



COMP2043.GRP Final Group Report

Outpatient Monitoring Mobile App

Team 18

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ABSTRACT

Considering that a large number of patients suffers from the inconvenience of obtaining medical service from hospital, it is of great significance to develop an application which provides online medical service. In this project, our group members have developed an application which enables patients to test physical data as well as receive remote treatment from doctors whenever and wherever. We developed Bluetooth function so that our application can receive and display physical data measured by sensors. In addition, to make remote treatment more convenient, we also developed real-time chat function so that patients and doctors can communicate with each other during treatment. The report explains the target problem and time plan of the project, background information and research about our project, requirement specification, design, interface, key implementation, testing, achievements and reflective comments.

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1 INTRODUCTION

1.1. Description of Problems to be Solved

Traditionally, it takes great amount of time for patients to receive treatment in hospital. Besides, Centers for Medicare and Medicaid Services (CMS) said in 2016 that hospital care is one of the largest treatment expenditures, about USD 1 trillion in the United States. According to the BIS Research (2018), the development of mobile medical applications has the potential to reduce hospital waiting time and global healthcare costs, improving patients' compliance and convenience. In addition, with the outbreak of COVID-19, the shortage of medical resources and high risk of infection in hospital make online medical platform of great significance.

The propose of our project (Outpatient Monitoring Mobile App) is to develop a mobile application through which doctors can remotely monitor patients and provide treatment instructions, which can improve the efficiency of medical treatment as well as provide convenience for both patients and doctors. By using OMA, patients provide their physical condition so that they can receive specific treatment planned by doctor remotely, which reduces waiting time, saves the inconvenience and avoids infection in hospital. By wearing sensors, patients' physiological data can be captured and monitored on the APP. Therefore, patients can know about their physical condition whenever and wherever possible. In addition, outpatients can chat with doctors through the APP which enables doctors follows up the patient's condition in real time.

1.2. Team Introduction

Saeid — supervisor

Jiazheng Wen — team leader, back-end

Xuting Wu — back-end, sensor

Shuning Pan — front-end, prototyping

Xinyu Gao — front-end, testing

Xingzhi Cen — sensor, device connection

Runxuan Bai — prototyping, testing

1.3. Time Plan

Task/Week	1	2	3	4	5	6	7	8	9	10	11	12	13	14	15	16	17	18	19	20	
1. Requirement specific	Red	Red	Red																		
1.1 analyze user requirements	Blue																				
1.2 analyze system requirement		Blue																			
1.3 allocate work and predict budget		Blue	Blue																		
2. Software Design				Red	Red	Red	Red														
2.1 system logical architecture				Blue																	
2.2 design components and API					Blue	Blue															
2.2 Database design																					
2.3 UI Design					Blue	Blue															
2.4 Make validation plan							Blue														
3. Software Development								Red	Red	Red	Red	Red									
3.1 Develop server side								Blue	Blue	Blue	Blue										
3.2 Develop application interface								Blue	Blue	Blue	Blue										
3.3 Develop database									Blue	Blue	Blue										
3.4 Integration and Debugging										Blue	Blue										
3.5 Write documentation											Blue										
4. Validation												Red	Red	Red							
4.1 Sub-system test												Blue									
4.2 System test												Blue	Blue								
4.3 Customer test														Blue							

Our plan arranges 20% time for requirement specification and application design, 60% time for application code and integration and 20% time for application test. The time span of the project is 20 weeks in two semesters of a

college junior. First three weeks are spent on the requirement specification because making requirements clearly is the cornerstone of a successful project. To ensure the system can meet users' need, a great number of interviews with patients and doctors are necessary. Therefore, it needs one week to become familiar with the user environment. It takes two weeks to identify the hardware and software requirements and one week to assign every team member's job. Finally, we arrange four weeks to design the system.

In the first week, a system architecture should be designed which tells how every module is connected. In the following two weeks, two members are assigned to design UI with three members assigned to design database, scenarios, and APIs respectively. At the same time, two members are assigned to build the server and study how to use sensors. In the final week of the whole design stage, a validation plan for the development stage should be carried out. Detailed design can reduce the workload greatly for the developing team.

After nine weeks, time will be used for development. In the first three weeks, three members will output code for server-side, application interface and database. The next five weeks are the winter break when team members report on the progress of the code and difficulties encountered each week via the Internet. The following stage is for integration and debugging. Sometimes debug and integrate turn to be harder than coding, so this stage will last for two weeks. The last week will be used to write the user document. Also, we arrange one week for sub-system test, one week for system test and two weeks for user test.

However, in the actual project developing process, time distribution and expectations do not conform to the plan. The main reason is that the virus outbreak lead to team member separately developed and tested in the home, no conditions to cooperate to complete development as planned together,

which lead to unexpected difficulties and delayed the project developing process. In particular, for the chat function, the back-end development encountered difficulties, resulting in two weeks of delay in finishing chatting part development, thus also leading to delaying in testing by two weeks.

2 BACKGROUND AND RESEARCH

2.1. Background Information

The recent global outbreak of COVID-19 has exposed problems in healthcare systems in most parts of the world, including shortages of healthcare resources and equipment, an increased risk of COVID-19 cross-infection in patients who were not infected but went to hospital for other diseases. In view of the above problems, our project (Outpatient Monitoring Mobile App) can alleviate them to some extent, reduce the burden of medical resource shortage and reduce the risk of cross-infection.

In addition to addressing the current COVID-19 epidemic, we did a lot of background checks on local hospitals. It is time-consuming for patients to receive treatment in hospital. After interviewing with several local hospitals, that is Ningbo Lihuili Hospital and Yinzhou Second Hospital, it is concluded that though they have improved their medical facilities as remedy for their weakness in taking care of patients, problems still exist when it comes to normal physical check such as testing blood pressure and temperature. Patients may need to stay in hospital for a long time waiting for reports. From the perspective of medical teams, there will be a shortage of nearly 122,000 doctors in the United States by 2032, as demand for doctors continues to grow faster than supply, according to the association of American medical colleges (2019). For patients and medical teams, the most significant role of mobile medical apps is to reduce

the time and cost of hospital treatment (Research on mobile medical developer, 2016). Therefore, a more advanced method for remote monitoring and treatment is required.

In addition, due to mobile revolution and recent advances in computer science, a new form of health care system--mobile health is feasible. According to Wang Yun Toh, etc. (2014), wearable wireless sensors are widely used in wireless human sensor networks for various physiological monitoring applications related to health or performance. Patients may use this system to keep connected with hospitals, medical teams and professionals during the procedure. Doctors can easily monitor patients' body condition and offer treatment suggestions. Though there are many existing medical applications in the market, most of them cannot provide multiple functions. A study carried out by Anon (2018) shows that, the majority of applications can only provide one of the following functions including: providing information, guidance, records, display and communication. The minimum implemented functionality is the communication function, accounted for only 2% of the total number of applications.

We decide to develop a software containing functionality of remotely monitoring patients' physical condition, providing communication platform between patients and doctors, automatically allocating doctor to outpatients as well as providing history records. Patients can briefly report their health conditions including health cues, feeling and experiment results to doctors to receive specific treatment. Doctors can create treatment plan corresponding to patients' health condition report and update patients' treatment progress in real time. In conclusion, the application might improve the efficiency of the medical treatment.

2.2. Research

2.2.1. Local hospital research

Due to the outbreak of COVID-19, Mayo Clinic and Mayo Clinic Health System have posted an announcement recently: all people going to the clinic must wear a face covering to slow down the spread of the virus. However, for people, it is hard to achieve this requirement because of the limited masks available to them. Furthermore, hospitals are more likely to contain COVID-19 virus compared to other places. Therefore, going to the hospital raises the likelihood that people are infected with COVID-19.

According to our members' personal experience in the hospitals of Ningbo China, it will take about 30 minutes to finish checking patients' temperature, blood pressure, heart rate, height, weight before diagnosing illness. Doctor Wang in Yinzhou Second Hospital said that patients may miss the optimum time because they may not be aware of the seriousness of their illness. In addition, waiting for a long time is unbearable if a patient is suffering from illness such as stomachache. Thus, the application should be able to collect patients' body information and automatically send information to doctors after which doctors could provide treatment advice for patients.

2.2.2. Products research

We searched several similar medical applications in the market. Medical applications on the market showed the following deficiencies such as insufficient functions, non-ideal social function and unable to collect patient performance body data. Below a new application in the Android store is analyzed as example.



Figure1: MyDoctor app

This application offers users multiple choices, and it introduces some medicine as well as some basic knowledge about several diseases and methods of treatment. However, it misses the connections between doctors and patients. Doctors also cannot obtain real-time patients' physical condition. We intend to create an application in reference to this case and also make some improvement, that is doctors can acquire their patients' normal information such as blood pressure and temperature.

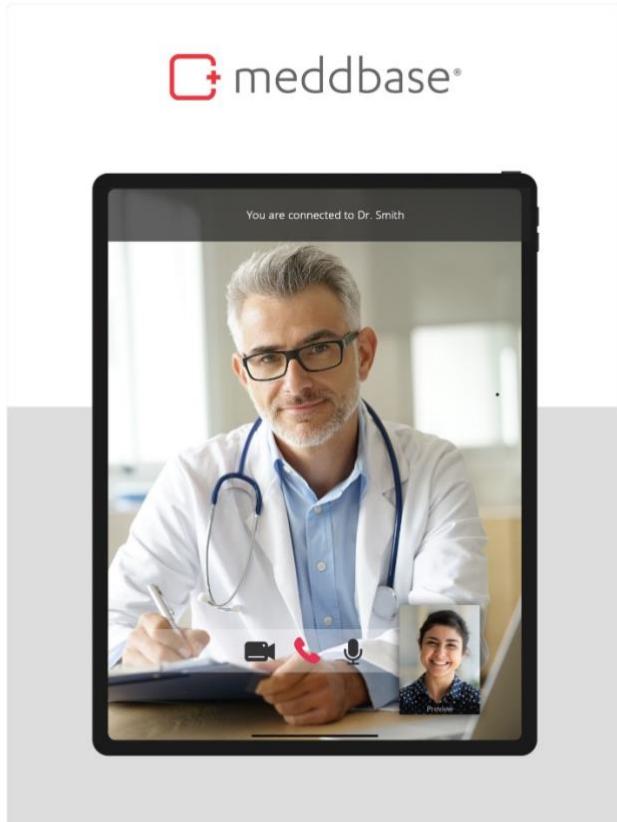


Figure2: Meddbase app

The meddbase allows video communication between patients and doctors. However, doctors do not know the patient's body specific data, only from the patient's oral to obtain the cause of the disease.

This can lead to poor judgment and even delay in the patient's treatment. It is more similar to an online doctor's appointment tool.

It is difficult to ideally help patient to complete remote medical services at home. Our application can accurately measure body data, such as body temperature and heart rate, according to the requirements of doctors through supporting sensors. It can even generate health reports automatically, allowing users to check their health status at any time.

3 REQUIREMENT SPECIFICATION

3.1. User requirement

User requirements specify all activities that users can perform in this App. The following part is user requirements for OMA.

1. Users can choose their user type (patient or doctor)
2. Users should firstly provide their phone number and corresponding right verification code before they have right to create their own account.
3. Users can register with unique username, and password.
4. Users can reset their password after entering phone number and verified by entering verification code received from text message if they forget password.
5. Users can change their password after logging into their accounts successfully.
6. Users can log in with their username and password.
7. For patients who firstly use this App, they need to complete a personal information questionnaire, containing information such as name and gender.
8. Users can update all their personal information.
9. For doctors who firstly use this App, they need to complete a personal information questionnaire, containing information such as name, gender, and personal resume (degree, professional experience and major).
10. Patients can choose “Basic Disease” or “Health Check” according to their requirements.

11. Patients can wear sensors to report their temperature, blood oxygen and heart rate.

12. If patients choose regular health-check, they need to fill height and weight in a corresponding questionnaire. In the same questionnaire, patients can also view their reported temperature, heart rate, blood oxygen. Their BMI (Weight divided by the square of height) will be calculated automatically and shown on the same page. (BMI: a reasonable way to judge a person's degree fat and thin)

13. Patients can choose a specific disease from headache, cold, stomachache after clicking "Basic Disease".

1) If patients choose cold.

They need to answer following questions in the questionnaire:

- a. Describe their current feelings
- b. How long have they had the cold
- c. List medicine they are allergy to

2) If patients choose stomachache.

They need to answer following questions in the questionnaire:

- a. Their current feelings
- b. Select their pain area
- c. Accompanying symptoms they have
- d. What food they have eaten
- e. How long they have a stomachache
- f. Whether they have the same symptoms before
- g. What medicine they have taken

3) If patients choose a headache.

They need to answer following questions in the questionnaire:

- a. When they feel pain
- b. How long it lasts
- c. Whether it is paroxysmal or continuously

- d. Whether patients have dim eyesight or feel dizzy
14. Patients can submit the questionnaire.
15. Patients can choose their preferred doctors if they want.
16. Patients can receive a message sent by the App when their application has been received by the doctor.
17. Patients can send a message to doctors in the “CHAT” page if doctors invite patients to chat.
18. When doctors terminate the chat, their patients will receive a message sent by the App shown in the “CHAT” page.
19. Patients can view their current process on “HOME” page, which includes the questionnaire content, feedback from doctors and process status (waiting, received).
21. Patients can view their history records on “MY” page.
22. Patients can view their physical data detected by sensors when they wore them last time on “HOME” page (in a health report).
23. Patients can give feedback of their treatment.
24. Patients can log out.
25. Doctors can see the name list of the patients who are waiting for treatment.
26. Doctors can check the questionnaire feedback about this patient. Then doctors can provide a more specific analysis of patients' physical situations and make a questionnaire for patients to get specific information.
27. Doctors can check the diagnostic report.
28. If doctors generate a questionnaire to gather more details, they can check new corresponding information received from patients.
29. Doctors will receive a message in “CHAT” page if they receive new information from patients.
30. Doctors can invite patients to chat and send a message.

31. Doctors can end the chat with the permission of patients if they think that treatment has been finished.
32. Doctors can search for historical treatment record according to the name of the patients or one specific duration.
33. Doctors can log out.

3.2. System requirements

System requirements specify configurations that the system must have to let the final app run smoothly and achieve user requirements mentioned above.

The following part is system requirements:

1. The system should provide the interface for users to choose their user type (patient or doctor).
2. The system should provide a registration page for users who use this app for the first time and prompt users to enter their phone number and verification code.
3. The system should prompt users to enter their username, password and confirm password after they provide accurate verification code.
4. The system should notify users when the “confirmed” password is different from the first entered password.
5. The system should prompt users to enter their personal information.
6. When logging in, the system should prompt that the password is wrong if the password entered by the user is different from the password for that username on the database.
7. The system should provide "forget password" button in the login page and when users click it, the system should promote users to enter their phone number and verification code. If the verification code is right, users are allowed to reset password.
8. The system should enable users to log out.

9. The system should pop up a "Home" page when users log in successfully.
10. The system should allow patients to choose the type of their requirements in the "Home" page: "Health Check" or "Basic Diseases".
11. The system should pop up a questionnaire for physical data after patients choosing "Health check".
12. The system should switch to a page which let patients choose specific disease from three options: Cold, Stomachache, Headache after patients choosing "Basic Diseases".
13. The system should switch to a page which contains a questionnaire with related questions after patients choosing Cold/Stomachache/Headache.
16. The system should pop up a window to check whether patients want to choose doctors by themselves or not after patients complete their questionnaire and click the "submit" button.
17. The system should switch to the "Home" page If patients click "skip" button and allocate doctors for them automatically.
18. The system should switch to "Choose doctor" page which contains available appointments of all doctors if patients decide to choose doctors by themselves.
19. The system should pop up a window to notify patients if they have successfully chosen their preferred doctors.
20. The system should allow patients and doctors to chat in the "chat" page and the system should only allow doctors to launch the conversation.
21. The system should terminate the conversation after the corresponding conversation terminated by doctors with the permission of their patients.
22. The system should provide unfinished process, historical process and disease data tracking on "MY" page.
 - 1) The system should provide a questionnaire content and doctor's treatment of the historical process after patients clicking the "Historical Process" button.

- 2) The system should provide the status of unfinished process(waiting for doctors, received or processing) after patients clicking the "Unfinished process" button.
 - 3) The system should provide real-time physical data after patients clicking "Real-time Data" under the situation that patients wearing the sensor.
23. The system should allow patients to update their information after clicking the "setting" button on "MY" page.
24. The system should allow patients to log out.
25. The system should enable patients to give feedback for the treatment to doctors in the "CHAT" page.
26. On the "HOME" page for doctors, the system should enable doctors to check and view patients' inquiries.
27. The system should indicate the status of patients' inquiry (new, in-process), the name of the patients and the time of the inquiries.
28. The system should enable doctors to see more detailed information of the inquiries, including the result of the questionnaire which is submitted by patients, feedback given to patients and the real-time temperature, heart rate, blood oxygen of patients.
29. The system should enable doctors to give a checklist for patients to carry out.
30. The system should enable doctors to revise their personal information.
31. The system should enable doctors to check, search for their historical treatment record during one specific time or according to patients' username.

3.3. Nonfunctional Requirements

Nonfunctional requirements specify system attributes, such as security, performance, reliability. The following part is nonfunctional requirements for

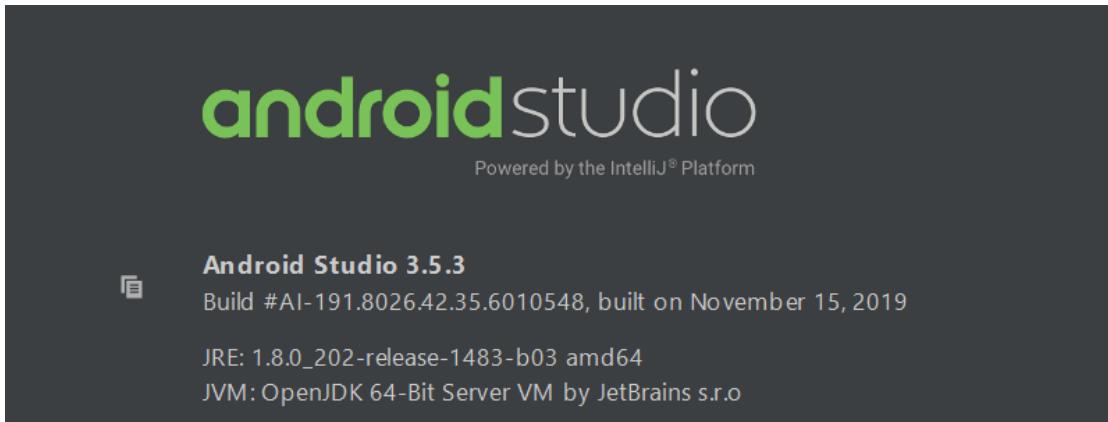
OMA:

1. Users can access the data within permission only after they pass the authentication.
2. The confidentiality and completeness of the data should be guaranteed.
3. The system checks data to prevent abnormal data.
4. The developed software should be run on android platform.
5. The developed software should be connected through Bluetooth to the sensors and transmitting data between them smoothly.
6. The system should handle invalid input.
7. The system should provide data backup to protect the data in the event of system data loss or system data corruption due to system errors or other reasons.

4 TOOLS AND TECHNIQUE

4.1. Development tool selection

First, we chose Android Studio as main platform because of its portability and utility. According to Rishabh software (2019), Android platform, known as an open source platform, has scaled up on flexibility and adaptability, closely connecting to the whole software ecosystem. The Android platform is well-managed and can be customized in multiple types of mobile equipment. In this case, using android will raise our ability to control and promote the mobile App. Besides, safety is another factor that we considered android studio as the main platform.



As shown above, we used Android studio 3.5.3. In this new version, several permission protocols are added in Android Studio to guarantee the safety of the software.

These protocols limit the usage of users' information. Software should ask users for permissions when their personal information will be used, which greatly boosts the safety of users' privacy.

In addition to safety and usability, several extra functions can be included in android studio platform. For example, we use Genymotion software as the virtual machine to run android software and Android Studio is compatible with it, which is helpful for testing the software.

4.2. Programming language selection

Java is chosen as our programming language. Rob (2017) points out that the java file is independent of platforms, which means that no matter where the code is written, it can be run freely. This advantage makes it easy to test software on Android mobile. Besides, object oriented, one significant value of java, enhances efficiency in project development, separating multiple characteristics (Rob,2017). In addition, java performs well when handling certain models such as Bluetooth. In this project, we used Bluetooth part to connect computers and phones. The Bluetooth library we chose to realize the

whole function is “Blue Cove 2.1.1”.

```

1 package sample;
2
3*import java.io.IOException;□
4
5 public class Bluetooth {
6     public static void main(String args[]) throws IOException {
7         LocalDevice device =LocalDevice.getLocalDevice();
8         RemoteDevice[] remotedevice =device.getDiscoveryAgent().retrieveDevices(DiscoveryAgent.PREKNOWN);
9         for(RemoteDevice d: remotedevice) {
10             System.out.println("Device NAmE: " +d.getFriendlyName(false));
11             System.out.println("Bluetooth Address:" + d.getBluetoothAddress());
12         }
13     }
14 }
```

In this demo, we wrote a function to get the information of our Bluetooth and printed corresponding address and name.

```

BlueCove version 2.1.1-SNAPSHOT on winsock
Device NAmE: S6
Bluetooth Address:000000010ACD
Device NAmE: “Administrator”的 iPhone
Bluetooth Address:3C2EF9C26E9D
BlueCove stack shutdown completed|
```

4.3. Sensor and microcontroller board selection

We used the Arduino board MEGA 2560 as the controller of the electronic kit, which can communicate and manipulate all types of sensors and Bluetooth. The program can be coded in Arduino studio and store in the microcontroller. It can also transport data through various ways, such as Bluetooth, USB, GSM and I2C communication. Besides, it can adapt to three kinds of system (IOS, LINUX WIN), which is of great convenience.

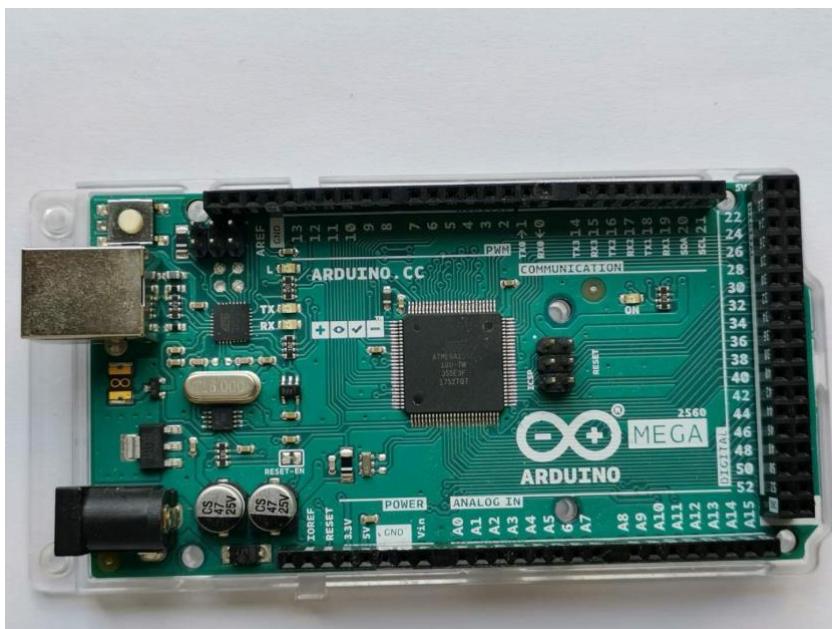


Figure1. MEGA-2560

The reason of selection Arduino is that its chip is reliable, with abundant electronic components and powerful coding libraries. (Arduino, no date)

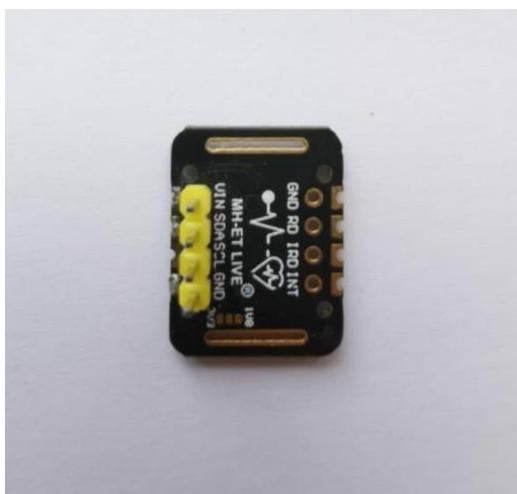


Figure2. Sensor-MH-ET LIVE _MAX30102

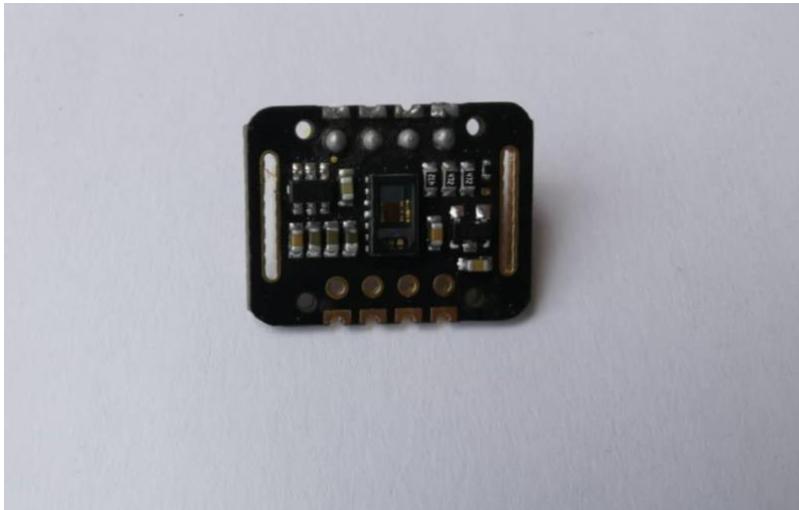


Figure3. Sensor-MH-ET LIVE _MAX30102-reverse side

MH-ET LIVE _MAX30102 Arduino chip is the chosen sensor in project. It integrates body temperature sensor, heart rate sensor and blood oxygen sensor. In addition, it is very small (2cm * 1cm * 1mm), which is portable and easy to be assembled. It is well suited to the miniaturization of sensors, which is conducive to the daily use of users.

Bluetooth is a companion device to the sensor. It is reliable and cheap to use. The reason we did not use GSM is because it requires SIM CARDS and extra costs.



Figure4. Bluetooth -HC-05

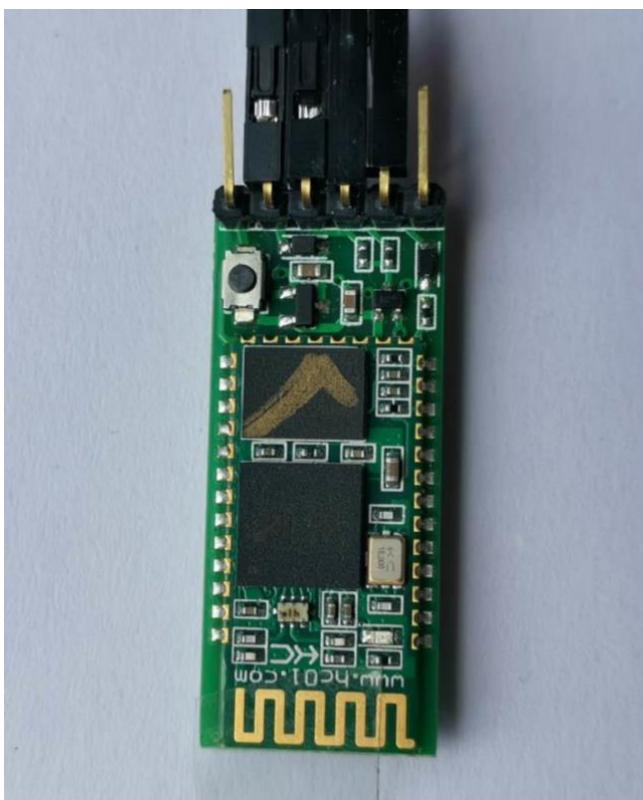


Figure5. Bluetooth HC-05, reverse size

To make sure that the app can be freely updated and installed, we bought a Centos server, prepared the MYSQL database server and put our website on it. This server is used to exchange information.

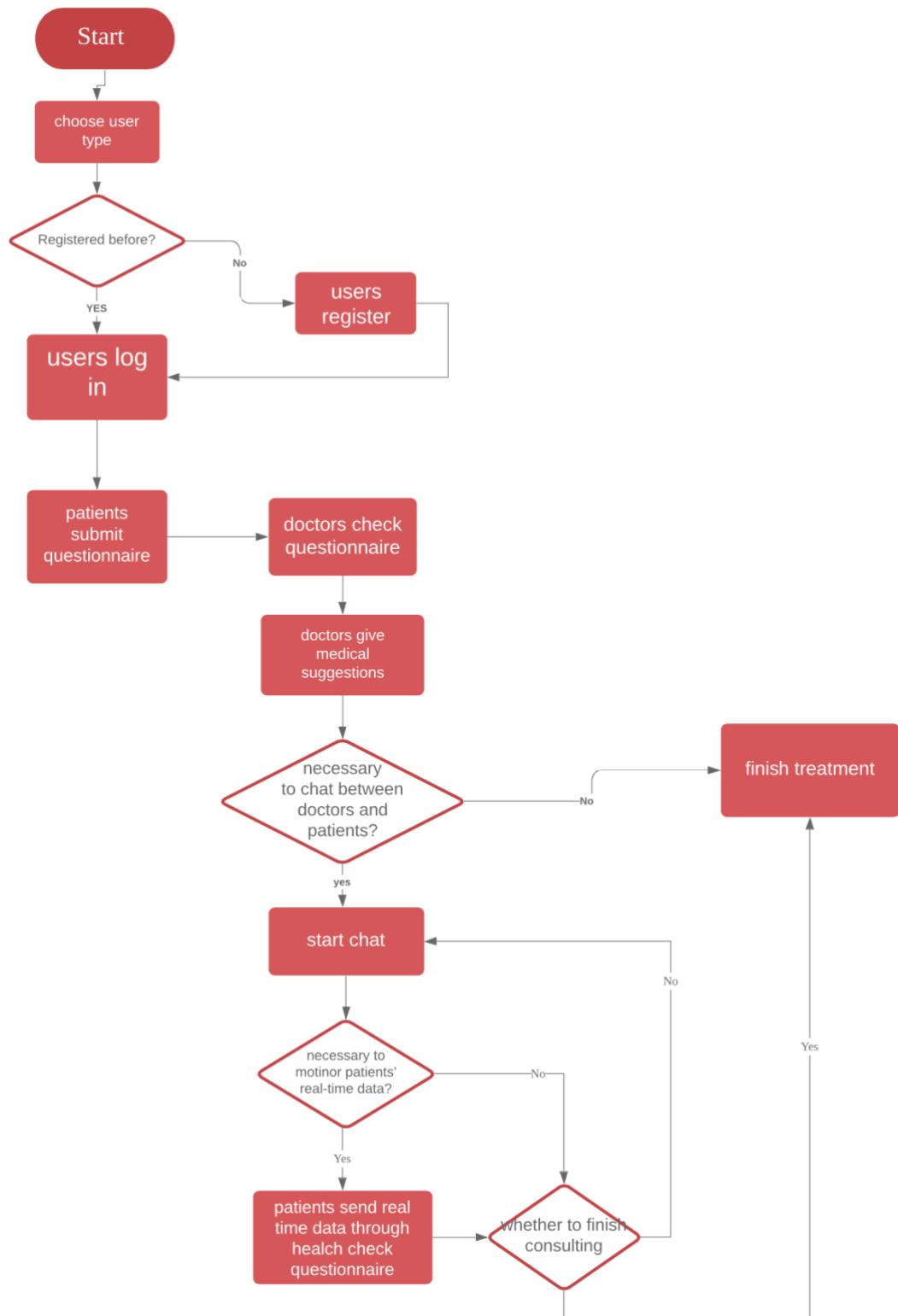
We chose MySQL to manage database because that it is efficient, fast, costless, easy to use and can be run on multiple platforms such as Linux and Android.

Communication between chips

Firstly, app sends collected request commands to Mega 2560 chip by Bluetooth. These commands are processed in Arduino Mega 2560 and sent to sensor chip by line with I2C serial protocol. Next, sensor collects the data and send to Mega 2560 chip. Finally, Arduino Mega sends useful data to the app though Bluetooth. The Bluetooth part connects sensors with the app to make data detected displayed in the app. Besides, our android app connects with MySQL so that data can be stored and transferred.

5 DESIGN

5.1. Flow chart



The above flow chart explains the process: users choose users type (doctor or patient). Then users log in or register a new account if they have not registered before. Next, patients choose one specific questionnaire (headache, stomachache, cold) or the health check form to fill in and submit it. The submitted questionnaire will be allocated to one specific doctor, who can give checklist and feedback to patients. Doctor can chat with patient and ask them to report their heart rate, blood oxygen and temperature regularly or ask patients for more useful information about their health condition. Patient can decide whether to finish this appointment.

5.2. Questions on questionnaire

This part is all the questionnaire designed for patients to answer in our application. Before we designed these questionnaires, we asked a number of doctors in hospitals what questions they could ask to get information about their patients' illnesses. Patients need to answer these questionnaires when they are using the application to see a doctor. All the questions are designed for specific diseases, and through these questions, doctor can determine whether the patient has the disease and the severity of the disease and can give appropriate treatment according to the answers to the questionnaire.

5.2.1. Health check questionnaire

1. Your Height
2. Your Weight
3. Your Blood oxygen (obtained by wearing the sensor)
4. Your Heart Rate (obtained by wearing the sensor)
5. Your Temperature (obtained by wearing the sensor)

6. Your BMI (calculated by system automatically after height and weight are entered)

Why we choose these data to collected?

Body temperature, heart rate, and blood oxygen are very helpful to the doctor in determining a patient's physical condition. It can also be combined with the patient description analysis of the cause of the disease, for the patient to receive treatment to buy time. For example, many pathogens can cause an increase in body temperature such as cold, viral and bacterial infections. Heart disease can lead to abnormal heartbeat response. Respiratory diseases such as coronavirus can cause an abnormal drop in blood oxygen.

5.2.2. Cold questionnaire

1. Briefly describe your feeling

- Fever
- Running nose
- Dizzy
- Cough
- Sore throat
- Sneeze
- Headache
- Phlegm
- Other

2. How long have you caught cold

- <3 Days
- 3~7 Days

- >7 Days
- >14 Days

3. List medicine you alleged to

4. Which medicine have you taken

5.2.3. Headache questionnaire

1. Briefly describe your feeling

- Astasia
- Blurred vision
- Dizzy
- Hard to sleep
- Inappetence
- Nausea
- Other

2. How long have you suffered from headache?

- <1 Days
- 1~3 Days
- about 1 week
- >1 month

3. Please choose your type of headache

- Persistent headache
- Intermittent headache

4. List medicine you alleged to

5. Which medicine have you taken

5.2.4. Stomachache questionnaire

1. Briefly describe your feeling

- Belly colic
- Pricking
- Sudden pain
- Sustained pain
- Swelling pain
- Other

2. Select your pain area

- Left upper abdomen
- Upper abdomen
- Right upper abdomen
- Left abdomen
- Center of abdomen
- Right abdomen
- Left lower abdomen
- Other

3. Do you have other accompanying symptoms

- Fever
- Cold sweat
- Diarrhea
- Vomiting

Other

4. Have you eaten the below things

- Cold food and drink
- Deteriorated food
- Raw food
- Long-awaited food
- Wild vegetables and fruits
- Other

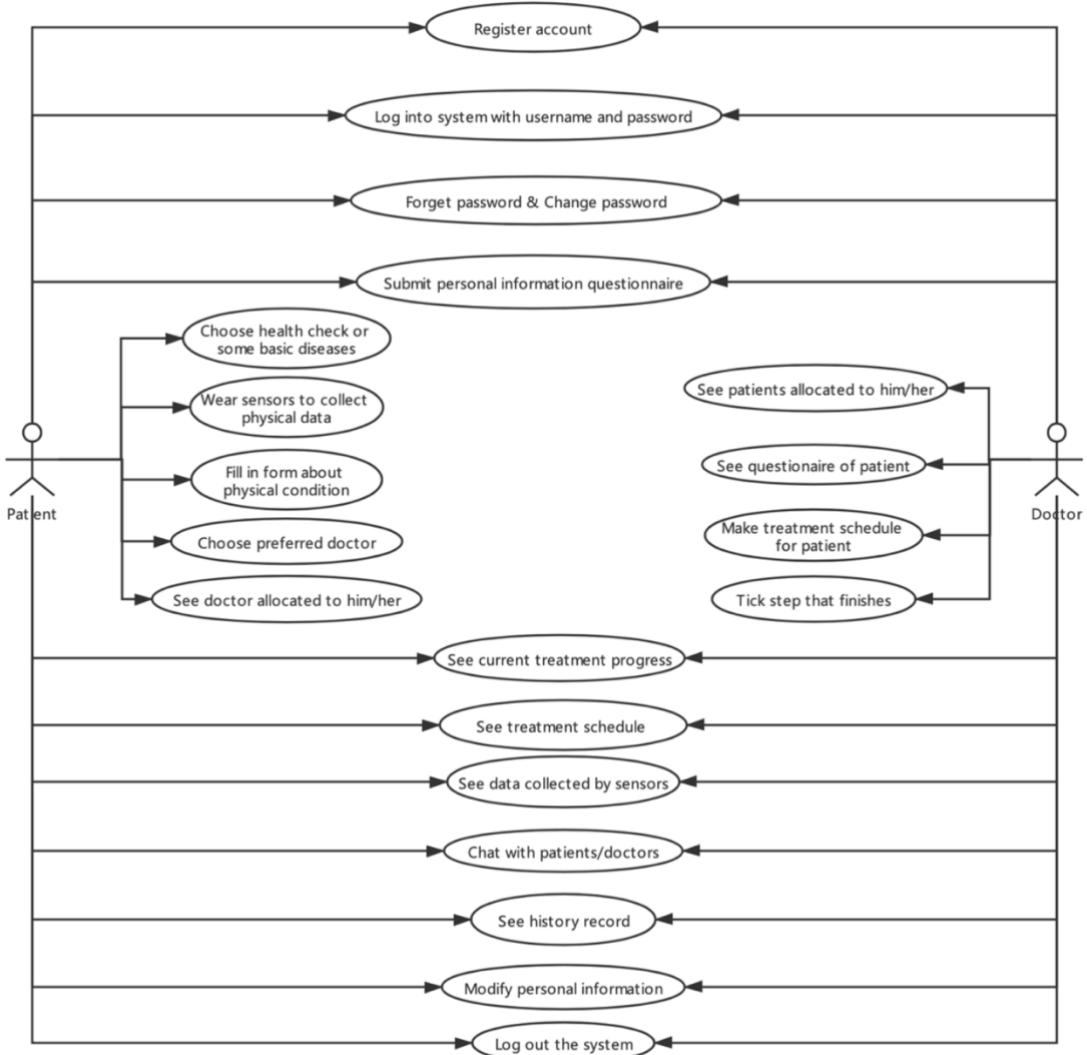
5. How long have you had a stomachache?

6. Do you have the same symptom before?

7. Which medicine have you taken?

5.3. Diagram design

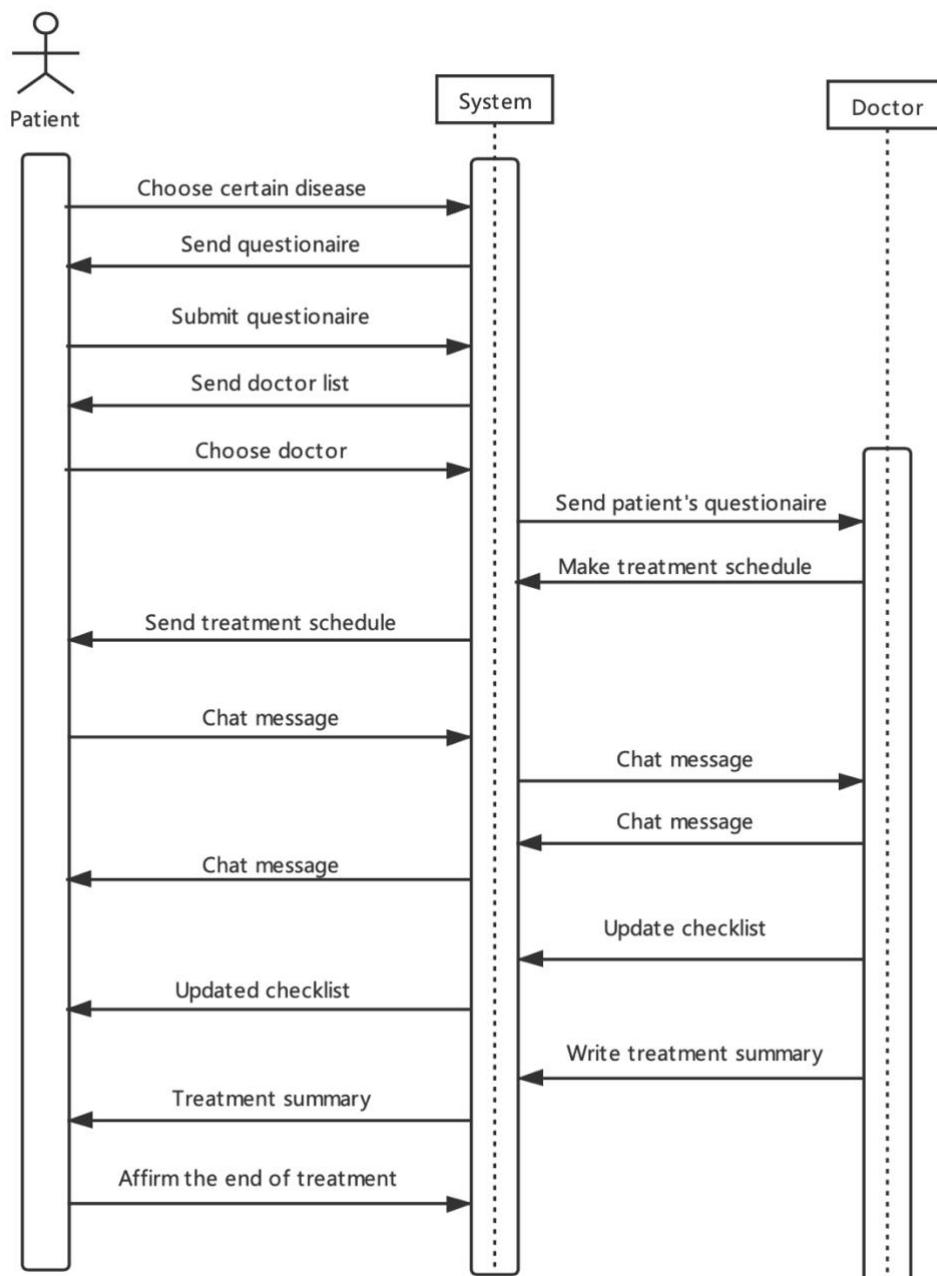
5.3.1. Use case diagram



The above sequence diagram shows how users interact with the system from the patient's perspective when patients want to see a doctor. First, patient chooses a disease, and the system sends back a questionnaire with questions about that disease after it receives the disease type. When patient submits the questionnaire after answering all questions, the system sends a doctor list with doctors classified by available date. After patient chooses a doctor, the system sends patient's questionnaire feedback to the corresponding doctor and the doctor makes treatment checklist for patient. The treatment checklist is sent back to patient by the system and patient

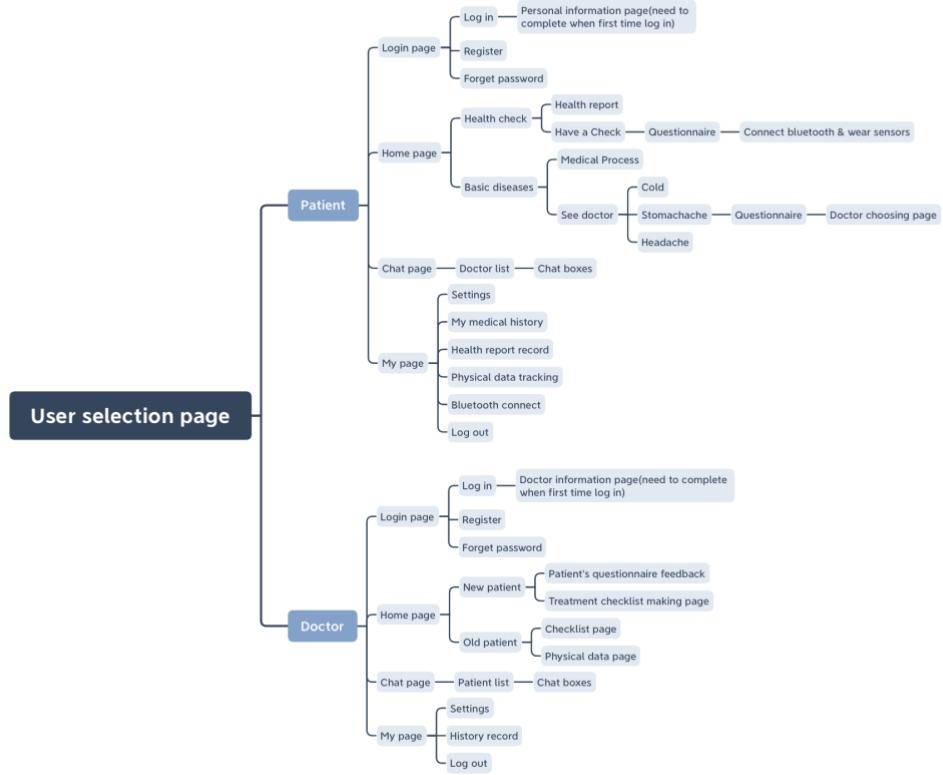
can take actions bases on the checklist. Patient and doctor can chat with each other during the treatment so that doctor can know how the treatment is going on and update the checklist. After all steps on the checklist are done, doctor writes treatment summary and it is sent to patient. Treatment finishes once patients affirm the end of treatment.

5.3.2. Sequence diagram



The above sequence diagram shows how user interactive with system from the patient's perspective when patient want to see a doctor. First, patient chooses a disease, and system sends back a questionnaire with questions about that disease after it receives the disease type. When patient submits the questionnaire after answering all questions, system sends a doctor list with doctors classified by available date. After patient chooses a doctor, system sends patient's questionnaire feedback to the corresponding doctor and the doctor makes treatment checklist for patient. The treatment checklist is sent back to patient by the system and patient can take actions bases on the checklist. Patient and doctor can chat with each other during the treatment so that doctor can know how the treatment is going on and update the checklist. After all steps on the checklist are done, doctor writes treatment summary and it is sent to patient. Treatment finishes once patients affirm the end of treatment.

5.3.3. Mind map for user interface

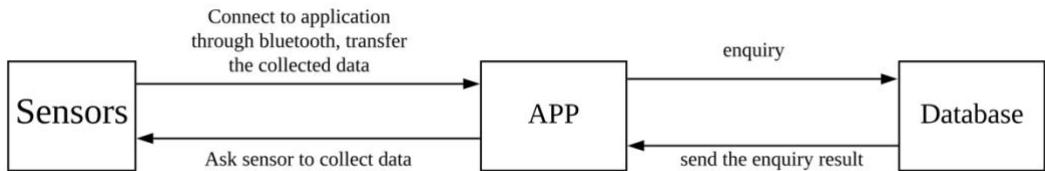


The above mind map shows design for user interfaces. Users can choose either patient or doctor account type to log in. There is a log in page with register and forget password buttons for both account types. Users need to fill in a personal information questionnaire when log in for the first time. After logging in, HOME, CHAT and MY buttons appear on the tab bar, on clicking which the corresponding page is switched to. For patient, there are two function bars in HOME, that is 'Health Check' and 'Basic Diseases'. In 'Health Check', patients can have health check by filling questionnaire and wearing sensors or view their last health report; While in 'Basic diseases', patients can start a treatment by clicking 'See Doctor' or check progress for their on-going treatment. For doctor, there are patient's questionnaire feedback and treatment checklist making page for new patients; while there are checklist page and patient's physical data page for patients under treatment. In CHAT, patient and doctor can send text messages to each other.

other when there is on-going treatment. In MY page, there are settings and viewing history record and log out function for both account type. While there is also Bluetooth connecting page for patients.

5.4. Prototype

The below chart explains the interaction between sensors, application and database.



Sensors are used to collect blood oxygen, heart rate and temperature and send it to application through blue tooth.

Application is client-side which is responsible for following functions:

Insert the data (e.g. when users register, when patients submit questionnaire)
 Update database (e.g. when users change their person information or password)
 Select from database (e.g. when doctor wants to check their patients' information).

Database is server-side, which is responsible to send the enquiry result to application.

5.5. UI design

This part is the application interface prototype diagram and corresponding function introduction that we designed through the MODAO application in the early stage of the project.

5.5.1. Register and Login page

Show in next page:



The system is designed for two types of users. In user selection page, either patient account or doctor account can be chosen.

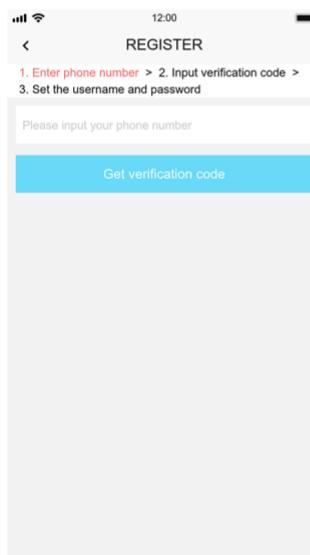
Please select your user type

Patient

Doctor



In LOGIN page (same for two kinds of users), user should enter user-name as well as password to login. There are also REGISTER and FORGET PASSWORD buttons below LOGIN button. If user does not have an account, REGISTER should be clicked to create an account. If user already has account but forget his/her password, FORGET PASSWORD is there to help.



In REGISTER page, user should first enter phone number, then enter verification code sent to phone. After binding phone number, he/she should enter username as well as password to accomplish register.

The image shows two side-by-side mobile phone screenshots. Both phones have a top status bar showing signal strength, Wi-Fi, battery level, and the time 12:00.

Left Phone Screenshot:

- Header: REGISTER
- Text: 1. Enter phone number > 2. Input verification code >
3. Set the username and password
- Input field: Please enter the verification code
- Button: Submit

Right Phone Screenshot:

- Header: Set the Username and Password
- Input fields: Input username, Input password, Confirm password
- Button: Submit

A single mobile phone screenshot showing the forget password process. The phone has a top status bar showing signal strength, Wi-Fi, battery level, and the time 12:00.

Header: Forget Password

Text: Please input your phone number

Button: Get verification code

In FORGET PASSOWRD page, after entering registered phone number, verification code will be sent to phone. User should first enter code to do authentication then reset his/her password.

The image shows two side-by-side mobile phone screenshots. Both phones have a top status bar showing signal strength, Wi-Fi, battery level, and the time 12:00.

Left Phone Screenshot:

- Header: Forget Password
- Text: Please enter the verification code
- Button: Submit

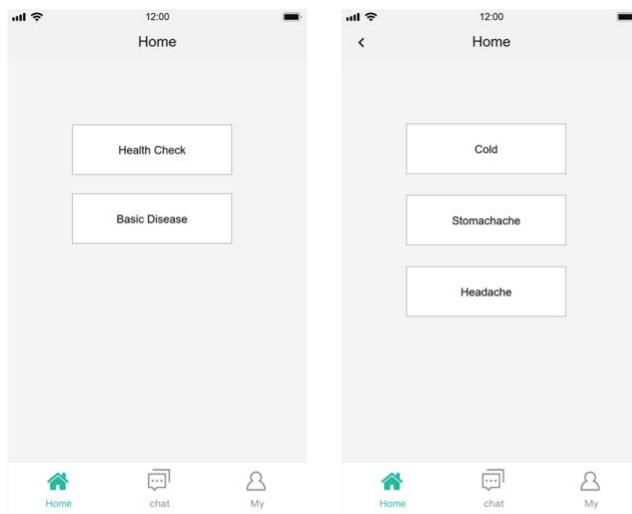
Right Phone Screenshot:

- Header: Reset Password
- Input fields: Input new password, Confirm new password
- Button: Submit

The image displays two side-by-side mobile application screens. Both screens have a top bar showing signal strength, battery level, and the time 12:00. The left screen is titled "Doctor Information" and contains fields for Name, Gender, and Age, followed by a "Personal Resume" section and a blue "Submit" button. The right screen is titled "Personal Information" and contains fields for Name, Gender, Age, Height, and Weight, also followed by a blue "Submit" button.

User should fill in a form for their basic information at the first time logging into the system

5.5.2. Home page for patient



In HOME page, there are two buttons for selection, Health Check and Basic Disease. Patient can click Health Check to do a simple body indicator test. If patient wants to see a doctor for cold/stomachache/headache, he/she can click Basic Disease.

The image shows a 'Health Check' form with six numbered fields. 1. Your Height: Input field with '单行输入' placeholder and 'CM' unit. 2. Your Weight: Input field with '单行输入' placeholder and 'KG' unit. 3. Your Blood Pressure: Input field with '110/65' placeholder and 'mmHg' unit. 4. Your Heart Rate: Input field with '80' placeholder and 'BPM' unit. 5. Your Temperature: Input field with '37.0' placeholder and '°C' unit. 6. Your BMI (Weight/Height^2): Input field with '22' placeholder. At the bottom is a blue 'Submit' button.

In Health Check module, patient should first enter height and weight manually. Patient should also wear sensors to collect his/her blood pressure, heart rate and temperature. A health report would be available to patient soon after patient submits the form.

The left screenshot shows the initial 'Health Check' screen with fields for height (165 CM), weight (85 KG), blood pressure (110/65 mmHg), heart rate (80 BPM), temperature (37.0 °C), and BMI (22). A success message indicates submission and receipt of a report soon.

The right screenshot shows the 'Health Report' screen, which displays the same data and adds a summary: 'Your final physical condition: Good'.

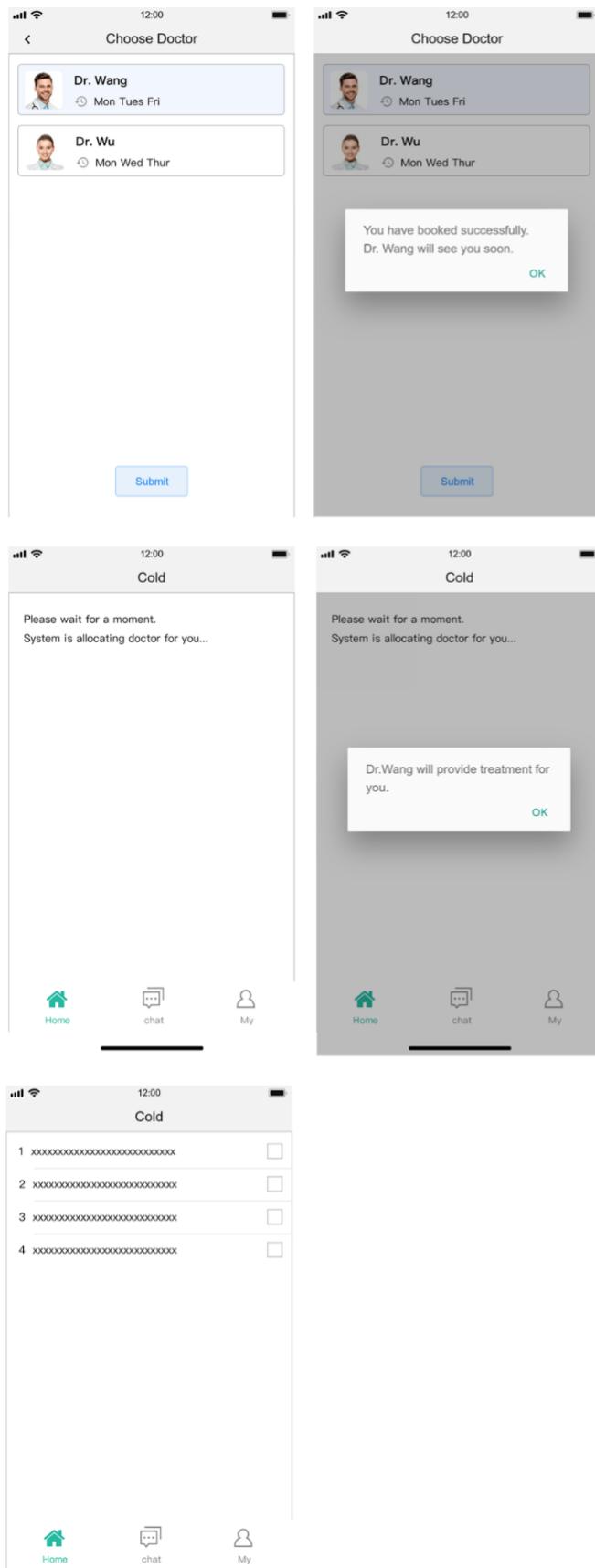
The left screenshot shows symptoms for a cold: Fever, Running nose, Dizzy, Cough, Sore throat, Sneeze, Headache, Phlegm, and Other (input field). It also asks how long the cold has lasted: < 3 days, 3 ~ 7 days, > 7 days, and > 14 days. The 'Other' option is selected.

The right screenshot shows the same symptom selection and duration options. A success message allows the patient to choose a doctor or let the system allocate one automatically.

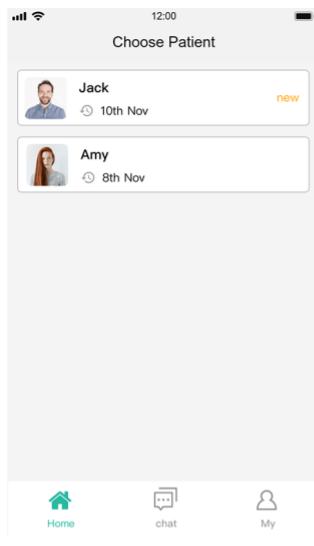
In certain basic disease module, patient should first fill in an form about their physical condition.

Taking cold as an example, patient should select his/her feeling, duration of having cold and other information. After that, patient can either choose doctor or let system allocate doctor for them automatically.

Finally, a schedule made by doctor would be available to patient on HOME page.



5.5.3. Home page for doctor



In Home page, all patients (patients under treatment and patients waiting for treatment) allocating to the doctor would show. Patients with "new" tag are patients who haven't started treatment yet; those without "new" tag are patients under treatment. Doctor can click patients shown on the page to carry out treatment.

The left screenshot shows patient details for 'Jack'. The title 'Jack' is at the top. Below it, the section 'COLD' is listed. The symptoms are numbered 1 to 4:

- 1 His/her feeling
 - Running nose
 - Sneeze
- 2 The time he/her has caught a cold
> 7 days
- 3 Medicine he/she alleged to
no medicine
- 4 Medicine he/she has taken
no medicine

Buttons for 'Next' and 'Previous' are at the bottom.

The right screenshot shows the 'Make Checklist' screen for 'Jack'. It lists 8 items with checkboxes and duration fields (1 to 7 days). Buttons for 'Previous' and 'Next' are at the bottom.

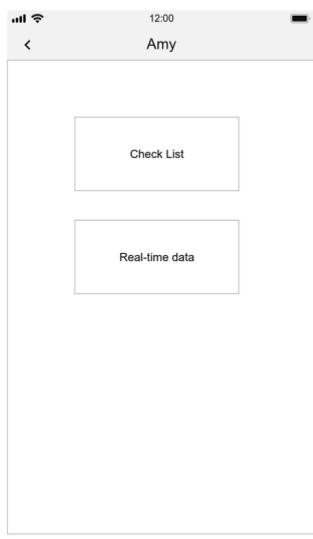
When selecting a "new" patient (Jack), feedback of Jack's questionnaire would pop up. Doctor should make treatment checklist based on the feedback. Doctor can tick items to be carried out and edit duration for each ticked item. After that, calculated total treatment time would pop up and the treatment page would be available to doctor. Treatment page contains Jack's check list (treatment schedule) and real-time data collected by sensors. Looking at Jack's check list, since no step has been carried out, there is no tick on check list. Real-time data module contains Jack's body temperature, heart rate as well as blood pressure. If Jack wears sensors, real-time data would show. Otherwise, data collected the last time he wore sensors would appear on the page.

The left screenshot shows the 'Make Checklist' screen again, but item 5 now has a tooltip: 'Estimated duration for the treatment is 14 days.' A 'OK' button is visible at the bottom right of the tooltip.

The right screenshot shows the 'Jack' treatment page. It has two main sections: 'Check List' and 'Real-time data'.

1 xxxxxxxxxxxxxxxxxxxxxxxxx	<input type="checkbox"/>
2 xxxxxxxxxxxxxxxxxxxxxxxxx	<input type="checkbox"/>
3 xxxxxxxxxxxxxxxxxxxxxxxxx	<input checked="" type="checkbox"/>
4 xxxxxxxxxxxxxxxxxxxxxxxxx	<input type="checkbox"/>

Body temperature	>
Heart rate	>
Blood pressure	>



When selecting a patient under treatment(Amy), treatment page would appear on the page. Treatment page contains Amy's check list(treatment schedule) and real-time data collected by sensors.

Doctor should tick certain item when it is carried out successfully. Looking at Amy's check list, step 1 and step 2 finished, so there are ticks behind them. Real-time data module contains Amy's body temperature, heart rate as well as blood pressure. If Amy wears sensors, real-time data would show. Otherwise, data collected last time she wore sensors would appear on the page.

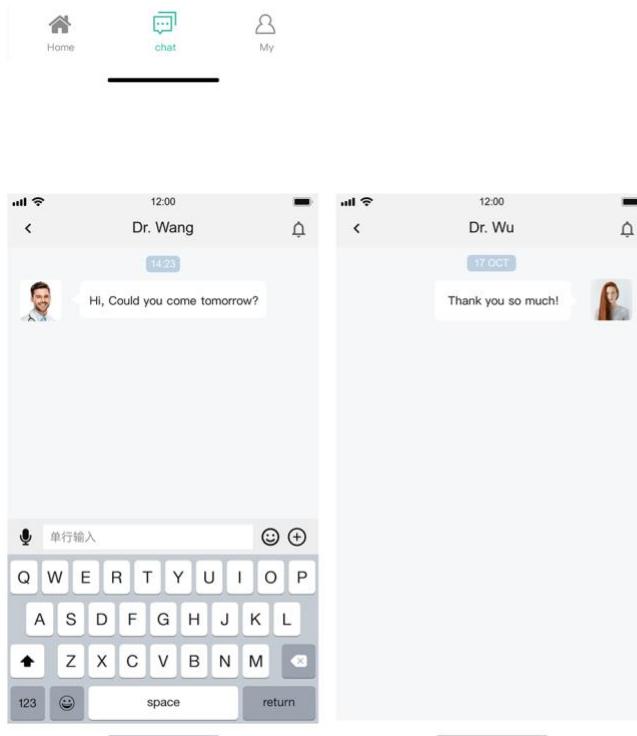
1 xxxxxxxxxxxxxxxxxxxxxxxxx	<input checked="" type="checkbox"/>
2 xxxxxxxxxxxxxxxxxxxxxxxxx	<input checked="" type="checkbox"/>
3 xxxxxxxxxxxxxxxxxxxxxxxxx	<input type="checkbox"/>
4 xxxxxxxxxxxxxxxxxxxxxxxxx	<input type="checkbox"/>

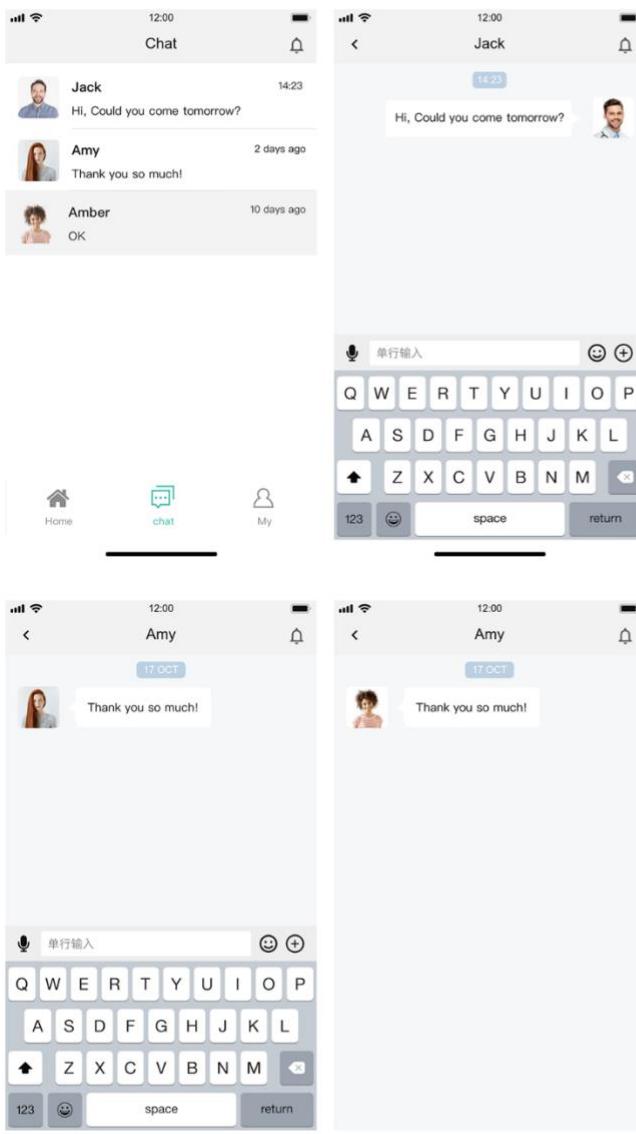
Body temperature	>
Heart rate	>
Blood pressure	>

5.5.4. Chat page



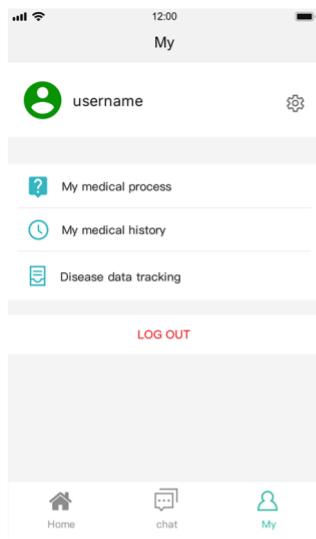
In patient's chat page, chats with doctors(current doctor in white bar and doctor saw patient before in grey bar) are shown. Time and content of the previous item are shown on the bar. When clicking white bar, patient can chat with doctor and see historical chat records, while patient can only see historical records when clicking grey bar.



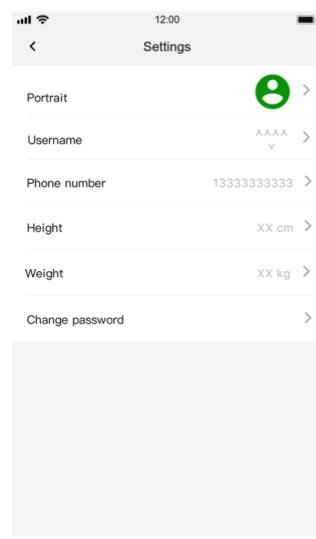


In doctor's chat page, chats with patients(patient under treatment in white bar and patient after treatment in grey bar) are shown. Time and content of the previous item are shown on the bar. When clicking white bar, doctor can reply patient and see historical chat records, while doctor can only see historical records when clicking grey bar.

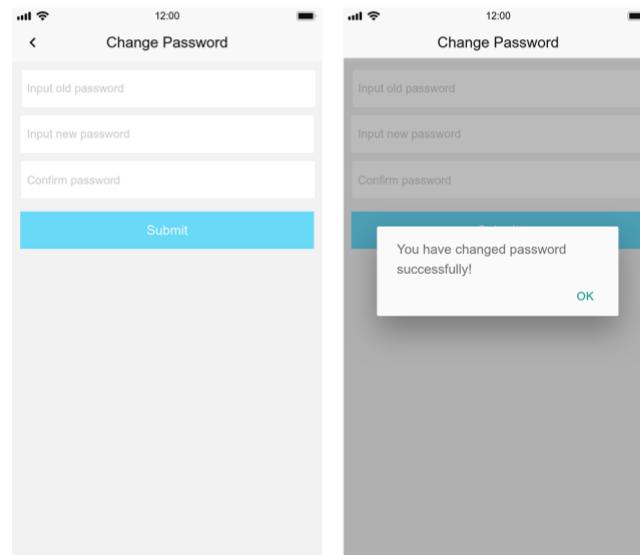
5.5.5. My page for patient

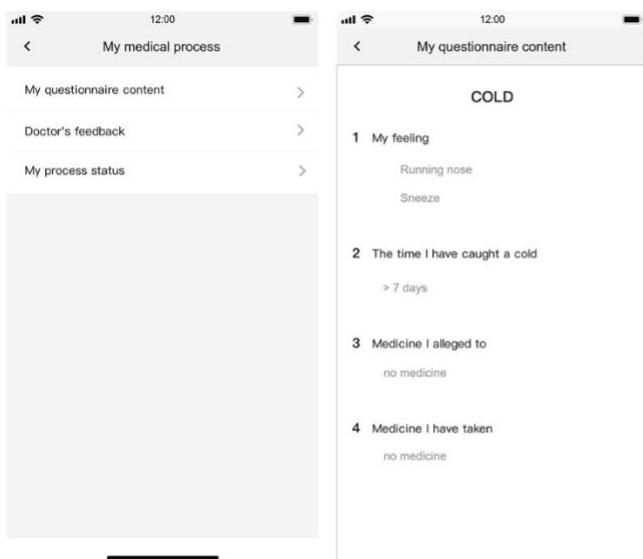


In My page, patient can change his/her basic information by clicking "screw" pattern to Settings page. Patient can view his/her medical process, medical history as well as data tracking by choosing these categories. Also, he/she can log out the system by clicking LOG OUT.



In Settings, patient can change his/her Portrait, Username, Phone number, Height, Weight as well as Password. When changing password, patient should input new password after typing in old password.

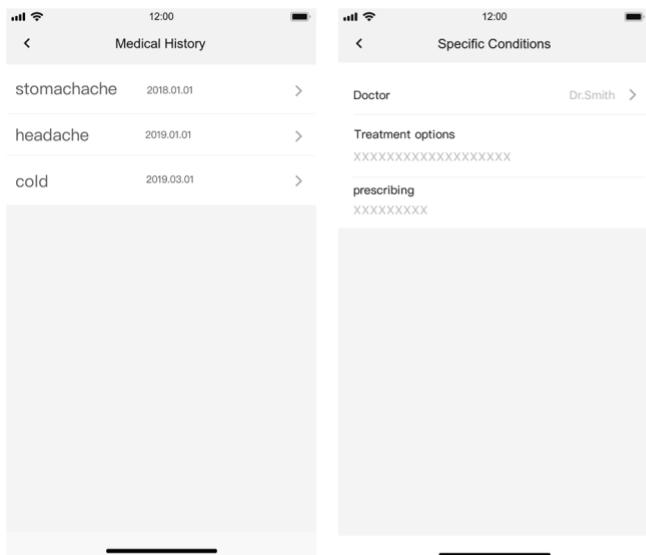




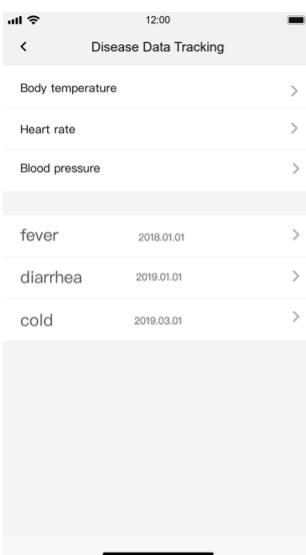
In My medical process, patient can view his/her questionnaire content, doctor's feedback as well as process status.

Parameter	Value	Unit
1 Your Height	185	CM
2 Your Weight	85	KG
3 Your Blood Pressure	110/65	mmHg
4 Your Heart Rate	80	BPM
5 Your Temperature	37.0	°C
6 Your BMI (Weight/Height^2)	22	

Your final physical condition:
Good

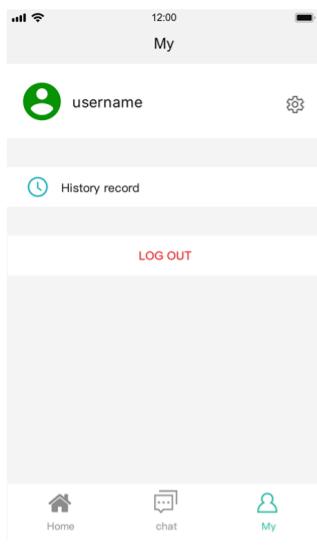


In My medical history, patient can view his/her history treatment time. When he/she click right arrow in certain record box, specific conditions would be shown.

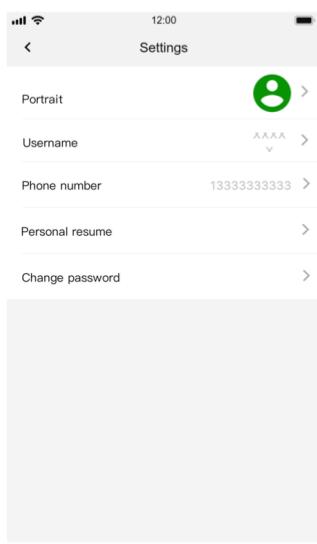


In Disease Data Tracking, patient can see his/her realtime body temperature, heart rate and blood pressure if sensors are worn. Otherwise, data collected last time would show. In addition, patient can view his/her historical disease time.

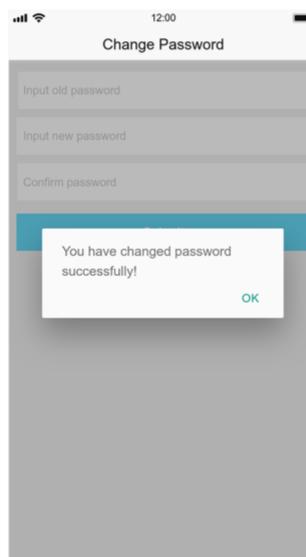
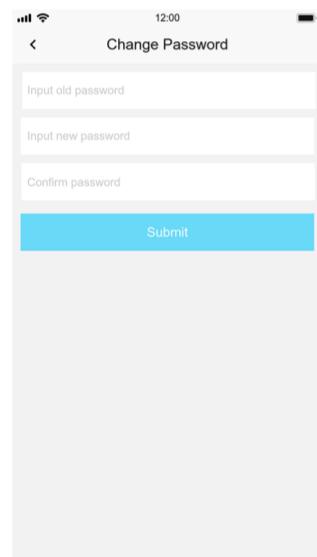
5.5.6. My page for doctor



In My page, doctor can change his/her basic information by clicking “screw” pattern to Settings page. Doctor can view his/her historical treatment record by choosing these History record. Also, he/she can log out the system by clicking LOG OUT.



In Settings, doctor can change his/her Portrait, Username, Phone number, Personal resume as well as Password. When changing password, doctor should input new password after typing in old password.





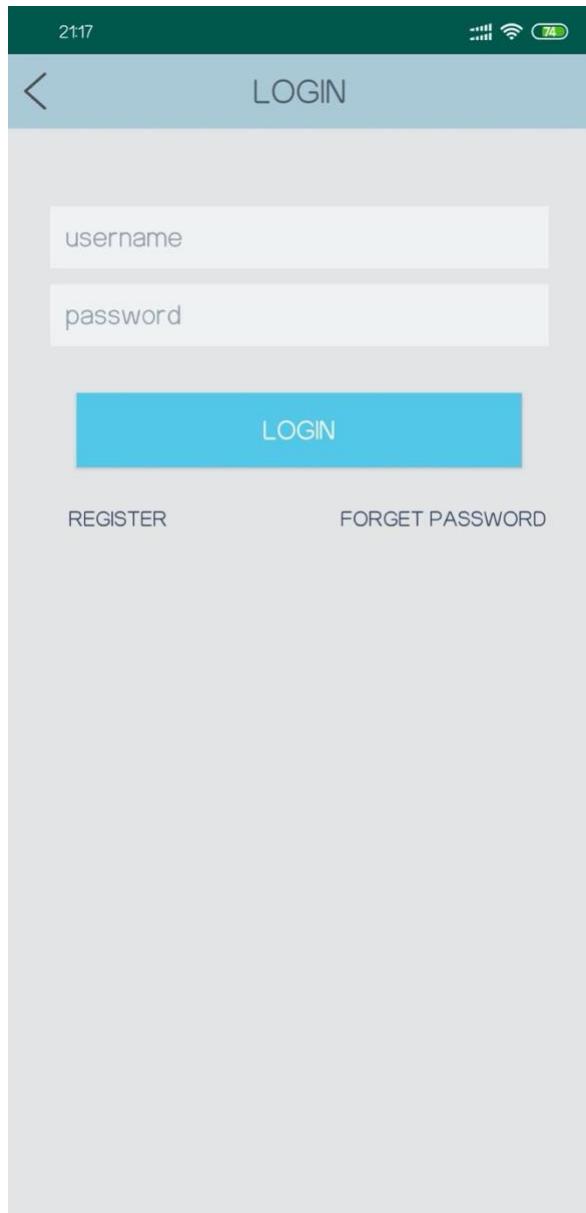
In History, doctor can view treatment time for historical patients. By clicking the right arrow in each treatment box, doctor can see detailed treatment record.

5.6. Application interface design

This part is the final version of our application interface design implemented by front-end. Only key interface pages are put here and there is also the introduction of main function to each key interface. For pictures of all user interface design, they are put to **11.2. User manual (page93)** as appendix.

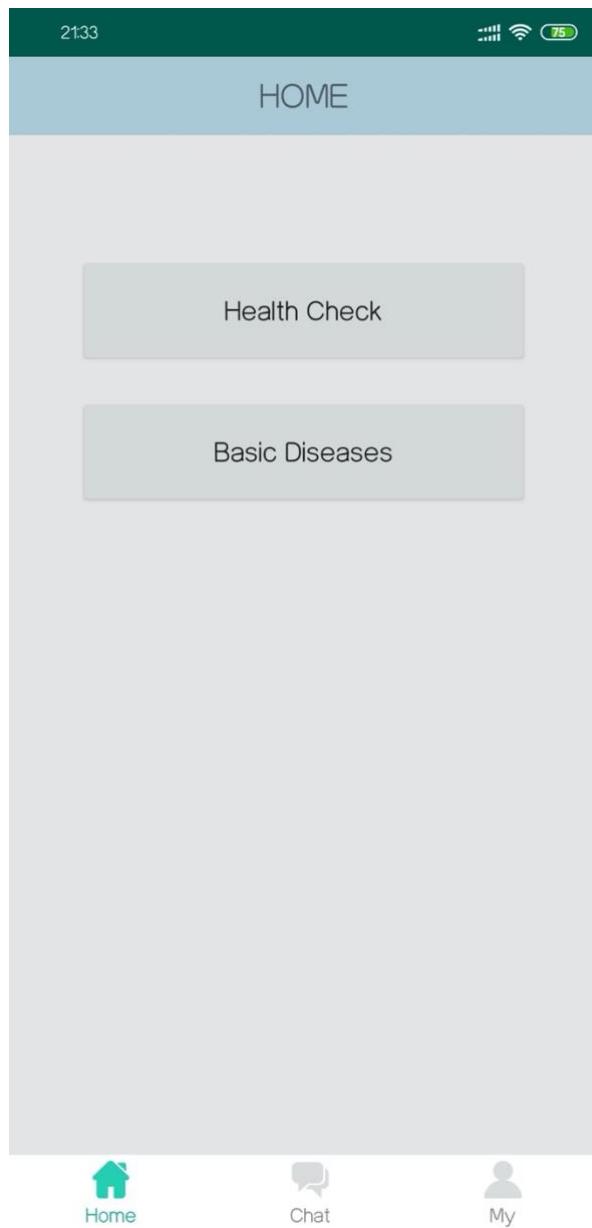
The whole application is divided into several main parts: account operation part, Home page part, CHAT page part and MY page part.

5.6.1. Account operation part

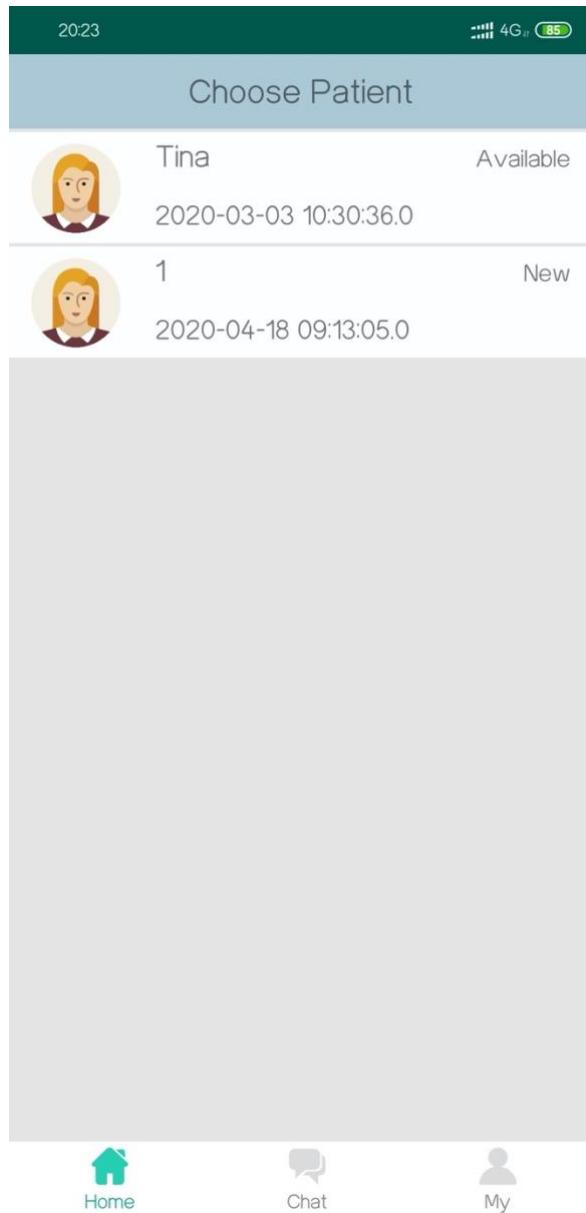


In account operation part, users can select user type (doctor or patient) when first using the application. They can register, log in their account and reset password if they forget password.

5.6.2. Home page part

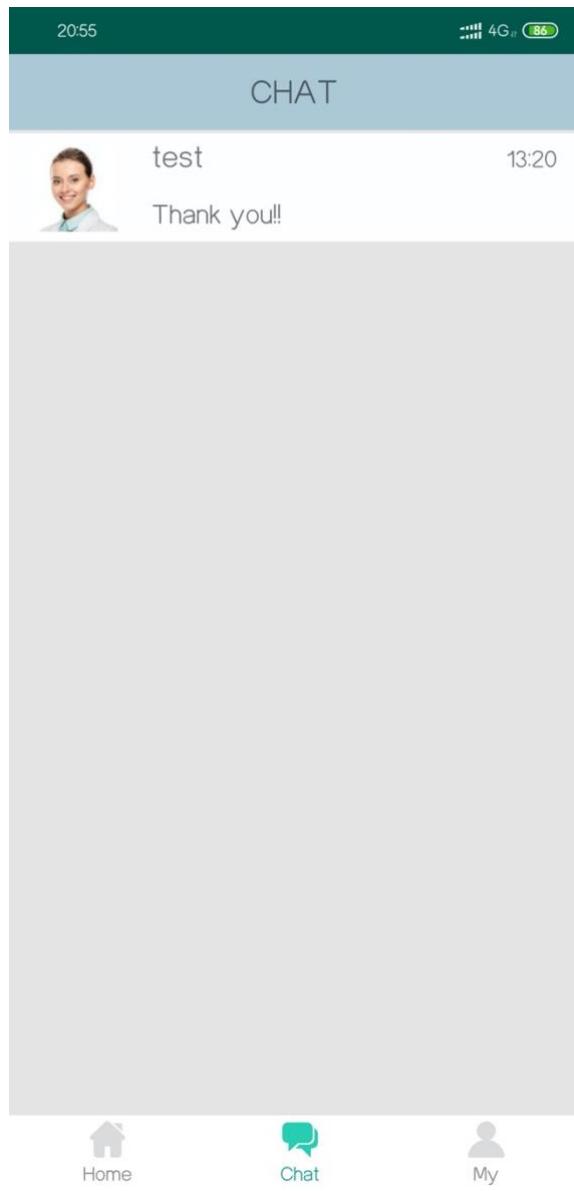


This is the HOME page for patient. In this part, patients can have a regular health check by completing questionnaire and wearing sensors to collect their basic physical data. They will get their health report with summary of physical condition after finishing the health check. Besides, patients can see a doctor for certain diseases: cold, headache and stomachache.



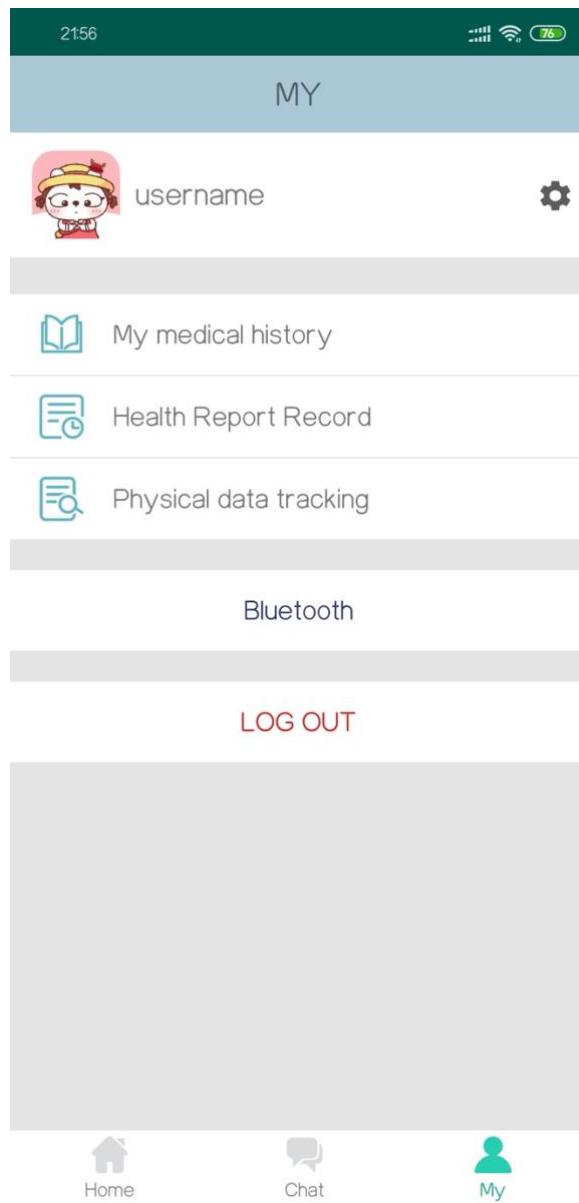
This is the HOME page for doctor. In this part, all patients (patients under treatment and patients waiting for treatment) allocated to the doctor would be shown. Patients with “new” tag are those who have not started treatment yet, doctor need to give a checklist according to the form of physical condition patients filled in. Patients with “available” tag are those who are under treatment, doctor can modify their checklist and check their real-time physical data collected by sensors.

5.6.3. Chat page part

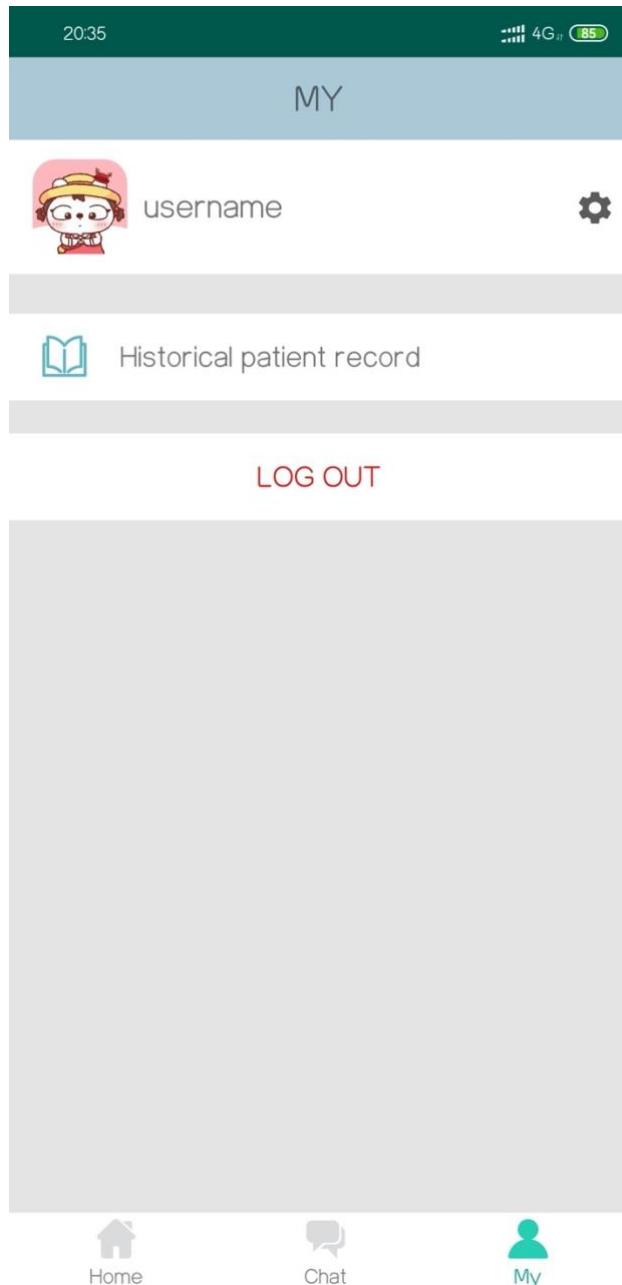


In CHAT page part, chats with doctors/patients are shown. Time and content of the previous item are shown on the bar. When choosing a chat bar, users can chat with the corresponding user. Patient can only view the chat with current doctors. If patient has finished the treatment, the chat with the doctor will disappear automatically. Users can send text messages to each other.

5.6.4. MY page part



This is the MY page for patient. In this part, patient can change basic information by clicking pattern in the top right corner to SETTINGS page. Patient can view his/her medical process, health report record, physical data tracking and connecting Bluetooth by choosing these categories. Also, he/she can log out the system by clicking LOG OUT.



This is MY page for doctor. In this part, doctor can change basic information by clicking pattern in the top right corner to SETTINGS page. Doctor can view his/her historical treatment record by choosing "My medical history" button. Also, he/she can log out the system by clicking LOG OUT.

6 IMPLEMENTATION

6.1. Introduction

This part will discuss the project's implementation, including the major system components and code hierarchy.

6.2. Major system components

In the whole OutPatient Monitoring mobile App project, there are three major components: **front end**, **back end**, **Bluetooth and sensor**. All these three components (source code) are written by groups.

6.3. Front end

The front end includes all user interfaces related to this App. It can be classified as **Adapter package**, **Chat package**, **Doctor package**, **Model package**, **Patient package**, **MyApplication** and **SelectUserActivity**

1. Adapter package

This package was designed for the ListView widget of user interfaces. There are four Java classes in this package, they are respectively **MyAdapters**, **MyCommunicationAdapters**, **MyHistoryAdapters** and **MyRealtimeAdapters**. The function of ListView widget is to present a list of information according to a certain template.

Adapter is responsible for deciding this template and the number of lists should be displayed.

Every class in this package was responsible for one specific listview and all of them clarify the following information: which template (layout source file) should be used, which type of information should be used, how to display information according to the template.

2. Model package

This package was designed for java classes in the Adapter package.

As mentioned before, adapters decide which type of information should be used in ListView. Then, all the information is collected to define a model(class). Objects of the model can be created according to the data stored in the database and then used by classes in the Adapter package.

3. Doctor package

This package was designed for completing the realization of all front-end functions of doctors. There are three sub-packages and three activities: **HOME package**, **LOGIN package**, **MY package**, **DocChatActivity**, **DocChatContentActivity** and **DoctorPageActivity**.

(1) LOGIN package was designed for implementing all functions related to login. There are three sub-packages: **Login package**, **Register package** and **ForgetPassword package**.

1. **Login package** was designed for normal login.
2. **ForgetPassword package** was designed for doctors when they forgot their password.
3. **Register package** was designed for registration.

(2) MY package was designed for doctors to update certain information and access their historical patients' information. There are two sub-packages and one activity: **History package**, **Setting package** and **DocMyActivity**

1. **History package** was designed for storing information of historical patients.

2. **Setting package** was designed for changing doctor's personal and account information: password, phone number, resume avatar and username.
3. **DocMyActivity** was designed for displaying start page which contains the functions mentioned above and log out.

(3) Home package was designed for connecting doctors and Patients. There are two sub-packages and two activities:
NewPatient package, OldPatient package,
DocChoosePatientActivity, DocPatientPersonalInforActivity.

1. **DocChoosePatientActivity** was designed for doctors to choose patients, including new patients and old patients.
2. **DocPatientPersonalInforActivity** was designed for displaying the patient's personal information: name, gender, age, height, weight.
3. **NewPatient package** was designed for doctors to implement actions need to perform for new patients: understanding the patient's condition, making a checklist based on the given information.
4. **OldPatient package** was designed for doctors to implement actions need to perform for old patients: checking the physical data, updating patient checklist completion and writing feedback for finished patients.

(4) DocChatActivity was designed for doctors to chat with patients. Doctors can choose to chat with the patient they are responsible for to get extra information.

(5) DocChatContentActivity was designed for doctors to chat with a specific patient.

(6) DoctorPageActivity was designed for jumping among pages: Home page, Chat page, My page.

4. Patient package

This package was designed for completing the realization of all front-end functions of patients. There are four sub-packages and one activity: **Bluetooth package, CHAT package, MY package, HOME package, PatientPageActivity**

(1) Bluetooth package was designed for communicate with sensors achieving data interchange.

Patients can measure their body temperature, blood oxygen and heart rate. These data can be displayed on the Heath Check page of this App and store into the database.

Bluetooth package implement these functions as following:

1. Asking the Bluetooth root from the Android system and open the Bluetooth.
2. Scanning the sensors and pairing with them
3. Sending the specific measure requirements to sensors
4. Reviewing body feature data from sensors

(2) CHAT package was designed for patients to chat with doctors. It is modified from an open-source project HRLChatUi (<https://github.com/huangruiLearn/HRLChatUi>). It enables live chat

between patients and doctors. Besides, users can obtain a history record by sliding up the screen.

(3) My package was designed for patients to perform the following actions:

1. Updating their information, including height, name, weight, Password, phone number, username, avatar.
2. Viewing their historical treatment records
3. Viewing their health reports
4. Connecting the Bluetooth
5. Viewing historical physical data
6. Logging out

This package contains two special sub-packages: **photopicker package** and **PhotoPickerStart package**. These two packages are designed for changing the avatar by either selecting a photo from album or taking a new photo.

(4) HOME package contains six sub-packages and three activities:

Login package, ChooseDoctor package, ForgetPassword package, Register package, Questionnaire package, Treatment package, PatientHomeActivity, PatientBasicDiseasesActivity and PatientHealthCheckActivity.

1. Login package was designed for patients to log in and for new users, they also need to complete a questionnaire about their personal information.

2. ChooseDoctor package was designed for patients to either choosing their preferred doctors or allowing the system to allocate doctors to them automatically.

3. ForgetPassword package was designed for patients when they forget their password.

4. Register package was designed for patients to register new accounts

5. Treatment package was designed for patients to perform the following actions:

- 1). Selecting demands: Health check or Basic disease
- 2). Viewing their medical progress/health report
- 3). Conducting a new treatment
- 4). Completing the corresponding questionnaire.

6. Questionnaire package was a collection of classes make up dynamic (working out at running time) questionnaires, which contains InputQuestionAnswer, Question, Questionnaire, SelectionQuestionAnswer and SubQuestionnaire.

7. PatientBasicDiseaseActivity was designed for a page dealing with two functions related to Basic Disease. Medical Progress Button is designed for patients to view feedback from doctors and progress of their ongoing treatment; while See Doctor Button is designed for starting a new treatment.

8. PatientHealthCheckActivity was designed for a page dealing with two functions related to health check. Health Report Button is designed for patients to view the last health check report, while Have a Check is designed for carrying out a new health check.

9. PatientHomeActivity was designed for displaying a start page which contains functions mentioned above.

(5)DoctorPageActivity was designed for jumping among pages:
Home page, Chat page, My page.

5. MyApplication was designed to obtain Activity object of the project.I

6. SelectUserActivity was designed for users to select their status:
doctor or patient.

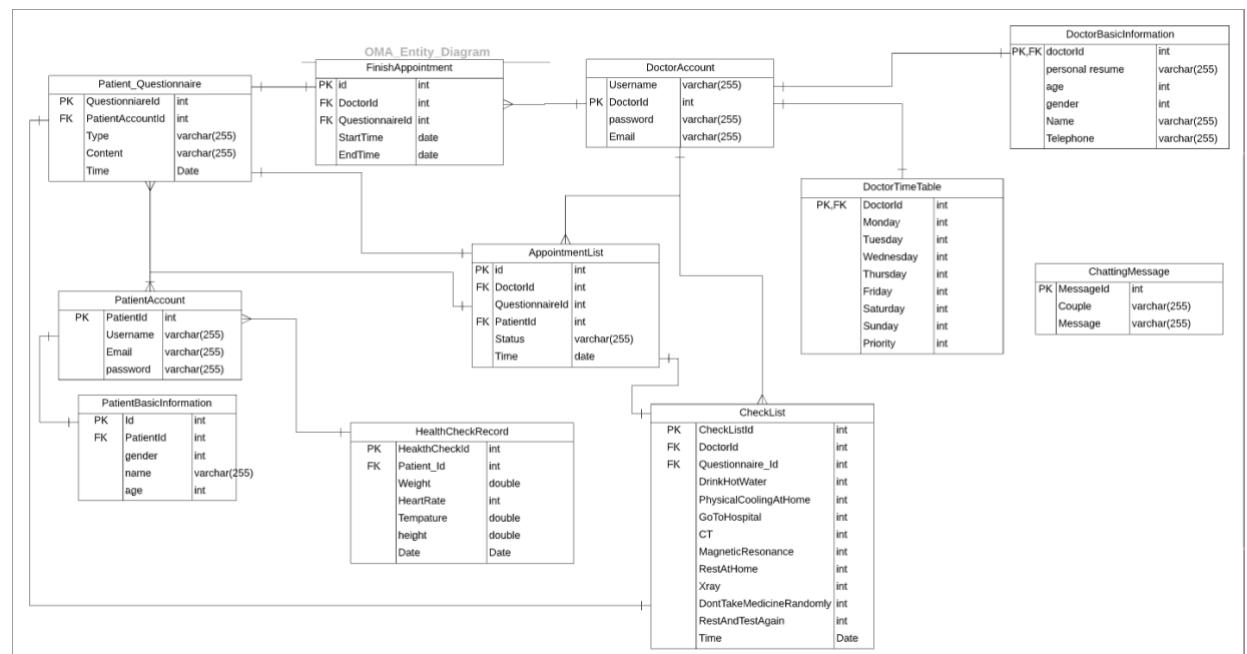
6.4. Back end

The back end mainly includes the **DATABASE** Package.

DATABASE Package

This package is about executing database operation. Database on the server can be connected so that the data about patients' questionnaires, feedback, checklist, data collected from sensors can be enquired and updated. Users can login and register.

Database design



The entity database diagram shows the relationship between every database table.

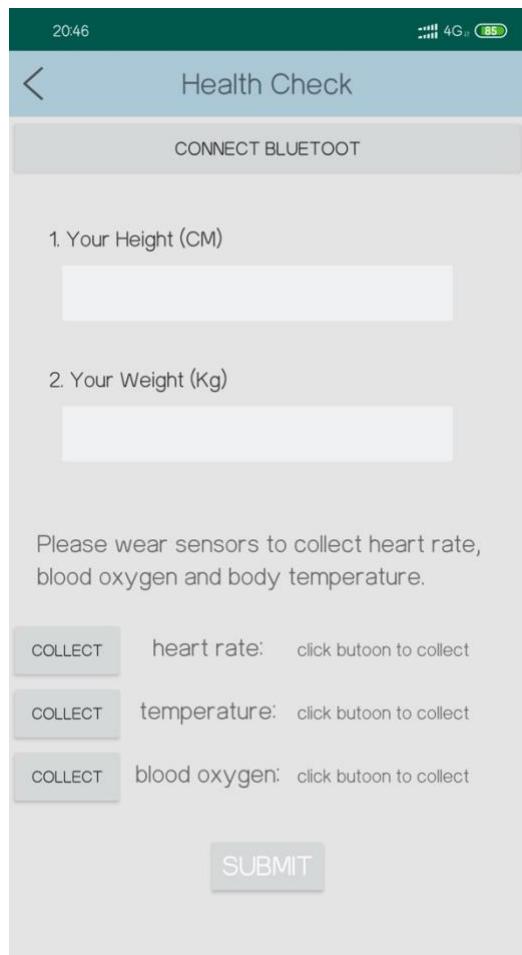
The tables DoctorAccount, DoctorBasicInformation, PatientAccount, PatientBasicInformation are used for users' registration, login and revise their personal information. ChattingMessage is used for doctor-patient communication. When patients fill in a questionnaire, the filled information will be stored in the table Patient_Questionnaire or HealthCheckRecord, then a doctor will be allocated according to the table DoctorTimetable. After that the information about which doctor is allocated to which patient will be stored in the table AppoinementList. Then checklist given by doctors for patient to carry out will be stored in the table CheckList. After patients decide to finish the appointment, the table FinishAppointment will be used to store the start time and end time of this treatment.

6.5. Sensor

When a patient consults a doctor, the doctor may need the patient's body data to determine the cause and measure the patient's condition. At this time, the patient can go to Health Checker page to measure the body data and generate a health report to send to the doctor. Base Sensor can measure body temperature, blood oxygen and heart rate. Patients can measure other data by adding sensors.

Firstly, when using the sensor, patients need to wear the sensor at their finger. Next, Clicking the connect button in the Heath Check page. It will jump to the Bluetooth page to scan and pair with sensor. And then, patients need to click collection button to require the sensor for measuring data. Because sensor miniaturization and function integration on a single chip. Patients need to measure their heart rate, body temperature and blood oxygen separately and keep it off for a few seconds to get the body data. These original data are collected and processed in the Arduino Mega 2560 with I2C serial sport protocol.

Next, Arduino Mega sent useful data to the app though the Bluetooth. Finally, clicking the submit button to upload the data to database and generate the health report. Patients can view the history of checking in the My page. The patients can also take an unlimited number of measurements until satisfied.



Clinking CONNECT BLUETOOTH button jump to Bluetooth view to pair with sensor.

It can insert your height and weight.

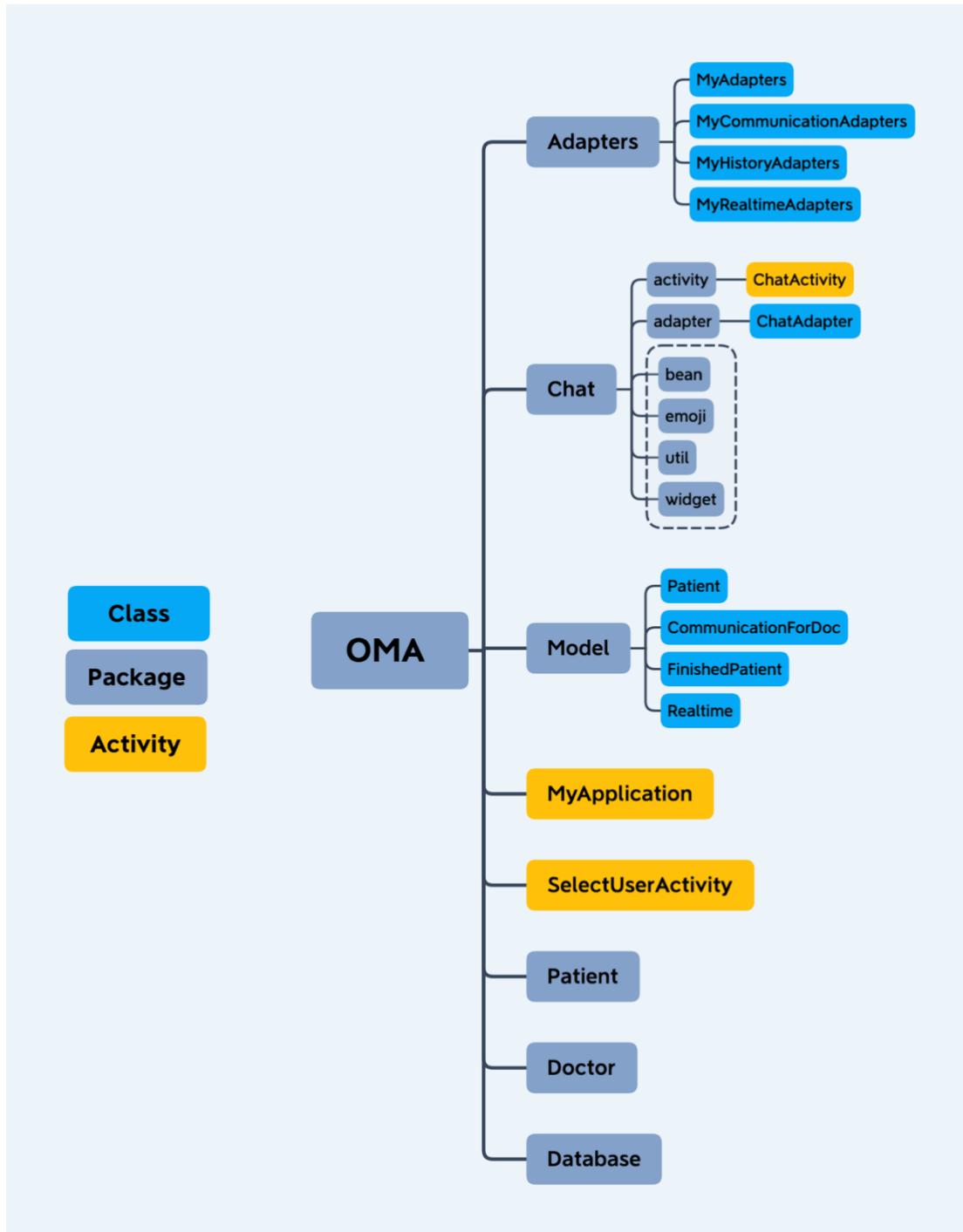
Clinking COLLECT button require the sensor collecting body data and submit to database.

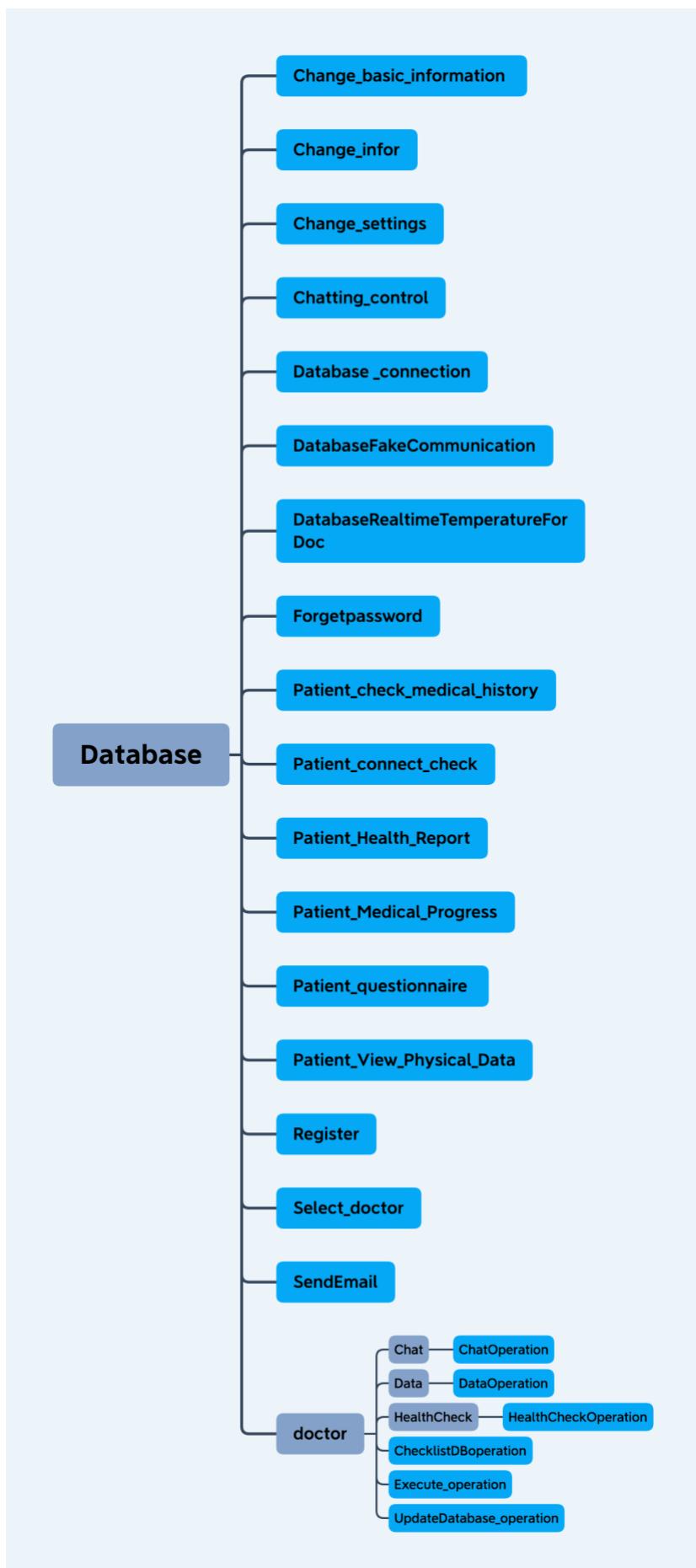
SCAN	Clinking SCAN button scan the paired devices.
LE-Manba	In this page, HC-05 is the Bluetooth of sensor name.
HAVIT I39	For special cases, different prompts about the user will help the user connect to Bluetooth.
HC-05	
SANSUI i23	
F2	
LE_WH-1000XM3	

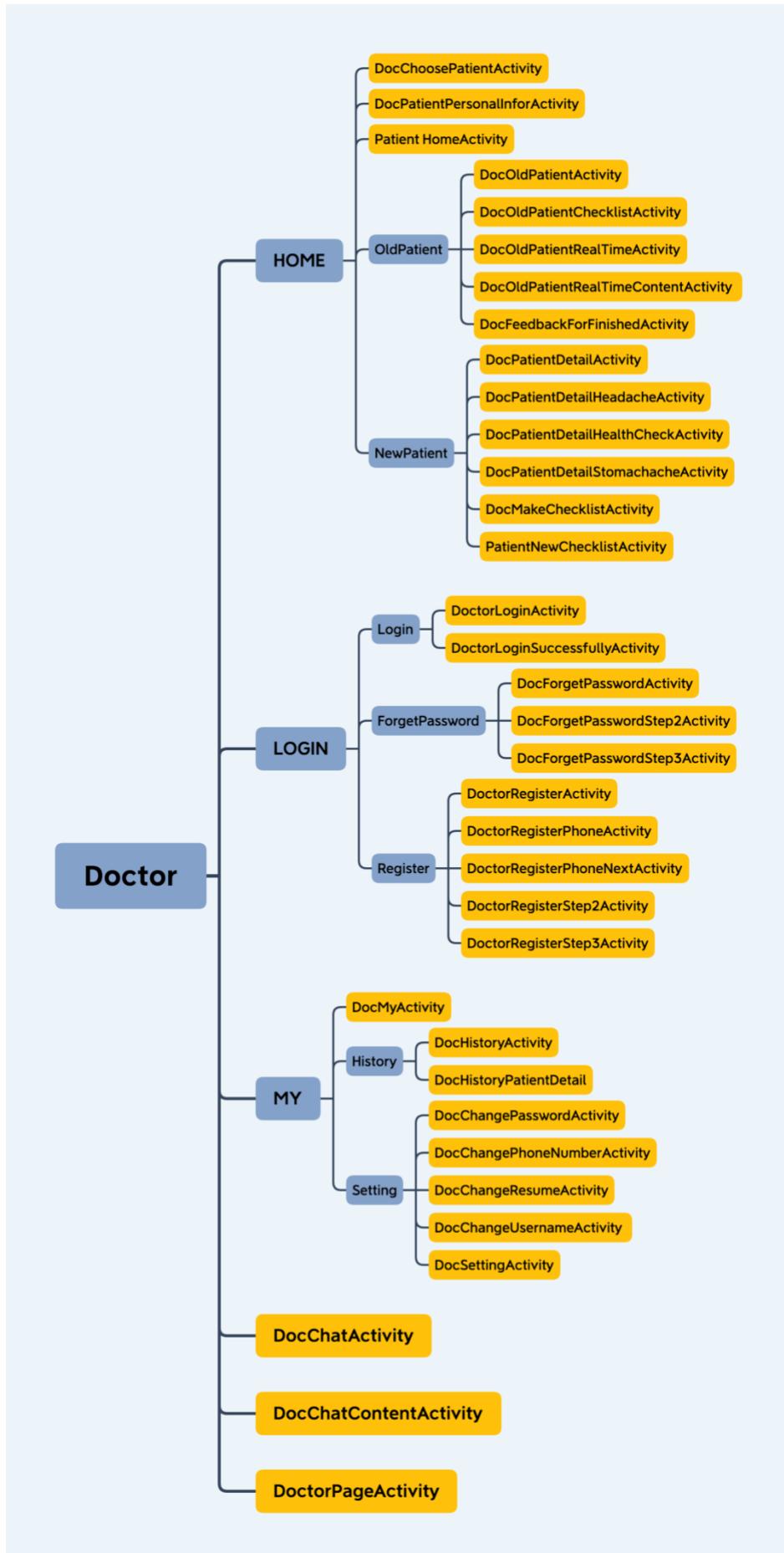
If cannot find the sensor in list
Please check whether pair with sensor in SETTING -> Bluetooth

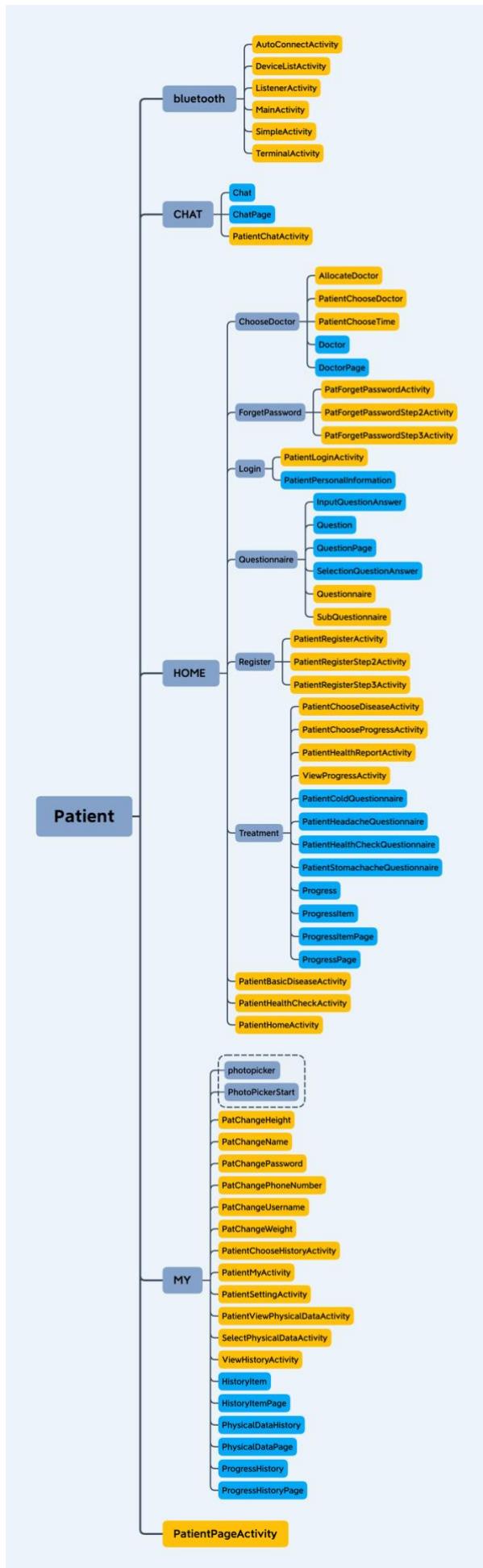
6.6. Code hierarchy

This part is the code hierarchy of our OMA application, which includes four parts: OMA, database, doctor and patient, as shown in next page:









7 TESTING

7.1. Introduction

We carried out many forms of testing to test our software. There are three major components in our project: front end, back end as well as Bluetooth and sensor. We tested the functional viability of the application by having the group members play the roles of the doctor and the patient through the actual medical procedure. Detailed test cases and test results are documented in the **11.3 Testing Records (page 134)**. In addition to functional testing, the team members conducted comprehensive testing in several parts. In this part, there are conclusions of testing split into several parts: system part, front-end part, back-end part and hardware part.

7.2. System testing

The whole system can be tested by using the black box. The purpose of it is to evaluate the end-to-end system specifications.

Three types of test are used:

1. Functionary testing

The main functions of the system are testing. First, login, registration and forget password functions are tested. Then the main functions for booking order and operating on orders are tested to guarantee the performance. Finally, the chatting's continuity and usability are tested to check if this function is working well.

2. Recovery testing

Since we used the far-end server as the main carrier and we build the database on it, problems happened in the server can cause serious situation. So firstly, closing and recovering the database are tested, with the result that database

can be accessed again without track. Besides, the chatting part is also tested. When the chatting targets are not online, the information can still be stored into database and can be assessed as history.

3. Pressure test

In order to test the usability of the software, we used five real phones to test the whole project, three for patients and the others for doctors. The patients and doctors performing the operations at the same time (including booking, operating on questionnaires and chatting part). Above operations work well. This is used to ensure the whole function's stability when multiple users are using the app simultaneously.

7.3. Front-end testing

Front-end Testing focuses on testing Graphical User Interface, functionality and usability of application. Here are few points for testing:

1. All buttons work.
2. All page jumps are correct.
3. Layouts appear the same as what have been designed.
4. Users get tip saying 'Please enter correct email address' if the string they type in is not a valid email.
5. Users get tip saying 'Username and password cannot be empty' if either field is empty when they click login.
6. Users get tip saying that 'Passwords are inconsistent' if strings typed in 'Input Password' and 'Confirm Password' are different.
7. Users cannot enter letters in fields that only accept numbers like 'Height' and 'Weight'.
8. There appears pop up window saying 'no record' if there are no records

in a page.

7.4. Back-end testing

Back-end testing focuses on testing whether the system is able to respond to the events triggered by the users correctly. Here are a few points of testing:

1. Users can register if entering the verification code which is received in the email correctly. They will be informed if they enter the wrong verification code, enter the username which has been registered before.
2. If the entered password and username is not matched, users cannot log in successfully and get tip saying that "the username or password is wrong".
3. Users get tip which indicating whether they change their personal information such as name, telephone, password, resume, photo successfully.
4. Patients get tip indicating whether they submit the questionnaire successfully.
5. Patients get tip saying that "the connection to sensor is failed", "does not receive the data from the sensor" if the sensors are disconnected or fail to transfer data through Bluetooth.
6. Users get tip saying "fail to send message" if the messages are not sent successfully.
7. Doctors get tip saying "fail to give checklist" if the checklist fails to insert into database.

7.5. Hardware testing

Hardware testing focus on evaluating the stability of the sensor, user habits, system/sensor compatibility and error rate of measurement. it helped in approving and checking the functional, technical and non-functional requirements with the whole system. Furthermore, it allowed the team to track

bugs in device interaction and human-device interaction, such as sensor and measurement failed to connect due to improper user operation. Device testing is important because it ensures that potential users are satisfied with the quality of the device interaction, and also facilitates the more user-friendly design and improvement of the app.

The main feedback received from black-box testing:

1. If the tester moves his finger violently or fix variations in tightness, the measurement will fail.
2. Certain factors can cause finger temperature to change a lot, such as the weather and hand washing.
3. If the tester does not wear the sensor correctly, the measurement will be inaccurate or fail
4. Tester loses patience for waiting the data and think whether the sensor damage, because measurement process needs about 10 seconds obtaining multiple data to get a relatively stable data.
5. When connecting Bluetooth, if tester back to the home page of android, app will connect Bluetooth fail.
6. App can't scan the sensor, if Bluetooth doesn't pair with the sensor at the setting of android.
7. The accuracy of the measurements is about ninety-three percent.

8 ACHIEVEMENTS

8.1. Overview

An android application aimed at providing patients remote treatment and physical data monitoring is developed. Two user types are considered in this application: patient and doctor. Users can sign up with their email and sign in with username and password. For the role of patient, they can take health check by filling basic information and wearing sensors, after which health report will be available on application. Besides, they can see doctors for basic diseases such as cold and stomachache, during which doctor sends checklist as guide. In addition to two main functions in HOME page, patient can see history for treatment and physical data as well as changing setting in My page. For the role of doctor, they list treatment steps after receiving questionnaire feedback from patients and update progress according to patients' feedback and up-to-date physical data, which updates on patient end synchronously. In My page for doctor, history for treatment can be looked up and basic information can be modified. Chat function is developed for both patient and doctor's convenience so that they can communicate during treatment period.

8.2. Achievements for user requirement

1. User can choose their user type (patient or doctor)
2. User should firstly provide their email and verification code sent to their email before they have right to create their own account.
3. User can register with their unique username, and password.
4. User can reset their password after entering their email and verification code sent to their email if they forget password.
5. User can change their password after logging into their accounts successfully.
6. User can log in with their username and password.

7. For patient who firstly uses this App, they should complete a personal information questionnaire containing name, gender, age and phone number.
8. User can update certain personal information in Setting.
9. For doctor who firstly uses this App, they can complete a personal information questionnaire containing name, gender, age, personal resume (degree, professional experience, major) and phone number.
10. Patient can choose “basic diseases” or “health check” according to their requirements.
11. Patient can wear sensors to report their temperature, blood oxygen and heart rate.
12. If patient wants to have a health check, they need to fill in height and weight in questionnaire as well as wear sensors., after which a health report will be available in “Health Report” in which reported temperature, heart rate, blood oxygen and BMI (Weight divided by the square of height) are shown. In addition, conclusion for their physical state is written at the end of the report.
13. Patient can choose a specific disease from headache, cold, stomachache after clicking “See doctor” in “basic disease”.
14. Patient can submit the questionnaire
15. Patient can choose their preferred doctors and time if they like.
16. Patient can see their medical progress on App when either his/her application has been received by the doctor.
17. Patient can send a message to doctor who is responsible for their current treatment in “CHAT” part.
18. When treatment terminates, chat box with that doctor disappears in chat box.
19. Patient can view their treatment progress (updated checklist) in “Medical progress” of “Basic diseases” in “HOME”
20. Patient can view their history records on “MY” page.
21. Patient can view their physical data tracking on “MY” page.
22. Patient can log out.

23. Doctor can see the list of the patients who are waiting for treatment.
24. Doctor can check the questionnaire information about each patient, after which they will work out a checklist as a treatment guide for patient.
25. Doctor can update patients' checklist according to information received from patients.
26. Doctor will receive chat boxes with patients who they are providing treatment for.
27. Doctor can see historical treatment on "MY" page.
28. Doctor can log out.

8.3. Achievements for system requirements

1. The system provides the interface for users to choose their user type (patients or doctors)
2. The system provides a registration page for users who use this app for the first time and prompt users to enter their phone number and verification code.
3. The system prompts users to enter their username, password and confirm password after they provide accurate verification code.
4. The system notifies users when the "confirmed" password is different from the first entered password when registering or resetting password.
5. The system prompts users to enter their personal information.
6. When logging in, the system prompts that the password is wrong if the password entered by the user is different from the password for that username on the database.
7. The system provides "forget password" button in the login page and when users click it, the system promotes users to enter their phone number and verification code. If the verification code is right, users are allowed to set a new password.
8. The system enables users to log out.
9. The system pops up a questionnaire for personal information when first time

user logs in.

10. The system pops up "Home" page when users log in successfully (except for the first time log in).
11. The system allows patients to choose the type of their requirements in "Home" page: " Health check" or "Basic Diseases".
12. The system pops up a questionnaire about health check after patients choosing "Have a check" in "Health check".
13. The system pops up page which let patients choose specific disease from three options: Cold, Stomachache, Headache after patients choosing "See doctor" in "Basic Disease".
14. The system switches to the page contains a questionnaire with related questions after patients choosing Cold/Stomachache/Headache.
15. The system pops up a window to check whether patients want to choose doctor and time by themselves or not after patients complete their questionnaire and click the "submit" button.
16. The system switches to the "Home" page If patients have chosen the "skip" button and finish all compulsory items. (the system will allocate doctor for them automatically)
17. The system switches to the "Choose doctor& time" page which contains available appointments if patients decide to choose doctor and time by themselves.
18. The system pops up a window to notify patients if they successfully choose their preferred doctor and time.
19. The system allows patients and doctors to chat in the "CHAT" page
20. The system terminates the conversation after the corresponding treatment terminates.
21. The system provides medical history and physical data tracking in patients' "MY" page.
22. The system allows patients to update their information after clicking the "setting" button on "MY" page.

23. The system allows patients to log out.
24. On the home page for doctors, the system enables doctors to check and view patients' inquiries.
25. The system indicates the status of patients (new, available), the name of the patients and the time of the inquiries.
26. The system enables doctors to see detailed information of the inquiries, including the result of the questionnaire, which is submitted by patients and the up-to-date temperature, heart rate, blood oxygen of patients.
27. The system enables doctors to give a checklist for patients to carry out and update it according to information received from patients.
28. The system enables doctors to revise their personal information.
29. The system enables doctors to check their historical treatment record.

8.4. Achievements for nonfunctional Requirements

1. User can access the data within permission only after they pass the authentication.
2. The confidentiality and completeness of the data are guaranteed.
3. The system checks data to prevent abnormal data.
4. The developed software runs on the android platform.
5. The developed software is connected through Bluetooth to the sensors and data transmit between them smoothly.
7. The system handles invalid input.

9 REFLECTION COMMENTS

9.1. Introduction

This part introduces the reflective comments during the early stage of the project and the development process of application, which includes the perspective of technical issues, project management and group work issues.

9.2. Technical issues:

For android development, with the release of Android 9.0, there is a new version of the support library called AndroidX and it is recommended to use instead of android.support library. However, there are large amount open source library using the old fashion library, which is incompatible with AndroidX. To make the open-source code used in our project work, we did a lot of research and migrated them to AndroidX.

For the registration stage, since the verification method with mobile phone number is difficult to implement, we changed to using email to send verification code.

With regard to sensors, original purchased equipment was not suitable for the actual operation of the project since the GSM of the SIM card is not convenient to transmit data from the sensor to computer. Therefore, we repurchased Bluetooth component to transmit the data. Our early stage plan decided to use smart bracelets as sensor. However, since it is not open source, we could not collect data and transmit to our app with it. As the solution for that, we bought sensor (MH-ET LIVE MAX30102) from Taobao which is able to test heart rate, temperature and blood oxygen. In addition, as the result of the outbreak of COVID-19, we could not go back to campus and sensors were only available to one member of our team, which brought much inconvenience to us.

As for the backend, due to lack of experience, we had difficulties in connecting android studio and our database at first, which took us great amount of time researching and implementation in early stage of our project. Fortunately, our application works fine with our database now.

9.3. Project Management and Group Work Issues

At the beginning of our project, based on each group member's respective skills, the division of our collaboration was simply divided into three parts: coding, prototyping and sensors testing. As the program process moved on, we constantly adjusted the division of tasks for each person. For example, in the process of application development, we divided ourselves into four parts: two members were responsible for front-end development, two members were responsible for back-end development, one member for connection of sensors and one for all function testing. We also divided out team into three small groups, each group has two members. The members of the group helped each other, and the three groups supervised each other to complete the tasks according to the schedule. This reasonable and flexible arrangement of personnel took a significant role in developing our application successfully.

For time plan, we had a complete and efficient project schedule at the beginning of our project. However, in the actual project developing process, time distribution and expectations do not conform to the plan. The main reason is that the virus outbreak lead to team member separately developed and tested in the home, no conditions to cooperate to complete development as planned together, which lead to unexpected difficulties and delayed the project developing process. In particular, for the chat function, the back-end development encountered difficulties, resulting in two weeks of delay in

finishing chatting part development, thus also leading to delaying in testing by two weeks.

For team management, we used some software to make our group work more efficient. First of all, we set up a We-chat group to share our progress and communicate with other members in real-time. In addition, we took an informal meeting via We-chat audio call every week to share our progress and discuss the plan for next period.

Secondly, Tencent Document was used to keep all documents related to the project. With the help of this Multi-person collaborative software, group members could edit files with each other in real time.

In addition, we used Trello (a Kanban-style list-making application) to make plan and assign work in early stage of our project. We created task boards in column ‘To Do’ to make assignments, move boards to ‘In progress’ and ‘Done’ to keep track of progress.

For version control issue, we used Gitlab as our remote repository. Each member created a branch from master and developed on it. Branches were merged to master from time to time (let others know your progress in time). Version control is of great significance since its records history, enables group working on the same project simultaneously and backups for the project. Detailed Gitlab pictures are showed in **11.3 Screenshots for Repository (page 145)**.

Overall, the team got connected strongly and our project got moving forward smoothly. We adjusted our plan flexibly to make sure the project can be done with high quality before deadline was due. For example, due to time limit and great difficulty of store audio picture message, we cut some chat functions and

made our chat part only available for text messages.

To summarize, efficient and orderly team management made our project moving forward successfully.

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<https://www.thatchermcs.com/blog?title=The%20Benefits%20of%20Java>

(Accessed: 14 November 2019).

11 Appendix

11.1. Real medical scenario

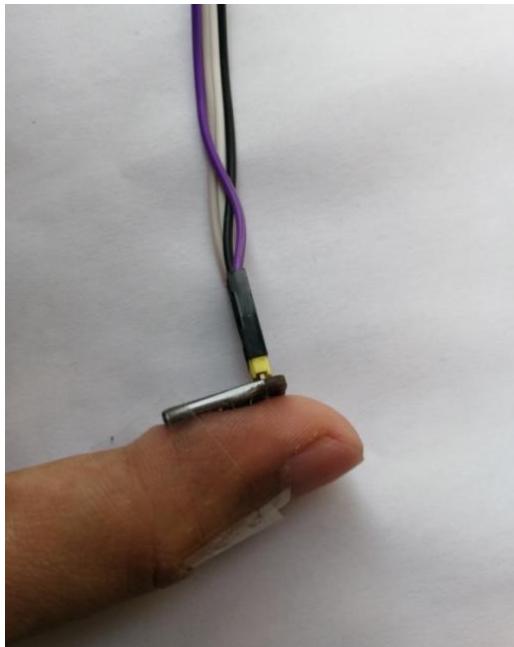
In this part, we will simulate the whole process of a real patient who have a cold from seeing a doctor to completing treatment through OMA application.

During the outbreak of COVID 19, Mike felt as if he had caught a cold. He did not want to go to the hospital because he was afraid of the risk of cross-infection of covid-19, so he installed OMA application on his phone through APK. He chose the user role as the patient, and then he registered the account by receiving the verification code via email and successfully logged in the account. Then he filled in his personal information.

Mike chose to **see a doctor** and chose the type of illness to be a cold. He first filled out a questionnaire about his cold illness. After filling out the questionnaire, he chose to ask Dr. Wang to treat himself on Monday.

When Dr. Wang opened OMA application and saw Mike's treatment request on the Home page, he selected several preliminary options for treating colds. Dr. Wang suspected that mike probably had a fever at the same time, so he sent Mike a message through the chat page, asking him to have a **health check** and measuring his temperature by wearing a sensor.

On Monday, Mike followed Dr. Wang's instruction and had a **health check**. He needed to wear a sensor to collect temperature data, as the following picture showed: (temperature, heart rate and blood oxygen are all collected the same as this way)



Dr. Wang would receive the data to further determine whether Mike had a fever due to a cold. Mike opened the Home page and chose to have a physical examination. He was instructed to enter his height and weight and to wear a temperature sensor to collect his body temperature. The data was uploaded to the database and was generated as a **health report** automatically.

After Mike finished his **health check**, he checked his **health report**, which showed his height, weight, temperature and BMI. The report concluded that his body temperature was higher than normal temperature and he had a fever.

Mike's body temperature collected by the sensor was uploaded to the database, from which doctor could receive the data. Then Dr. Wang could see Mike's body temperature directly in **real-time data**. Mike's temperature was higher than normal, and Dr. Wang diagnosed that he had a fever, so he modified his treatment options to drink hot water and physical cooling at home in **checklist**. In addition, Dr. Wang told Mike through the chat page, let him go to the drugstore to buy the corresponding cold and fever medicine.

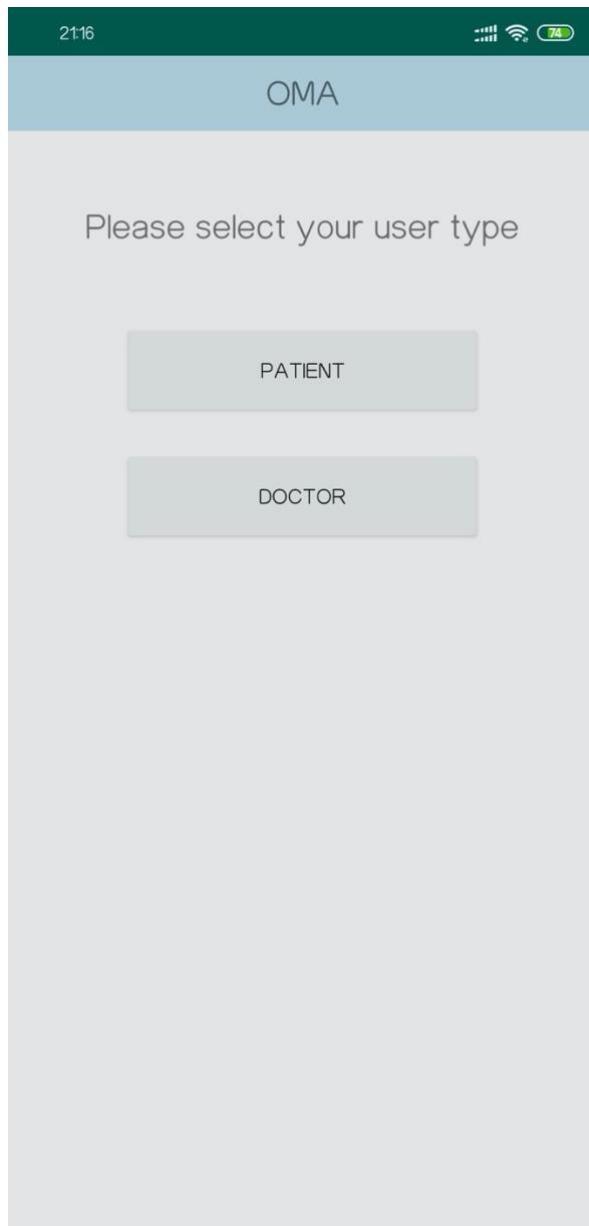
For the next week, Mike followed the treatment option in **medical progress**

and took his medicine at home, according to Dr. Wang's treatment plan, and kept in touch with Dr. Wang through the chat page to consult with him about the disease. Every time when Mike finished a **treatment option**, Dr. Wang would tick behind the option. When Mike finished all treatment options, Dr. Wang asked him to measure his temperature again, and the report showed that Mike's temperature was normal, and his adverse reactions to the cold had disappeared. His cold was cured finally. Dr. Wang wrote the feedback about the summary of treatment process and Mike can check it in **medical progress** page.

After finishing the treatment, Mike opened MY page, where he could view his **medical history**, **health report records** and **physical data tracking**, through which he can have a comprehensive review of the treatment process for the disease. He felt this OMA application is very convenient and useful for patients.

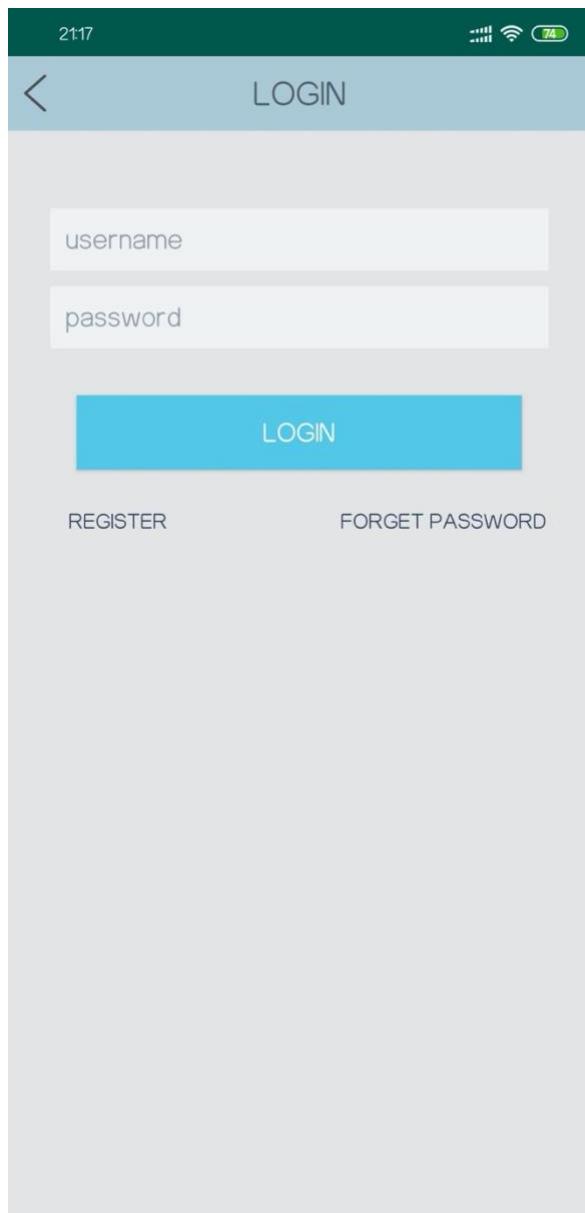
11.2. User Manual

11.2.1. Account operation



User type selection

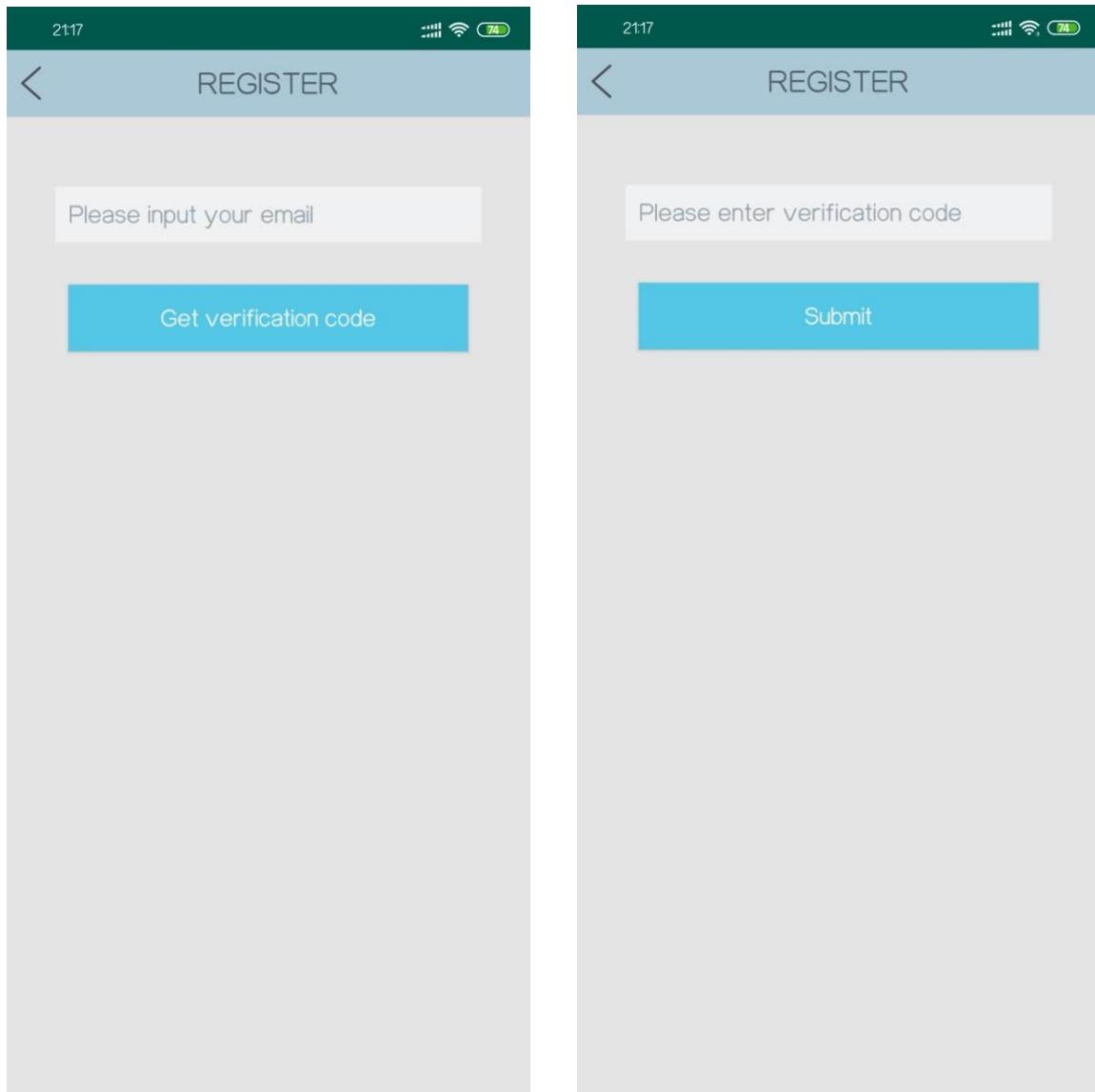
The system is designed for two types of users. In user selection page, either patient account or doctor account can be chosen. Click “PATIENT” or “DOCTOR” button to choose user type. As shown in the following figure.

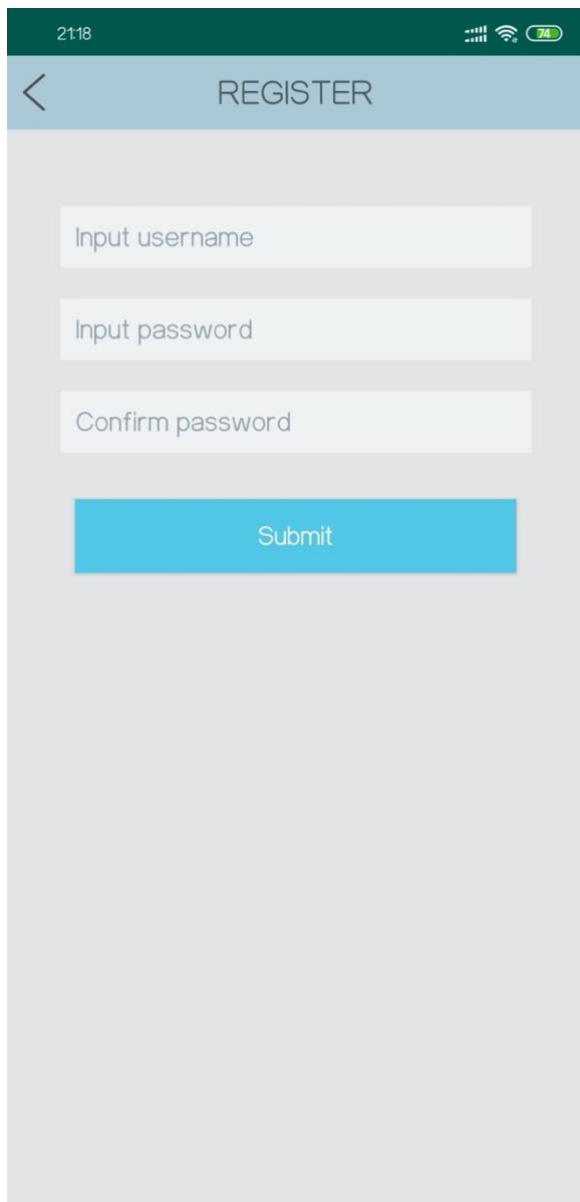


Sign up

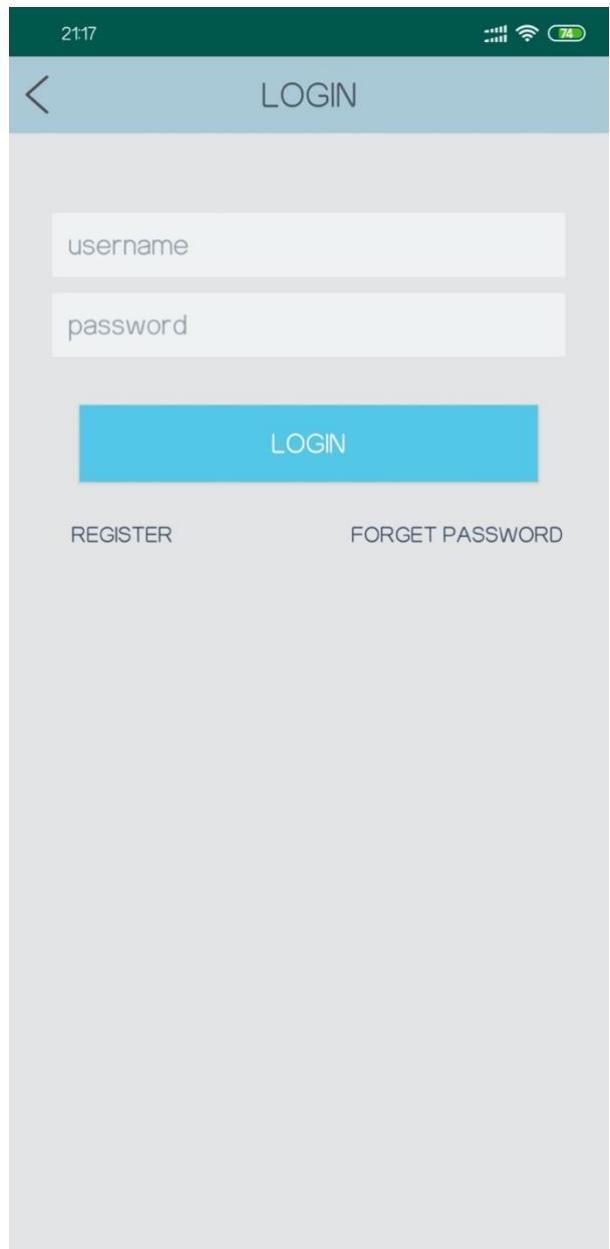
After selecting the user type, the user comes to the LOGIN page, the new user needs to click the “REGISTER” button in the lower left corner to sign up for an account.

In REGISTER page, user should firstly enter email address and click “Get verification code” button, then the backend system will send verification code to the email. User enters the verification code and click “Submit” button.



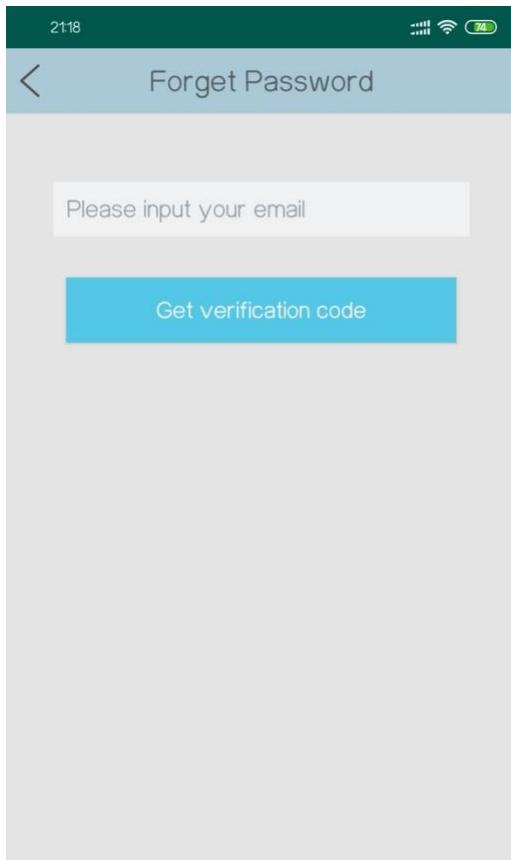


Finally, user needs to set the username and password then clicks “Submit” button. Now, the registration has been finished.



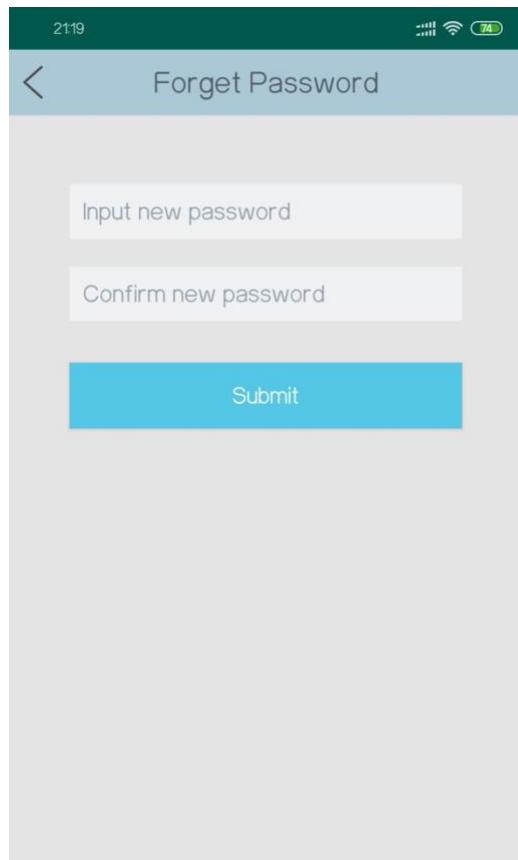
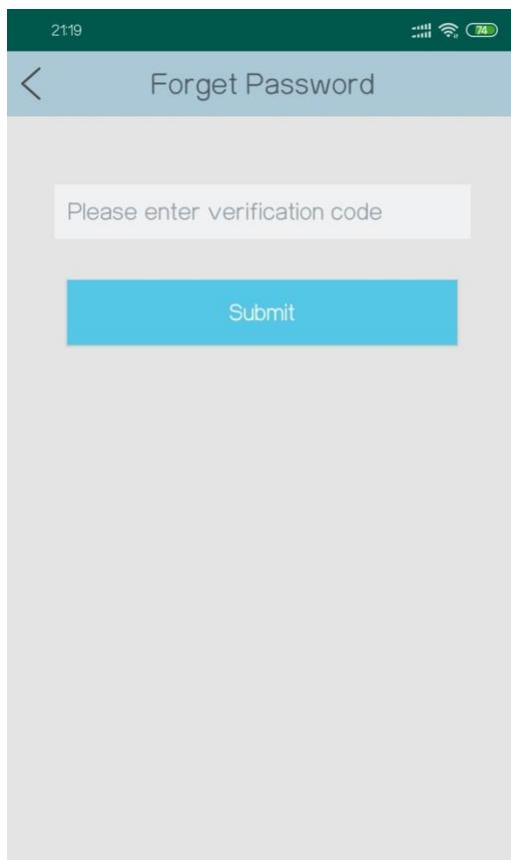
Login in

In LOGIN page (same for two kinds of users), user should enter username and password to login. There are also REGISTER and FORGET PASSWORD buttons.



Forget password

For those who have accounts but forget their password, they can click FORGET PASSWORD in LOGIN page to set new password. In FORGET PASSWORD page, after entering registered email address, verification code will be sent to phone. User should first enter code to do authentication then reset the new password.



Fill in user information

When user first login their account, both doctor and patient need to fill in a form for their basic information.

The image displays two side-by-side mobile application screens. Both screens have a dark blue header bar at the top with the time '21:28' and signal strength indicators. The left screen is titled 'Personal Information' and contains the following fields:

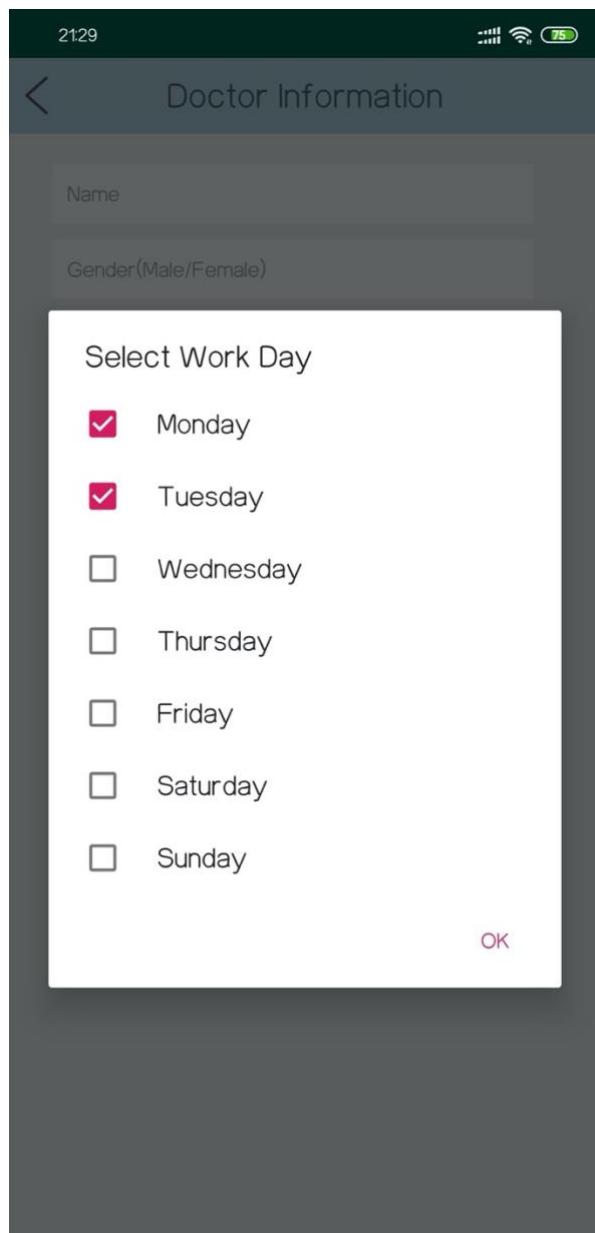
- 1. Your Name: An input field with a placeholder box.
- 2. Your Gender: A radio button group with 'Male' and 'Female' options. 'Male' is selected.
- 3. Your Age: An input field with a placeholder box.
- 4. Your Phone: An input field with a placeholder box.

A large 'SUBMIT' button is located at the bottom center of this screen.

The right screen is titled 'Doctor Information' and contains the following fields:

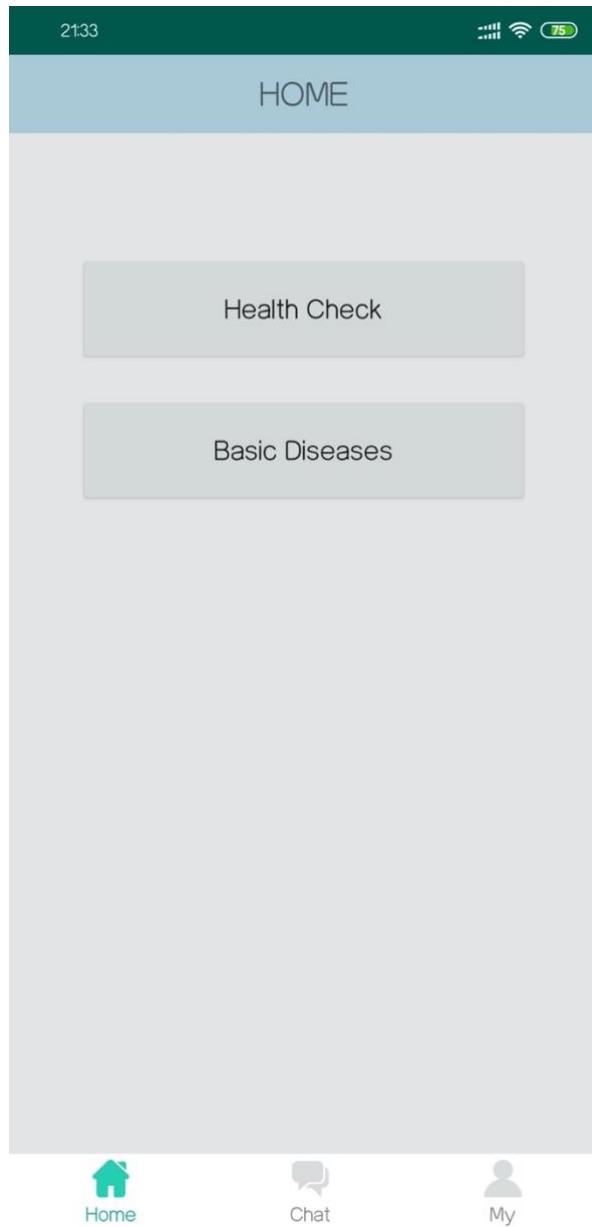
- Name: An input field with a placeholder box.
- Gender(Male/Female): An input field with a placeholder box.
- Age: An input field with a placeholder box.
- Phone: An input field with a placeholder box.
- Personal Resume: A large input field with a placeholder box.

Below the resume field is a 'SELECT WORK DAY' button, and at the bottom right is a 'SUBMIT' button.



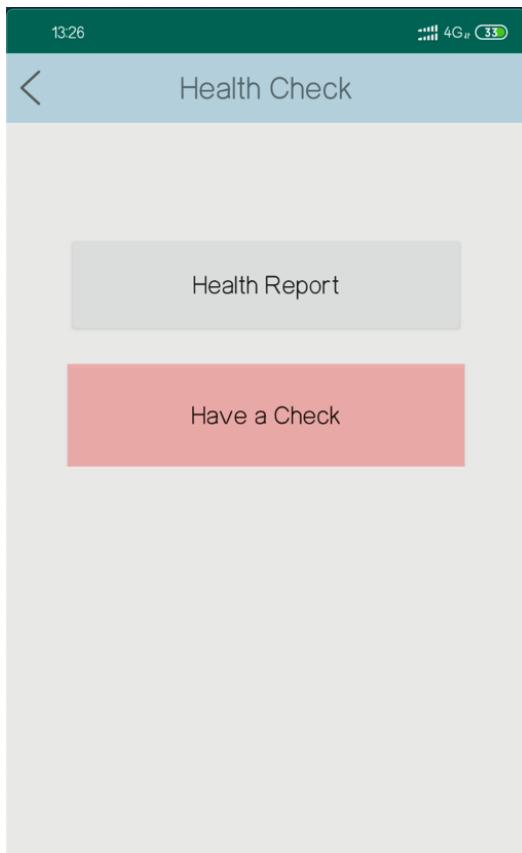
Doctor should also choose his/her “working days” from Monday to Sunday after finishing filling in the basic information.

11.2.2. Home page for patient



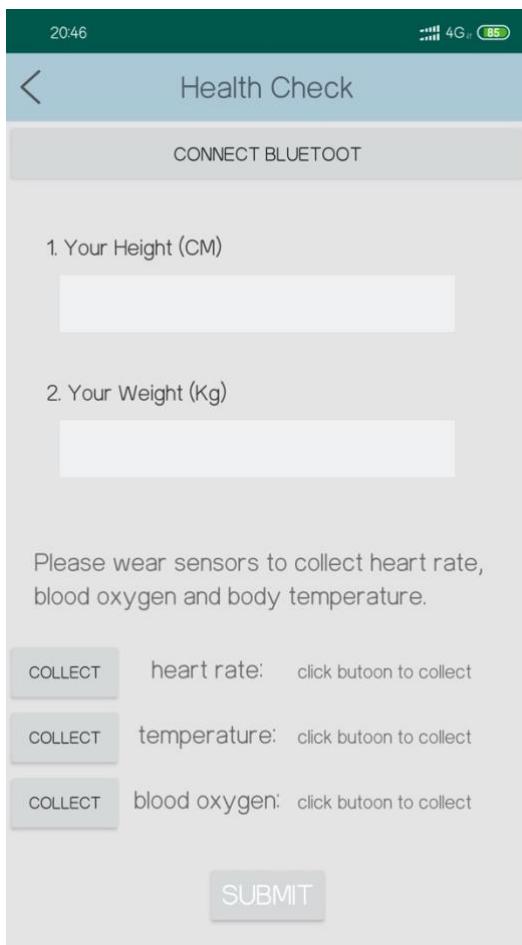
Home page

In HOME page, there are two buttons for selection, "Health Check" and "Basic Diseases". Patient can click "Health Check" button to do a simple body indicator test. If patient wants to see a doctor for diseases, he/she can click "Basic diseases" button.

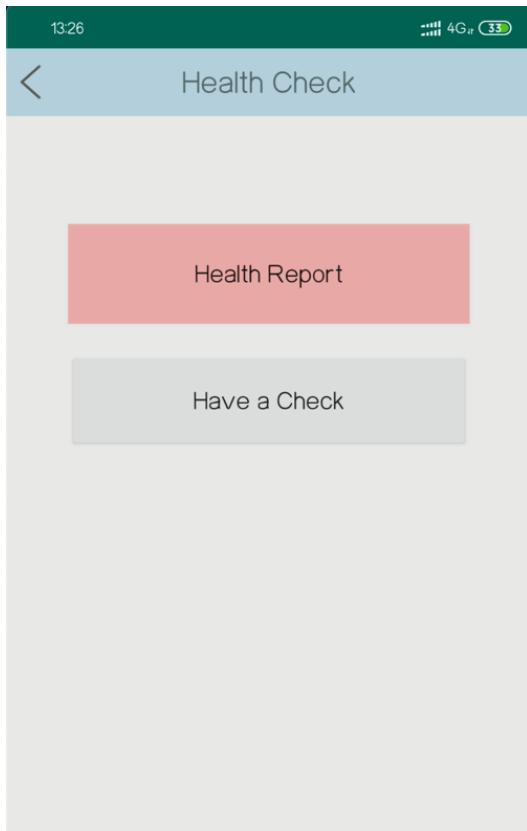


Health check

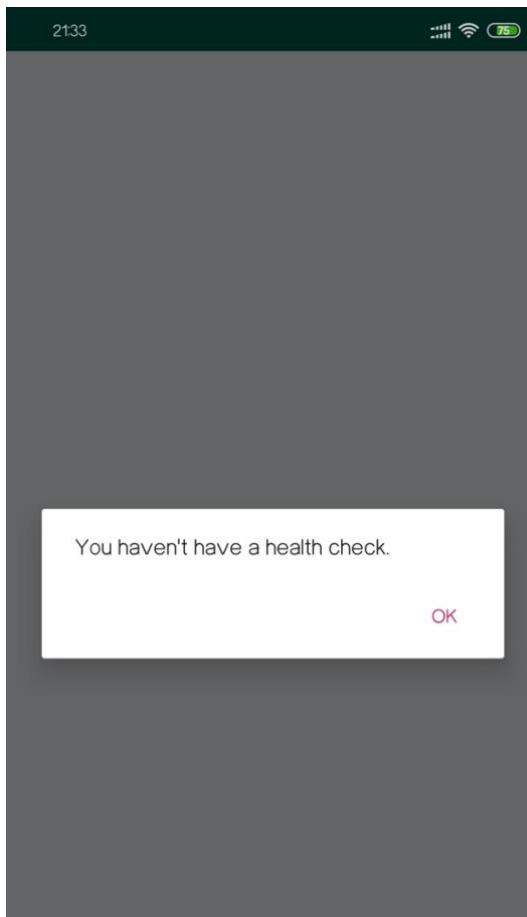
After clicking “Health Check” button, in the HEALTH CHECK page, patient first click “Have a check” button then fill in a form about his/her height and weight. Meanwhile, patient should wear sensors to collect information about heart rate, blood oxygen and body temperature. A health report would be available to patient soon after submitting the form.



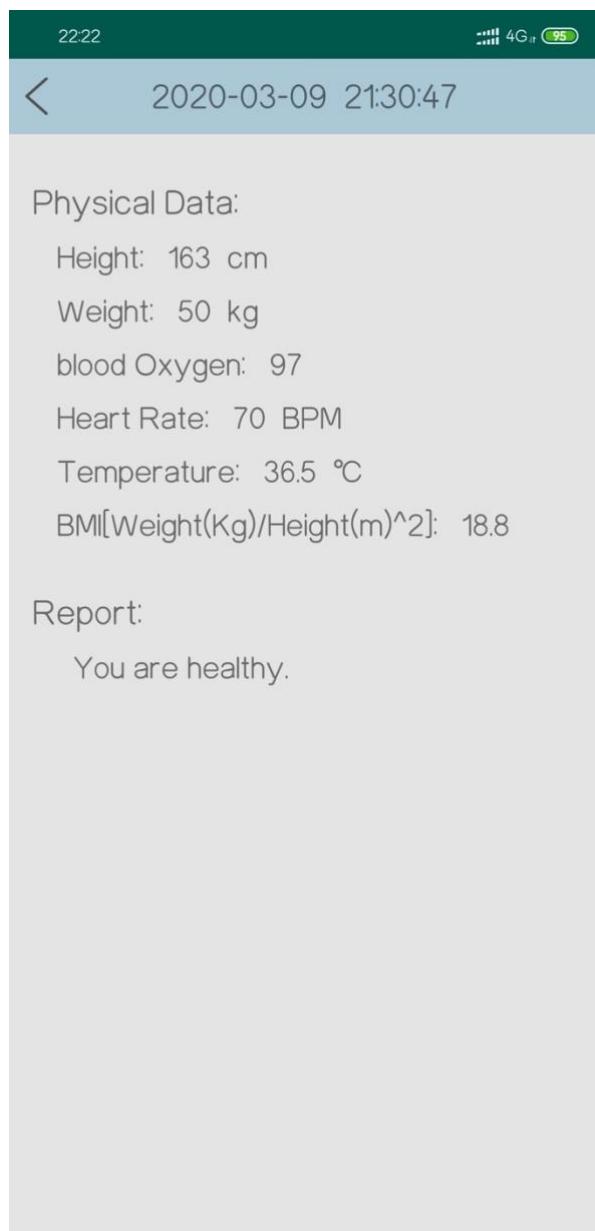
The patient can click “COLLECT” button to collect specific physical data. He/she can collect all three types of physical data or just collect one physical data. The data can be collected for many times.



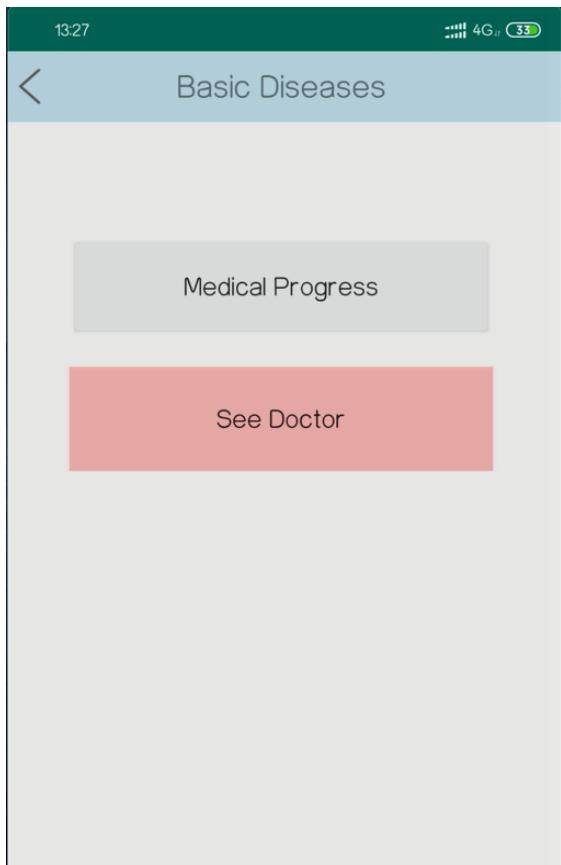
Then patient comes back to HEALTH CHECK page, he/she can click “Health Report” button to check the health report obtained before.



If the patient hasn't finished a health check, he/she cannot check the health report, and the application system will appear a default page to prompt the patient that “You haven't done a health check.”

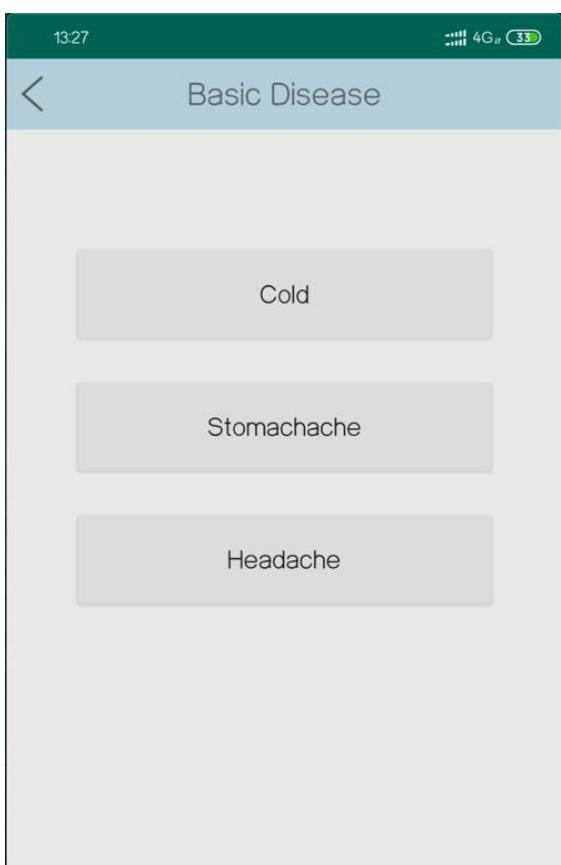


The report information includes height, weight, data from the sensors and a calculated BMI data. Finally, the report will give a conclusion about whether the patient is healthy or not. If the patient is unhealthy, the report will also conclude the diseases he/she has.



Basic diseases

After clicking “Basic diseases” button, in the BASIC DISEASES page, patient first click “See Doctor” button then choose a certain type of disease in three basic diseases: Cold, Stomachache and Headache.



After choosing the disease type, patient should need to fill in a form about their physical condition. Taking cold as an example, patient should select his/her feeling, duration of having cold and other information completely. The patient cannot submit the form if he/she does not fill in all questions, the application will prompt to complete the questionnaire.

2135 75

< Cold

1. Briefly describe your feeling (multiple choice)

Fever

Running nose

Dizzy

Cough

Sore throat

Sneeze

Headache

Phlegm

2. How long have you caught a cold?

< 3 days

3 - 7 days

> 7 days

> 14 days

3. List medicine you alleged to

4. Which medicine have you taken?

SUBMIT

The image shows a smartphone screen displaying a mobile application titled "Stomachache". The app interface includes a header bar with signal strength, battery level, and a back arrow. Below the header, the title "Stomachache" is centered. The main content area consists of several numbered questions with corresponding input fields:

1. Briefly describe your feeling (multiple choice)
List of options:
 - Belly colic
 - Pricking
 - Sudden pain
 - Sustained pain
 - Swelling pain
2. Select your pain area (multiple choice)
List of options:
 - Left upper abdomen
 - Upper abdomen
 - Right upper abdomen
 - Left abdomen
 - Center of abdomen
 - Right abdomen
 - Left lower abdomen
 - Lower abdomen
 - Right lower abdomen
3. Do you have other accompanying symptoms? (multiple choice)
List of options:
 - Fever
 - Cold sweat
 - Diarrhea
 - Vomiting
4. Have you eaten the below things? (multiple choice)
List of options:
 - Cold food and drink
 - Deteriorated food
 - Raw food
 - Long-awaited food
 - Wild vegetables and fruits
5. How long have you had a stomachache?
[Text input field]
6. Do you have the same symptom before?
 Yes
 No
7. Which medicine have you taken?
[Text input field]

SUBMIT

The image shows a smartphone screen displaying a mobile application for a headache survey. The app has a light blue header bar with the title "Headache". Below the header, there are five numbered questions with corresponding answer options.

1. Briefly describe your feeling [multiple choice]

Astasia
 Blurred vision
 Dizzy
 Hard to sleep
 Inappetence
 Nausea

2. How long have you suffered from headache?

< 1 days
 1 - 3 days
 about 1 week
 > 1 month

3. Please choose your type of headache

Persistent headache
 Intermittent headache

4. List medicine you alleged to

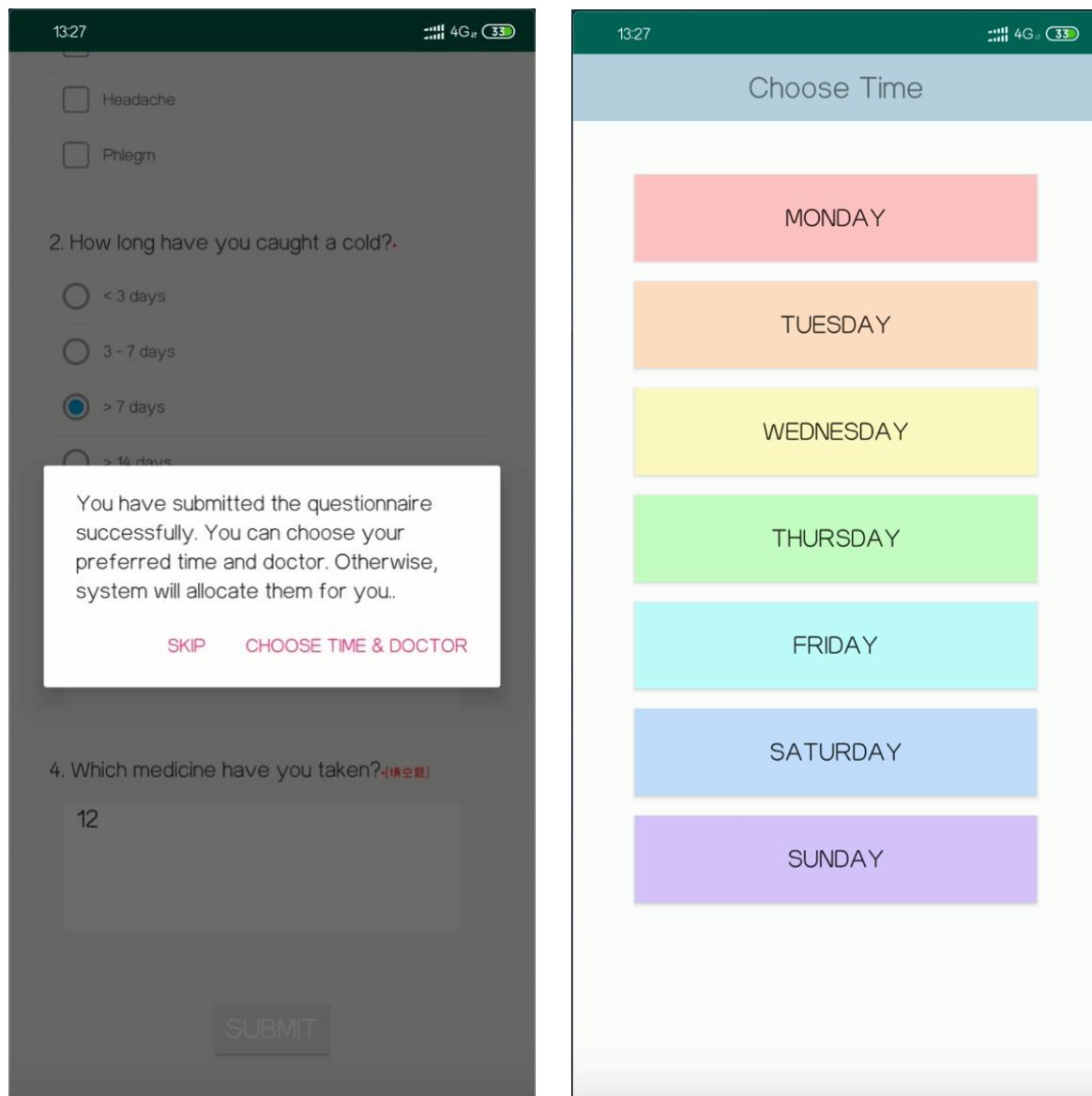
(A large, empty rectangular input field for listing medicine.)

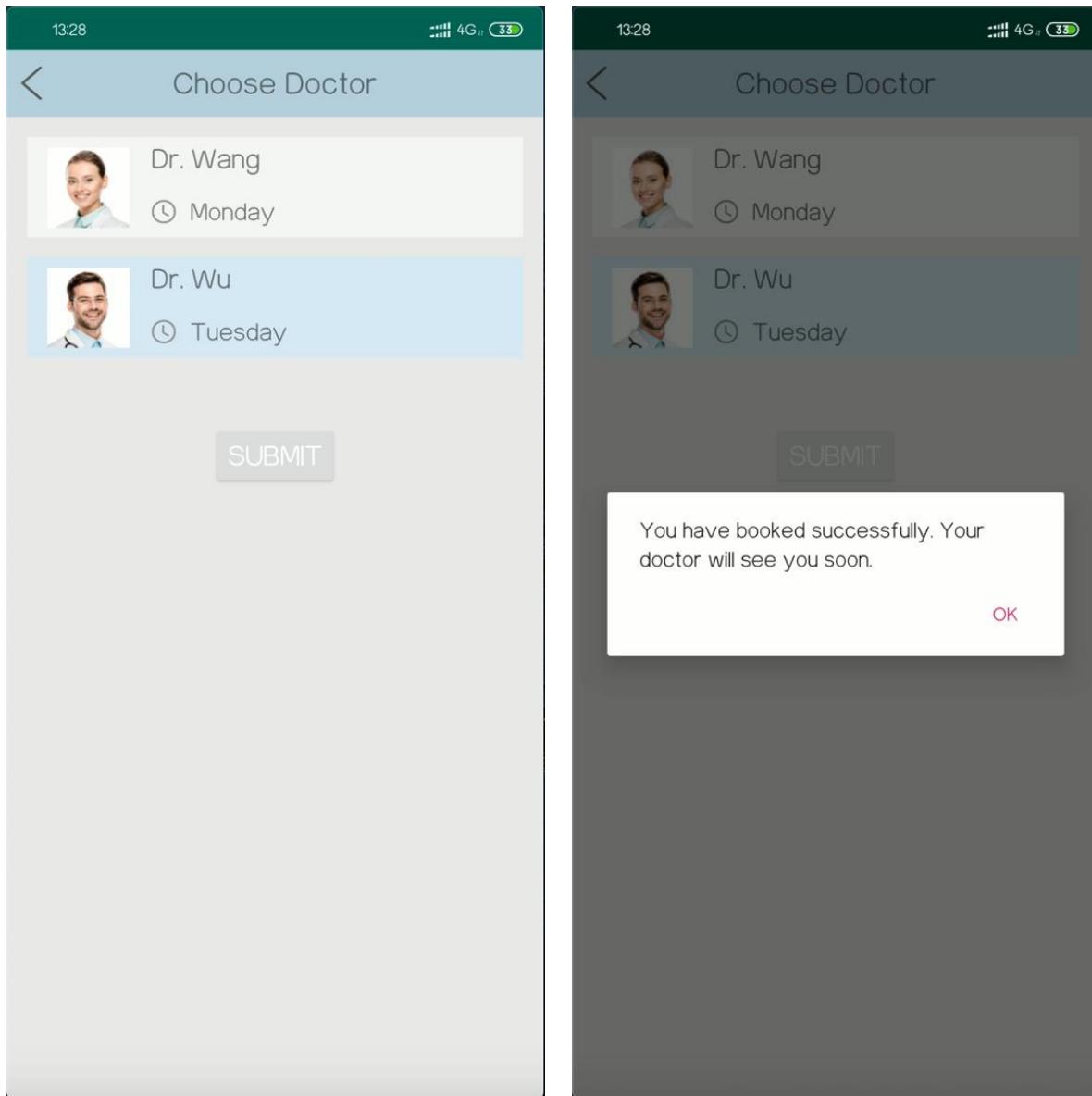
5. Which medicine have you taken?

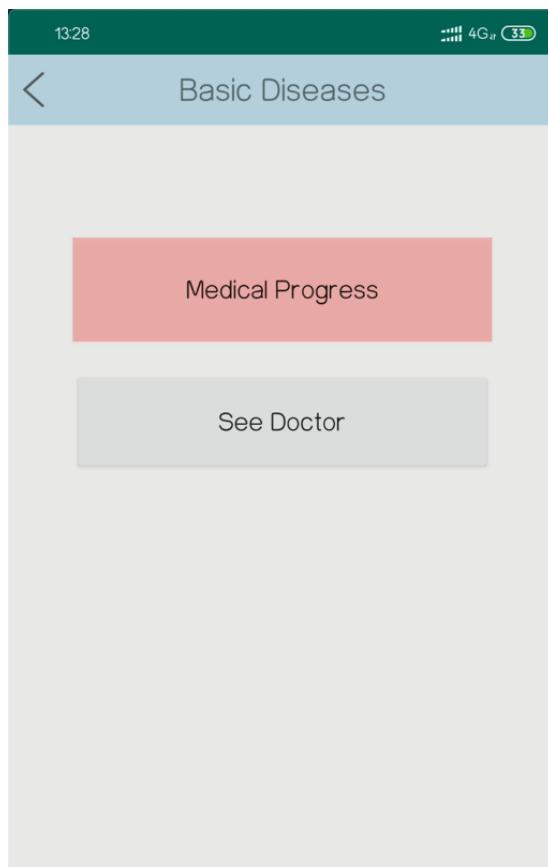
(A large, empty rectangular input field for listing medicine.)

SUBMIT

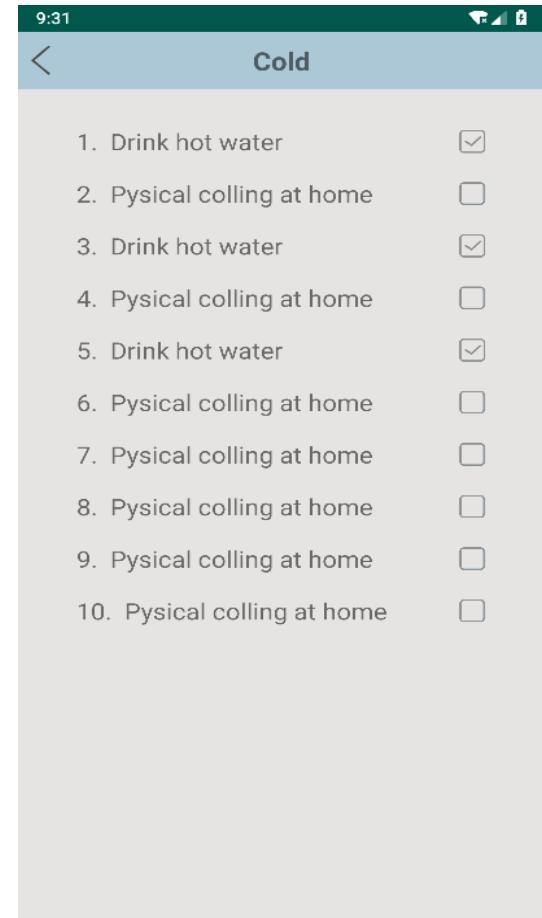
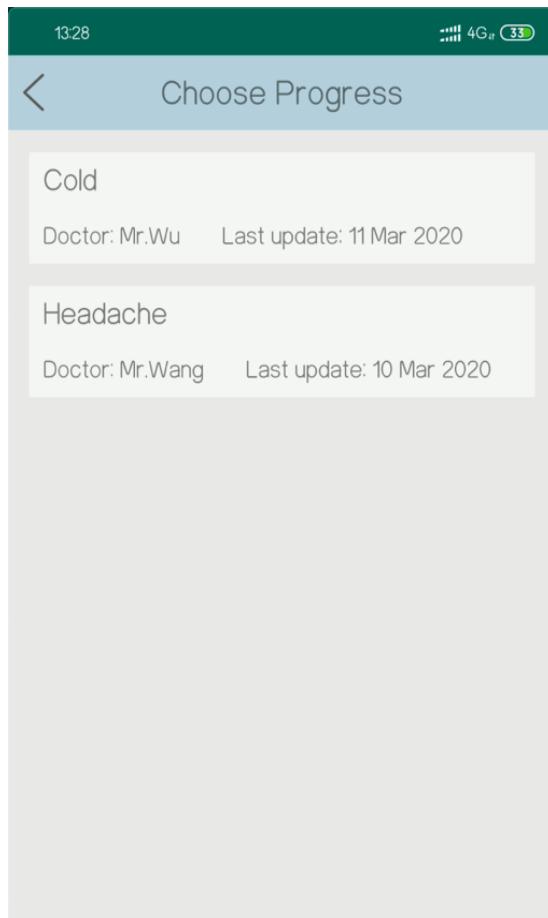
After that, the application will prompt patient to choose preferred time and doctor. The patient can also click “SKIP” button and the system will allocate them automatically. If patient clicks “CHOOSE TIME & DOCTOR” button, he/she will choose a certain time from Monday to Sunday and then choose a preferred doctor from available list. After choosing the doctor, the application will prompt the patient that he/she has made an appointment successfully.





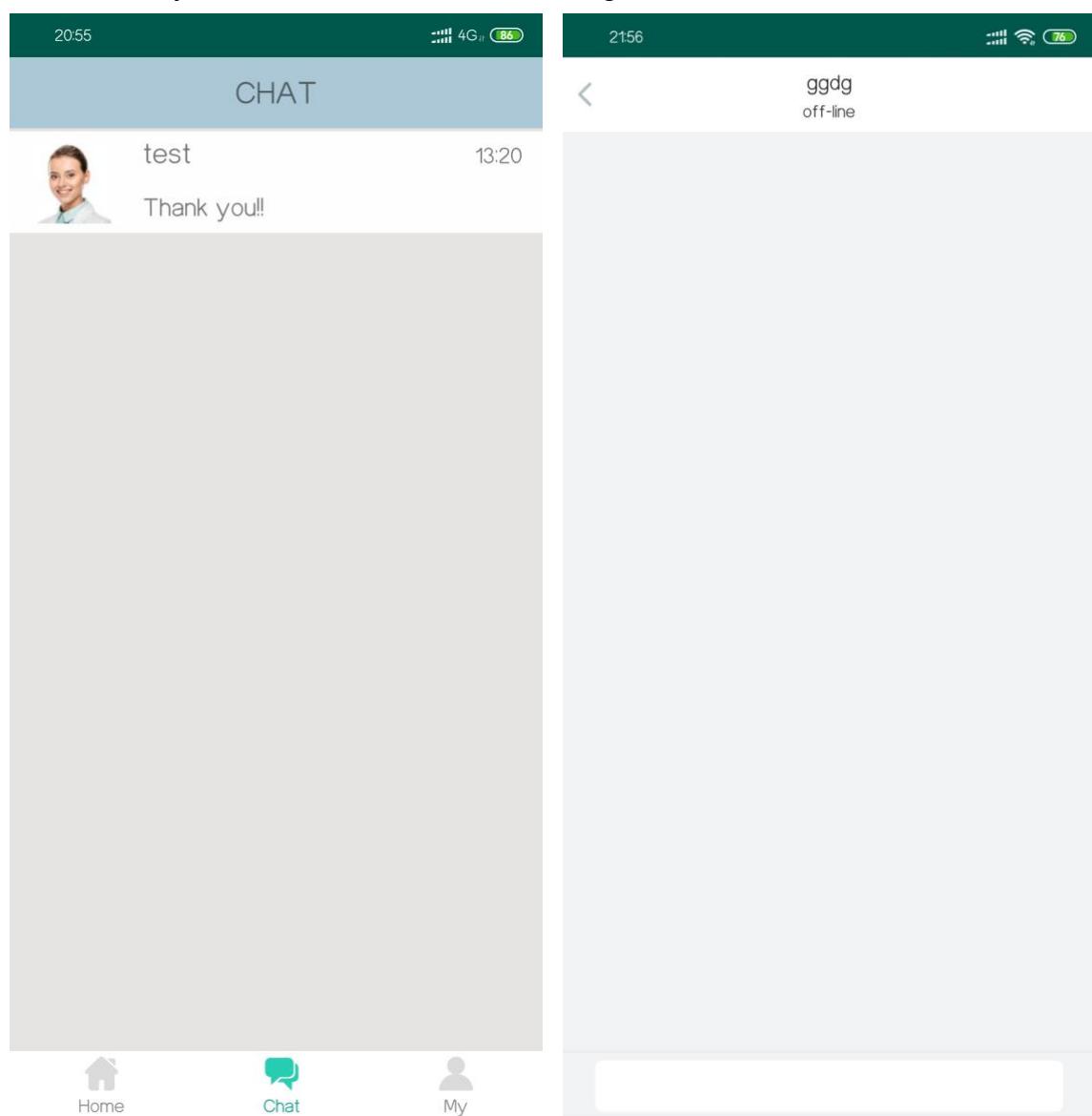


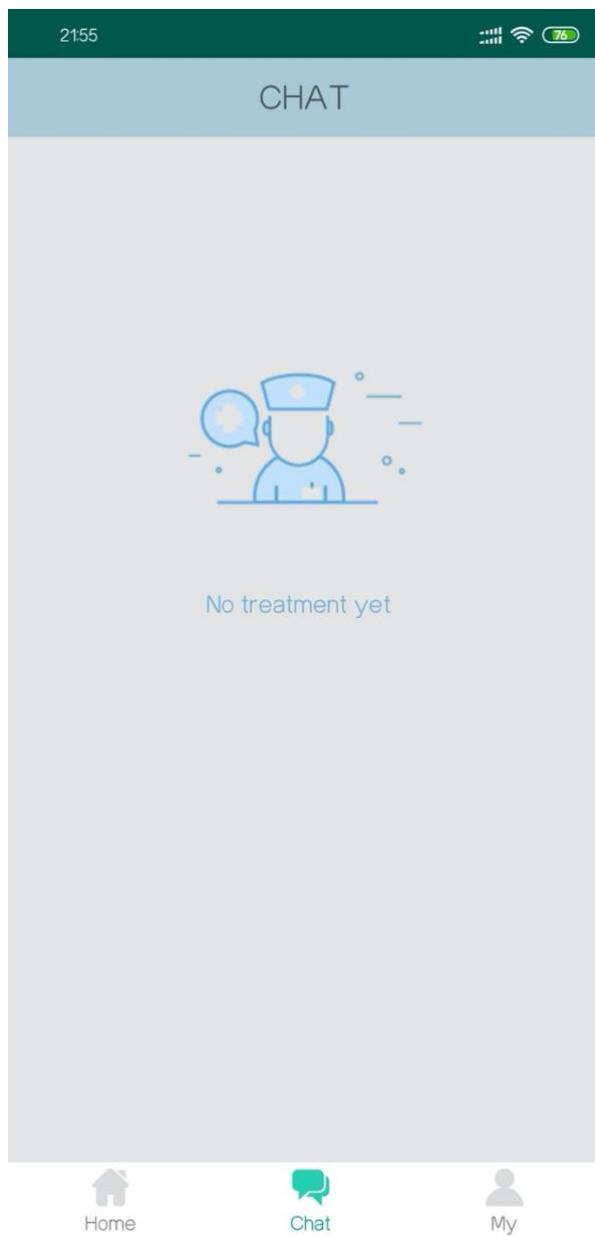
After choosing the doctor, the patient can come back to the BASIC DISEASES page, he/she can click “Medical Progress” button to check his/her medical progress. In this module, patient can check his/her successful appointments and medical progress at any time. They can also check the treatment options and make actions. Doctor will tick behind after patient completes one option. Once doctor ticks all options, patient will receive the feedback of doctor about the summary of the treatment process.



11.2.3. Chat page for patient

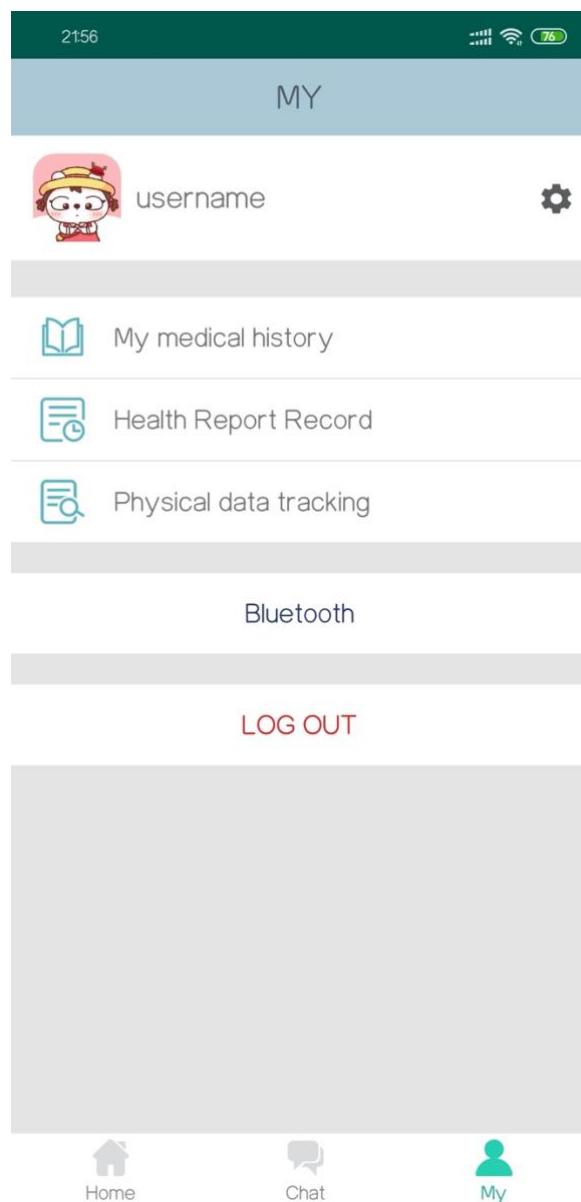
In patient's chat page, chats with doctors are shown. Time and content of the previous item are shown on the bar. When choosing the current doctor, patient can chat with the doctor. Patient can only view the chat with current doctors. If the patients have finished the treatment, the chat with the doctor will disappear automatically. Patients can send text messages to the doctor.





If the patient is not currently under treatment for any disease, the chat page will not have a chat dialog box with the doctor, the system will display that “No treatment yet.”.

11.2.4. My page for patient

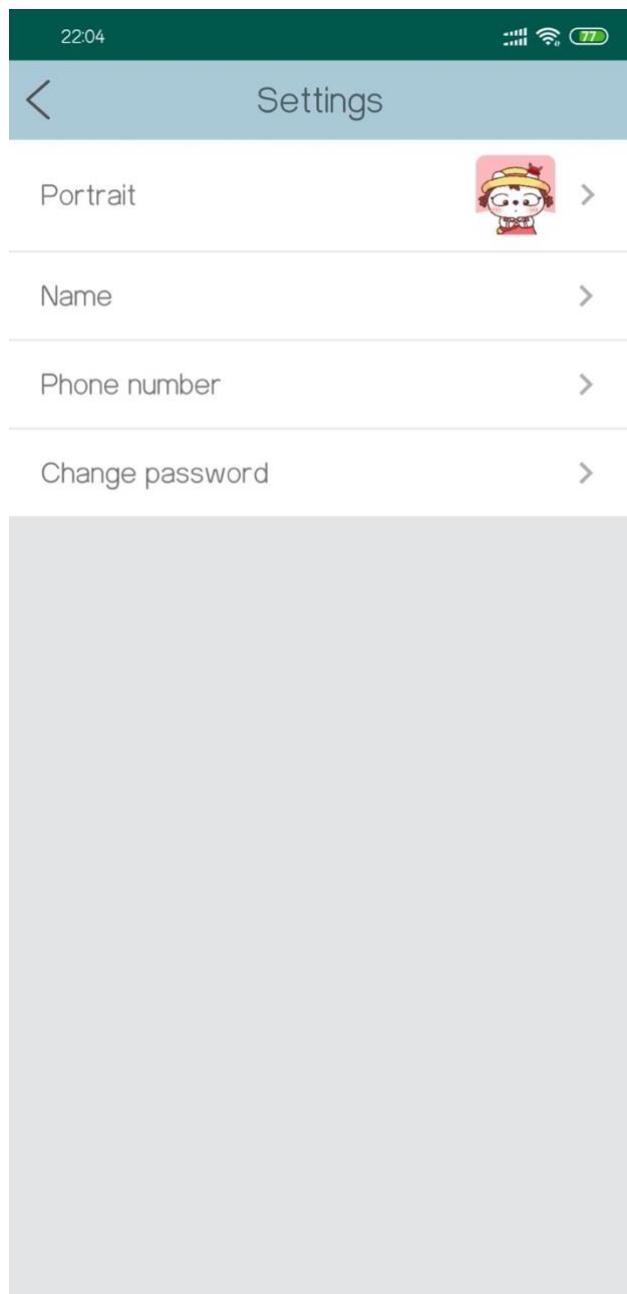


My page

In MY page, patient can change basic information by clicking pattern in the top right corner to SETTINGS page. Patient can view his/her medical process, health report record, physical data tracking and blue tooth data by choosing these categories. Also, he/she can log out the system by clicking LOG OUT.

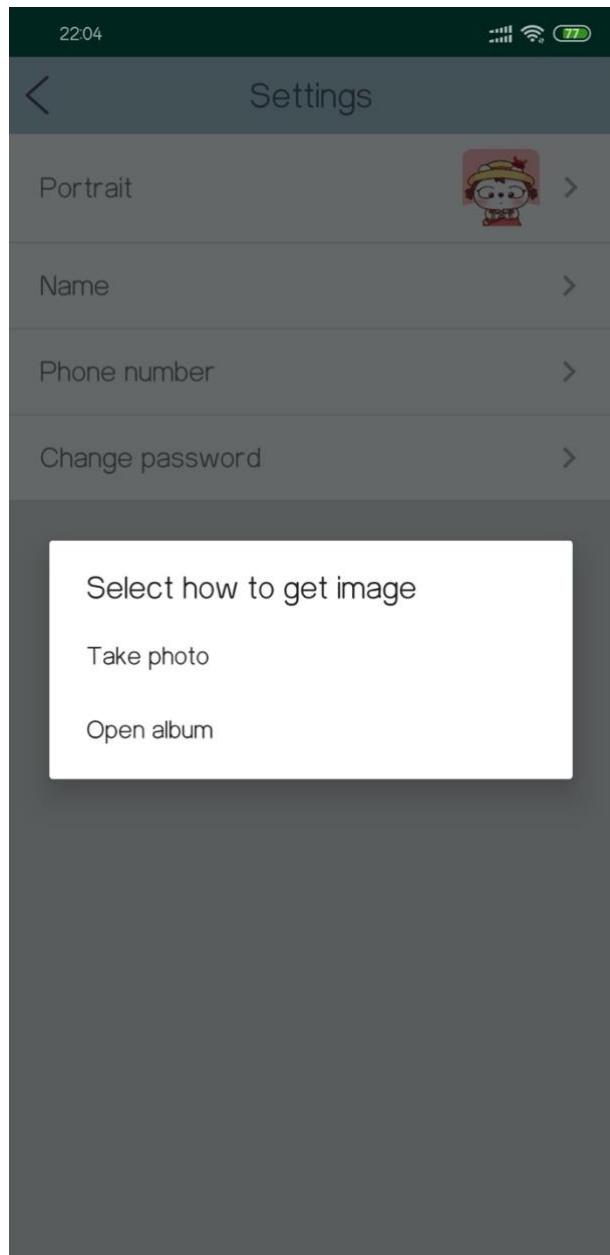


OUT.

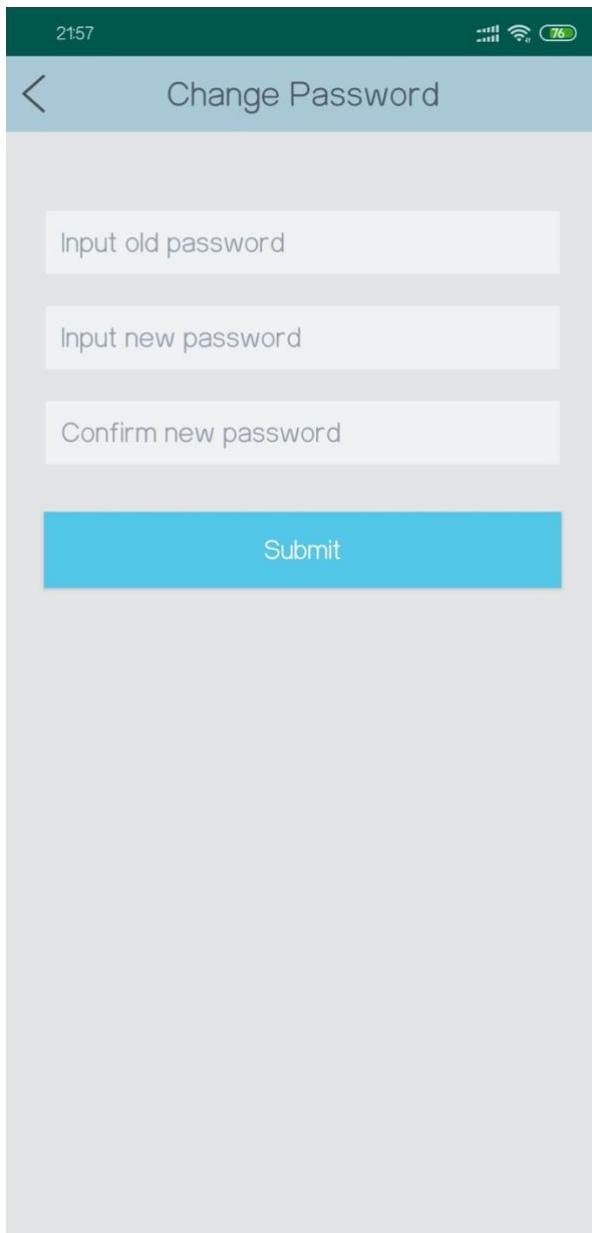


Settings

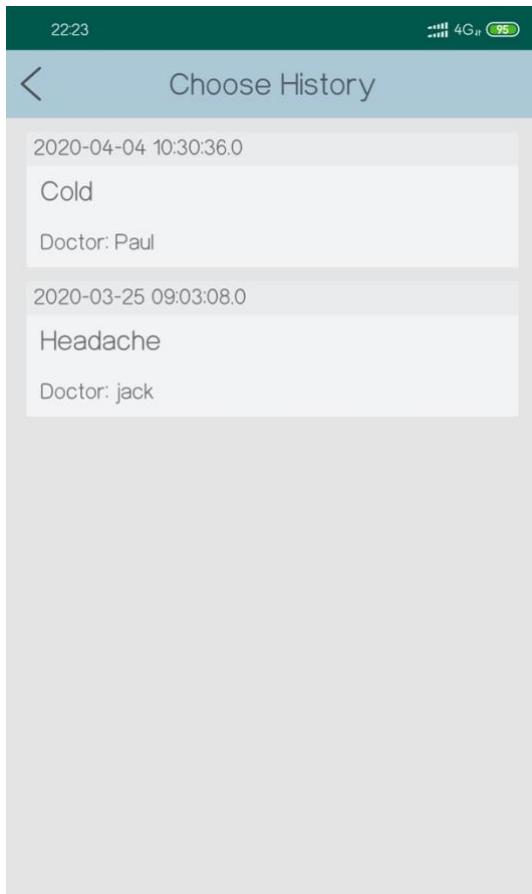
In SETTINGS page, patient can change his/her Portrait. They can also change their name, Phone number as well as Password.



When changing portrait, patient can choose picture by taking photo or from his/her phone album.

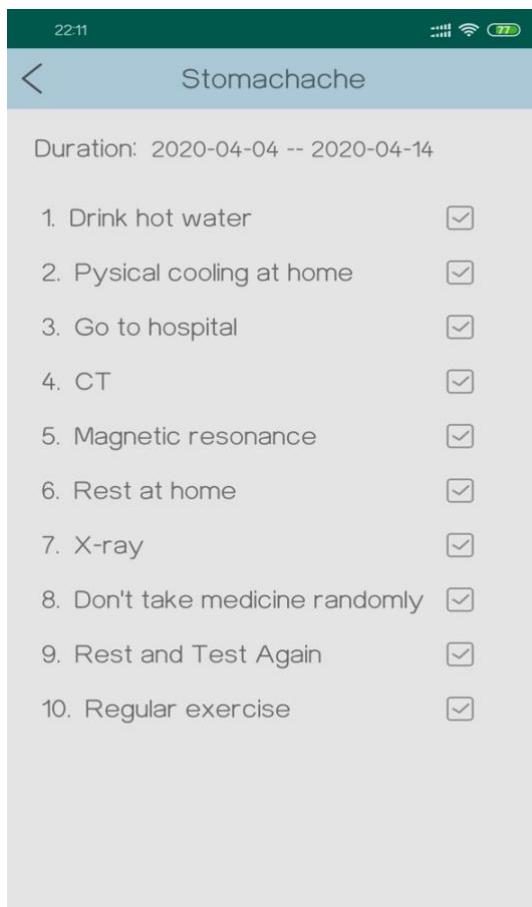


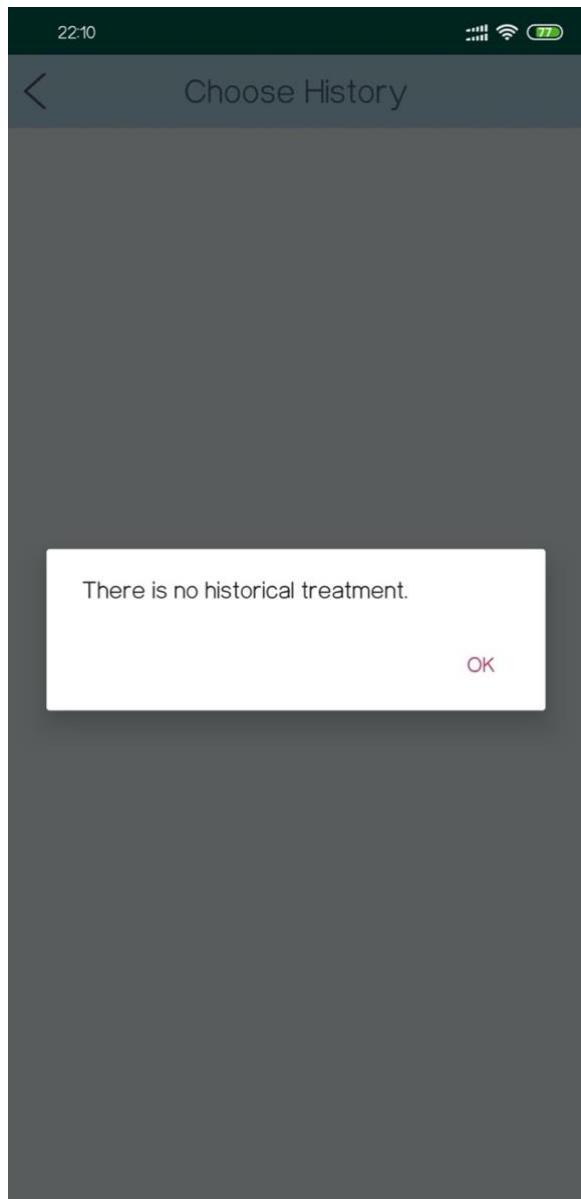
When changing password, patient should input old password and new password, then confirm new password. Then the system will prompt “You have changed password successfully!”. After changing the password, the patient should re-login the account.



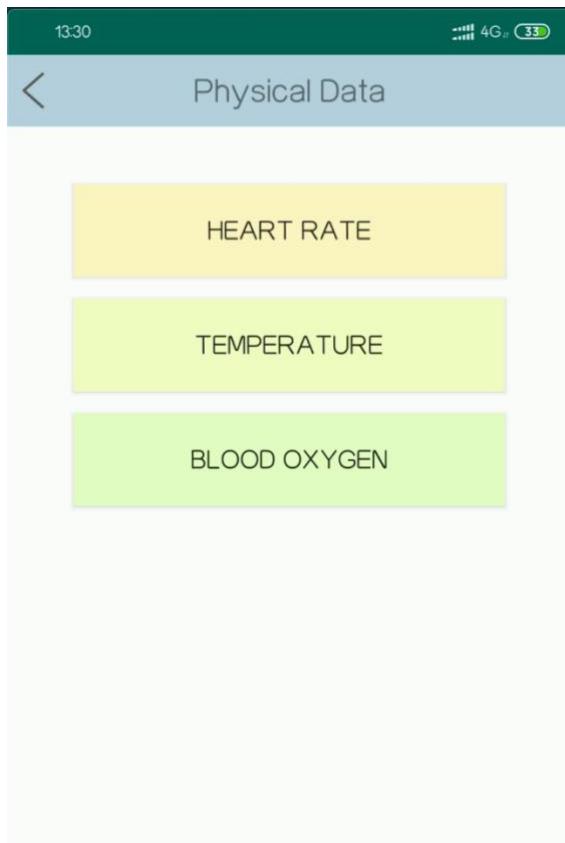
My medical history

In MY MEDICAL HISTORY page, patient can view his/her historical medical records. They can check the doctor, duration of diseases, treatment options and prescribing.





If there is no medical history, the application system will appear a default page to prompt that “There is no historical treatment.”

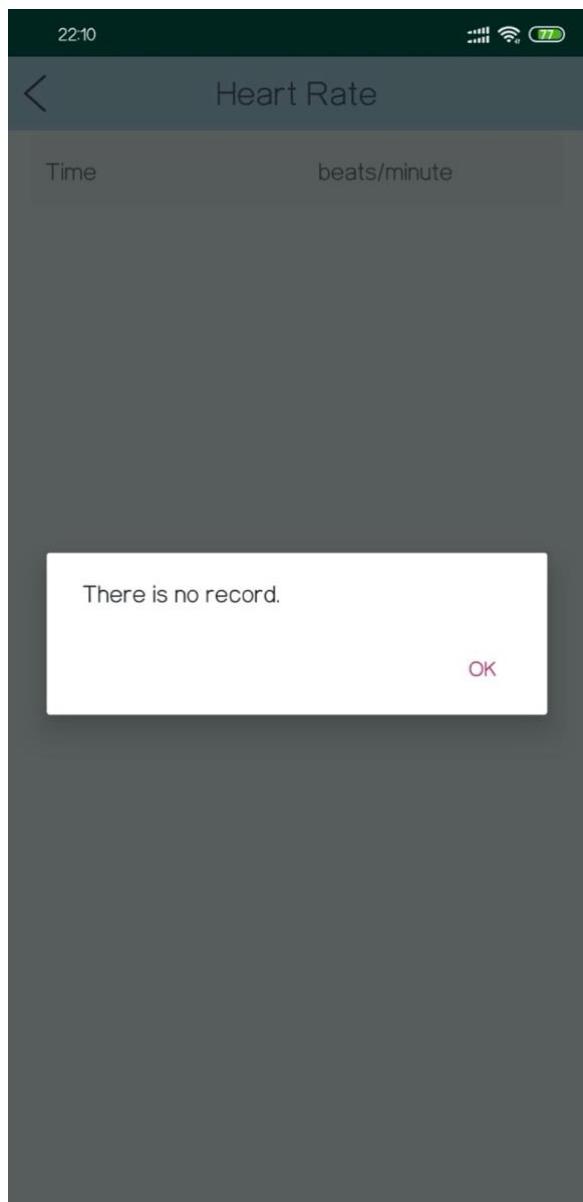


Physical data tracking

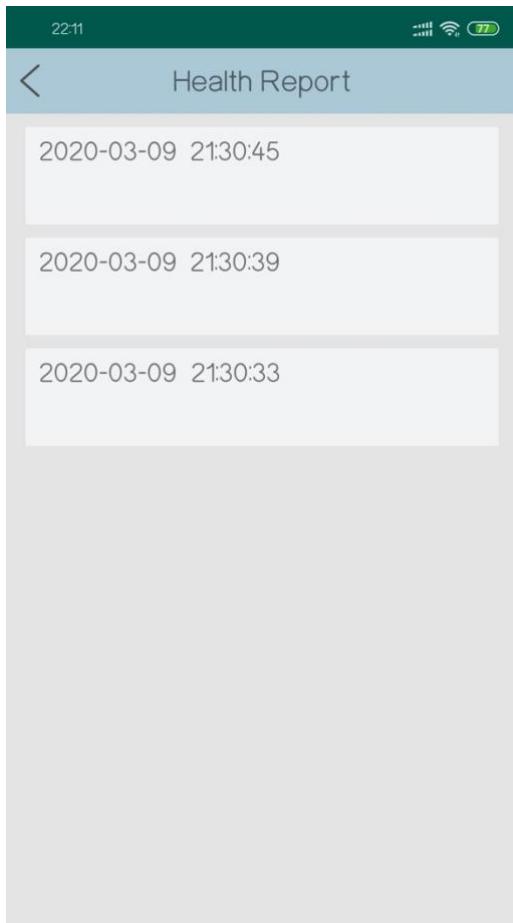
In PHYSICAL DATA TRACKING page, patient can view his/her all physical data record that the sensors collected before.

Time	beats/minute
2020-03-09 21:30:47	70
2020-03-09 21:30:39	68
2020-03-09 21:30:45	65

For example, the patient wants to check his/her heart rate collected record. He/she can view the specific data and check time.

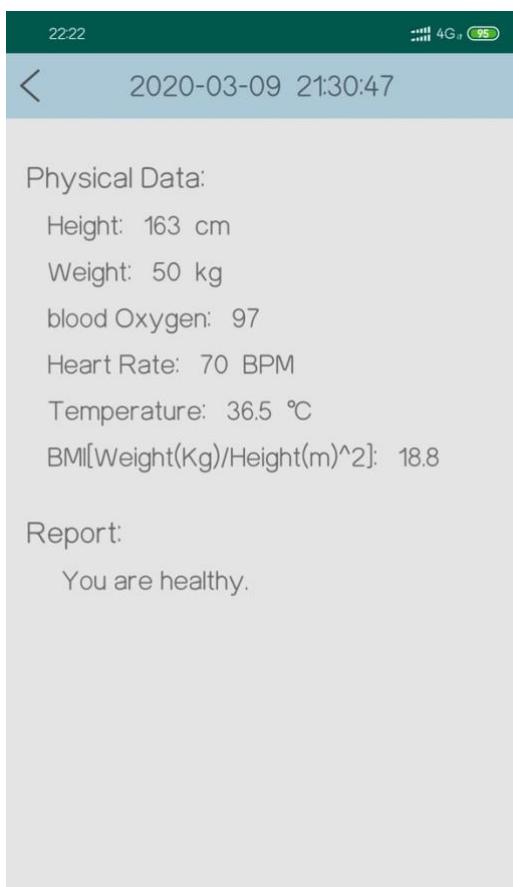


If there is no physical data record, the application system will appear a default page to prompt that “There is no record.”.

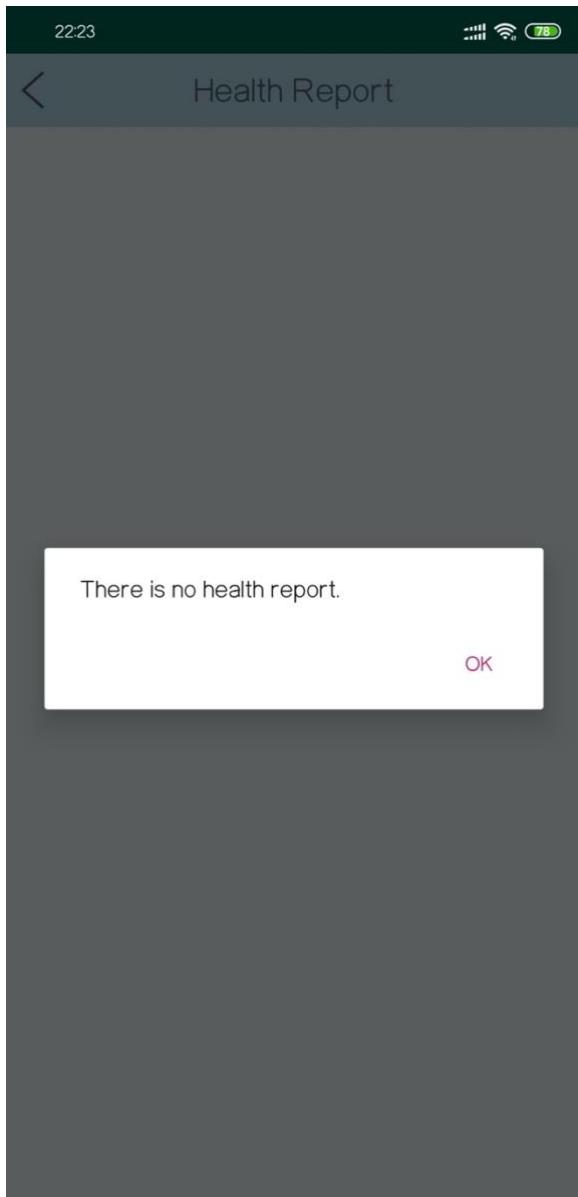


Health Report Record

In HEALTH REPORT RECORD page, patient can view all his/her health report before.

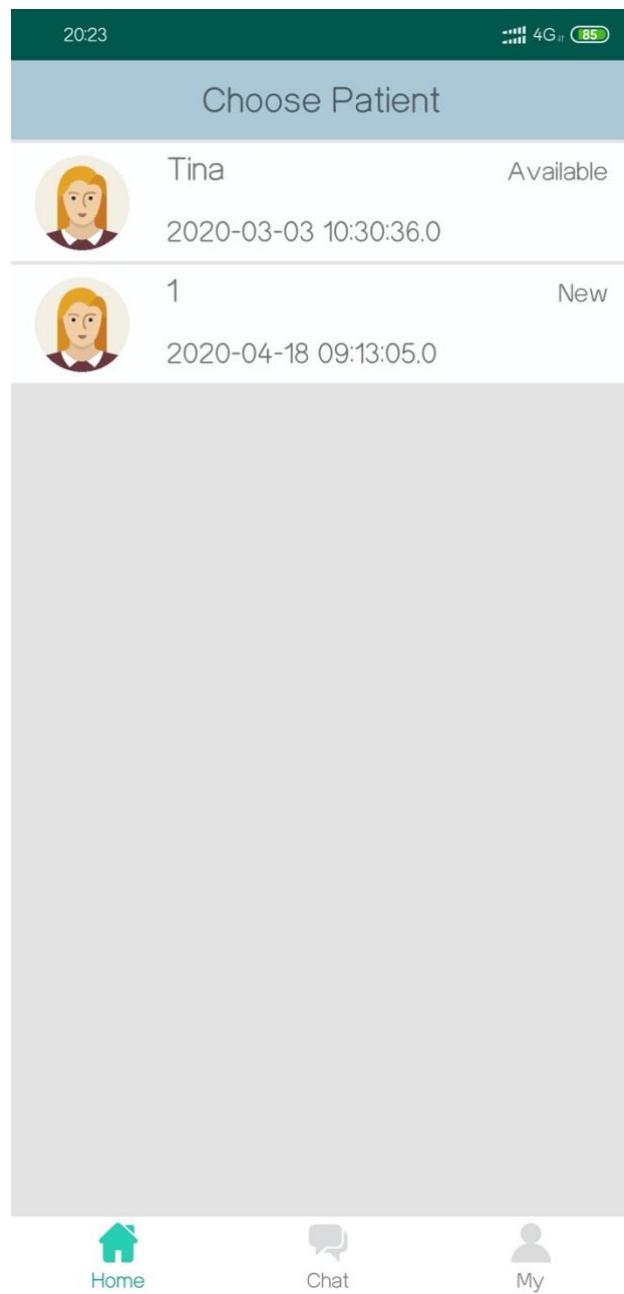


The report information includes height, weight, data from the sensors and a calculated BMI data. Finally, the report will give a conclusion about whether the patient is healthy or not. If the patient is unhealthy, the report will also conclude the diseases he/she has.



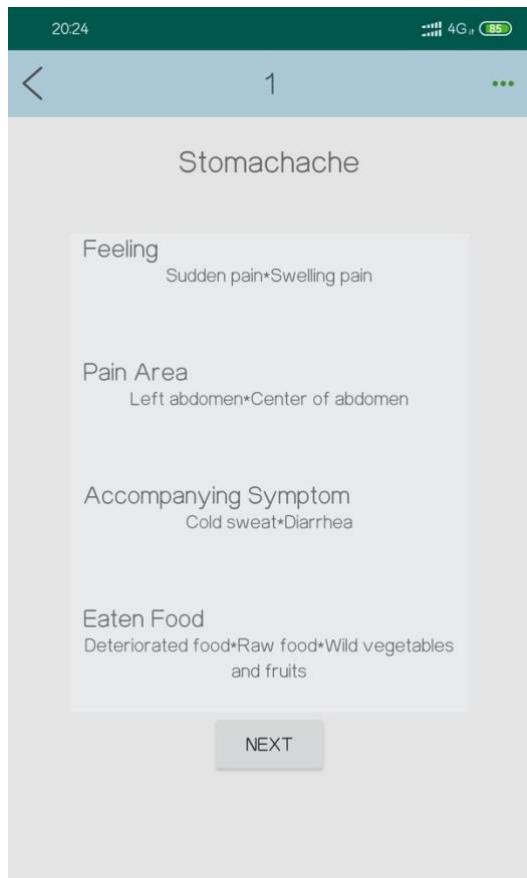
If there is no health report record, the application system will appear a default page to prompt that “There is no health report.”.

11.2.5. Home page for doctor



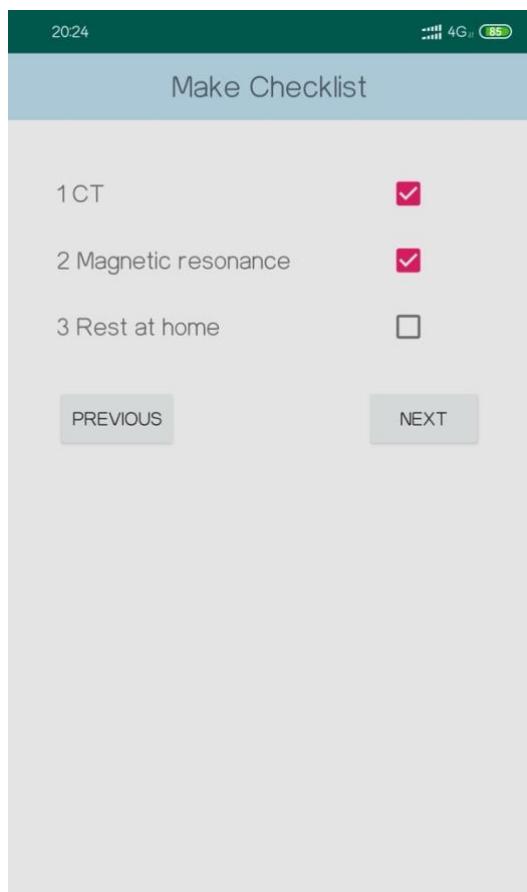
Home page

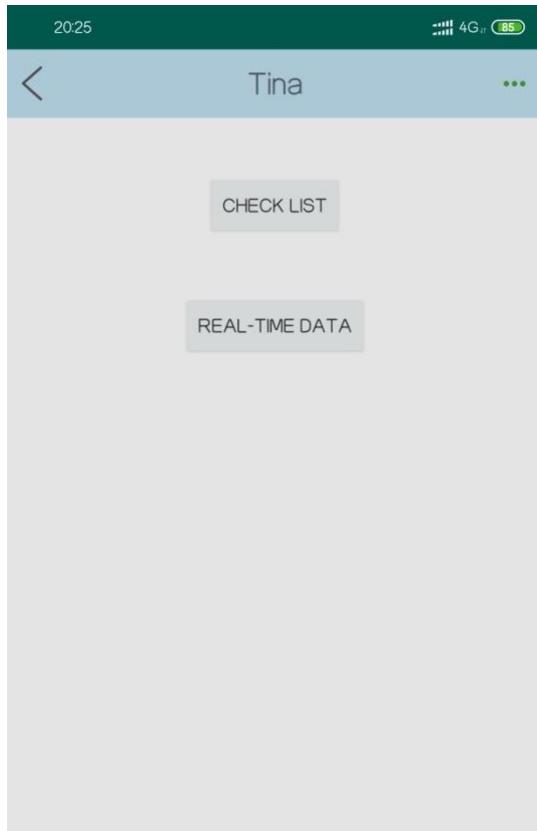
In HOME page, all patients (patients under treatment and patients waiting for treatment) allocating to the doctor would be shown. Patients with “new” tag are those who haven’t started treatment yet, doctor need to give a checklist according to the form of physical condition patients filled in. Patients with “available” tag are those who are being treated now, doctor can modify their checklist and check their real-time physical data collected by sensors.



“new” patient

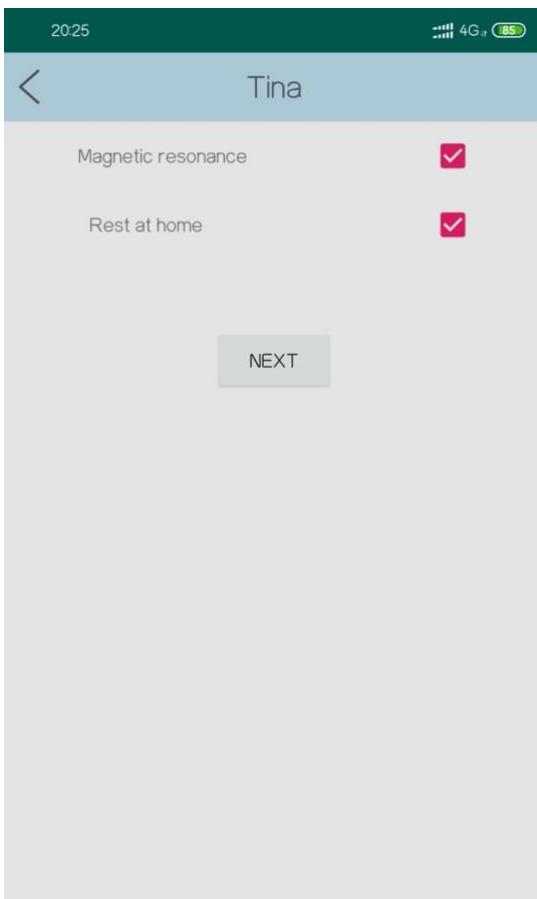
When selecting a “new” patient, the feedback of this patient’s questionnaire would be popped up. Doctor should check the patient’s questionnaire first, then click “NEXT” button and tick the treatment option for the patient according to his/her questionnaire. Then click “NEXT” button, what the patient needs to do according the patient’s treatment option would be popped up. Then click “FINISH” button and come back to HOME page, and the “new” tag would become “available” tag.



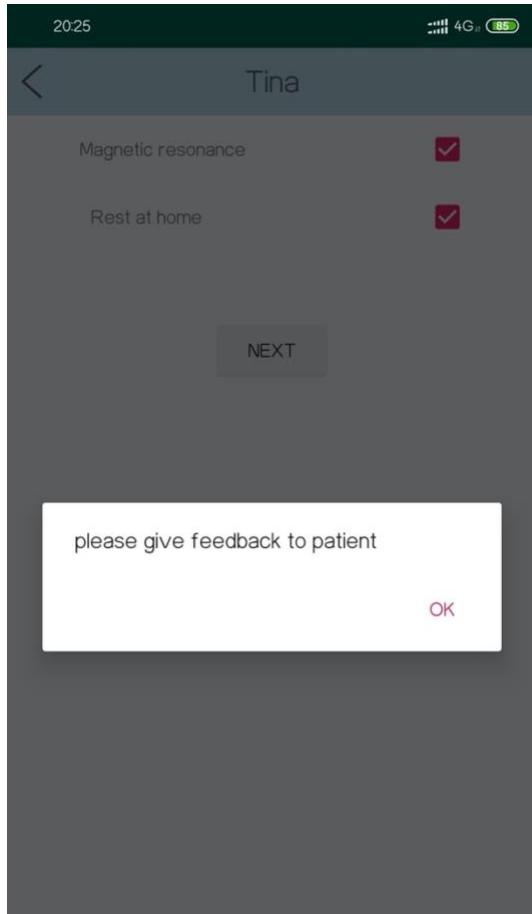


“available” patient

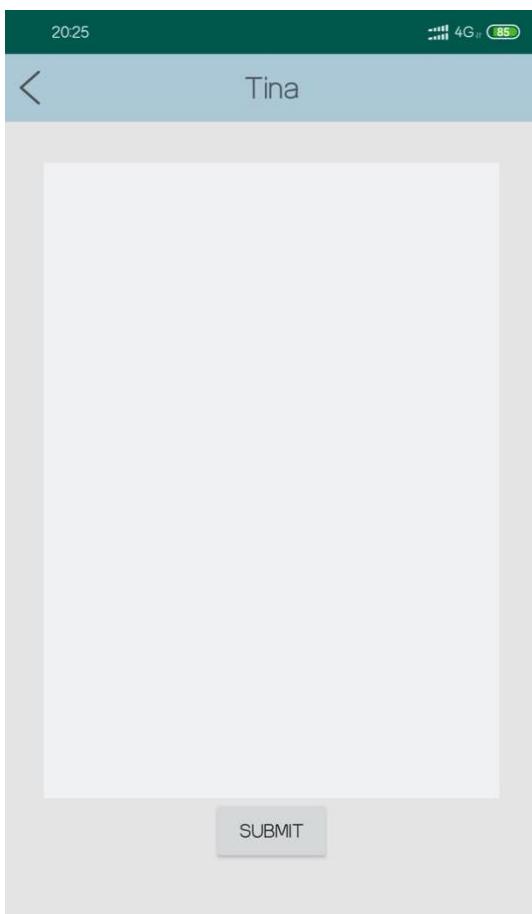
When selecting a patient being treated (“available” patient), treatment page would be appeared on the page, which contains the patient’s checklist and real-time data collected by sensors.



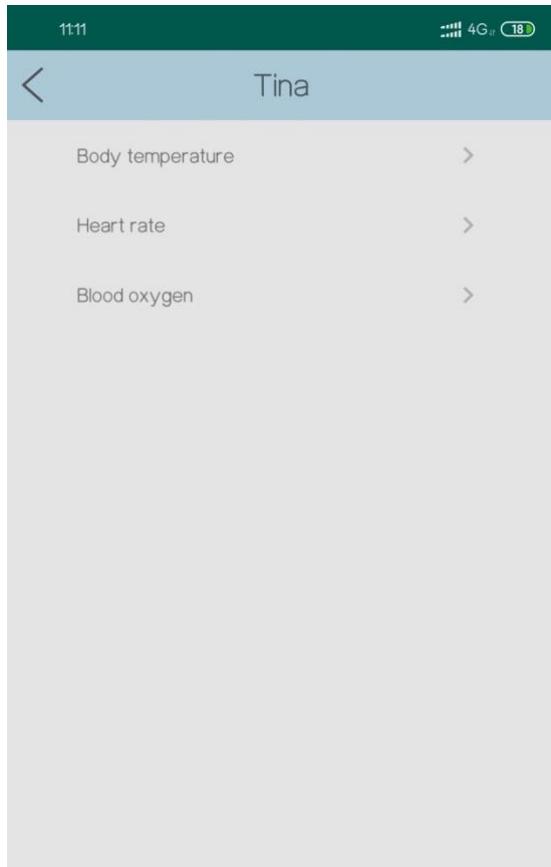
When clicking “CHECK LIST” button, doctor should tick certain item when it is carried out successfully. If the patient’s checklist has finished step1 and step2, doctor should tick behind them.



When the patient has completed all treatment recommendations and all treatment options have a tick behind, doctor needs to give the feedback to the patient. The system will prompt that "please give feedback to patient".



The doctor can write down the summary of treatment process. The feedback can be checked by patient in medical progress after he/she completes all options.



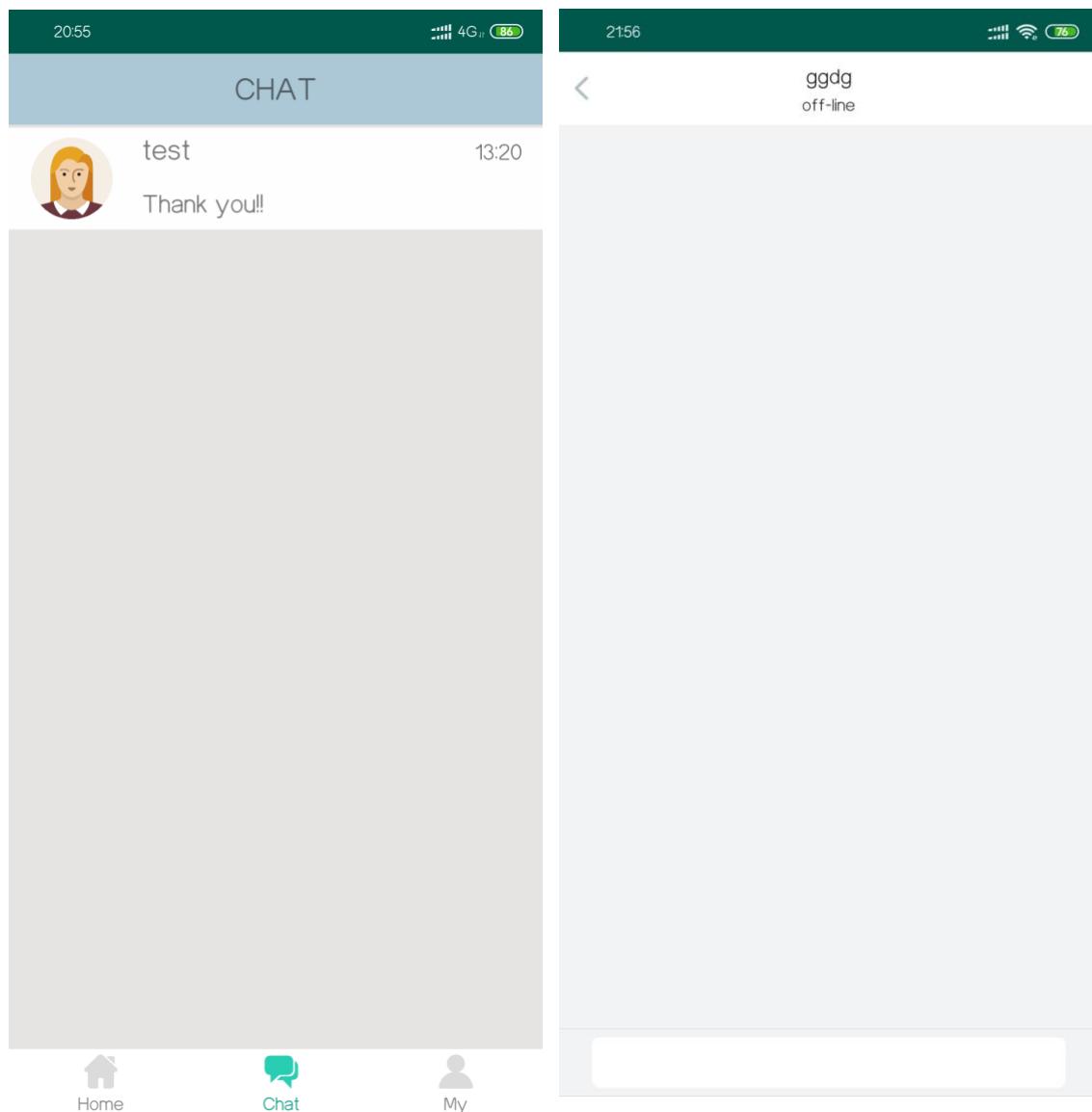
Real-time data module contains the patient's body temperature, heart rate as well as blood oxygen.

Time:	2020-03-09 21:20:33
Temperature:	37.3
Time:	2020-03-09 21:30:33
Temperature:	37.8

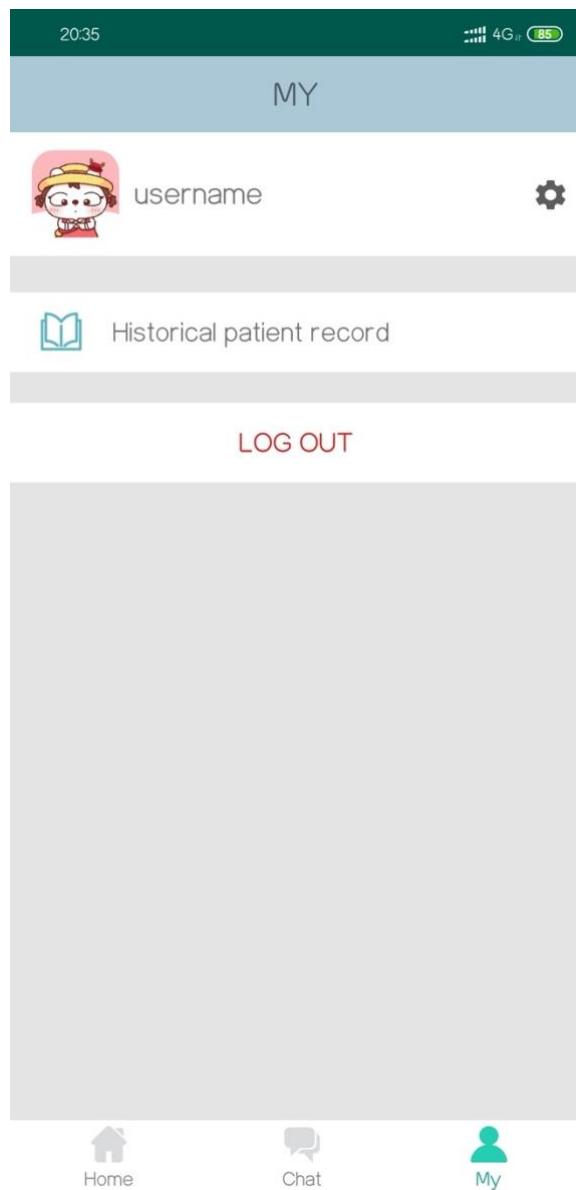
For example, if the patient wants to check the body temperature of the patient, he/she can check all records of the patient's temperature in the list.

11.2.6. CHAT page for doctor

In doctor's chat page, chats with patients are shown. Time and content of the previous item are shown on the bar. When choosing the current patient, doctor can chat with the patient. Doctor can only view the chat with current patient. If the doctor has finished the treatment, the chat with the patient will disappear automatically. Doctor can send text messages to the patient.

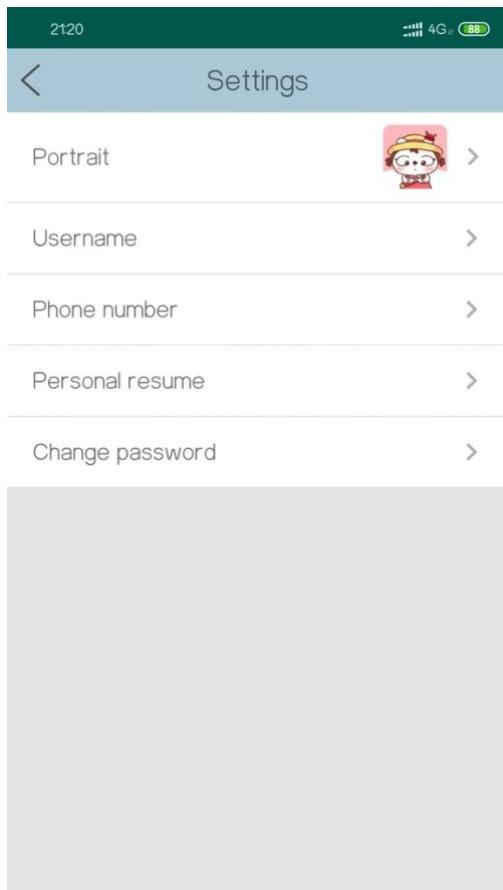


11.2.7. My page for doctor



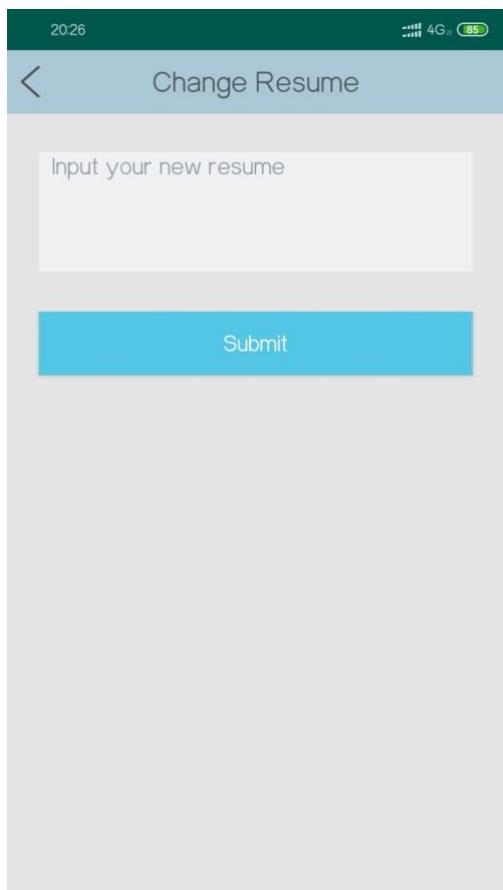
My page

In MY page, doctor can change basic information by clicking pattern in the top right corner to SETTINGS page. Doctor can view his/her historical treatment record by choosing "My medical history" button. Also, he/she can log out the system by clicking LOG OUT.

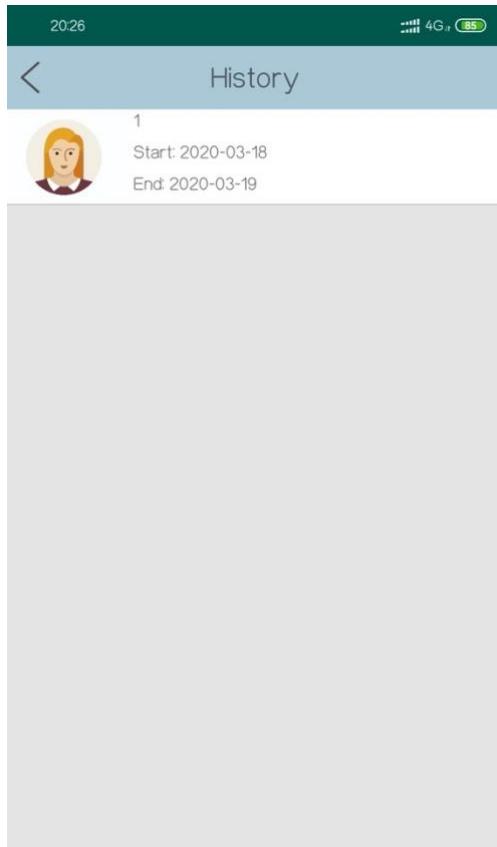


Settings

In SETTINGS page, doctor can change his/her Portrait by taking photos directly or choosing photos from phone album. They can also change their Username, Phone number, Personal resume as well as Password. For changing portrait and password, it is the same operation as the patient part.

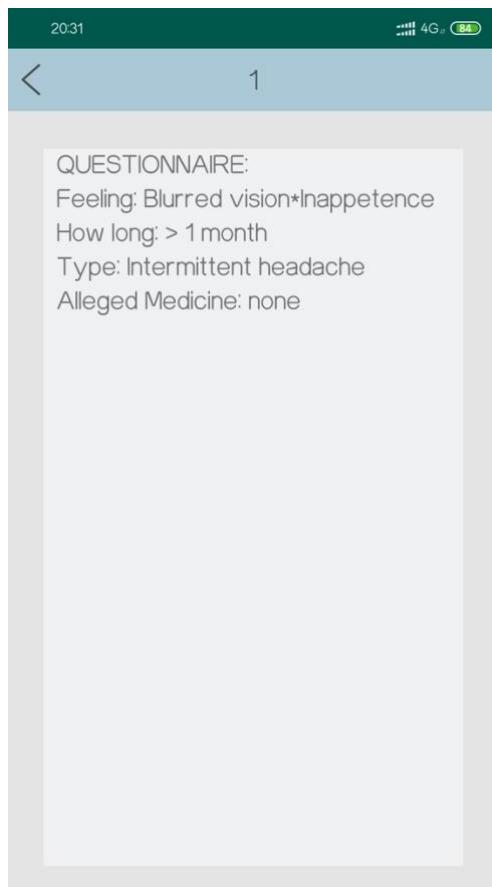


What is different from patient part is that doctor can change the resume. When first log in the application, doctor needs to fill in his/her personal information including the resume. Here, the resume can be changed.

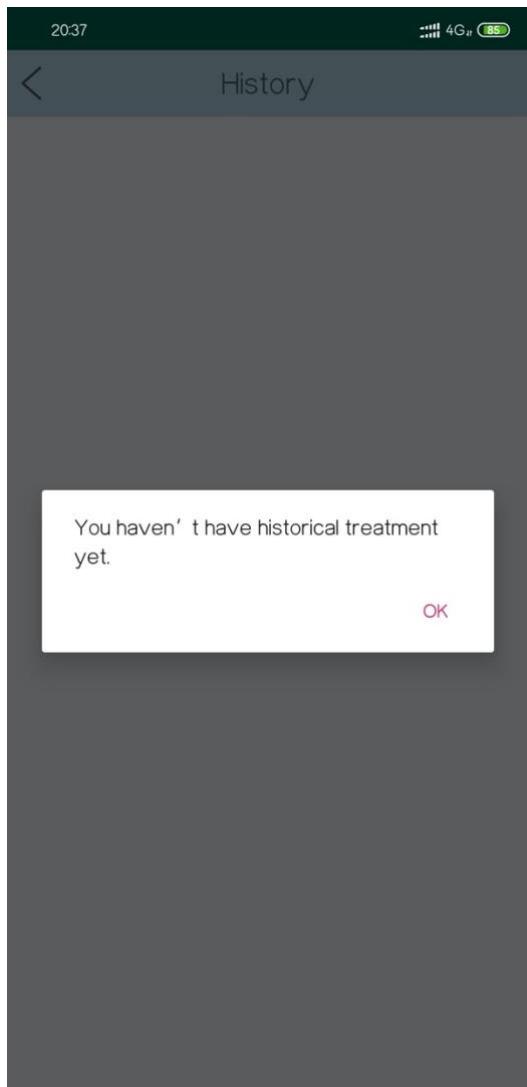


Historical patient record

In MY MEDICAL HISTORY page, doctor can view his/her treated patients list. They can check the patients, duration of diseases, treatment options and prescribing.



The historical patient record will show the patient's disease questionnaire, the duration of disease, the type of disease and prescribing.



If the doctor hasn't finished treating a patient, there is no historical treatment record, the application system will appear a default page to prompt that "There is no health report.".

11.3. Testing Records

Account Operation Testing

Show in next page:

Test ID	Test Description	Execution Steps	Expected Result	Actual Result	Fixed (Y/N)
1	Can user select user type?	1) Open OMA application. 2) The user type selection interface appears. 3) User click user type button.	User can choose user type between “Doctor” and “Patient”.	User can choose user type between “Doctor” and “Patient”.	
2	Can user register an account?	1) Click “Register” button to sign up. 2) Input user’s email address and get verification code to confirm. 3) Input username and password to submit.	User can register an account successfully.	User can register an account successfully .	
3	Can user get verification code by email?	1) Click “Register” button to sign up. 2) Input user’s email address and get verification code to confirm.	User can get verification code by email.	User can get verification code by email.	
4	Can user log in the account registered?	1) Input username and password. 2) Click “Login” button.	User can log in successfully.	User can log in successfully .	
5	Can user log out the account?	1) Log in the account. 2) Open My page. 3) Click “Log Out” button.	User can log out successfully.	User can log out successfully .	
6	Can users who forget their password reset it?	1) Click “Forget Password” button. 2) Input user’s email address and get verification code to confirm. 3) Reset password.	User who forgets password can reset it.	User who forgets password can reset it.	
7	Can user log in with new password	1) Input username and new password	User can log in with new	User can log in with new	

	he/she reset?	user reset. 2) Click “Login” button.	password he/she reset.	password he/she reset.	
8	Does user need to fill in his/her basic information when first login.	1) Login the account firstly. 2) The basic information form appears. 3) Fill in user's basic information and submit.	User needs to fill in basic information when login the account firstly.	User needs to fill in basic information when login the account firstly.	
9	Does user need to fill in his/her basic information when it's not first login?	Login the account after first time.	Basic information form does not appear and user needn't to fill in.	The basic information form does not appear and user needn't to fill in.	
10	Can doctor type users choose their working days when fill in the basic information?	1) Doctor type user login the account firstly 2) The basic information form appears. 3) Click “Select working day” button 4) Choose his/her “working days” from Monday to Sunday	Doctor type user can choose their working days from Monday to Sunday when filling in the basic information.	Doctor type user can choose their working days from Monday to Sunday when filling in the basic information.	

Home page testing

Test ID	Test Description	Execution Steps	Expected Result	Actual Result	Fixed (Y/N)
11	Can patient make a health check in home page?	1) Click “Health Check” button at home page. 2) Click “Have a check” button. 3) Input patient’s height and weight. 4) Wear sensors to collect data. 5) Click “Submit” button.	Patient can make a health check successfully. The application can collect data through sensors wearing by patient.	Patient can make a health check successfully . The application can collect data through sensors wearing by patient.	
12	Can patient get his/her health report after making a health check?	1) Make a health check. 2) Click “Health Report” button in HEALTH CHECK page.	Patient can get the health report successfully. The report shows the physical data that sensors collected and conclude whether the patient healthy or not.	Patient can get the health report successfully . The report shows the physical data that sensors collected and conclude whether the patient healthy or not.	
13	Is the data collected by the sensor transmitted to the application?	1) Making the health check. 2) Wear sensors to collect data.	The data collected by the sensor can be transmit to the application successfully and appears on the health report.	The data collected by sensor cannot be transmit successfully .	Y
14	Can patient choose specific disease to	1) Click “Basic diseases” button at	Patient can choose specific	Patient can choose	

	see doctor in home page?	<p>home page</p> <p>2) Click “See a doctor” button.</p> <p>3) Choose a specific disease.</p> <p>4) Fill in the disease information form.</p> <p>5) Choose doctor&time or skip.</p> <p>6) Click “Submit” button.</p>	<p>disease to see a doctor successfully.</p> <p>The application will prompt he patient that he/she has made an appointment successfully</p>	<p>specific disease to see a doctor successfully .</p> <p>The application will prompt he patient that he/she has made an appointment successfully</p>	
15	Can patient choose doctor and time he preferred?	<p>1) See a doctor in home page.</p> <p>2) Click “Choose time&doctor” when prompt finishing the questionnaire.</p>	Patient can choose doctor and time he preferred.	Patient can choose doctor and time he preferred.	
16	Can patient skip choosing doctor and let the system allocate automatically.	<p>1) See a doctor in home page.</p> <p>2) Click “Skip” when prompt finishing the questionnaire.</p>	Patient can skip choosing doctor and let the system allocate automatically.	Patient can skip choosing doctor and let the system allocate automatically.	
17	Can patient check his/her medical progress after seeing a doctor?	<p>1) Click “Medical Progress” button at BASIC DISEASES page.</p> <p>2) Choose the specific disease to check medical progress.</p>	Patient can check his/her successful appointment, medical progress and treatment options specifically in this module.	Patient can check his/her successful appointment , medical progress and treatment options specifically in this module.	
18	Does patients list appear on doctor's account?	<p>1) Log in a doctor's account.</p>	The patients list consists of new	The patients list consists	

	home page?	2) Open up home page	patients and available patients appear on home page.	of new patients and available patients appear on home page.	
19	Can doctor give a checklist for new patient?	1) Choose a new patient in home page. 2) The feedback of this patient's questionnaire would be popped up. 3) Make treatment checklist based on the feedback.	The feedback of the new patient's questionnaire pops up. The doctor can make treatment checklist based on the feedback successfully.	The feedback of the new patient's questionnaire pops up. The doctor can make treatment checklist based on the feedback successfully .	
20	Can doctor modify the checklist of patients being treated?	1) Choose a patient being treated with available tag. 2) Click "Check List" button. 3) Tick certain items.	Doctor can modify the checklist of patients being treated. Doctor can tick certain items in patient's checklist.	Doctor can modify the checklist of patients being treated. Doctor can tick certain items in patient's checklist.	
21	Can doctor check the real-time data of patients being treated?	1) Choose a patient being treated with available tag. 2) Click "Real-time Data" button.	Doctor can check the real-time data of patients being treated. Data consists of body temperature, blood oxygen and heart rate.	Doctor can check the real-time data of patients being treated. Data consists of body temperature, blood oxygen and	

				heart rate.	
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Chat page testing

Show in next page:

Test ID	Test Description	Execution Steps	Expected Result	Actual Result	Fixed (Y/N)
22	Does the chat page display the dialog box of the doctor selected by the patient?	1) Login a patient account. 2) Open up chat page.	The chat page displays the dialog box of the doctor selected by the patient.	The chat page displays the dialog box of the doctor selected by the patient.	
23	Does the chat page display the dialog box of the patient treated by the doctor?	1) Login a patient account. 2) Open up chat page.	The chat page displays the dialog box of the patient treated by the doctor.	The chat page displays the dialog box of the patient treated by the doctor.	
24	Can user send text message in the chat box?	1) Open up chat page. 2) Choose the dialog with the doctor. 3) Send text message to the doctor.	User can send text message successfully.	User can send text massage successfully.	
25	Can user send voice message in the chat box?	1) Open up chat page. 2) Choose the dialog with the doctor. 3) Send	User can send voice message successfully.	User cannot send voice massage. This function has been deleted due to technical reason.	N

		text massage to the doctor.			
26	Can user send picture in the chat box?	1) Open up chat page. 2) Choose the dialog with the doctor. 3) Send a picture to the doctor.	User can send pictures successfully. The picture can be from phone album or be taken directly.	User cannot send picture. This function has been deleted due to technical reason.	N

My page testing

Test ID	Test Description	Execution Steps	Expected Result	Actual Result	Fixed (Y/N)
27	Does user can change the portrait?	1) Open up my page. 2) Click setting pattern. 3) Choose portrait column.	User can change the portrait by taking photos directly or choosing photos from phone album.	User can change the portrait by taking photos directly or choosing photos from phone album.	
28	Does user can change basic information?	1) Open up my page. 2) Click setting pattern. 3) Change basic information	User can change username, phone number and other basic information successfully .	User can change username, phone number and other basic information successfull y.	
29	Does user can change password?	1) Open up my page. 2) Click setting pattern. 3) Choose “change password ” button.	User can change password successfully .	User can change password successfull y.	
30	Does patient can check his/her medical history in my page?	1) Open up my page. 2) Click “My medical history” button.	Patient can view his/her historical medical records. They can check	Patient can view his/her historical medical records. They can	

			th31doctor, duration of diseases, treatment options and prescribing.	check the doctor, duration of diseases, treatment options and prescribing.	
31	Does doctor can check his/her medical history in my page?	1) Open up my page. 2) Click “My medical history” button.	Doctor can view his/her treated patients list. They can check the patients, duration of diseases, treatment options and prescribing.	Doctor can view his/her treated patients list. They can check the patients, duration of diseases, treatment options and prescribing.	
32	Does patient can check his health report record in my page?	1) Open up my page. 2) Click “Health report record” button.	Patient can view all his/her health report before.	Patient can view all his/her health report before.	
33	Does patient can check his physical data tracking in my page?	3) Open up my page. 4) Click “Physical data tracking” button.	Patient can view his/her real-time body physical data if sensors are worn. Otherwise, data collected last time would be shown.	Patient cannot view real-time body physical data. Patient can only view data collected each time before.	N

11.4. Screenshots for Repository

GRP_GROUP18 > Outpatient Monitoring Mobile APP > Details

Outpatient Monitoring Mobile APP

Project ID: 16333169

220 Commits 15 Branches 0 Tags 9.6 MB Files 9.6 MB Storage

Auto DevOps

It will automatically build, test, and deploy your application based on a predefined CI/CD configuration.

Learn more in the [Auto DevOps documentation](#)

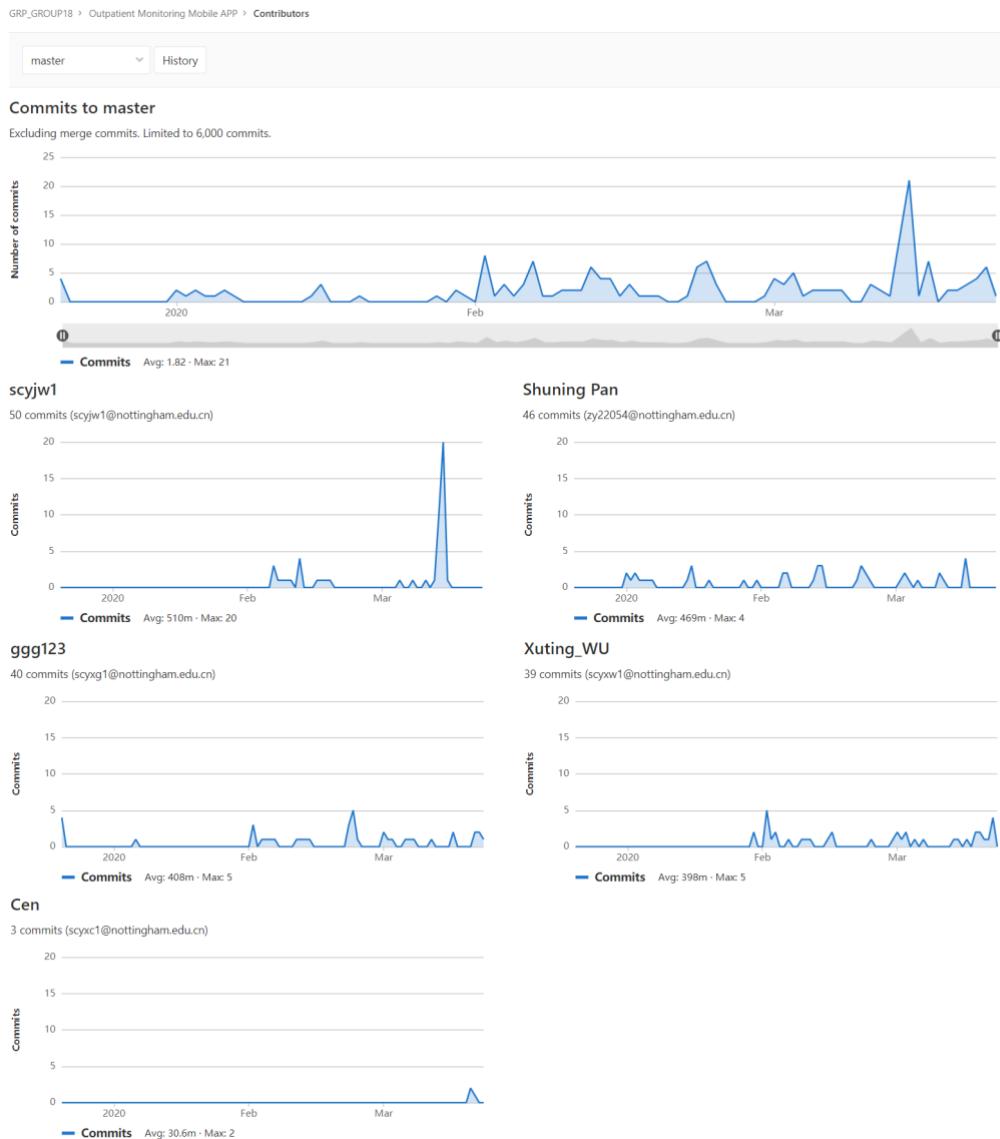
[Enable in settings](#)

master outpatient-monitoring-mobile-app / History Find file Web IDE Clone

Doc: comment ggg authored 6 hours ago 1649d4cd

Add README Add LICENSE Add CHANGELOG Add CONTRIBUTING Add Kubernetes cluster Set up CI/CD

Name	Last commit	Last update
.idea	Doc: comment	6 hours ago
app	Merge branch 'dev_doctor' of https://gitlab.com/grp_group18/o...	6 hours ago
gradle/wrapper	Merge branch 'master' of https://gitlab.com/grp_group18/o...	1 month ago
.gitignore	merge	1 month ago
build.gradle	Merge branch 'frontEnd' of https://gitlab.com/grp_group18/o...	3 weeks ago
gradle.properties	update all	4 weeks ago
gradlew	Doctor Login and Register	3 months ago
gradlew.bat	the latest version of patient	1 month ago



11.5. Meeting Records



Call to order: 1st formal Meeting

A meeting of [Group 18](#) was held at the PMB on 18th October 2019 at 2:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#) as well as our supervisor [Saeid](#)

Topics of Discussion:

- Briefing of the project - More in-depth than the EOI requirements sheet
- A detailed introduction to the project gave by Saeid
- Ask and answer questions about the project

Points of Action:

- The questions discussed to ask:
- App development for Android or iOS? —— Android maybe better for us.
- Do we need to develop app for PC? —— Yes.
- What equipments do we need (sensors) ? Where can we get it? —— Saeid will give us and we can also use ourselves'.
- The function of doctors should be achieved on PC only or PC and mobile both? —— Both.
- What to present on the website? —— Members, Meetings, Documents and so on.

Next (Formal) Meeting:

25th October 2019 at 2:00pm at SEB

Meeting Minutes

Call to order: 2st formal Meeting

A meeting of Group 18 was held at the SEB Hall on 25th October 2019 at 2:00pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan as well as our supervisor : Saeid Pourroostaei Ardakani

Topics of Discussion:

- The main content of the research ethics
- The need for the website
- Some mind information for user requirement and system requirements
- Sensor and processor discussion
- The scenarios about the symptom

Points of Action:

- Fill the Ethics checklist with together our supervisor
- Show our website to our supervisor and we talk about some shortage of it
- Ask supervisor about our questions on the user requirement and system requirements
- The supervisor also shows us some sensors and middle processors about our project, we should read some other information to decide if we can use these sensors to finish our project
- We made a discussion that we should make scenarios, such as the headache, flu, backache. We divide the project into serval small part, every member finishes their own scenario.

Note: The information about the sensors should be understood and the use of the sensors should be discussed !

Next (Formal) Meeting:

1th November 2019 at 2:00pm

Meeting Minutes

Call to order: 3st formal Meeting

A meeting of [Group 18](#) was held at the PMB on 1st November 2019 at 2:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#) as well as our supervisor [Saeid](#)

Topics of Discussion:

- Ethic application form uncertain options discussion and get supervisor's signature
- A detailed introduction of Sensor gave by Saeid
- Ask and answer questions about the project
- Check the website

Points of Action:

- The questions discussed to ask:
- Whether it involves ethic of baby? —— this project doesn't use sensor with baby, it focus on Common ailments
- Which brand of sensor we will used to? —— Arduino. Saeid gave 2 sensor controller and introduced State-of-the-art sensors: the Head-mounted brain signal sensors
- When will sensor arrival? ——Next month
- Get supervisor's signature for ethic application form
- Check the each page of website and update the supervisor information ——Saeid said well done

Next (Formal) Meeting:

8th November 2019 at 2:00pm at SEB



Meeting Minutes

Call to order: 4th formal Meeting

A meeting of [Group 18](#) was held at the SEB Hall on 8th November 2019 at 2:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

as well as our supervisor: [Saeid Pourroostaei Ardakani](#)

Topics of Discussion:

- Get the opinions of Ethics checklist with together our supervisor
- Change the problem in our Ethics checklist
- Exchange our problem in searching our project

Points of Action:

- We talked about some questions happened in our checklist and fix it
- We searched apps and made some search about our project and show them to our supervisor, and asked for his opinions
- We asked for more information about the sensor and called for help

Next (Formal) Meeting:

15th November 2019 at 2:00pm



Meeting Minutes

Call to order: 5th Formal Meeting

A meeting of **Group 18** was held at AI lab on 15th November 2019 at 2:00pm.

Attendees

Attendees included **Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan** as well as our supervisor Saeid.

Topics of Discussion:

- Ask question about transfer data with sensor
- Discuss about our process
- Talk about prototypes which has been designed

Points of Action:

- Begin work on a prototype on user interface
- Start working on database design and class diagram
- Do further research on server and how it can be implemented on laptop
- Optional - Do further research on how to sending verification code to users when they register.

Note: Due to being a preliminary meeting, all members should consider doing the points of action to get a decent base understanding of the requirements of the project.

Next (Formal) Meeting:

22th November 2018 at 3:00pm

Meeting Minutes

Call to order: 6th Formal Meeting

A meeting of [Group 18](#) was held at AI lab on 22th November 2019 at 2:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

1. Prototype revision
2. Details about questionnaire design
3. Database revision
4. Data collection from apple watch or wrist band

Points of Action:

- Modify prototype: separate “Health check” and “Disease”; revise the “chat” page between patients and doctors; enable doctors to generate questionnaire according to the real situation...
- Modify database: change the primary key; modify the relationship between some database...
- Try to use apple watch to collect data and use them. ● Modify user requirements according to the changed prototype ● Start writing system requirements.

Note: Due to being a preliminary meeting, all members should consider doing the points of action to get a decent base understanding of the requirements of the project.

Next (Formal) Meeting:

29th November 2019 at 2:00pm

Meeting Minutes

Call to order: 7th Formal Meeting

A meeting of [Group 18](#) was held at SEB 428a on 29th November 2019 at 2:10pm.

Attendees

Attendees included Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan as well as our supervisor Saeid

Topics of Discussion:

- Show revised prototype: move health check (originally in the same page with cold and stomachache) in Home page for patients into independent category; add a page for allocating doctor automatically for patient if he/she does not choose certain doctor
- Show Entity-Relationships diagram for database
- Advantages & Disadvantages of designing a big table for all diseases and designing a table for each disease
- Add basic information in doctor's table

Points of Action:

- Revise prototype: (in page for doctor making schedule for patient) make the duration for each step revisable rather than total time revisable;
- Research for sensors
- Write interim report

Next (Formal) Meeting:

10th December 2019 at 2:00pm



Meeting Minutes

Call to order: 8th Formal Meeting

A meeting of [Group 18](#) was held at SEB 428a on 10th December 2019 at 2:10pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan as well as our supervisor Saeid

Topics of Discussion:

- Show draft of interim report
- Discuss marking standards for interim report

Points of Action:

- Add references to report
- Add UML diagrams to report
- Reformat the report

Next (Formal) Meeting:

20th December 2019 at 2:00pm

Meeting Minutes

Call to order: Informal Meeting

A meeting of [Group 18](#) was held at the PB Hall on 16th October 2019 at 6:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Ruxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

- Briefing of the project - More in-depth than the EOI requirements sheet
- Wider context of the problem
- Creating the application account 'trello' - recording the team task progress
- Clarify the task division of meeting minutes
- Identify the questions to ask when meeting the supervisor

Points of Action:

- The questions discussed to ask:
- App development for Android or iOS?
- Do we need to develop app for PC?
- What equipments do we need (sensors) ? Where can we get it?
- The function of doctors should be achieved on PC only or PC and mobile both? ● What to present on the website?

Note: Due to being a preliminary meeting, all members should consider doing the points of action to get a decent base understanding of the requirements of the project.

Meeting Minutes

Call to order: Informal Meeting

A meeting of [Group 18](#) was held at the third space on 13th November 2019 at 6:30pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

- Later work distribution: divide the team into two groups, one (two people) for design and drawing prototypes, the other (four people) for draw class diagram, write user requirements and design database.
- Thinking about the questions asked on the formal meeting • Prototype ideas

Points of Action:

- Begin working on prototype
- Do research on server and database
- Design database
- Draw class diagram



Meeting Minutes

Call to order: Informal Meeting

A meeting of [Group 18](#) was held at the third space on 20th November 2019 at 6:30pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

1. Details about prototype design
2. Brief discussion about report
3. How to use sensors to collect data
4. Database revision
5. Job should be done in the following week
6. List current problems which will be asked in the formal meeting.

Points of Action:

- For prototype part, complete the interface design of the doctor part • For database part, add more database about doctors information. • Internet search: how to use sensors to collect data
- According to the prototype, complete user requirements.

Meeting Minutes

Call to order: 1st formal Meeting of spring semester

A meeting of **Group 18** was held online in wechat group on 3rd March 2020 at 3:30pm.

Attendees

Attendees included **Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan** as well as our supervisor **Saeid**

Topics of Discussion:

- The progress of project in vacation
- The plan of future project progress

Points of Action:

- Sensors bought from Taobao have been connected (1 temperature sensor 1 heart rate sensor and 1 bluetooth).
- Data from sensors should be converted (machine language format to readable English language format)
- Two choices of converting data format:1. Find an application online to achieve the function of converting data format. 2. Just leave it and using GSM message SIM card to communicate from Bluetooth to mobile phone.
- The most challenging part of design now is the chatting. For now we can't achieve real-time chatting, there will be time delay.

Next (Formal) Meeting:

10th March 2020 at 3:30pm online

Meeting Minutes

Call to order: 2nd Formal Meeting of Spring Semester

A meeting of [Group 18](#) was held online in wechat group on 17th March 2020 at 4:30pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan as well as our supervisor Saeid

Topics of Discussion:

- The progress of projects in last two weeks
- The plan for next week
- Deadline for the project
- The way for user to access our application

Points of Action:

- Front-end part has almost been done except for chat part.
- For back-end part, scheduling has been finished while giving feedback from doctor to patient and getting history record are being working on.
- Database design has almost been done.
- No progress in blue tooth part due to no android phone at hand
- The way for user to access our application should be decided (whether using barcode for user to scan in wechat or providing application link for user to log in with username and password)
- Prototype for the project should be done in April while we can still optimize our application after that.
- Aiming to work on chat part in next week.

Next (Formal) Meeting:

24th March 2020 at 3:30pm



Meeting Minutes

Call to order: 3rd formal Meeting of Spring Semester

A meeting of Group 18 was held at the third space on 24th March 2020 at 3:30pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan as well as our supervisor Saeid.

Topics of Discussion:

- Later work distribution
- Report current process

Points of Action:

- The front-end of chatting function is finished, now continues to finish the back end.
- Sensors can measure data and transfer it to the mobile phone
- The update of project deadline (maybe delay)

Next (Informal) Meeting:

31st March 2020 at 3:30pm



Meeting Minutes

Call to order: 4th formal Meeting of spring semester

A meeting of **Group 18** was held online on 31st March 2020 at 3:30pm.

Attendees

Attendees included **Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan**

Topics of Discussion:

1. Progress of chatting part
2. Progress of website
3. Bluetooth and sensors (current problems and how to solve them)
4. Problems of achieving chatting part

Points of Action:

- Finish chatting part in two weeks
- Update website
- Test prototype
- Test sensor (transfer data)
- Discuss content of report

Next (Informal) Meeting:

7th April 2020 at 3:30pm

Meeting Minutes

Call to order: 5th formal Meeting of spring semester

A meeting of **Group 18** was held online on 15th April 2020 at 3:30pm.

Attendees

Attendees included **Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan**

Topics of Discussion:

1. First draft of final report
2. How the app is installed
3. The final version of app

Points of Action:

- Added some background information about the relationship of COVID-19 virus outbreak and what our project application can do to such situation
- Discussed how the OMA application will be installed by users---put the install link on the website for users to download apk of the OMA application
- Discussed the situation if users delete the app, can they re-login the app by using their old username and password--- yes.

Next (Informal) Meeting:

21st April 2020 at 3:30pm

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Meeting Minutes

Call to order: 6th Formal Meeting of Spring Semester

A meeting of **Group 18** was held online in wechat group on 21th April 2020 at 3:30pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan as well as our supervisor Saeid

Topics of Discussion:

- The remaining undone parts
- Marking criteria for projects
- Problems about report comments by Saeid

Points of Action:

- Remaining back end part should be done in two days
- Group report should be refined and some parts need to be rewritten.



Meeting Minutes

Call to order: 1st informal Meeting of spring semester

A meeting of [Group 18](#) was held online in wechat group on 13th March 2020 at 2:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

- The confirmation of project progress of each group member
- The discussion of front-end and back-end development
- The plan of future project progress

Points of Action:

- The group leader reiterated the deadline for the task and made clear everyone's progress.
- Make it clear that the team members will almost finish off the tasks over the next week except the chatting part
- The most challenging part of design now is the chatting. For now we can't achieve real-time chatting, there will be time delay. The function of chatting part will be up to do from next week.
- The deadline of final report hasn't been changed (April 9th).

Next (Informal) Meeting:

20th March 2020 at 2:00pm online

Meeting Minutes

Call to order: 2nd Informal Meeting of Spring Semester

A meeting of [Group 18](#) was held online in wechat group on 22th March 2020 at 3:30pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Xuting Wu, Shuning Pan

Topics of Discussion:

- The progress of projects in last week
- The plan for next week

Points of Action:

- Assigning Bluetooth part to Cen.
- Assigning backend for chat to Wen and Wu.
- Assigning frontend for chat to Pan and Gao.
- Bai would write first draft for group report based on video recorded by other members.

Next (Informal) Meeting:

24th March 2020 at 3:30pm

Meeting Minutes

Call to order: 3rd informal Meeting of Spring Semester

A meeting of [Group 18](#) was held at the third space on 24th March 2020 at 4:00pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

- Later work distribution: 1 group is responsible for transfer data from Bluetooth to mobile phone. 1 group starts to test the function of the current application. The rest will focus on achieve the chatting function.
- Report current process: The front end is almost finished. The back end gets stuck in achieving chatting function.

Points of Action:

- Continues to achieve the chatting function
- Starts to test the current realized function
- Starts to write report
-

Next (Informal) Meeting:

31st March 2020 at 2:00pm



Meeting Minutes

Call to order: 4th informal meeting of Spring Semester

A meeting of [Group 18](#) was held online on 5th April 2020 at 3:30pm.

Attendees

Attendees included [Jiazheng Wen](#), [Xingzhi Cen](#), [Runxuan Bai](#), [Xinyu Gao](#), [Xuting Wu](#), [Shuning Pan](#)

Topics of Discussion:

- Database revision: add a new database to store history record (back-end)
- Modification of checklist part and other parts(front-end)
- Discuss some questions about final report
- Deal with some problems related to bluetooth

Points of Action:

- Make adjustments to all mentioned topics
 - Finish final report
-
-
-

Next (InFormal) Meeting:

12th April 2020 at 3:30pm

Meeting Minutes

Call to order: 5th informal Meeting of spring semester

A meeting of **Group 18** was held online on 15th April 2020 at 4:00 pm.

Attendees

Attendees included **Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan**

Topics of Discussion:

1. First draft of final report
2. How the app is installed
3. The final version of app

Points of Action:

- Added some background information about the relationship of COVID-19 virus outbreak and what our project application can do to such situation
- Go through all the reports and assign each person the task of revising the first draft of final report
- Discussed how the OMA application will be installed by users——put the install link on the website for users to download apk of the OMA application
- Discussed the situation if users delete the app, can they re-login the app by using their old username and password—— yes.

Next (Informal) Meeting:

21st April 2020 at 4:00pm





Meeting Minutes

Call to order: 6th Informal Meeting of Spring Semester

A meeting of [Group 18](#) was held online in wechat group on 21th April 2020 at 4:30pm.

Attendees

Attendees included Jiazheng Wen, Xingzhi Cen, Runxuan Bai, Xinyu Gao, Xuting Wu, Shuning Pan

Topics of Discussion:

- Sections in report to be rewritten and refined

Points of Action:

- Assign remaining sections which need to be rewritten and refined to group members
- Group report should be finished in two days