

## Group Assignment: Task Analysis

### SyncMed

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#### Problem and Solution Overview

In the present day and age, many people track their own health using mobile apps and doctors keep records of their patients from yearly checkups. However, there is never any interaction between these two. Currently, there are a decent number of medical facilities that have some sort of online access to medical records that patients can view, but there is no big, overarching system yet. The other main issue that modern healthcare faces is the transfer of information between healthcare workers. When a first responder reaches an accident scene, he must obtain information about the patient quickly, and then he passes that information as well as information about any treatment performed along to the second responders. They then must pass that information on to the ER, then the ER to the operating room, then on to the Intensive Care Unit. This can lead to communication errors that have dire consequences for a patient. Our solution is a mobile app that allows a patient to enter in their information and have their doctor verify it and sync their full medical history. In the event of an emergency, an emergency worker can use their version of the app to pull up this medical history and record procedures done on the patient, thus preventing communication errors while simultaneously giving the paramedic all of the information they need for treatment.

#### Task Analysis Questions

1. Who is going to use the system?

We envision that our user space will be partitioned into three largely disjoint factions: regular (non-medical professional) users, emergency responders, and doctors/nurses in a non-emergency setting. The reason for this partitioning is that our application handles three fundamental tasks -- allowing users to enter in self-collected medical data, enabling emergency responders to make faster, more justified decisions, and accelerating times needed to transfer information between sites of medical care (hospitals, clinics, etc.).

2. What tasks do they now perform?

Current tasks for regular users involve self-monitoring their medical data and attempting to find patterns that interest them. An example of this is a diabetic who tries to calculate the best time to take his/her insulin depending on past history of how their blood sugar responds to meals. This diabetic likely keeps track of this information on paper and tries to look for patterns

themselves. Our application will serve as a centralized repository for that information, and streamline the data processing by presenting the data in visually-enticing ways (that are not misleading), and providing algorithms that perform common and useful tasks for home users. Paramedics currently have to try and ask people at the scene for information about the injured, and people tend to be a source of bad information. This process is time-consuming and provides no guarantees of success. From our third contextual inquiry, we also learned that the people at the scene of a medical emergency tend to be very distressed or distraught, preventing them from effectively communicating with the first responders. Our application, which never gets distraught will provide a quick source of reliable, comprehensive information.

Doctors and patients are frequently forced to wait for unacceptable amounts of time to get files transferred between care centers. Most hospitals are on separate health care systems, which means that some form of slow, paper-based communication of medical records is necessary. Our application eliminates this situation, allowing for people who switch between hospitals to receive better care from better-informed physicians.

### 3. What tasks are desired?

The tasks that are desired are the ability to track personally measured medical data, to quickly communicate important medical information to first responders, and to speed up the currently slow process of transmitting medical charts between different points of care. We also may include support for other desired tasks; one of these is rating nearby hospitals and doctors.

### 4. How are the tasks learned?

We aim to reduce the time necessary to learn the tasks by utilizing the principles of good design. The customer will benefit from knowing what the primary functions of the application are, which we will accomplish via effective promotions. No training should be necessary, although first responders and doctors will need to know how to read medical data (likely a skill that they already have). Users will have to have some basic knowledge about the medical information that they choose to enter, but this is likely already the case.

### 5. Where are the tasks performed?

The user-entry aspect of the app will be performed wherever people choose to enter their own medical data, typically in their own home. Conditions in this location should be good for using applications, especially due to the level of privacy at home. We may also provide a way to discretely enter in data without displaying other sensitive information. For example, if a user wants to enter in some data after every meal, they will be able to do so without revealing private information, even if eating publically. The emergency aspect of the app can obviously be used wherever medical emergencies happen, which is basically everywhere. Of course, since so many conditions will be encountered, it is unavoidable that our application will be difficult to use at rare instances. We will try to make the interface so easy to use that even in compromised situations, the user has a good chance of succeeding. Stress is certainly a factor, but paramedics are used to handling such extreme scenarios. At the doctor's office, conditions are more favorable. It is a lower-stress environment and time is less critical. Also, it is less likely that the phone will be damaged or destroyed (think of a car accident in the first responders scenario).

6. What's the relationship between customer & data?

The relationship between the customer and the data is simple: the data is a reflection of the user. All of the data involved is personal data, meaning that privacy is a major concern for us. The data will primarily be accessed on the phone and the computers at the hospital (after a sync is complete). This means that we can partially rely on existing privacy measures that are already used at locations that store medical information. First responders will need to access the data on a user's phone remotely (from inches away), which will be accomplished via a secure QR code system. The information that a paramedic receives will be deleted after it is no longer useful (likely after only a short time, when the patient arrives at the hospital).

7. What other tools does the customer have?

The tools available to users are devices currently used to measure health information. Examples of these are blood sugar monitors and blood pressure cuffs. Paramedics have access to many tools that will interact with our system in that our app tells them information that helps them decide what tools to use to serve the patient.

8. How do customers communicate with each other?

Our customers fall into one of three groups: normal users, paramedics and doctors. Our application connects them by synchronizing medical history data between users and paramedics or users and doctors. Doctors can verify and update patient's medical histories into a database after each treatment. When a data transfer is needed in a timely manner, our proposed QR code system would help paramedics pull up critical patient information in seconds.

9. How often are the tasks performed?

Tasks for normal users, such as tracking health or medical conditions, are performed on a daily basis. For diabetics, controlling blood sugar is critical for their health condition and medical treatment. Caloric intake measurements can be useful for keeping fit. Tasks like synchronizing medical charts and updating medical history take place sporadically, depending on how frequently the user visits the doctor.

10. What are the time constraints on the tasks?

A regular user's time constraints depend highly on the task at hand. Typically, there are few extreme constraints. A regular user is likely most concerned with making accurate data entries at home and fast, discrete entries in public. We will support this need by having an "in public" option that has a simpler interface and does not display more personal information than is necessary. Obviously, for paramedics, seconds count. They need a summary of pertinent and accurate information as fast as they can get it. Doctors will see improvements in their data transfer waiting times even if this app takes hours to sync. Of course, we expect that it will take much less time than that. Currently, there is little hope of getting data transferred while the patient waits at the new facility, and this application will change that.

11. What happens when things go wrong?

Accuracy is a very deep concern when handling medical information. If a user miss-enters self-gathered information, that information could mislead paramedics or doctors in the future. It could

also lead the user to reach false conclusions about their dietary habits or how their medication is affecting them. Accuracy for paramedics is even more crucial. When seconds count, a mistake caused by false or misleading information is unacceptable. This is why we will ensure that the application emphasizes only crucial information, and the most reliable information (generally not information entered by regular users). Doctors face the same problems as paramedics if they receive false information. As a backup strategy, medical information entered on the app that has not been synced to an official medical record is stored in the cloud. Upon a sync, this data is deleted to diminish privacy concerns.

### Current Versions of Tasks

1) Easy

User wants to enter today's data for his blood sugar.

2) Medium

First responder wants to pull up patient's medical history to see allergies and current medications.

3) Hard

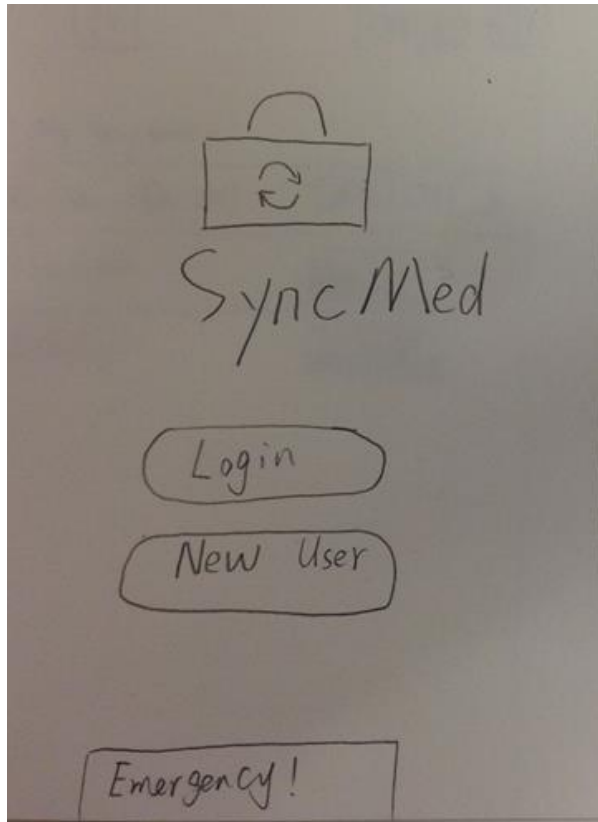
The patient's doctor is performing the patient's annual checkup and wants to view his past medical history for comparison. After the checkup, he must enter in the new information and sync it to the patient's device.

### Storyboards and Selected Interface Design

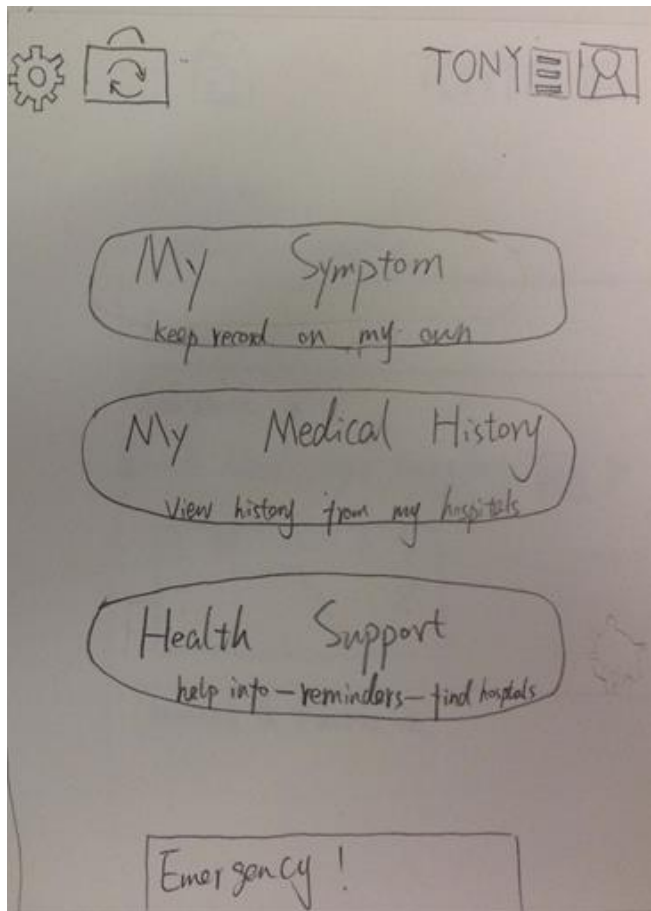
Our team members come from various backgrounds, including design, computer science, and psychology. This diversity influenced us to come up with three interface designs which are quite different from each other. One of us gave a high priority to security issues. In her design, users must enter a password to log in before they are able to check or edit any information. Doctors or first responders need to scan the QR code displayed on the regular user's phone during an emergency in order to have access to their medical history. On the other hand one of us thought that the app needs to focus more about the core function, which is designing a user-friendly and helpful interface for users to keep track of their own symptoms and report them to doctors. This idea resulted in the design of a symptom tracking & recording system with innovative functions, such as the use of infographs to visualize symptom statuses within a specific period of time and using gestures to simplify interactions. A third team member has a background in user experience design; he highlighted what users care about the most. According to the reports from the contextual inquiry, he addresses the basic and severe needs first, develops them into different functions, and gets those functions well organized by putting them into hierarchies.

With all these designs, stemming from people with different backgrounds, taken into consideration, we decided to make an app with all the core ideas combined together. It makes our product more useful and more revolutionary to the current flawed systems.

For the following paragraphs, I'm going to roughly walk through our revised interface.

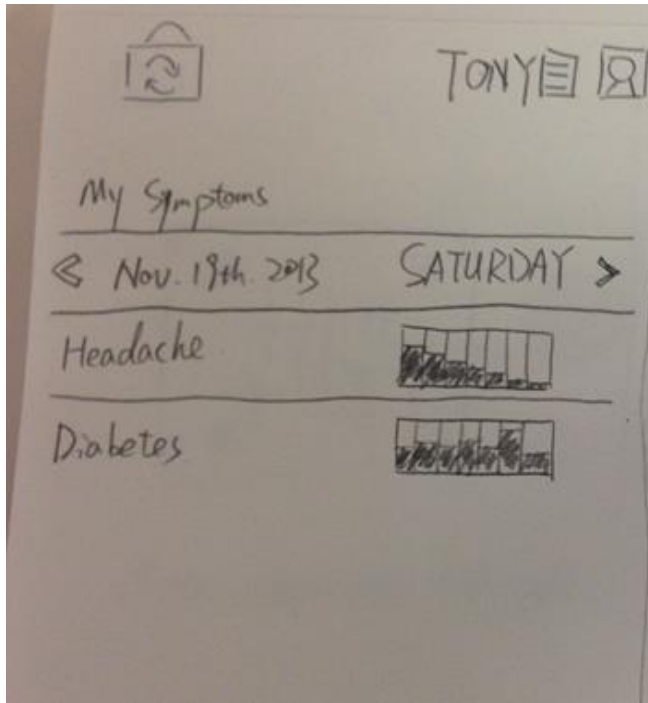


This is the login/register page. Since personal medical information is quite confidential, users need to login with their given user name and password in order to check or record any information. There's an "Emergency" button on the bottom of the interface, which is designed for first responders to check users' medical history in emergency situations. This button will show up in most pages and we'll talk about it specifically in the following pages.

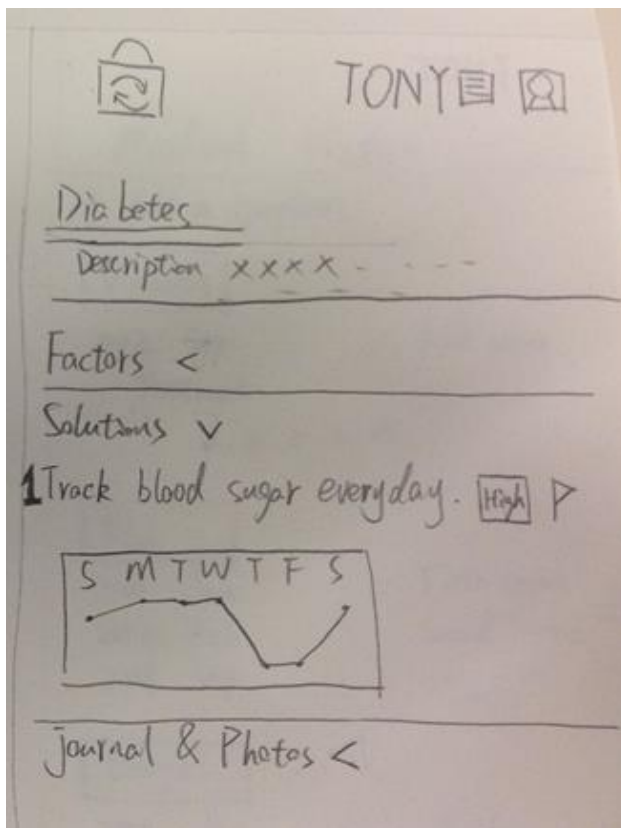


After logging in, users will see this page. Basically, we can call it the “Homepage”. The user dashboard sits in the top right corner. Users can view their names, photos and manage personal preference settings by clicking the button. Also, doctors and first responders can check the name and status to make sure they got the right medical information for the right patient. Also from the top left side, users can do stuff like change default font size and color, set notifications, get information about the app, contact the developer and so on by clicking the button.

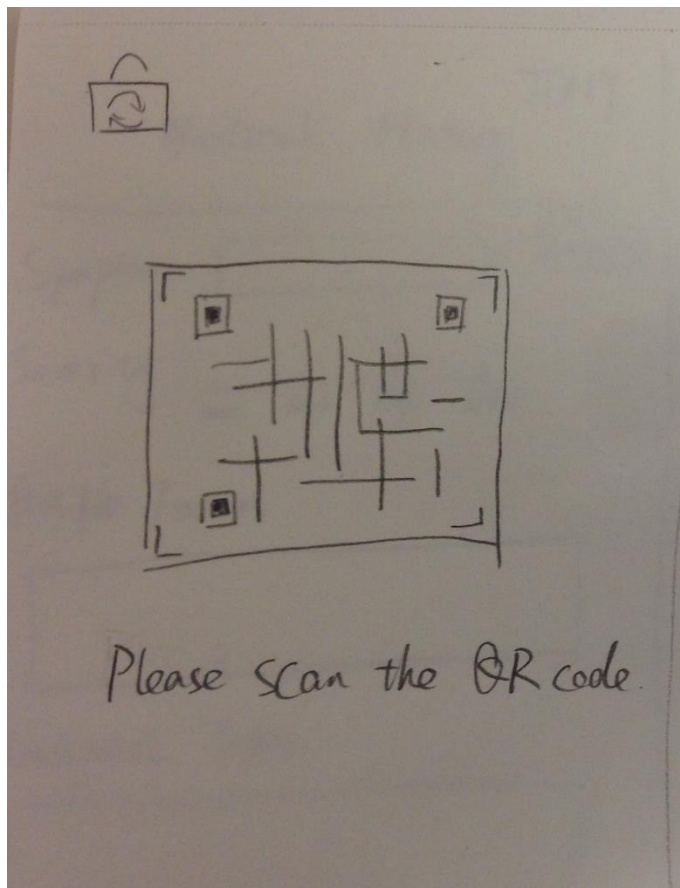
Generally, the app has 3 core functions: to enable general users to enter in and eventually analyze their own medical information, to allow others to view their medical information in an emergency, and to allow for the syncing of medical records during doctor visits. We also offer health support – information discussing how to manage emergencies, what are the suggested treatments for common illnesses, and discussing hospital rankings, sorting hospitals nearby according to reputations or distance.



By clicking the “My Symptoms” button, users will have a brief view of existing symptoms they have or had, record statuses on a daily or weekly basis, and keep track of how these symptoms evolve after proper treatment.

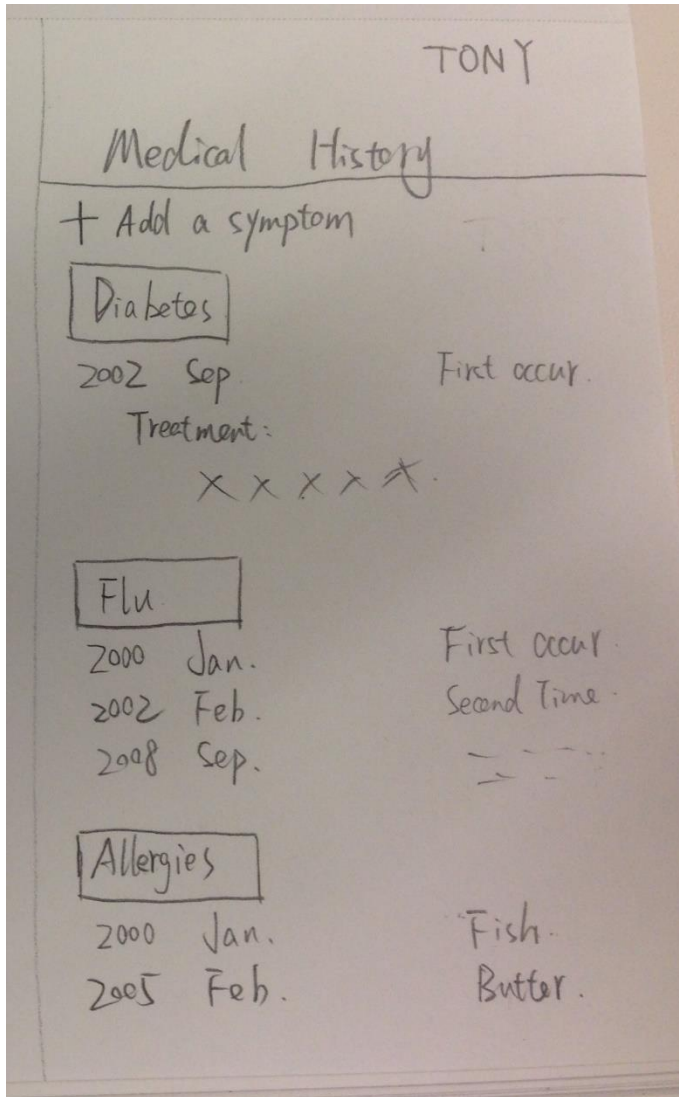


By clicking one of the existing symptoms, users can have a much more detailed view. Besides the description of the symptom, they can check factors which led to the symptom and add new information. What makes life easier is that gestures are introduced here; the user can simply slide right to delete potential causes which are ruled out by doctors and slide left to put those unneeded factors into history. Under “solutions”, users can both check suggestions from doctors and set alarms to remind them to take the correct medicine in time. They are also welcomed to add related journals or photos so that doctors can have a better understanding of their treatment. Depending on the circumstance, doctors may use this information to revise treatment plans.

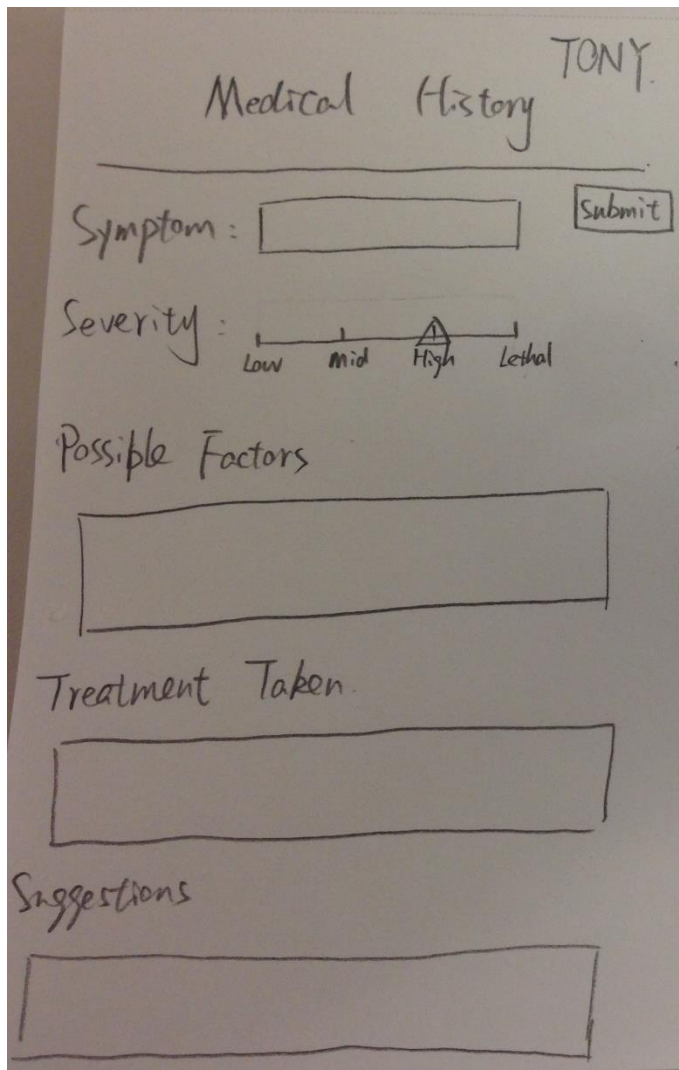


When users need to view their own medical history, they need to get authorization from systems; when it comes to doctors or first responders, they need to scan the QR code (unique for each user) generated by the app with their special scanner. So this is the page seen after someone clicks the “Emergency” button.





After confirmation from the system, users can see their medical history, which is always synchronized with the database from hospital. Every time doctors make any change, the data will synchronize automatically on local apps.

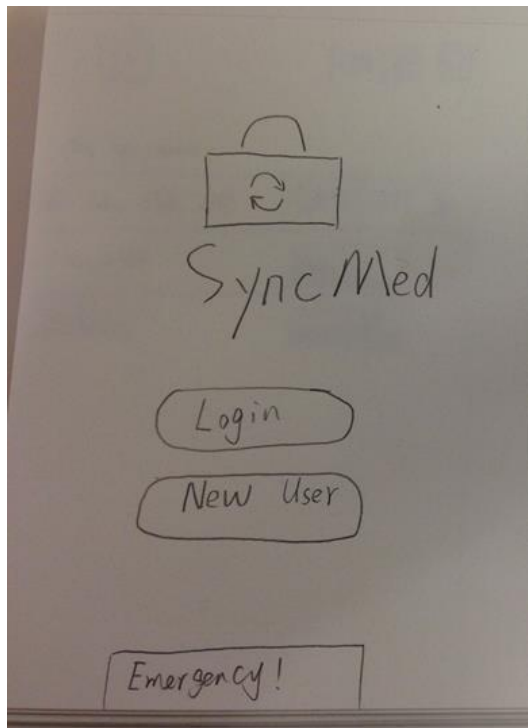


In an emergency, first responders can refer to patients' medical history, medicine taken, and allergies to give quick treatment. What's awesome about the app is they can record initial diagnoses, possible factors and treatment taken on the app and pass that precious information on to doctors for further action.

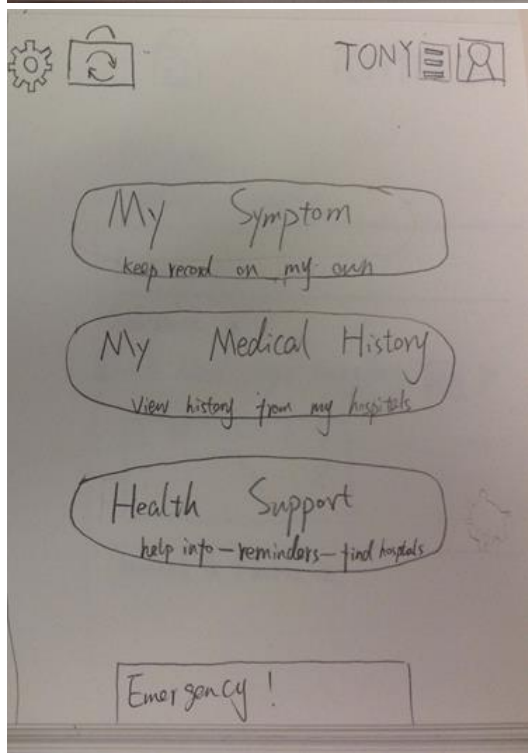
## Storyboards

Design 1

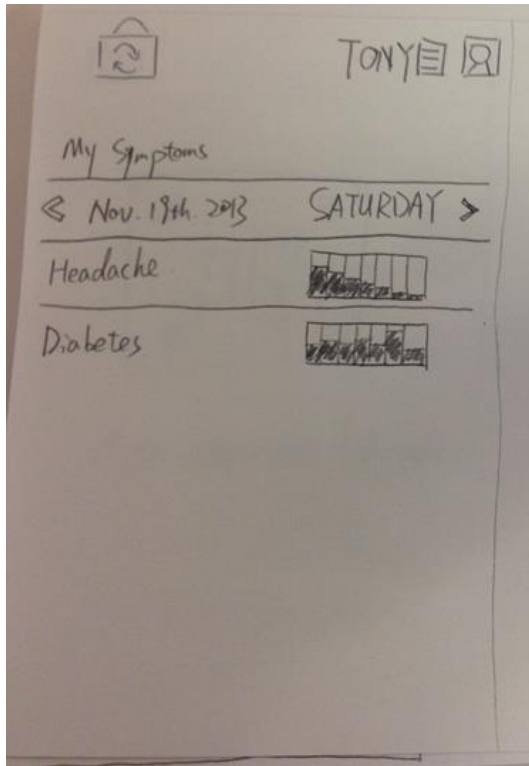
Tracking, recording a medical condition, and medicine alarm/intake.



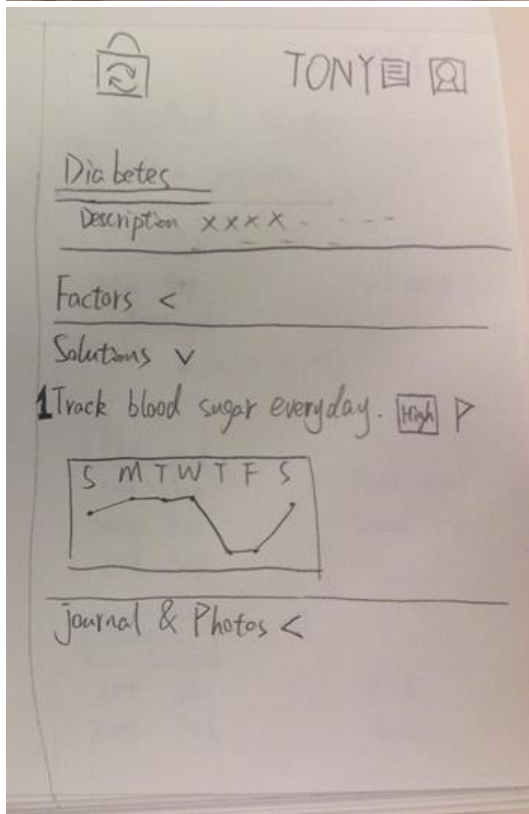
Tony opens the App, since he already had an account, he doesn't need to register any more. He enters the password to login.



Tony wants to check his previous status of diabetes and record his blood sugar for today, so he clicks "My Symptom".



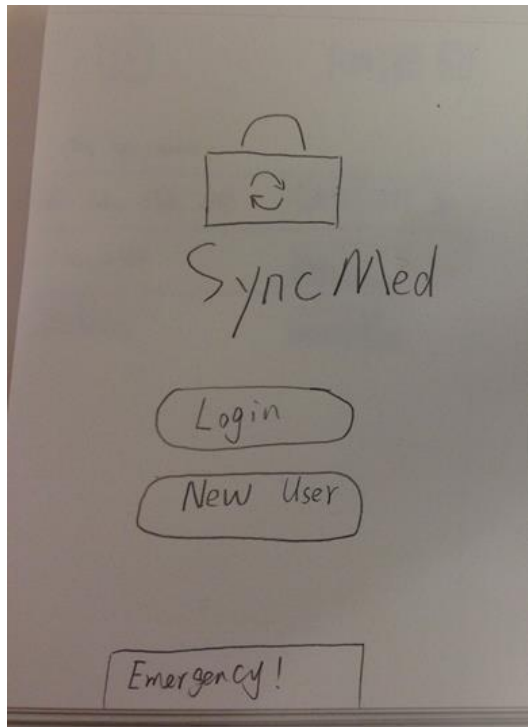
Under "My Symptoms", Tony clicks "diabetes".



Tony doesn't feel very good today; his blood sugar is way above normal. So he just put "High" under "solutions", and he sets an alarm for tomorrow in order to keep a closer watch on the status.

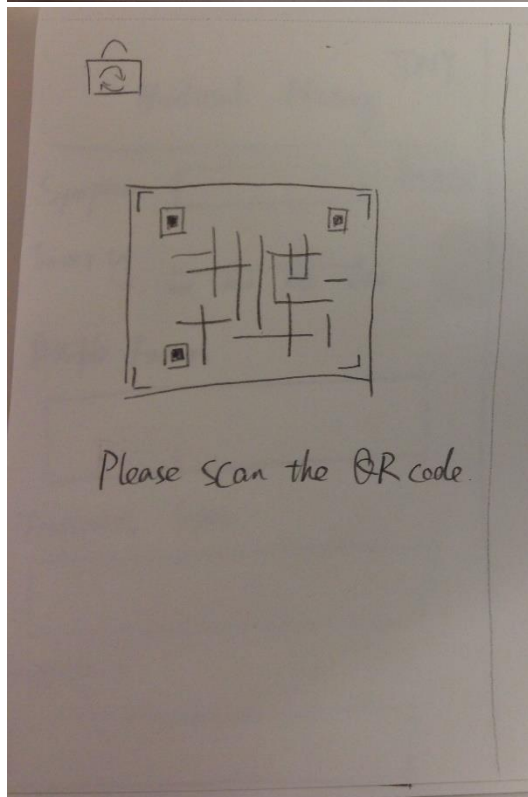
## Design 2

First responder gathering emergency information about patients

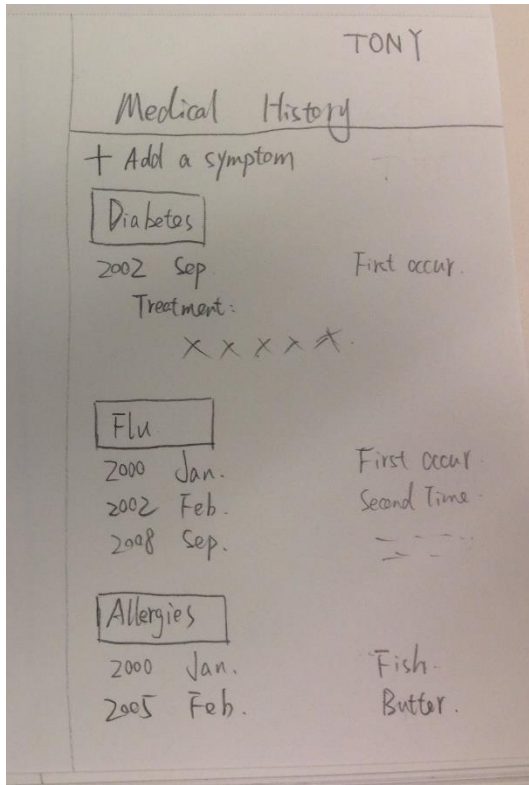


Tony fell into a coma.

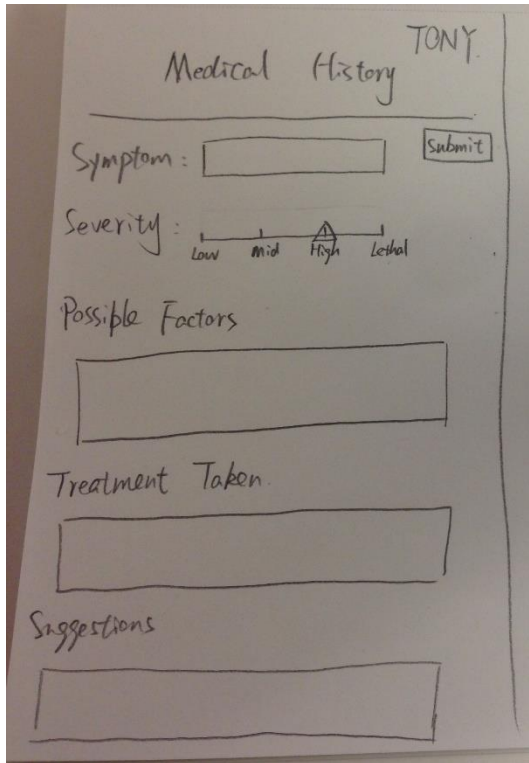
In order to figure out the reason for this, the first responder takes out his phone, opens the app, and clicks "Emergency" button.



First responder scans the QR code with his special scanner to log in to the medical history database.



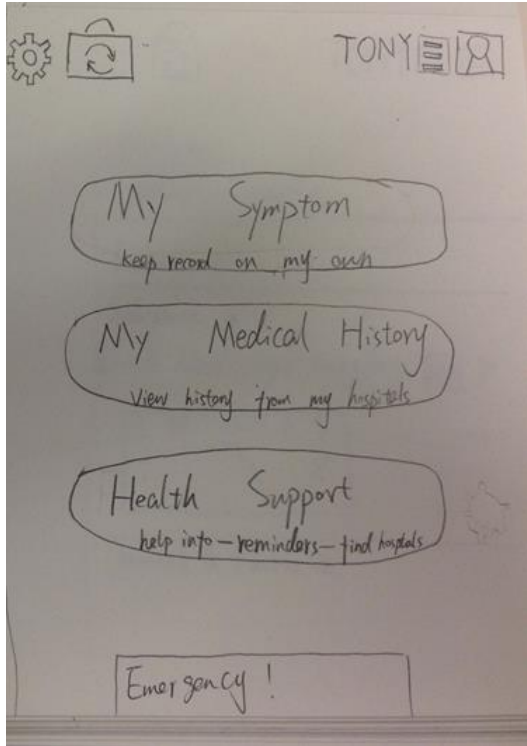
The first responder checks Tony's medical history, and learns about Tony's severe allergy to butter.



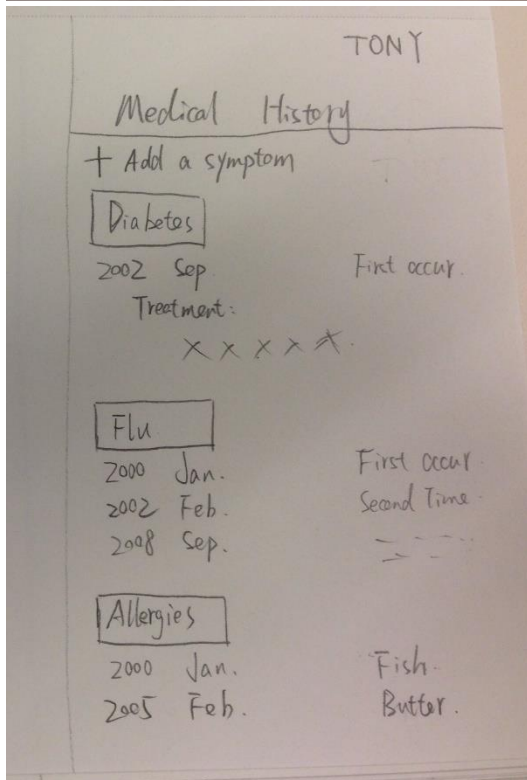
First responder provides treatment to save Tony's life and records the treatment given, possible factors and suggestions for the ER.

### Design 3

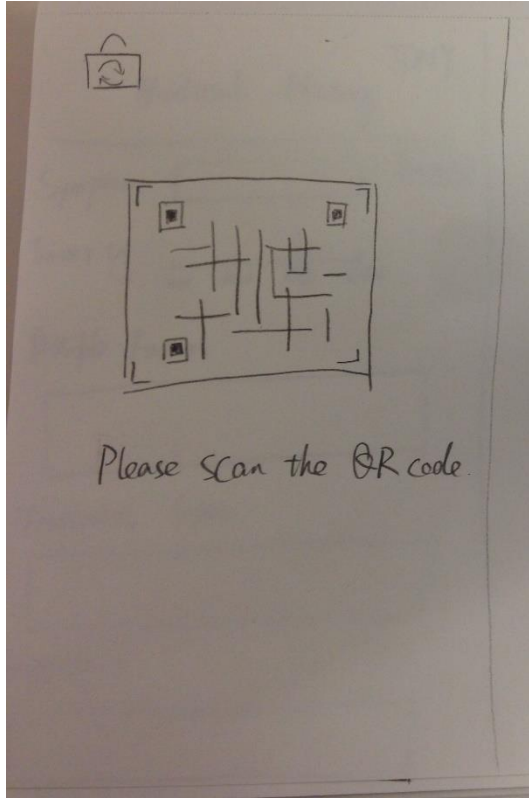
Transfer of information between doctors when moving areas or seeing a new doctor



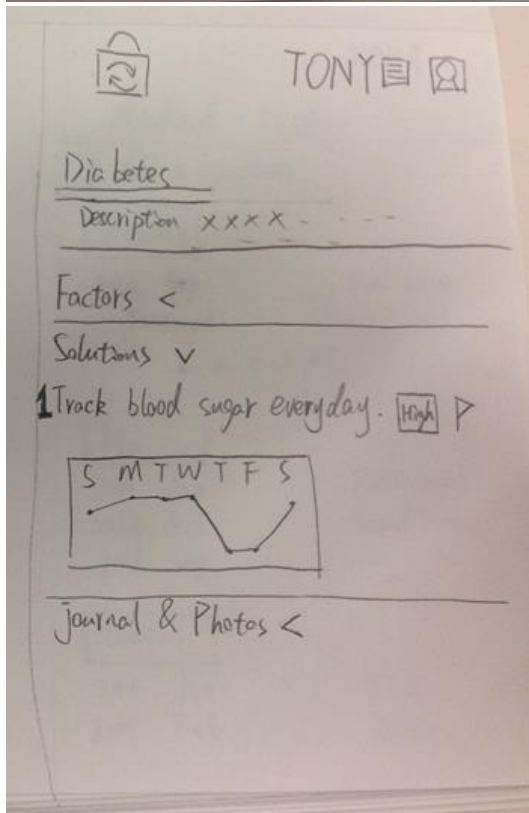
Tony got sick when traveling in Boston; he had to go to see a doctor there.



After entering the password and getting confirmation for the system, Tony is able to view his medical history.



Doctors in Boston scan the QR code with his special scanner to get the medical history on the cloud and synchronize it with the local database.



Tony also pulled out the data he recorded every day to help the doctor with his diagnosing. This leads to a revision of the treatment plan.



## Scenarios

Scenario 1: You are diabetic and your doctor has asked that you take blood sugar measurements and record them on the app. You should login to the app using your PIN number and then use the app's tracking feature to keep track of your blood sugar levels throughout the day. In the morning, your blood sugar is 70 mg/deciliter, at lunch you are at 60 mg/deciliter, and at dinner you are at 80 mg/deciliter. Your doctor has also asked that you track your insulin usage, so you should use the feature of the app that lets you make note that you took insulin after each meal.

This scenario demonstrates the typical use of the app by a standard user. They can use the app to track the progress of treatment of any diseases or medical conditions they have. The app also has functionality that allows the user to mark when they have taken specific medicines or set an alarm to remind them to take a medication.

Scenario 2: As a member of a paramedic squad working in an ambulance, you have been called out to a residential area to treat a person who has fallen gravely ill. Upon reaching the scene you take his phone and must use the emergency function to get his medical history and check for allergies and a potential cause for his illness. You can do this by browsing both his medical history and his medical alerts, which have key information about his allergies and the medications he is currently taking.

This scenario represents typical usage of the app by a first responder. For a first responder, it is crucial to know a user's allergies and any medications they are currently taking. Afterwards, they can use the app to record any treatments done. This task is especially important because the next person that treats the patient, such as the ER or the surgeon operating on the patient, has an exact record of any treatments performed. This eliminates any possible communication errors.

Scenario 3: You are a doctor working at a neighborhood clinic and a new patient has come in to see you. He is from out of state, but has his data synced to the app on his phone. Use your app to view his medical history before your examination. Afterwards, enter in the data you have gathered so he has his updated medical history. You must also later enter the test results from the test you conducted.

This is another important function of the app because it allows for a common medical history between doctors and prevents them from having to use a much more difficult system to transfer medical history. It is also nice because it allows the user to have access to their test results in a quick and timely manner and also be able to view past test results at points in time when they most likely would have lost a paper or email copy of their test results.