

Product Requirements Document v1

Project Name: SMART

Company Name: WELL HEALTH

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INTRODUCTION

Background:

Due to the current pandemic, there has been a tenfold increase in virtual healthcare visits leading to communication barriers between patients and doctors which leads to certain things slipping through the cracks. According to surveys, 74% of patients in the U.S. would use telehealth services. In the pandemic situation, about 76% of patients care more about access to healthcare than need for human interactions with their healthcare providers.

During remote health care, doctors cannot share their screens with patients. As a result they cannot visually explain the complex medical terms. Audio information is less descriptive than graphical representation. We want to let users understand the terminology by displaying the definition and the charts in real-time conversation.

Problem:

Most patients find appointments stressful because they have to remember and understand all the information given to them by doctors. It's estimated that 90 million people in the U.S. have difficulty understanding what their doctor tells them about why they are sick and how to take the medications they are given. This results in 20% to 30% of prescriptions for chronic medical conditions never being filled, and at least half of these medications not being taken as prescribed. Plus, estimates are

that nonadherence leads to up to 10% of hospitalizations and an estimated 125,000 deaths annually.

Many patients don't follow up after the referrals. About 20 percent of patients don't follow up on their doctor's referrals to specialists. That will be a serious problem as they will not get health care in time and it will put their health in risk.

In the current COVID situation, people who suffer from small illnesses are not willing to go to hospitals for treatment to lower the chance of being exposed to potential infection. On top of that, the complication of remotely filling out different forms and health records makes the process of communication between doctor and patient even harder.

Current Solution:

The current solution to a part of the problem is Abridge. It is an app that can record the conversation between patient and doctor, and take notes of the medical terms, so that patients can better understand their health condition in a more professional way. Abridge has several advantages.

Firstly, it is able to understand complex medical terms and provide helpful information after the appointment.

Secondly, It is able to provide a transcription of the appointment for the patient. However, the app has some visible limitations. It is unable to provide assistance to the patient in real time during an appointment. It is unable to provide an interactive transcription of the appointment that can be shared across the patient's electronic medical records.

Moreover, it is unable to unify a patient's multiple medical records across different healthcare providers. Based on our own testing, it only provides detailed explanations of less professional terms, like "lung", "cancer", but is not able to detect words like "aphthous stomatitis", which belongs to the kind people do not understand. Seen from this app, the current solution is helpful, but a more interactive and professional solution is needed.

Project Specifics:

Our project consists of two main parts. First, capturing voice input from the device's microphone, and providing in-depth information on all the medical terms involved, and give medication and pharmacy recommendations.

Secondly, based on the medical history of the patient, generate and update the electronic health records. Everytime this patient has some new illnesses, our app can recommend a suitable hospital/specialist, and auto-generate the format of the specific EHR that collects the related information to this illness.

Team Goals and Objectives:

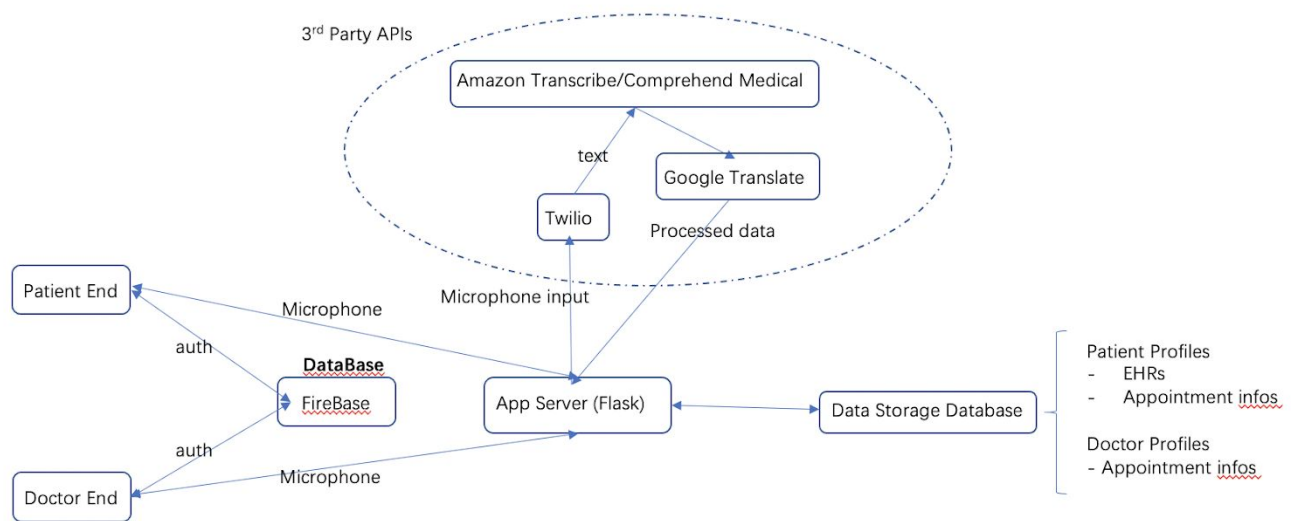
Patients' conversations with providers are full of meaningful moments, important clinical data, follow up tasks all with key pieces of information and advice about how to best manage their care. The goal of our project is to provide patients with a platform that provides this information in real-time while they engage with their providers. Medical records, treatments, and follow-up tasks such as referrals, prescriptions and lab orders will be automatically transferred to the patient application and data will be categorized, organized, and augmented in a way that the patient can understand. All of this data is stored securely and is accessible by patients at any time.

Assumptions:

- We assume the patient and doctor have access to internet connection, microphone, and video chat software installed either on phone or computer.
- We assume doctors and patients use this application that is associated with the same clinic.
- We assume that the platform has a patient's medical information records before the medical appointment with doctors.
- We assume all patients' electronic health records are from the same clinic with the same format.

SYSTEM ARCHITECTURE OVERVIEW

Diagram:



REQUIREMENTS

User Stories and use cases:

1) Log into the application

User Story: As a user, I can log into the application if I have a user account so that I can interact with the virtual assistant and secure personal information.

Acceptance Criteria: User can enter the username and password onto the login screen and submit for authentication. If the username and password did not pass the authentication, an error message will be displayed and the user can login again. If the username and password are correct, the users will be directed to the homepage.

Scenario 1: Authorized user log into the account.

- When the user starts the application, they will see a UI for them to log into their account.
- Once they are authorized, they can then access the app.

Scenario 2: Unauthorized user log into the account

- When the user starts the application, they will see a UI for them to log into their account.
- If they are not authorized users, they will see a message showing they are unauthorized.

Github: <https://github.com/busycsu/WHP/issues/1>

2) Sign up for application

User Story: As a user, I can create my own account which stores my access history and personal information.

Acceptance Criteria: For first time users, a sign-up option will also be available to register as a new user. Users will insert their name, username, date of birth, email address, password, and other information to create an account. After the account creation is confirmed, the user will be directed to the login page.

Scenario 1: New user can sign up for their account

- If the user doesn't have an account, they can click the sign up button, which will direct them to the sign up page.
- Then the user's account information will be stored in the database.

Scenario 2: New user signs up for the account that already exists.

- The sign up page will display a message showing the account already exists.

Github: <https://github.com/busycsu/WHP/issues/7>

3) Access previous appointment history and reports

User Story: As a user, I can go back into the history log to see the reports generated from past appointments, so that I recap the conversation with doctors after the meeting.

Acceptance Criteria: There is an appointment history and report history page for users to access, the timeline of past appointments are shown and reports generated that correspond to each appointment can be downloaded by clicking the 'detail' tab of the appointment.

Github: <https://github.com/busycsu/WHP/issues/2>

Scenario 1: User check their previous appointment

- Users will see their previous appointments history in their dashboard.

Scenario 2: New user check their previous appointment

- Users will see their history empty if it is their first time scheduling the appointment

4) Explaining medical terms to the user

User Story: As a patient, I am able to see the pellucid explanation for medical terms as my doctor tells me about my diagnosis result so that I won't have problems understanding these medical terms.

Acceptance Criteria: As users' conversations with doctors start, when a medical term is mentioned by the doctor, it will be explained in real time to the user.

Github: <https://github.com/busycsu/WHP/issues/4>

Scenario 1: Medical terms are detected

- In real-time conversation, the AI will extract the medical terms and search for explanations for those terminologies.

Scenario 2: Medical terms are not detected

- The interface will then display the normal conversation scripts.

5) Access to patient's electronic health record

User Story: As a patient, I will be able to access my historical electronic health records so that the system will keep traces of the patient's historical health conditions.

Acceptance Criteria: At the patient's end, the electronic health record will be displayed in the user interface.

Github: <https://github.com/busycsu/WHP/issues/5>

Scenario 1: Users have their current electronic health records

- Users will see a button for accessing the health record.
- Then they will see their EHRs from our database.

Scenario 2: New users don't have their electronic health records

- The AI will assist patients to fill out the important information for EHRs.

6) Ability to persist patient's electronic health record

User Story: As a patient my electronic health record should be persisted by the application in the database.

Acceptance Criteria: The system will store each user's electronic health records, including reasons for appointment, diagnosis, doctor's advice, and prescriptions of

medicine, in the database. The appointment history will also be stored into the database.

Scenario 1: Users want to store their electronic health records

- Patients will see a button for storing EHRs.
- One window will pop up and will guide patients to store their EHRs.

Scenario 2: Users want to delete their electronic health records

- Patients will see a button for removing EHRs.
- One window will pop up and ask users to confirm their choice.
- When users say yes, their EHRs will be removed.

Github: <https://github.com/busycsu/WHP/issues/8>

7) Ability to update the patient's electronic health record

User Story: As a patient my electronic health record should be updated by the application and pushed to my EHR system via an API integration.

Acceptance Criteria: Any updates to a patient's EHR will be updated in the EHR used by the provider side via API integration with the EHR.

Scenario 1: When patients finish their appointments

- AI will update the EHRs for patients. According to the conversation they have with doctors.

Scenario 2: Users want to update their electronic health records by themselves

- Patients will see a button to edit EHRs.
- One window will pop up and will guide patients to edit their EHRs.

8) Multilingual Interface

User Story: As a patient, if my native language is not English, I can switch the language of the content presented in the interface into the language that I am most comfortable with, which can be Spanish, Chinese, and etc.

Acceptance Criteria: This feature will be implemented by using an api like google translate which automatically generates translation. There will be a selection list button that contains all supporting languages on the upper right corner of the webpage. The user can select a language and textual content on the webpage will then be translated into that language.

Scenario 1: Users are not comfortable with reading English

- Patients will see a language option button.
- Then the user clicks it and will see a list of languages.
- Then the users will select their primary language.

Github: <https://github.com/busycsu/WHP/issues/6>

9) Ability to generate a medical transcribed report post appointment

User Story: As a patient, I will have a medical transcription report for the appointment provided to me once my appointment has concluded.

Acceptance Criteria: This feature will generate a transcription report based on the appointment voice recording using a speech to text converter and build out a medically transcribed report using NLP.

Scenario 1: Patients just finish their appointment with their doctors

- Patients will see a pop up window that concludes the conversation they had.
- It will also include the medical prescription and the follow up details for the future appointment.

10) Appointment Scheduling

User Story: As a patient, I can schedule an appointment with my doctors through a virtual assistant.

Acceptance Criteria: When patients want to schedule an appointment, they don't need to go through a long and misleading process. They can just tell our virtual assistant about their symptoms and our virtual assistant will handle the rest of the things for patients.

Scenario 1: Users want to schedule an appointment.

- Patients will see a button to launch the virtual assistant.
- Patients will see a virtual assistant will guide them to schedule the best appointment for them.

APPENDICES

Technologies:

- Frontend: React, react-bootstrap
- Backend: Java, node-js, Flask, Firebase, Python

- APIs: Amazon Medical Transcribe, Open AI, AWS Comprehend Medical, Google Translate
- Database: Firebase, SQL

Resources

<https://wellapp.com/blog/millennials-approach-to-health/>

<https://www.kevinmd.com/blog/2018/11/why-patients-dont-do-what-physicians-tell-them.html>