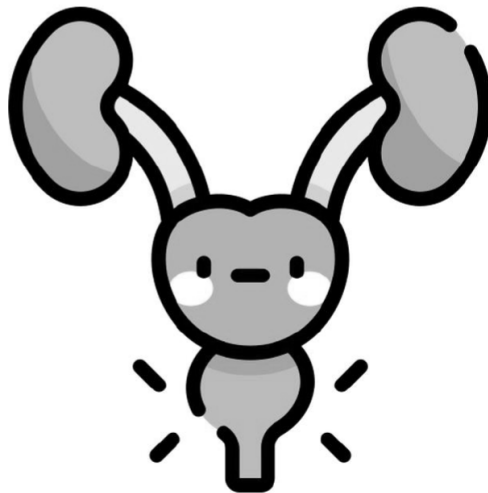


ECE1778: Creative Applications for Mobile Devices

U Health Final Report

Word Count: 2343



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1.0 Introduction

1.1 What is U Health

The “U Health” app is a data storage app with patients and doctors as end users that monitors the prognosis of localized prostate cancer. The app has the following features:

- User Authentication
- Questionnaires that provide objective evaluation of various aspects affected by prostate cancer
- Appointments and medications features allow the user to record and remind themselves of upcoming events.
- Timeline providing a visual representation of the patient’s past treatment and prognosis empowering a sense of progression
- Preventative medicine reminders that display important health risks that prostate cancer patients are susceptible to

1.2 Why U Health

The “U Health” app is important to have for an objective evaluation of the user’s conditions and progress, which in most cases is done with subjective information and has a lot of memory bias, both from the patient and from the physician. This effect is especially prevalent for long-lasting conditions such as prostate cancer. Localized prostate cancer management requires input from various specialists and also from patients, in order to balance tradeoff between different treatments, and recommend what is best for the patient in terms of life expectancy and quality of life, “U Health tries to get the patients more involved into their own care.

2.0 Statement of Functionality & Screen Shots from App

2.1 Authentication

The app has a standard sign up page with privacy policy and log in page with the app’s logo. (Figures 1-3)

2.2 Home Page

Once logged in, the user lands on the home page and has access to all features that “U Health” offers. The preventative medicine is displayed as “Tip of the day” and changes every 30s. The user may also choose the slide and view the next tip. (Figure 4)

2.3 Questionnaire

Available questionnaires are displayed with a brief description, selecting one will display the user's past performance on the given question set and the option to start a new questionnaire will appear (Figure 5-6)

If the user missed any question, they will be directed back to that specific question when they try to submit. For ease of navigation, the user could also move between questions using the slider. (Figure 7-10)

On successful submission, the user is redirected to the result page with their final score and interpretations of their score. They could visit the website detailing the question sets through the further information link. (Figure 11-12)

2.4 Personal Information

Depending on the choice to the radio buttons, further information may be requested from the user. Some of the information requires the user to enter as many events as needed, E.g., the surgery and transfusion (Figure 13-15).

The user can forward to the past diagnosis page where they could select a list diseases from the existing categories or add as others in text. The user may opt out from submitting their information in either the information page or the diagnosis page. (Figure 16-17)

2.5 Timeline

Appointments are color coded and are shown in a brief form in timeline. Expanding an appointment displays the completion note, medication that the user is on at the time of the appointment as well additional files that the user has uploaded. Clicking on the file will display it in fullscreen. To navigate the timeline, the user can filter the list by either appointment types or time periods. The filter can be cleared by interacting with the cancel button in the app bar. (Figure 18-22)

2.6 Sharing Feature

In order to view another user's information, the current user must make a request to the said user's email (Figure 23). Once the request is made, the requested user can now view the request in "View Requests" (Figure 24). In the 24 hours that each request lasts, the requested user can choose which information they would like to share (Figure 25). Upon acceptance, the requesting user now has 24 hours to view the shared information in the "View" tab (Figure 26-27)

2.7 Appointments

The appointment module enables the user to take note of and manage their scheduled and past appointments. Appointments of all status and types are shown in the first page. Appointments in the future are in light green, appointments updated by the user are in purple (Figure 28). The user can also delete from existing appointments (Figure 29).

After adding an appointment, an alarm clock will be set at 24 hours prior to that appointment. This alarm clock will generate a notification that includes basic information of the exact incoming appointment and leads the user back to the appointment list page.(Figure 30- 32)

To get more information about an appointment, a user just needs to click on the tag (Figure 33). In case of “postponed”, a new time picker dialogue would show up for the user to update (Figure 34-35).

If the appointment is completed, the app jumps to an update page where our user can upload multiple images and few lines of summary for this appointment (Figure 36).

2.8 Medications

The medication list page shows both terminated and ongoing medication plans. Terminated plans are in violet while ongoing plans are shown in indigo (Figure 37). Adding a medication plan leads to a page similar to that of the appointment (Figure 43).

To see full details of a medication plan, a user needs to click on a medication tag (Figure 38). When the medication is due, a notification would bump out to remind the user of it. Accepting this notification would start another alarm (Figure 39-40).

A low storage reminder would show up when current pills are less than 5 doses of a medication plan (Figure 42).

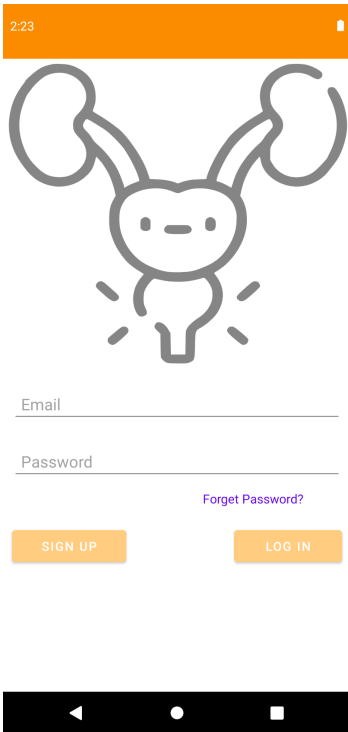


Figure 1. Login Page

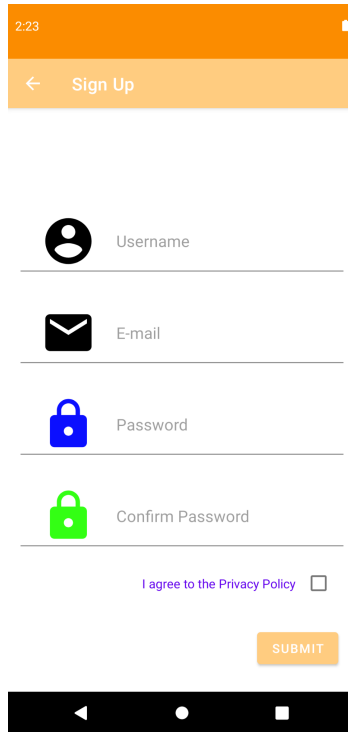


Figure 2. Sign up Page

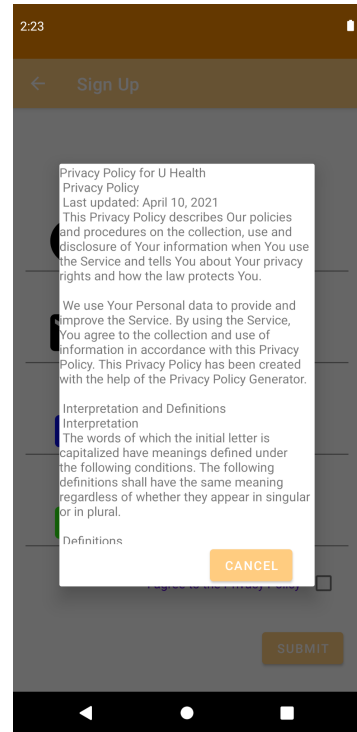


Figure 3. Privacy Policy

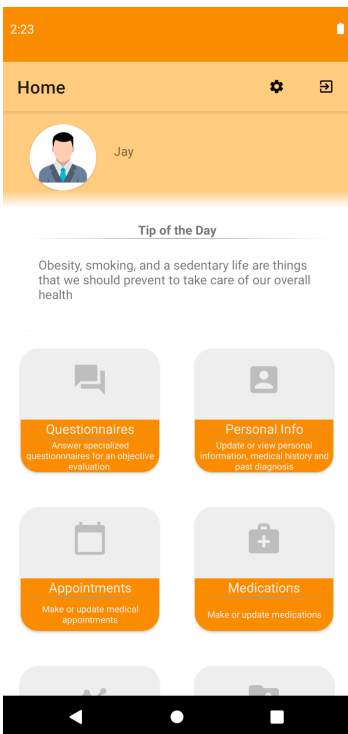


Figure 4. Home Page

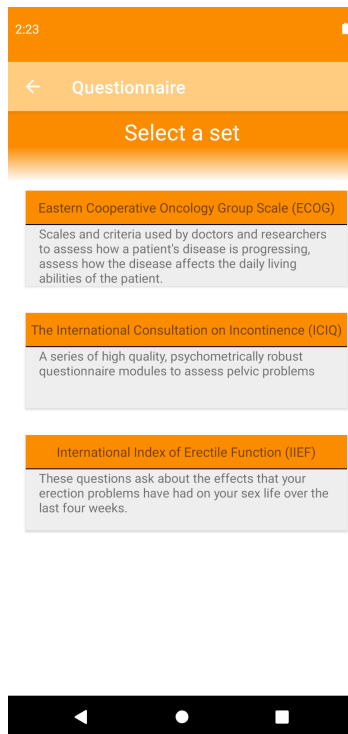


Figure 5. Question Sets

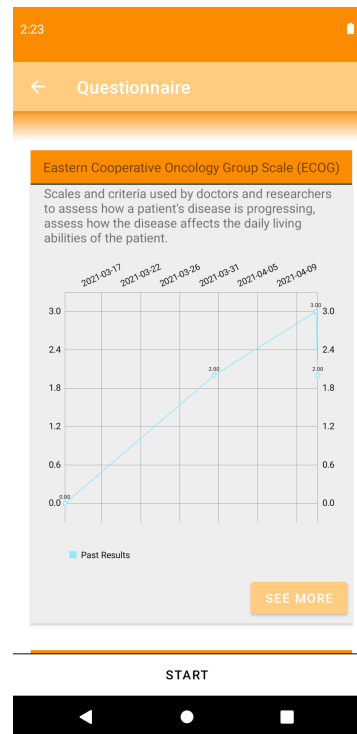


Figure 6. Additional Info

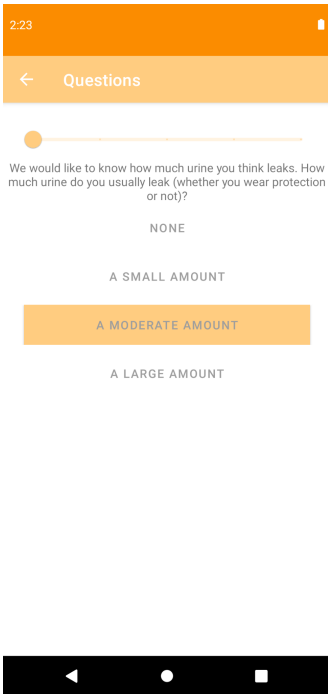


Figure 7. Question example

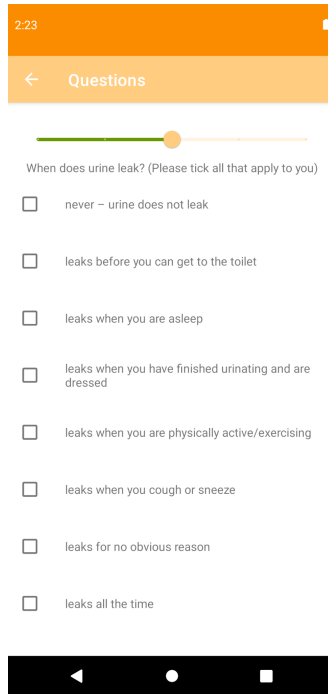


Figure 8. Question example

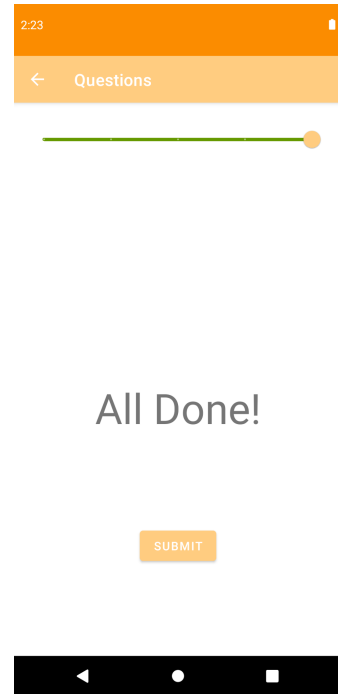


Figure 9. Submission

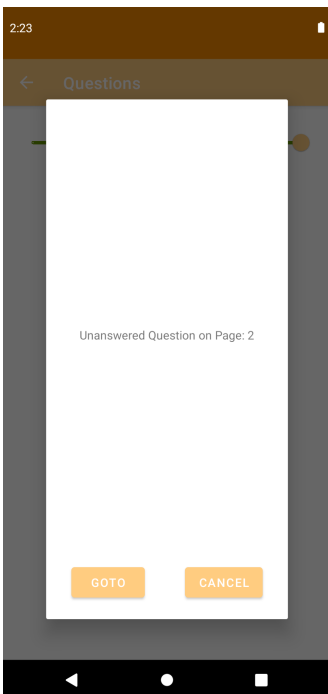


Figure 10. Return to Unanswered Question

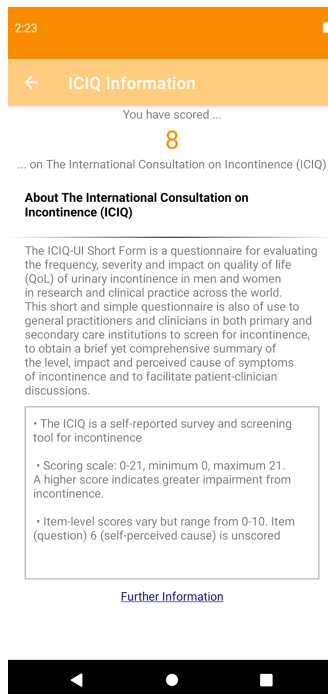


Figure 11. Score page with Interpretation

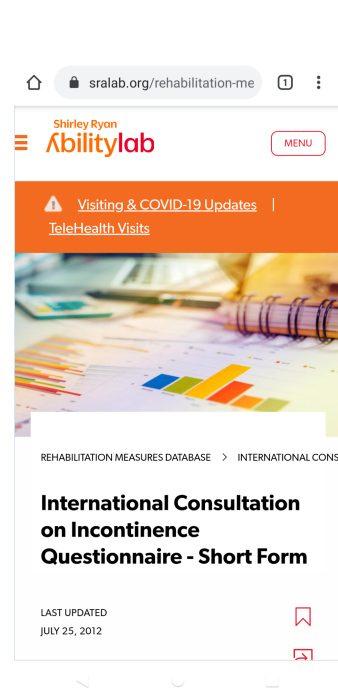


Figure 12. External Information

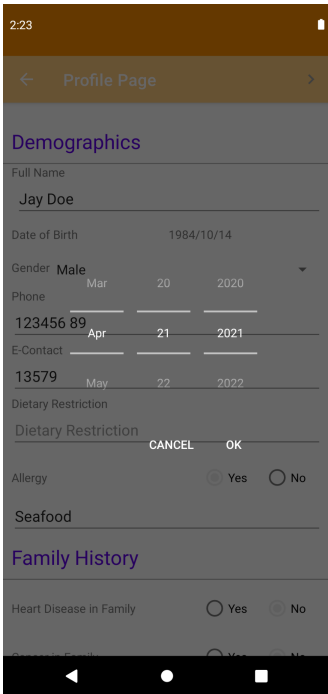


Figure 13. Personal Information - Birthday

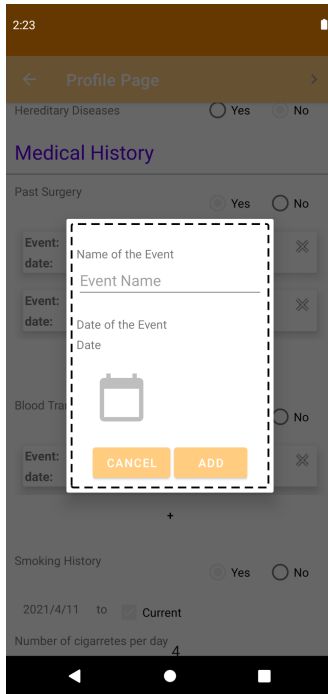


Figure 14. Personal Information - Surgery

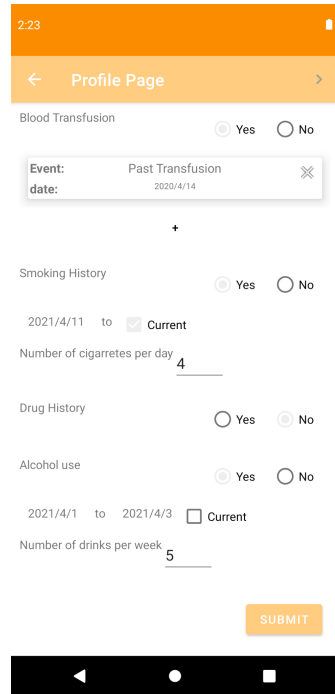


Figure 15. Personal Information - Smoking History

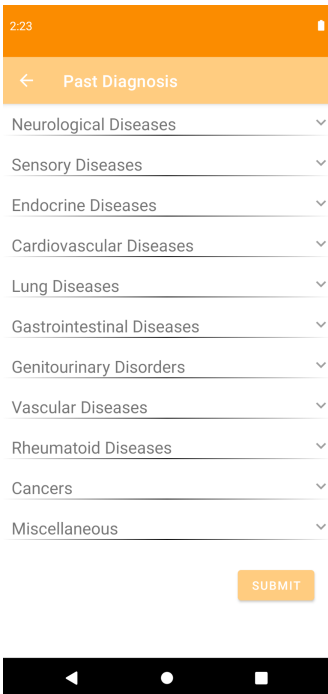


Figure 16. Past Diagnosis collapsed

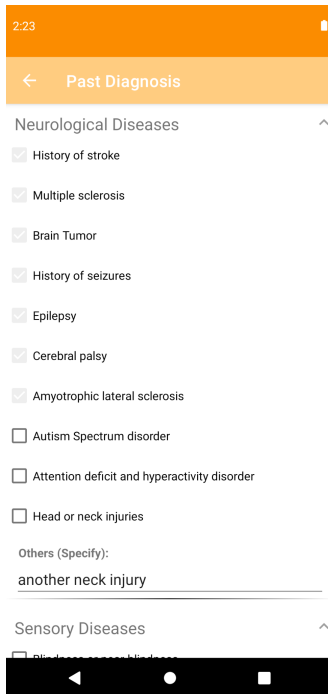


Figure 17. Past Diagnosis expanded

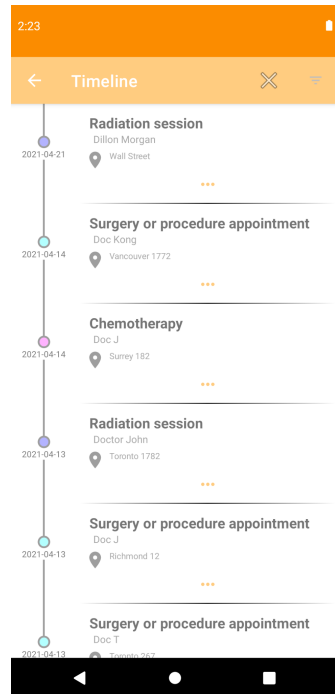


Figure 18. Timeline

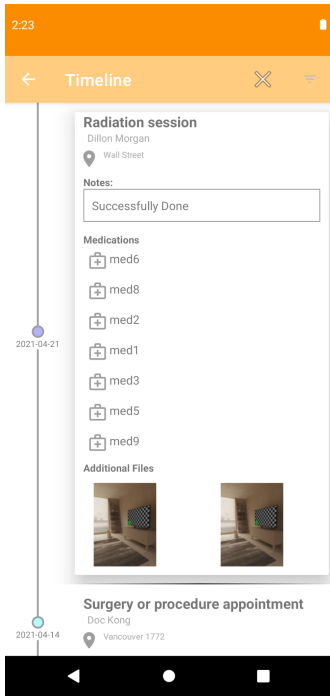


Figure 19. Timeline Expanded



Figure 20. Additional Files Zoomed in

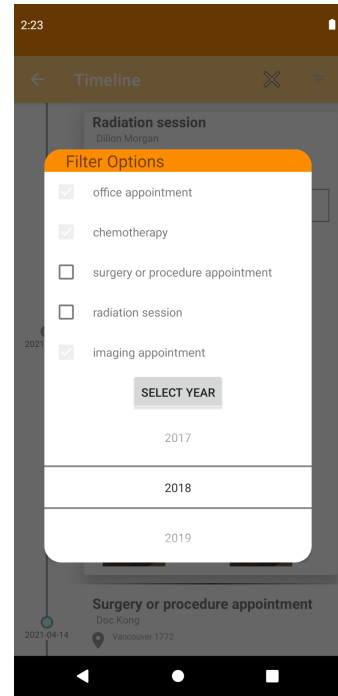


Figure 21. Timeline Filter

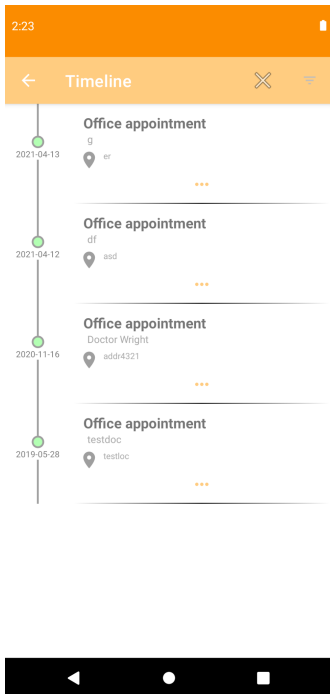


Figure 22. Timeline filtered

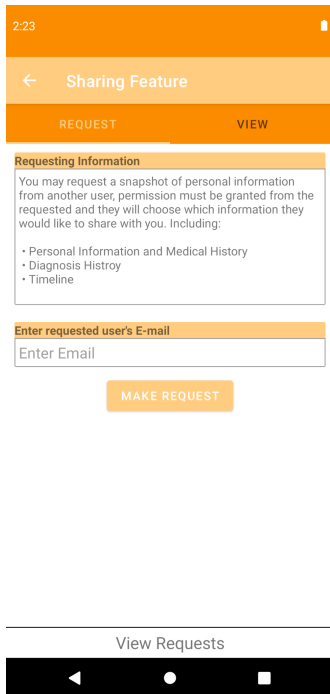


Figure 23. Sharing-make request

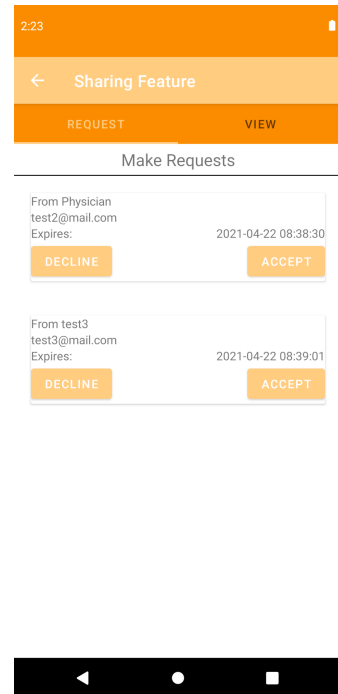


Figure 24. Sharing-view requests

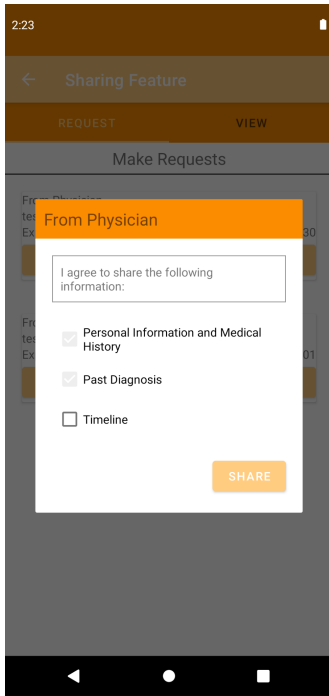


Figure 25. Sharing-Accept request

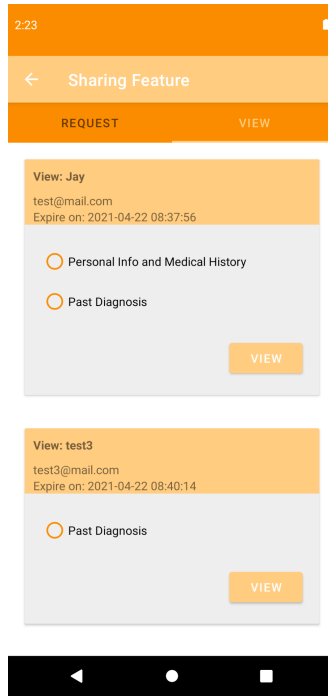


Figure 26. Sharing-View accepted request

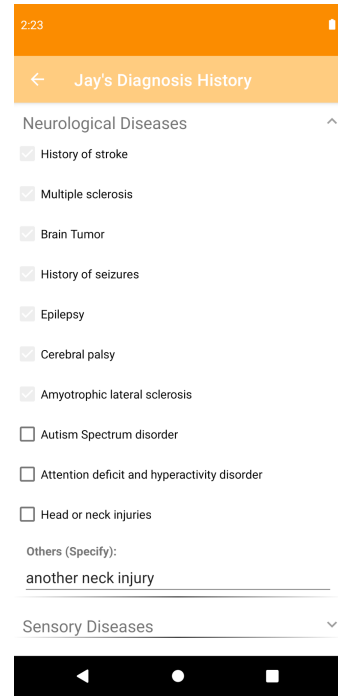


Figure 27. Sharing-View shared Information



Figure 28. Appointment Page

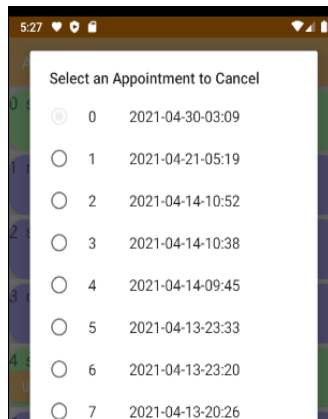


Figure 29. Deleting from Appointment page

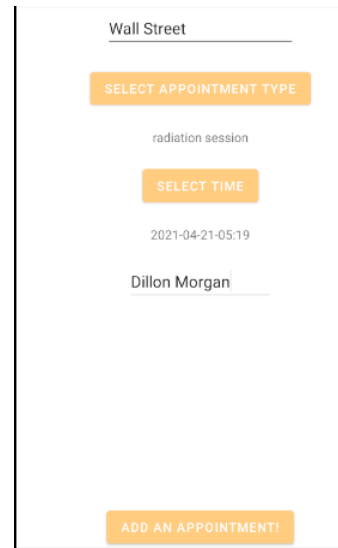


Figure 30. Add Appointments

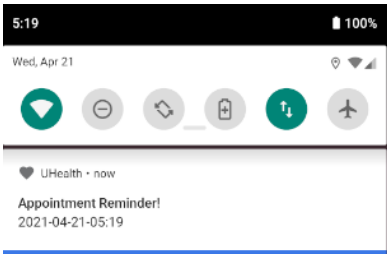


Figure 31. Appointment Notifications

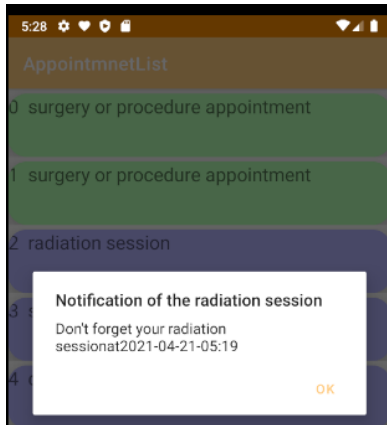


Figure 32. Update appointment reminder



Figure 33. Appointment additional information

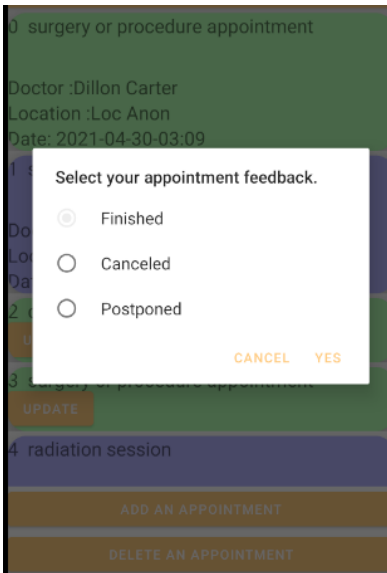


Figure 34. Appointment Update Dialog

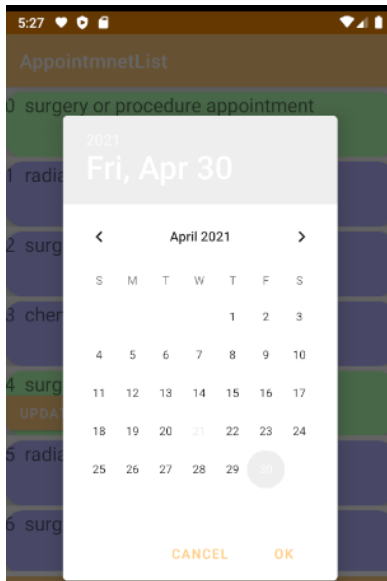


Figure 35. Appointment postpone dialog

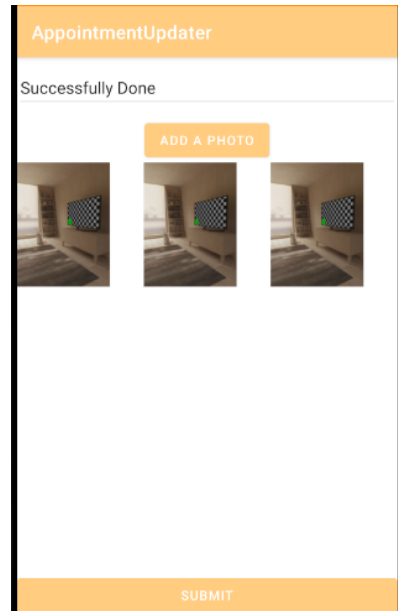


Figure 36. Appointment finished dialog

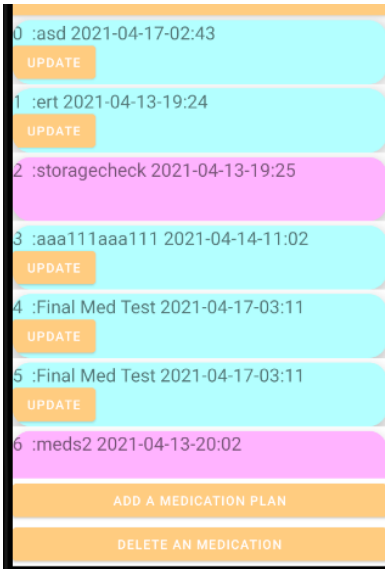


Figure 37. Medication Page

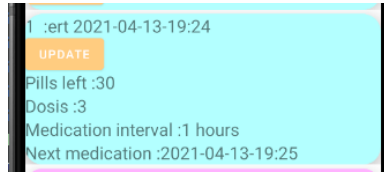


Figure 38. Medication Additional Information

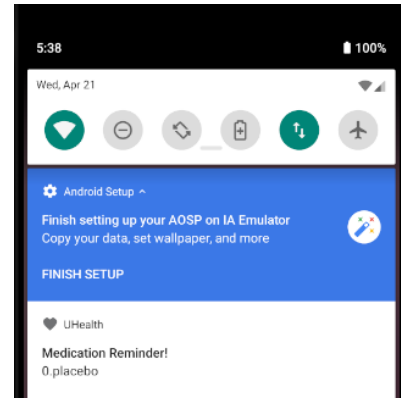


Figure 39. Medication Notification

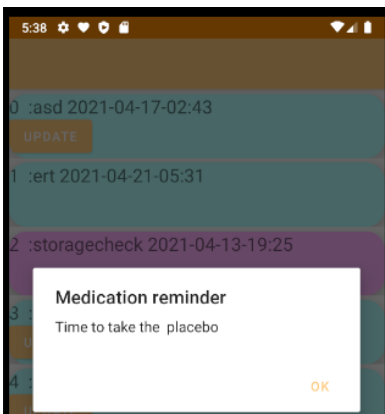


Figure 40. Medication reminder

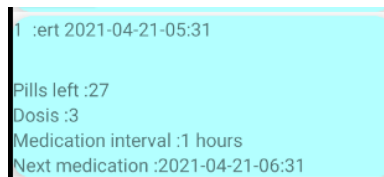


Figure 41. Medication Completion

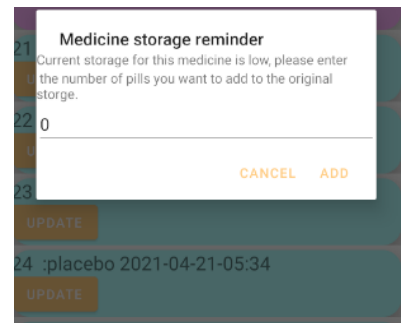


Figure 42. Medication low storage dialog

MedicationAdder

placebo

START OF MEDICATION

2021-04-15-10:35

MEDICATION TYPE

periodical

24

20

1

ADD A MEDICATION PLAN

Figure 43. Add medication

3.0 Overall Design

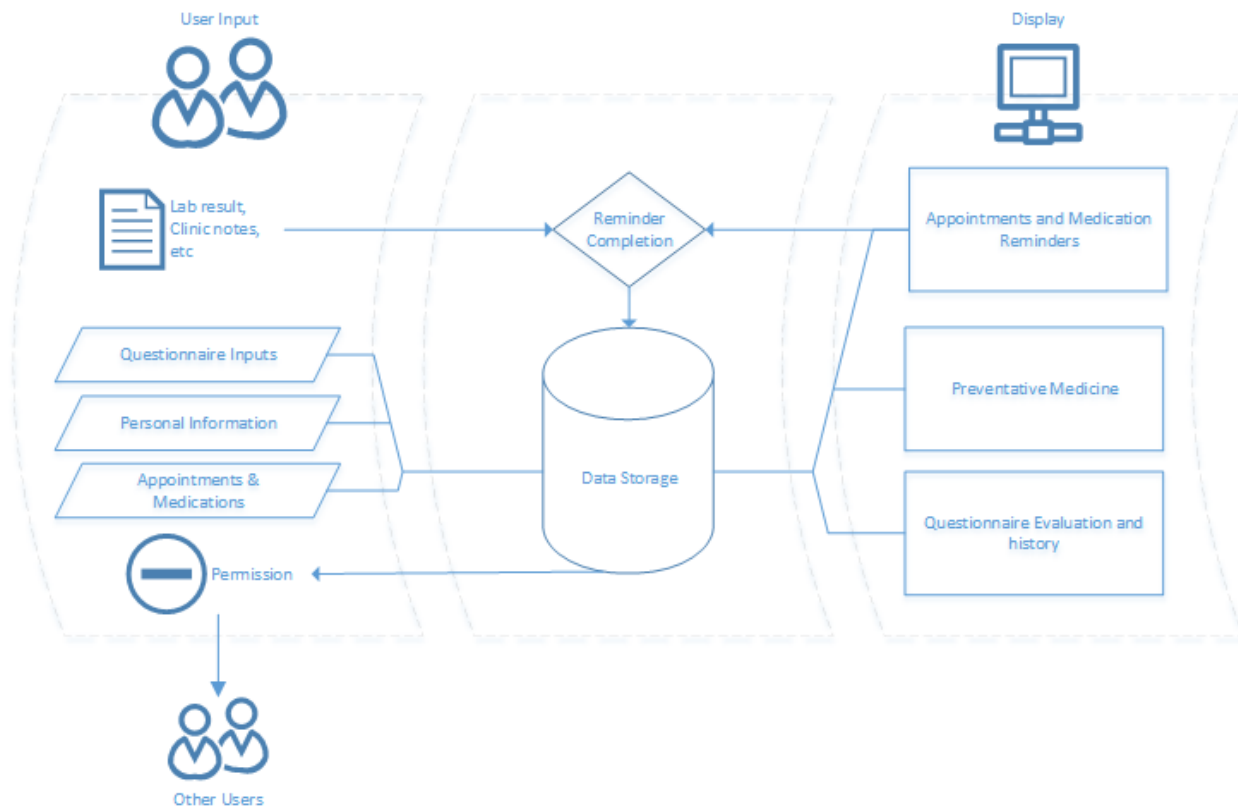


Figure 44. Software Design

As a storage app for medical information, “U Health” interacts heavily with a cloud database that is Google Firestore. The app has a signup/login module implemented with Google Firebase Authentication.

The user input block includes the input to questionnaire, personal information, past diagnosis, appointments and medications. With questionnaires, the user is asked to provide answers to each question in a list which is saved to the database upon submission. The resulting score of each question set is calculated and outputted with the respective conclusion. The personal information module and timeline modules are simple store and display.

The appointment and medication modules work similar in function, they have pages to display past and future events, add new events or update existing events. Each event sets off notifications to request for user input. For example, the appointment notification asks the user to mark a due appointment as either complete or missed and if complete,

enter a short summary and upload files. The notifications may be periodic (for ongoing medications) or one time (for appointments) depending on the nature of the event.

The sharing module allows the user to make a request to another user. The request has an effective period after which it will be nullified and deleted. Permission must be granted by the requested in order for the requesting to view the information.

4.0 Reflection: What did you learn

The greatest difficulty encountered is our confusion over the scope of the project initially. In our initial proposal, we were too general and decided to focus on the preventative medicine feature. However, as we progressed and narrowed down to localized prostate cancer only in spiral 2, the goal of features became more manageable and defined. The second difficulty that we encountered is properly structuring the codes. Both programmers have limited experience in mobile application development and there was some redundancy across the parts. If we were to restart the project, we would benefit tremendously from further narrowing the scope before starting development and also plan out the required features and widget to avoid redundancy in coding.

In terms of communication, we encountered some difficulties in properly relaying feature definitions to each other. This was especially difficult when specific designs are explained from a technical to a non-technical perspective or vice versa. However, we soon discovered that having the receiver re-explaining the feature in their own words would ensure the idea was properly understood. This is a technique that we would hope to deploy in earlier stages of our project.

5.0 Contribution by Each Group Member

Yang (Alan) Xiu (Programmer):

Implemented the coding, UI and testing of the following activities

- Home Page/Authentications
- Questionnaire
- Personal Information
- Timeline
- Sharing Feature

Dongqi Huang (Programmer):

Implemented the coding, UI and testing of the following activities

- Appointment module
- Notifications and reminders

- Medication module

Jaime O.Herrera-Caceres (Specialist):

- Responsible for the app idea, features and general flow of the app
- Provide the questionnaires, personal information sheets, health tips and clinical expertise
- Provide specific fields to appointment and medication data structures.

6.0 Specialist Context

Nowadays, many hospitals or institutions have “patient portals” in which the patients can see some notes or study results, but that depends on the physician's dedication and can result to be very technical for the patients who may not really understand the significance of the findings. One of the objectives when you go see a physician, is to understand the information and even be able to explain it and replicate such knowledge of your disease, but unfortunately that is not always the case.

U Health has achieved the objective to create an app that facilitates patient’s control and knowledge about their own disease. The patients are able to input the conclusions of the appointment according to their understanding right at the moment or right after the appointment, avoiding memory bias that happens if they don't write it down and try to remember in the future. Some patients bring a notebook, but this is not as convenient as U Health since it can always be lost, or they don't understand the writing, and most importantly, they rarely have an adequate order as they could do with U Health. U Health, also allows to take pictures of the clinical notes dictated by the physicians or even bloodwork or imaging results, to have not only the personal interpretation of what happened during the appointment but also the objective, more technical, reports from the medical groups.

Another very interesting feature of U Health is how it keeps track of the medications. With the app the patients will be able to input more accurate information than what is usually stored in the health systems, as the latter are rarely accurate because it depends on a third party who needs to add the information into the system and that does not always happen. It is best to get direct information from the patient regarding what medications they are taking at a certain given time, and for how long.

Finally, it is our duty as physicians taking care of patients with prostate cancer to take care of their overall health, together with their Family Physicians and other specialists. We rarely have time to get into the preventive medicine aspects since the clinics are usually quite rushed and we focus our efforts on giving advice directly related to prostate cancer care. Having said that, patients with prostate cancer usually live a long life with the disease (over 10 years), so it is extremely important to give them

information on how to take care of their overall health (healthy eating, keeping active, mindfulness, etc.) as well on how to prevent or how to make an early diagnosis of other disease that are prevalent for men on their age range. U Health will aim to offer this information to patients so that they can take control over such situations.

7.0 Future Work

The app could be made more intuitive and user friendly. So far, we focused on the functionality of the app, but at a given time we will start working on a more friendly user interface and we will show the app to more people in order to obtain their feedback in terms of the functionality of it.

We also want to expand on the Preventive Medicine reminders, adding links to obtain further information in case the patient wants to learn more about what is included in the reminder.

We would also like to add a forum, in which patients with different stages of the disease could share their experience during the “journey” with prostate cancer. Patients could talk about different types of radiation therapy and how they did with them, different types of surgeries or even focal therapy treatments. Currently the patients rely mostly on what the physicians say but the truth of the matter is that we can only talk about what we see or read in medical literature, but the full patient experiences are rarely portrayed.

8.0 Posting on the Course Website:

I agree to have the following posted on the course website:

	Video/final presentation	Report	Source code
Alan	Yes	Yes	Yes
Dongqi	Yes	Yes	Yes
Jaime	Yes	Yes	Yes