continues, the child's wound looks inflamed. Not sure if the wound is severe enough for the hospital. Not sure what to do, so continues to clean and monitor.
- At 10 pm, the child has an itching wound. Cleaning it doesn't affect it. At this point, general practitioners are closed. Rachel is more worried but unsure of what to do.
- 2:00 am Rachel wakes up due to stress. She checks in on her child and the wound still looks inflamed. Thinks to herself that it will get better with time.

Version 2

- Wakes up late at 7 to prepare lunch for her kids who are in kinder garden and primary school, she is questioned: is there enough time for her to prepare for her meal, feeling tired and anxious
- She sends her kid to primary school off to school by bus at 7:30 and walks the other kid to a local kindergarten, then scrambles herself into the public transit to get to her work
- She starts working as a waitress at a local restaurant at 8 until 1 pm, without lunch she rushes to the school to pick up her kid at kindergarten
- As she leaves her kid at a daycare center, she rushes to her second job as a cashier at a local convince store from 3 to 9 pm. she worries about her bigger kid as he is sick a few days earlier
- 9 pm, she rushes to the daycare to get her kid and rushes back home to make dinner for the family, she feels like
- at 11pm, as she arrives home, she finds that her bigger son is sleeping on the sofa, upon closer inspection, she finds a heavy bruise on the childs arm, and the child seem to be in pain
- she does not know what to do because all the clinics are closed, she is very worried and panicking on how she can help her son
- she remembers the app that she downloaded to her phone that she thought it was useful for this situation
- she quickly opens the app. Her goal is to get the treatment suggestion for her son's wound as fast as possible
- She selects the camera function as it is the fastest way for the wound to be identified
- She takes a picture and the app identifies it as a black bruise, the app says that the bruise dimensions is not suggestions are made on how to improve this situation

Version 3

- After her hectic work shift, Rachel goes to pick her kids up from school around 3:30 PM.
- She notices a wound on one of her kids' knees and is immediately alarmed by the severity.
- Despite repeated attempts to ask for any information about the wound, the child provides none.
- Since Rachel's next shift starts right away, she has no time to drive her kid to the hospital for wound care facilities. The wound appears to be bleeding.
- Rachel has some wound aid in her house that can be used to dress her kid's wound. But she is unsure about the wound type and how to treat it.
- Rachel needs assistance in categorizing wounds and associated treatment options. With this information, she is capable of dressing the wound accordingly.

Version 4

- Rachel meets her son in the evening after work
- She realizes her son has a wound on his knee. it's a bit swollen with a small cut
- She thinks to herself that this is a simple playground injury
- She doesn't take it seriously and cleans it with some antiseptic solution
- Later that night, her son gets a bad fever. His knee wound seems to have swollen more
- Rachel panics.
- She tries to call her family doctor but since it's late at night so she can't reach him
- She feels until she can identify the wound, she won't feel relieved. She wonders if she should call the emergency services

Persona 2: Jennie

60 years old

Mother

Version 1

- 7:00 AM: She has to get up very early for preparing breakfast for the family and go to the grocery store.
- 12:00 PM: Because she has no time, she can only eat junk food for lunch. sometimes she wants to change her eating habits, but healthy food is extremely unaffordable.
- 01:00 PM: Kid's teacher calls her that her son Peter fights with classmates again.
- 02:00 PM: She feels overwhelmed and anxious and craves sweet food.
- 04:00 PM: She feels her wound cannot be recovered more easily than before. Then she just buy some anti-inflammatory medicine for wounds. She plans to see the doctor. because of long distance and work, she can't receive decent treatment.

Her mother is suffering from long-term diabetes. so she knows she needs to test her blood sugar, but just always forgets or doesn't know the frequency of the test.

- 09:00 PM: When she back home, she try to search for related information online, but she doesn't know how to explain her condition and read the professional paper.
- She tries to ask for help from her husband but gives up in the end.
- 10:00 PM: She feels her wound getting worse.

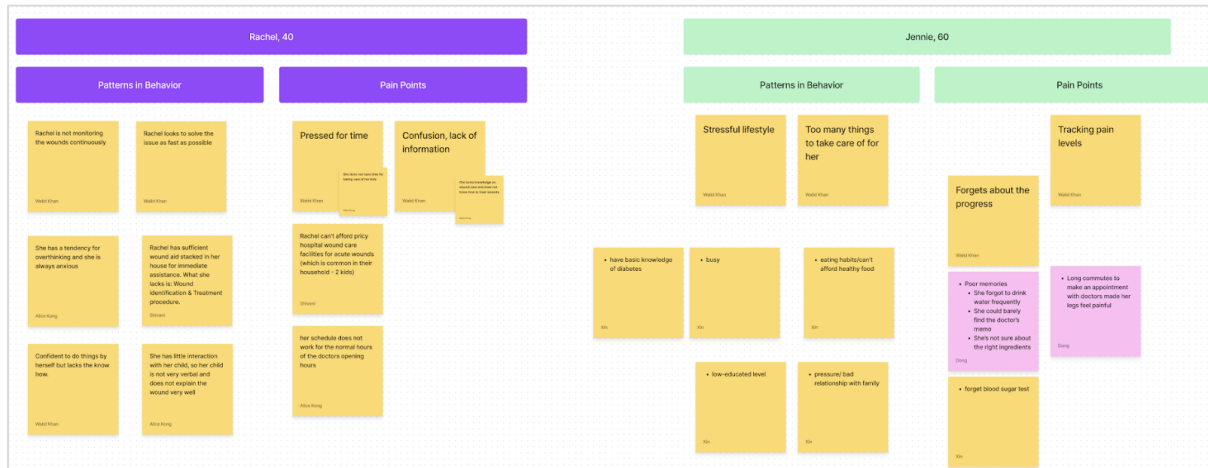
Version 2

- In the morning, before she goes to the clinic, she needs to prepare for it.
- **6:50 AM**
She tried to wake up but she felt very weary due to the high blood sugar level.
- **7:30 - 7:40 AM**
She struggled to stand up from the bed and took the fast blood test at home.
- **7:45 - 8:30 AM**
She took some fresh water and made the breakfast- oat noodles for her and her family members.
- **8:40 - 9:20 AM**
She felt quite sober and opened the podcast to receive news.
- **9:20 - 10:00 AM**
She went downstairs and did exercise.
- **10:00 - 11:00 AM**
She went to the supermarket and bought some chicken breast for lunch
- **11:00 - 12:00 PM**
She tried to cook low-sugar food according to the doctor's suggestion but she didn't know which food is less sugar.
- **12:00 - 02:00 PM**
She took a long sleep and was heading for the clinic.
- **02:00 - 03:00 PM**
She felt pain in her left toe during the bus commuting.
When the doctor took some notes for her, she took a picture in case she lose the memo. But a couple of days later, she failed to remember which day did she go.

Version 3

- Jennie wakes up in the morning a bit late. She is feeling pain in her foot where she has a wound that has been healing for a couple of weeks
- She cut her feet accidentally on a broken piece of glass 2 weeks back and she has a bad laceration
- Fortunately, she did not need to stitch the wound but since it's on her foot it was not healing properly.
- She does most of her household work by herself. So she needs to move around the house quite often. As a result, she is getting dust and other particles in her wound constantly

- The pain she's feeling this morning seems to be worse than yesterday
- She calls her local clinic but could not describe the condition properly. The clinic just prescribed her some painkillers until the next visit.
- She feels worried. She cannot remember if her wound healing was progressing well.
- She also cannot remember when she was supposed to dress/apply medicine to her wound again. She lost track of the time when she last used her meds.



Product Features

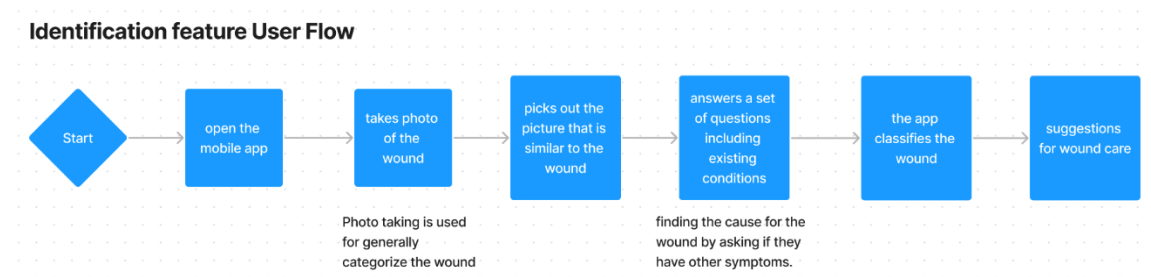
Based on the learnings from research and insights provided by client, the project team settled on four key features for the application.

- Identification
- Tracking & suggestion
- Reminder & self-care
- Multiple profiles

Identification Function

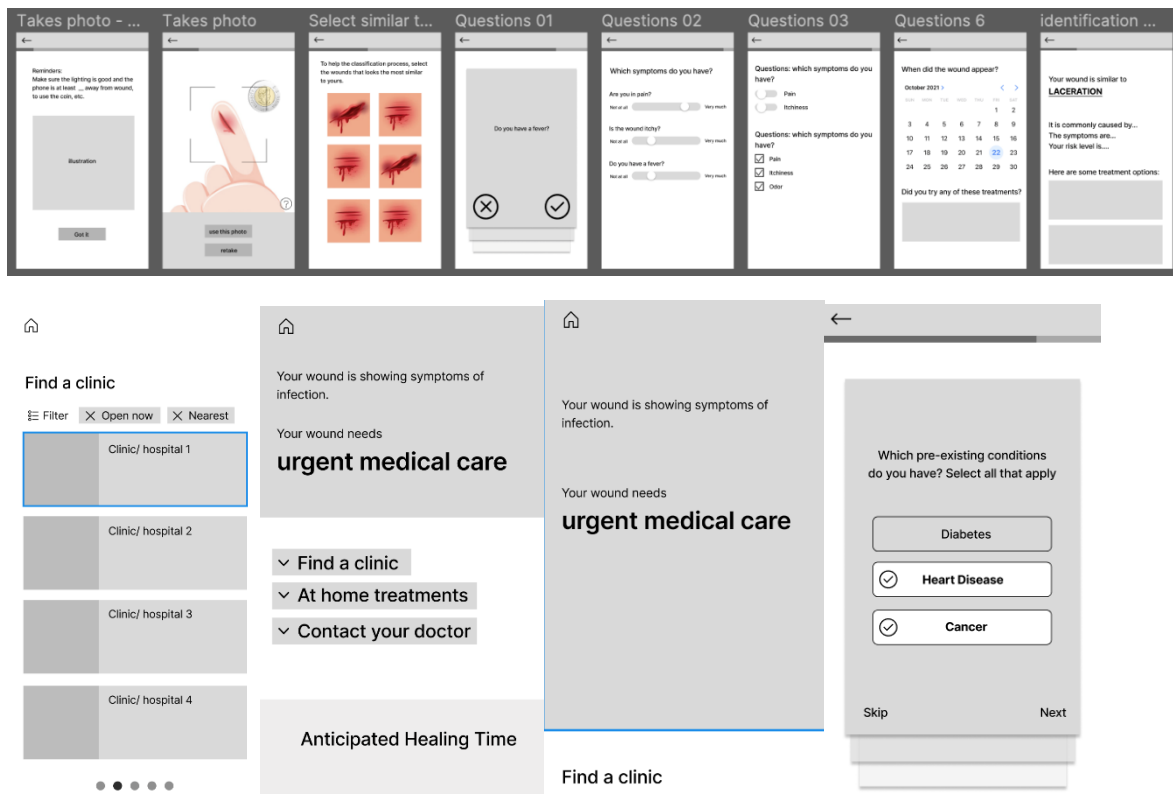
The main usage of the application is assessing the wound condition. Ideally, the identification feature allows the users to take a picture and categories the wound in a genre and give out wound care suggestions. However due to technical challenges, the camera was not able to pick up the data that we wanted, such as color and type of wounds. As a result, some of the data collection ideally done with the camera is turned into a question that the user has to answer manually.

At the beginning of the design process, we created a general user flow.



With the user flow created, the method used to present the information is explored. Low fidelity user interface is created to experiment with different types of navigation systems and presentation styles.

For the identification UI, the most difficult part is ensuring the design encourages the user to skim through a large number of questions without making it tiring. We explored the traditional way of asking questions which is more form-like that included different types of questions but realized that it was a long and draining process. As we are exploring design options, a decision that we made is that there will not be any open-ended questions. The application will ideally have all the potential answers on display as choices in multiple-choice questions. This is to ease the categorizing process of the wound condition and wound suggestions.



User testing was conducted with these interfaces to test their usability. (See more in user testing section.)

Final UI design is created for the whole identification function is presented in the annexure.

Advantages

- Location selection function
- Reference picture
- AI measurement tool
- Nearby hospital or clinic recommendation

Tracking and Suggestion

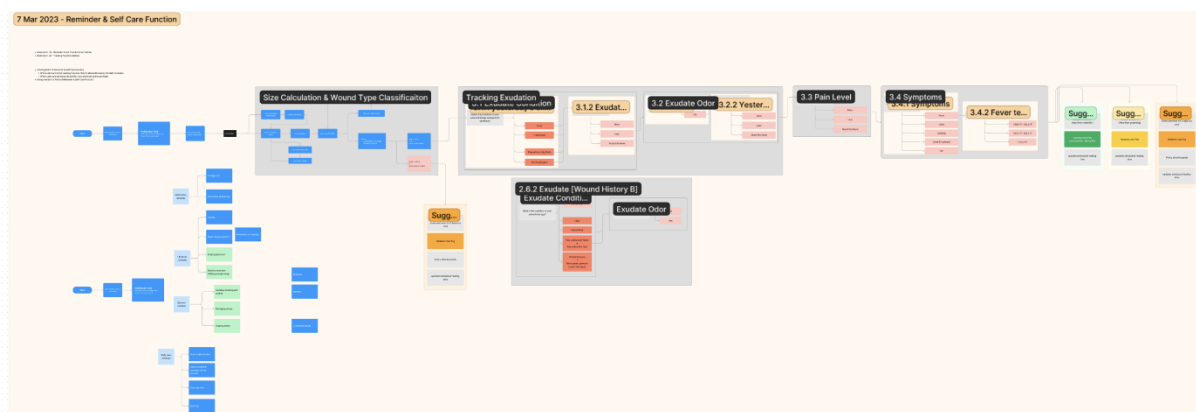
Based on our research, older individuals and diabetics are both at higher risk for developing chronic wounds that can be slow to heal and prone to infection. Therefore, the tracking function in a wound care app for these populations may have additional features that are specific to their needs.

Features:

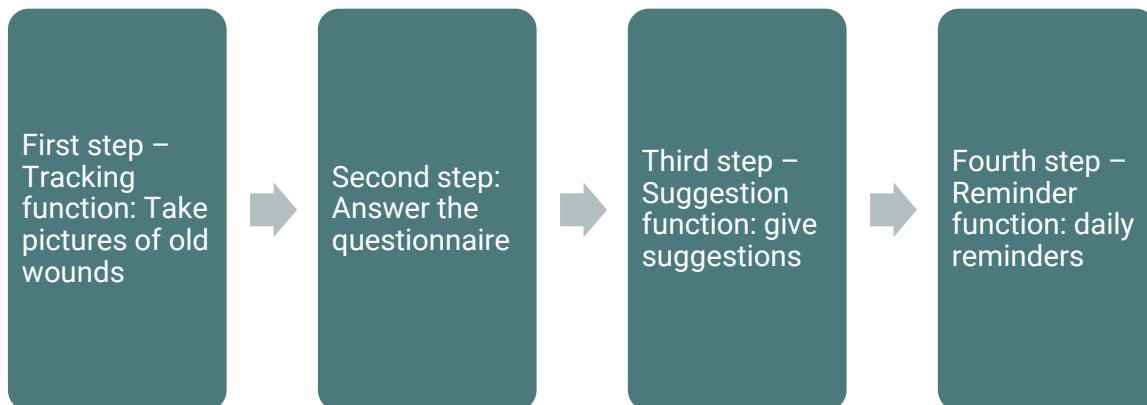
1. Personalized care plans: The app offers personalized care plans based on the user's age, medical history, and other factors. These care plans may include customized reminders for taking medications, changing bandages, or visiting healthcare providers.

2. Educational resources: The app may provide educational resources specifically tailored to older individuals and diabetics, such as tips for managing blood sugar levels or preventing falls that could lead to further injury.
3. Communication with healthcare providers: The app may enable users to communicate directly with their healthcare providers, allowing them to share information about the wound's progress and receive timely feedback on their care plan.
4. Customized suggestion: Users need to upload their healing condition every week, so that app will provide accurate suggestions and adjust wound healing plan simultaneously.
5. Anticipated healing time: Based on the updated pictures of wounds and the result of questionnaire, the app will provide anticipated healing time and it will be altered due to the wound conditions.

User Flow –Tracking Function



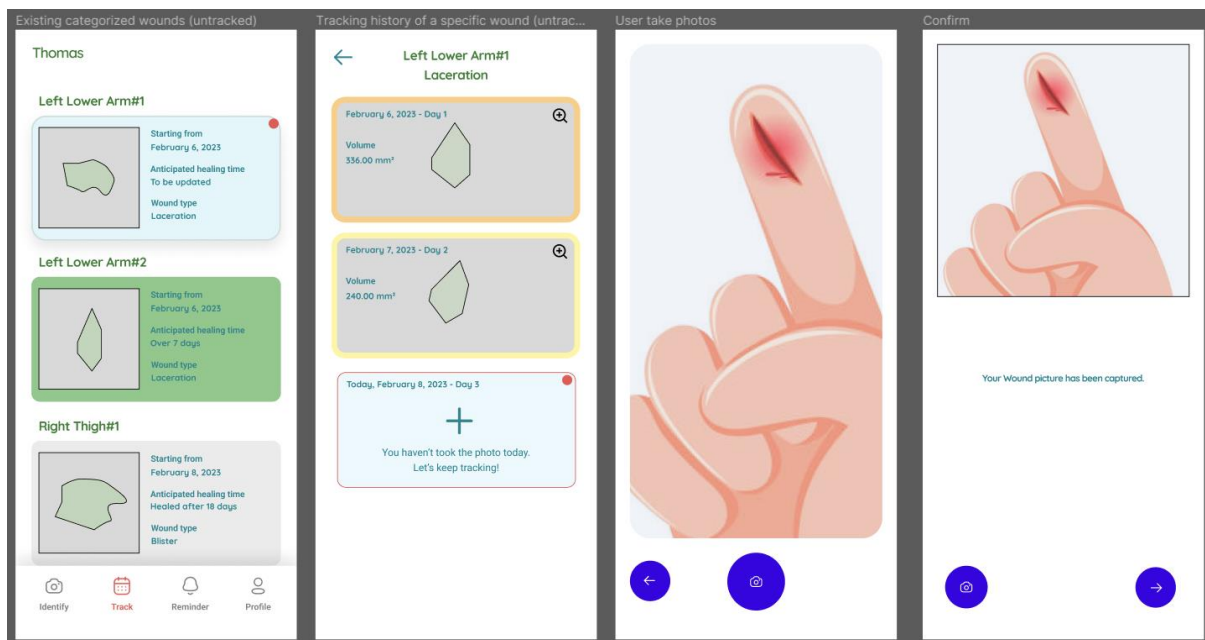
Skeleton:



UI design – Version 1

Design purpose:

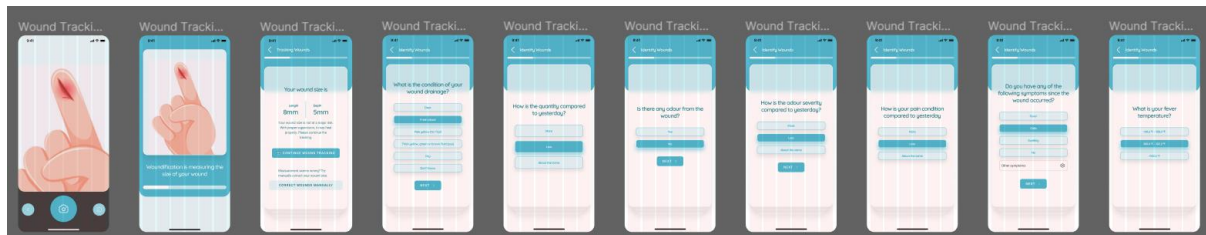
The system will record users' healing conditions based on the data they uploaded and the answer of questionnaire. The healing process can be observed directly, and an updated anticipated healing time will be given at the end.



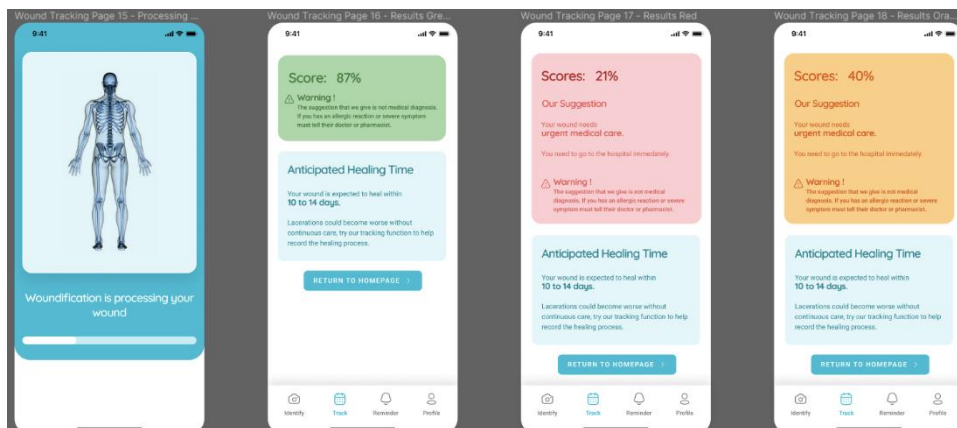
UI design – Final Version

We refined the UI design and added more functions on the surface, like data picker, search bar, and wound detail page. Users can check their healing process and healing stage easily.

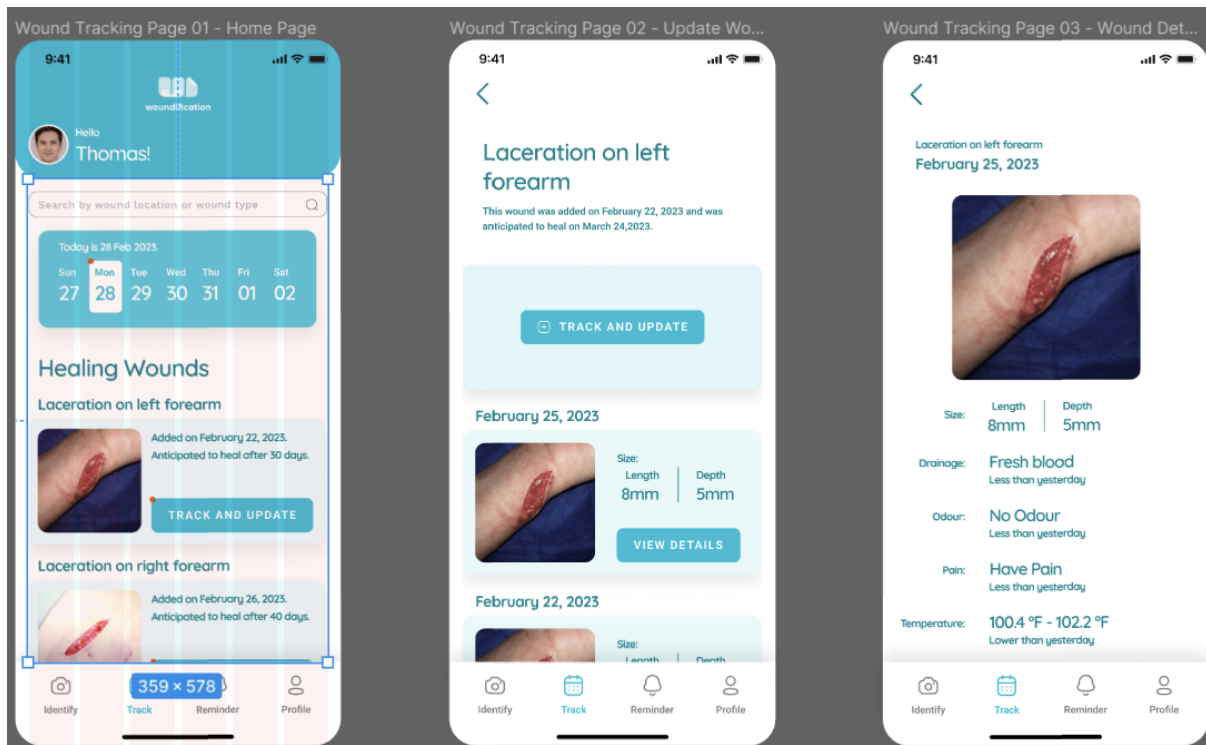
Because our system will push customized suggestions every day based on their wound condition, by selecting the time, users have convenient access to track their wound record.



(Taking picture and questionnaire)



(Suggestion and anticipated time)



(Wound healing process recording)

Reminder & Selfcare

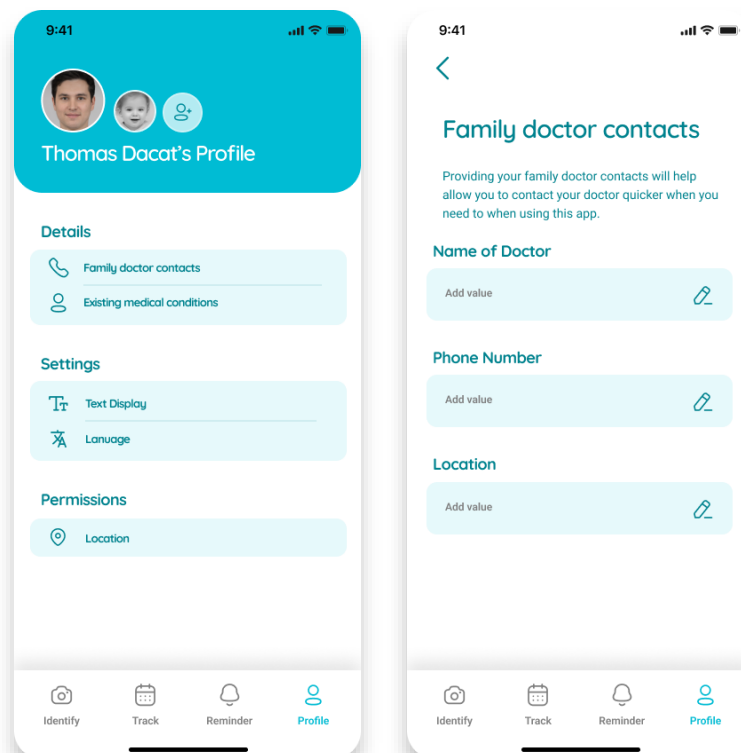
This feature is meant to provide users vital information about how to take care of their wounds. The key elements of this feature are:

- Remind users to take their medicine
- Remind users to track their healing progress
- Provide users with knowledge about how to take care of wounds (such as showering instructions, dietary advices etc.)

A detailed user interface is provided with the project archive in the form of a Figma file.

Multiple Profile

This feature allows users to save multiple profiles into one application on a device. This feature designed for parents and guardians in families who would like to track wounds for other members of the family. This feature also contains helpful information such as the contact details for the family doctor.



User Testing

First User Testing

Background summary

This is the first user testing conducted in the project. The purpose of the test is to observe how users answer questions using the user interface in the identification feature in order to figure out this interface's usability. Another focus is figuring out the feature list for the suggestions page at the end of the identification process. Therefore, the two major questions we are asking are: How effective is the UI design we came up with? What does the user expect in the final suggestions page?

Time: 10:30 to 13:00 on Feb 16, 2023

Testing materials: [Waiver-User Test 1- Assessment Questionnaire UX.pdf](#), phone to run the prototype, timer, prompt cards

Testers: Number of participants: 7, age range: 25 - 45

Testing team (3 people):

- Note-taking, asking them questions
- Briefing the user and observing and assisting with technical issues
- Print materials, and assist with on-site problems

Methodology

Preparation

- Cut the cards and stack them into piles.
- Open the prototype on the phone and check if it is working.

Introduction and testing

A 30-minute interval is booked for each tester. The tester is first briefed with a rough background and context of the test purpose and process. Then a waiver is signed by the tester to get their consent. The tests start with the user drawing one card from the 'bleeding' pile, 'body temperature' pile, 'type of causes' pile, and two from the 'used treatment' pile. After the user is familiarized with themselves with the drawn cards, the phone with the prototype opened is handed to them. The timer starts and the time used from start to finish reading the last page of the prototype is recorded.

Survey

At the end of the test, a series of questions are asked, which include:

1. How many questions does the user "feels" he/she has answered?
2. Does the user feel answering questions is repetitive?
3. Does the user feel he/she is answering too many questions?
4. Did they have trouble finding the right option for any of the questions?

5. Did the user notice the back button on top? - If yes, what does the user think the purpose of it was? If the user says "back button" where does the user think the button takes back to?
6. What information did the user feel was most important in the assessment suggestions? Why?
7. There was a loading screen at the end of the assessment. What do you think the app is doing during the loading screen? Do you think the assessment loading screen was fast/slow?
8. Did the user expect/want any other info in the assessment?

Limitations

The questions and answers we were using were not the final ones that will be in the application, so the actual length of the identification process may vary. There are other symptoms that we did not take into account in the cards pile (which only included body temperature, cause of wound, bleeding, and used treatment) which could lengthen the process.

Test Results

The recorded time and survey results are listed below:

- The range of time used for completing the questionnaire is 54s - 105s
- The average time for completing the questionnaire is avg. time is 74s (1min 14s)
- On average, the user felt like they answered 7 questions, which is less than the questions we had.
- Users did not feel like the questions were repetitive.
- Users did not have trouble finding the right answer for each question
- 57% of users noticed the back button. All participants expect the button to lead them back to the previous question.
- 57% of the testers said the 'you need urgent medical care' message is important on the suggestions page.
- Half of the testers did not notice the loading screen at the end of the prototype. The other half that noticed the loading screen expected the application to be assessing their condition
- The users expect the suggestions page to include the nearest clinic with a sorted list, considering the medical insurance, cost, time, location, travel options and cue time.

Findings and Recommendations

For increasing the usability of the interface of the application, here are the suggestions that could enhance the usability:

- There are no critical changes, as users understand what and why they are being asked the questions. Users feel that the process was quick and non-repetitive.
- There are some hesitations on the question asking for pain and bleeding. Changing the question asking for pain level to a yes/no question could be a solution, eg. 'Do you have any pain?' Followed up with 'Was it not as painful as yesterday?'
- Some users feel like the questions that asked 'do you have diabetes?' and 'do you have heart disease?' were repetitive. Setting up a profile for each user to store existing medical conditions was pointed out by a user as a suggestion.

For creating the feature list for the suggestions page, the expected features from the users are listed below:

- Core suggestion message
- Showing the linkage between the cause/symptoms and the suggestion for the user to better understand why this treatment is suggested
- The nearest clinics could be sorted by location, distance, cost, waiting time, and the acceptance of medical insurance
- Suggested homeware treatments, even though the app suggests the user go to the hospital, users would still like to have access to that information
- Travel options and suggestions to the clinics
- List of contact of family doctors or hospitals
- The anticipated healing time of the wound

Second User Testing

Background Summary

Testers: Number of participants: 7, age range: 25 - 45

Testing team (3 people):

- Note-taking, asking them questions
- Briefing the user and observing and assisting with technical issues
- Screen recording and virtual meeting host

Additional Information/ Legend

- First User (Order of UI prototype presented: **123**)
- Second User (Order of UI prototype presented: **213**)
- Three User (Order of UI prototype presented: **321**)
- Fourth User (Order of UI prototype presented: **231**)
- Fifth User (Order of UI prototype presented: **312**)
- Prototype 1: Long scrolling screen
- Prototype 2: Folder UI
- Prototype 3: Swiping UI

Observations (through mouse/ facial expression)

1. First User

- Prototype 1: Very clear and quick in navigating the task.
- Prototype 2: Faster than the previous task.
- Prototype 3: Had trouble in interaction because she assumed that the swiping dots was clickable.

2. Second User

- Prototype 1: Quite smooth and straightforward.
- Prototype 2: Quickly realize there's a drop-down menu and managed to find the clinic. But had trouble finding the medicine(took her around 2 and a half minutes) and gave up.
- Prototype 3: Quickly retrospective in adding the medicine into the shopping chart.

3. Third User

- Prototype 3: in the beginning, she failed to find a way to jump to the next page. She felt confused about the logic of the clinic function to the treatment part. She can't find the fever medicine.

- She was more familiar with prototype 2 and 1

4. Forth User

- In prototype 3, she was only able to find the options after a cue was given that this is a mobile phone interface and she can swipe. Expects a next/previous button to indicate swiping.
- In prototype 2, managed to complete all tasks with ease
- In prototype 1, managed to complete all tasks with ease. Does not like any of the prototypes fully. Prefers a '**tabbed**' design for clinics/medicines etc. Feels the app is showing too many options. Only specific actions that the user needs to take.

5. Fifth User

- Prototype 1: She has been familiarized with the UI and can find all the functions smoothly. The filter is used smoothly without any problem.
- Prototype 3: She was a bit confused with the swiping motion and the linkage between the previous page and the next page, which lead to having trouble finishing different functions. The shopping list feature is used without any problem.

Questions Asked

1. Could you tell us the differences between these three user interfaces?
2. What format do you prefer for getting wound care suggestions?
3. Can you rate your experience doing the following tasks from the suggestion template?
4. At which stage, did the user feel confused or not clear when trying to complete the task? And did we solve this confusion among the three templates?
5. Did the user expect/want any other info on the suggestion pages?

Findings

All prototypes:

The names of the medicine were not prominent enough, so the users had a hard time finding the correct item in the first prototype they were introduced

Swiping UI:

- Users did not relate the 'home care treatment' to the recommended medicines
- Most of the users clicked the dots on the swiping UI
- The swiping UI is the most consistent in terms of layout

- The swiping UI transitions are confusing
- It seemingly functions as a tutorial and onboarding page that needs to go through all pages.

Scrolling UI:

- The page is too long for the scrolling UI.
- Efficiency depends on the length of information. Fewer clicks mean that it's faster when there's less information. But it may become lost and impatient when there's much information.

Folder UI:

- The folder UI allows the user to see all the options available which are good.
- Categorized information makes the information more reasonable and intuitive.

Overall:

Positive:

Swiping UI is the most consistent in terms of layout.

Negative:

The dots of the swiping UI could be changed to nav bar.

Recommendations

All prototypes:

- The 'At home treatment' word needs to be changed to something that is more related to medicine, eg. 'Recommended medicine'.
- The names of the items should be more prominent.

Swiping UI:

- The dots in the swiping UI could be replaced by a nav bar, and could be used as the UI.
- Have a simple transition for the swiping UI.

Scrolling UI:

- Maybe need to think about the critical value of the length of information that affects the user's satisfaction.

Folder UI:

- Maybe consider increasing the wording association for "medicine" in the title.

Technology Specs

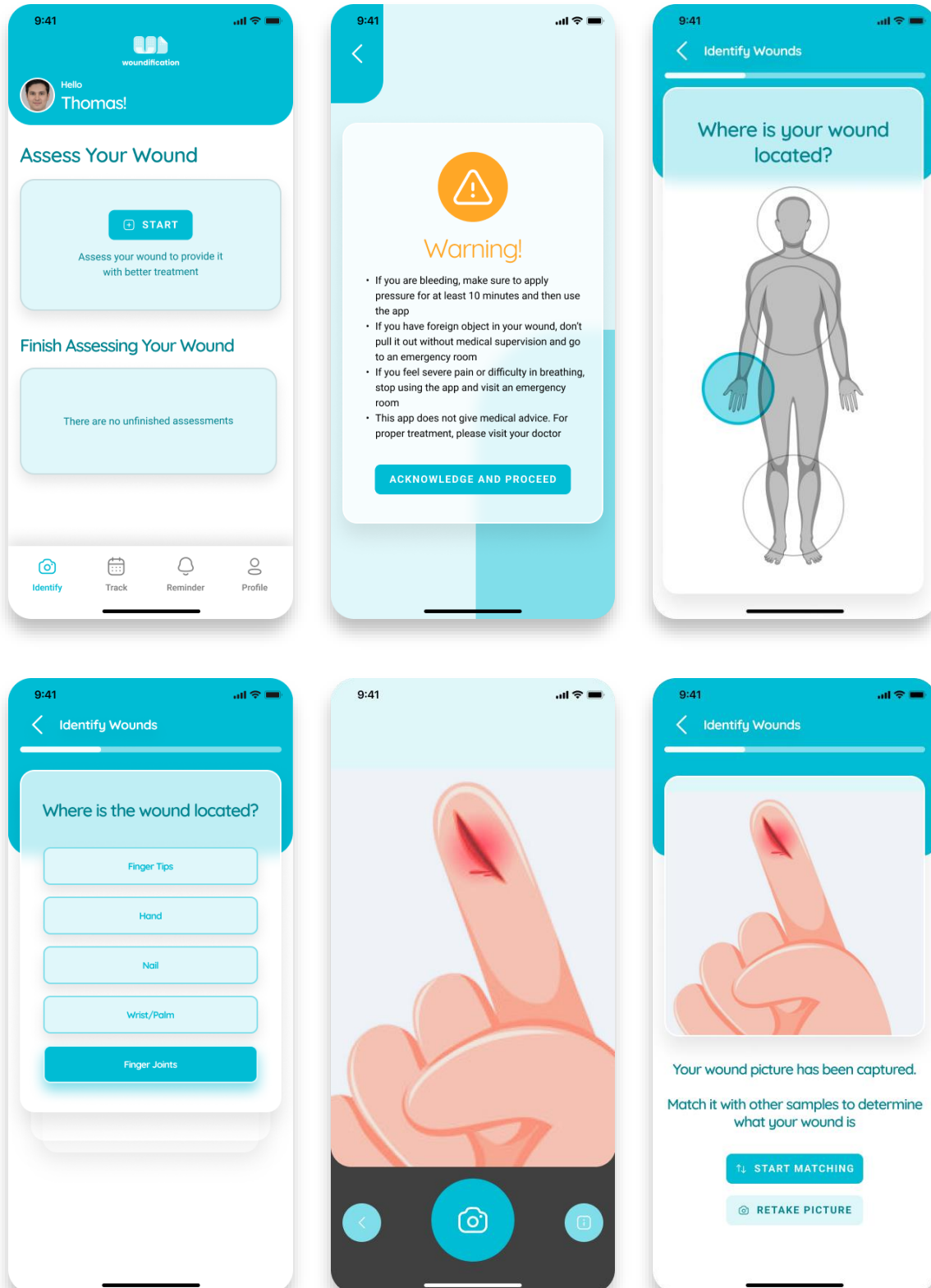
An interactive prototype has been prepared for the project which includes the identification questionnaire. The prototype along with all the source code is provided in a Git repo with the project deliverable archive.

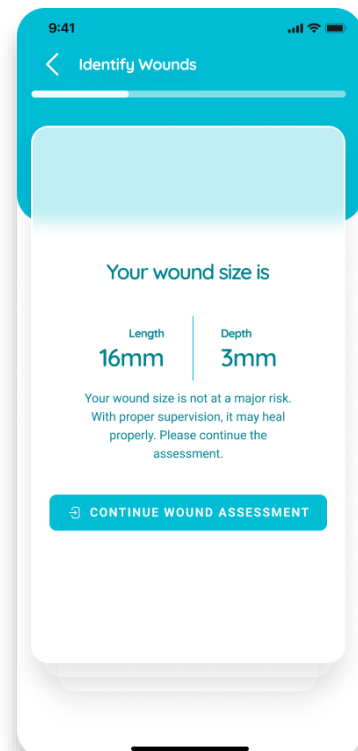
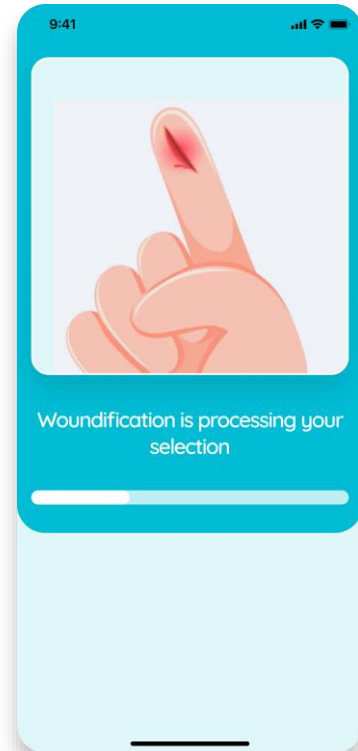
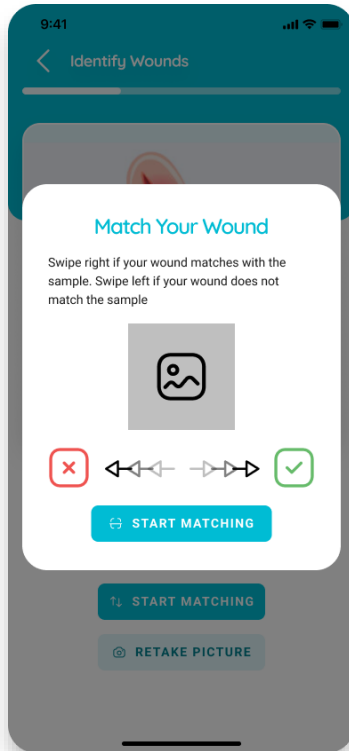
Conclusion

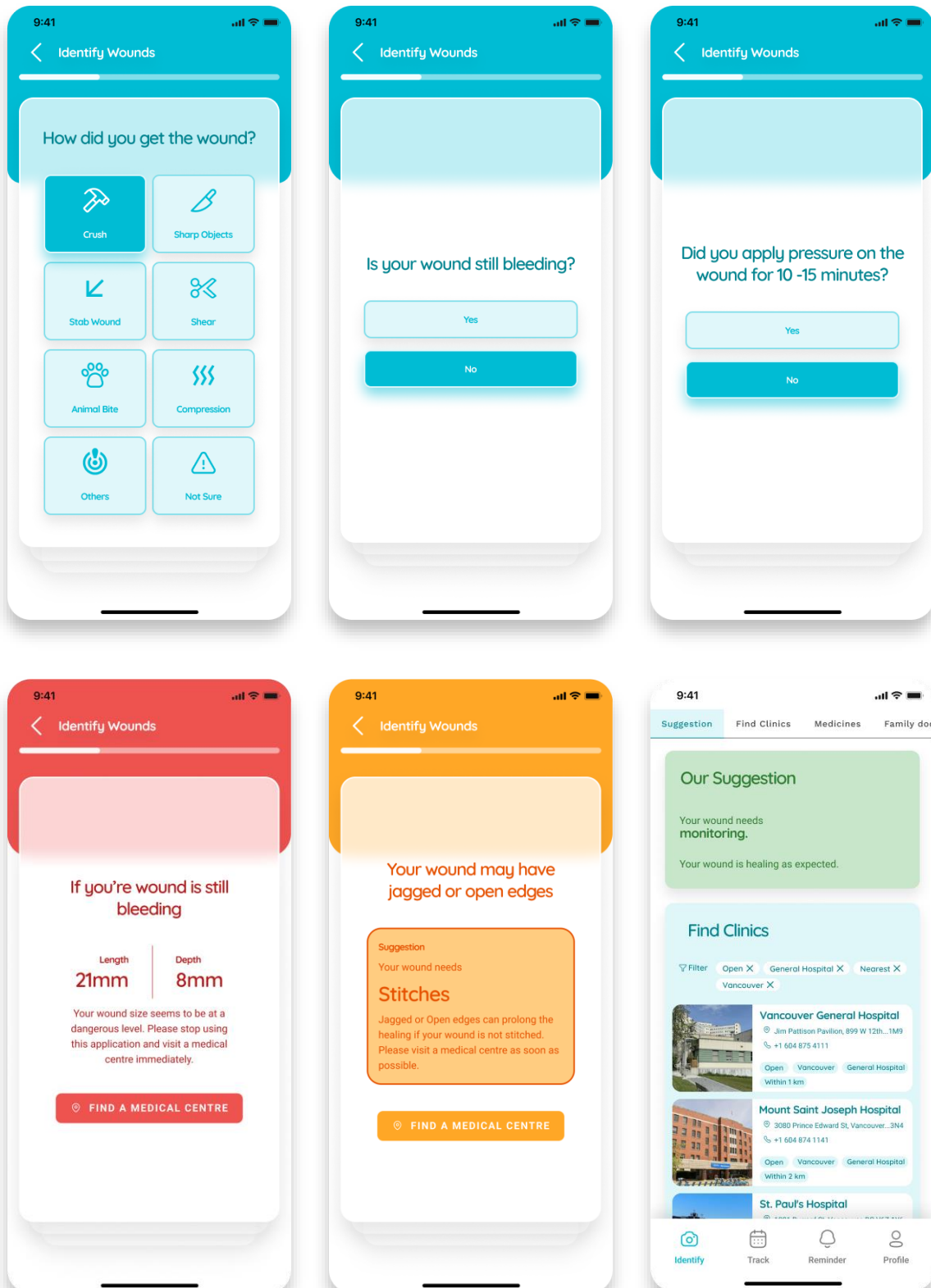
Woundification is a concept that has the potential to revolutionize wound care. Through this project, the groundwork for further development have been laid. This documentation should give the future product teams critical insights and challenges about the product and help them decide development objectives such as building image databases or image recognition algorithms.

Annexure

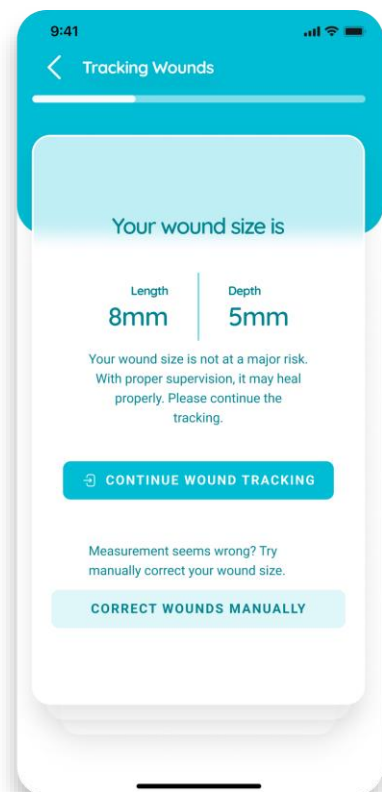
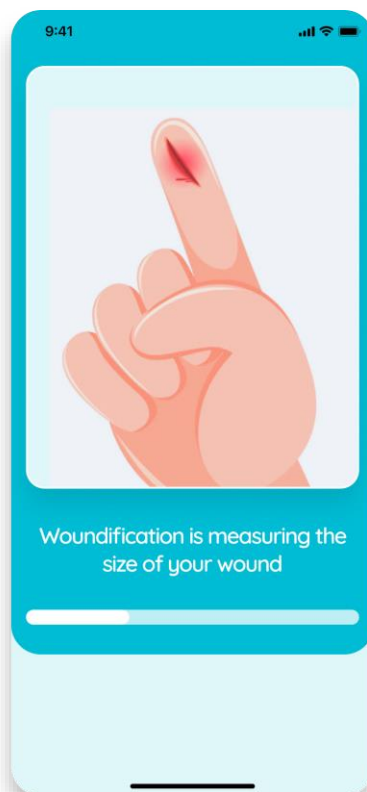
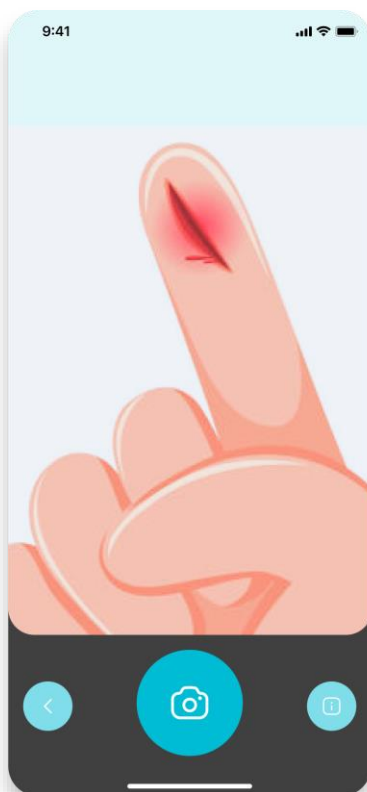
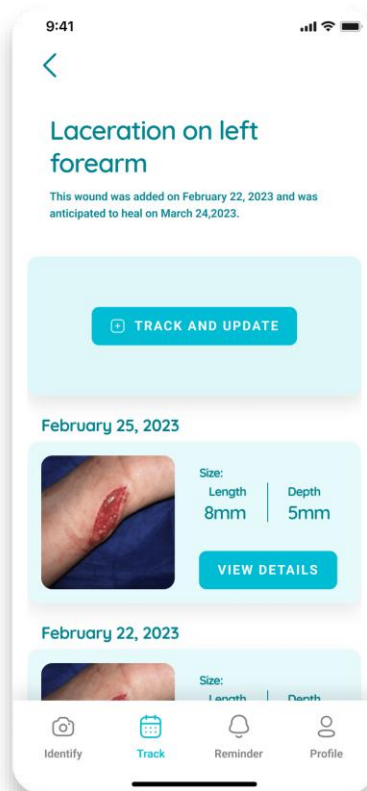
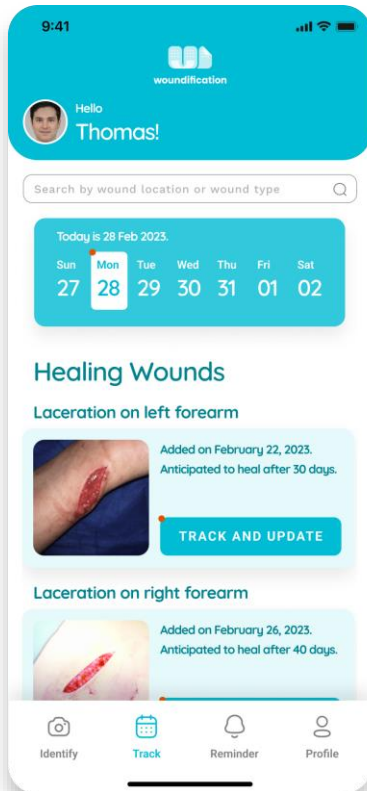
Annexure 1: UI Design – Identification

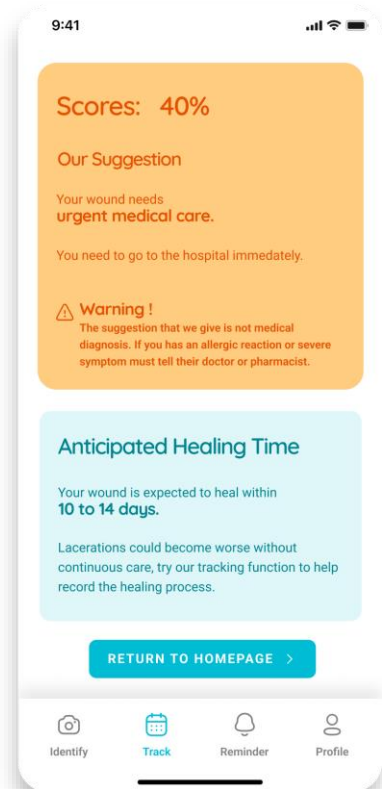
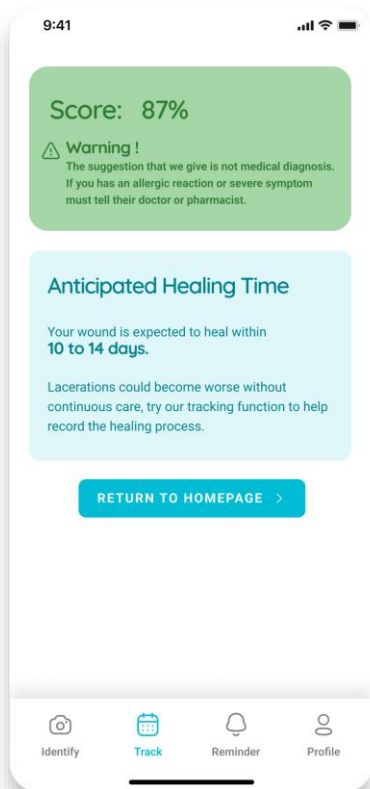






Annexure 2: UI Design – Tracking





Annexure 3: UI Design – Reminder & Selfcare

