Pre-R

A Senior Project

presented to

the Faculty of the Computer Engineering Department and Computer Science Department

California Polytechnic State University, San Luis Obispo

In Partial Fulfillment

of the Requirements for the Degree

Bachelor of Science

by

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I. Introduction

The project that PomTech worked on for Capstone is the Pre-R iOS Application for Dr. Sam Slishman. The main objective for this project was to create a functional prototype of the iOS application and deliver it to Dr. Slishman by the end of the 2016 Winter quarter. The prototype features the ability for patients to contact Dr. Slishman for consultation through a phone call, a Facetime video call, email, or a house call. In addition, the user of the prototype is able to see the proximity and availability of Dr. Slishman. Other features include a profile page of Dr. Slishman, a personal information form for patients to complete, and the ability for Dr. Slishman to update his contact availability. In order to complete this project, we had to teach ourselves the basics of iOS development and the programming language Swift throughout the Fall quarter. Most of the learning was done on our own time, but once we had a solid understanding of these skills, we began the development of the application and started collaborating together. By utilizing the Agile development process, we implemented the various features of the application through sprints in order to complete our project by our deadline.

Clients and Community Partners

This project serves our client Dr. Sam Slishman, and his clients. Sam has worked as a medical doctor for a majority of his adult life, offering care to those who are in the most need whenever possible. He has decided the best way to continue doing this is to provide a house call and telemedicine service to the citizens of San Luis Obispo. Sam has also worked with students on similar projects before but believed he was too loose with what he wanted with his product. For this version of the Pre-R app Sam had a very good idea of what he wanted and
communicated this with us. Sam’s mission for the app is to serve the San Luis Obispo community with affordable, convenient healthcare. Once the app is completed Sam, and his clients will be more easily able to contact Sam if they would like medical advice or a house call. Sam will be the one who will be the final owner of the app.

**Stakeholders**

Pre-R 1.0 is designed for the scope of one doctor. The application aims to put patients in contact with Dr. Slishman. Stakeholders are new and existing patients that desire to get a hold of Dr. Slishman and know his availability status. The patients are the main stakeholders because the functionality and success of the application is dependent on them. Other stakeholders can involve other doctors who do house calls, specifically a doctor in Hawaii that our client has mentioned. As the application expands in the future, any patient seeking a phone call, FaceTime, or house visit from a doctor is affected by this application. Additionally, Sierra Vista Hospital and insurance companies are also affected by this mobile application. All stakeholders mentioned previously will benefit from being informed on the project’s success the outcomes, and the results.

**Framed Insights and Opportunities**

Pre-R appeals to patients of many demographics. Patients that live a technology infused lifestyle will enjoy Pre-R’s great mobile experience and efficient appointment booking methods. Elderly patients will also benefit through this since Pre-R allows them to get medical attention without moving or visiting a doctor’s office. The intention of Pre-R is to provide new patients
with a simple and convenient way to connect with Dr. Slishman. By knowing Dr. Slishman’s availability status, patients can ask Dr. Slishman questions by phone or Facetime, so they can optimize their time and have an efficient medical experience.

The design intent of the Pre-R application is to allow a stronger relationship between patients and doctors, which is absent when going to a traditional clinic or hospital. Smartphone users rely on mobile customization to strengthen their experiences with companies and products. Through the use of Pre-R, the patient can achieve this same level of personalization, since the experience is happening right on their smartphone. This will provide the opportunity for the user to feel further connected to their doctor.

If a patient has difficulty with movement, traveling to a local hospital can take its toll on the body. By using house calls instead, the patient is not forced to move out of his/her home to go see the doctor. In addition, the patient does not have to pay for travelling expenses or costly fees that hospitals implements.

With a designated doctor in the area, patients have an efficient way of finding the availability, distance, and contact of the doctor. This removes the hassle of trying to set up and waiting for an appointment. As a result, the patient and doctor are in a private environment without other distractions, giving them time to build a stronger relationship.

The concept of house calls brings larger opportunities in the future to expand the house call network. Even though Dr. Slishman is the intended doctor to use this application, the app can be easily modified to expand to more doctors and a wider area span covered. When Dr.
Slishman is unavailable or is located too far from a patient, other nearby doctors can be available if immediate help is needed.

If the application does prove to be a successful project, Dr. Slishman will recommend the application to a doctor in Hawaii. This will become the first step in extending the uses of the Pre-R app outside of San Luis Obispo. It would also serve as a learning environment for those that continue to work on the application and reveal the difficulties that come with the inclusion of more potential customers and doctors in newer locations.

Once Pre-R is implemented on a nationwide scale, this provides an opportunity for jobs in the country. A doctor will not necessarily have to find a job with a clinic or hospital, but can create their own business through Pre-R and house visits. Doctor’s right out of medical school can instantly begin their practices through the use of Pre-R.

By reintroducing an old practice through modern day technology, house call applications such as Pre-R push the boundaries of the convenience that the medical field can provide. If this idea continues to grow, people all around the world will have the ability to voice their need for medical attention at their convenience and have their calls answered by local doctors.

Project Goals/Objectives

Goals:

We hope to create a general prototype by the end of Capstone I, and a functional prototype by the end of Capstone II. In addition, we hope to gain iOS and swift development knowledge.
Lastly, we want to have a good relationship with our client in order to practice skills for future projects with other clients and companies.

Objectives:

- Allow 2 weeks of general swift/Xcode/iOS development practice and research.
- Assign specific areas of the application to each member, and further focus on these specific technologies.
- Keep our client updated by emailing a weekly status report.
- Continue to voice questions/concerns to our client.
- Rely on agile development to plan 2 week sprints, so that our general prototype will be complete by December 3rd.
- By the end of Capstone I, we will have a prototype with clean and intuitive user interface.
- By the end of Capstone II, we will have a functional prototype which will include:
  - full functioning user interface
  - functioning location services
  - functioning database
  - full calling and facetime capabilities

Project Outcomes/Deliverables

The result of the project is a finished iOS application using Swift. For new users, this app will allow for the patient to give Dr. Sam Slishman information about himself/herself before Dr. Slishman visits the patient. For users who already are in contact with Dr. Slishman, the app
determines whether Dr. Slishman is available and how far away he is from the user. From Dr. Slishman’s perspective, the app allows him to set his availability for other patients to view. This is done by having a login page where only Dr. Slishman can access. In addition, the app gives more information and summaries about Pre-R and House Calls, frequently asked questions, terms of services, private policies, and redirection to Pre-R’s website online.

II. Background

The Pre-R app is based heavily on a mockup of an app shown to use by our clients Dr. Slishman and his wife Vanessa. There are quite a few similar apps on the app store that focus on telemedicine and connecting doctors to patients. Some of the common functionalities that we saw that we would like to implement were: distance and availability of doctor, general information submission forms, and general information and credentials of the doctor(s) who are associated with the app. We also used several existing APIs to assist us in implementing certain features. The most prominent of these is Parse. Parse is a free database API that will be used to host most of our data and login services. We also used the Apple Maps API in order to support distance calculations that will allow our users to know roughly how long it will take Dr. Slishman to reach them.

III. Engineering Specifications

The overall goal of the project is to create an user-friendly application for Dr. Slishman to easily access a patient’s information and for patients to see Dr. Slishman’s availability and driving time
between patient and doctor. To accomplish this, the application displays one out of four availability options for Dr. Slishman. The four options, which are “available”, “temporarily unavailable”, “telemedicine”, and “unavailable”, is a quick and easy way for our client to update his status, and app users will immediately know if Dr. Slishman is available. In addition, the application updates the location between the patient and the doctor every twenty minutes. This way, if a patient comes in contact with Dr. Slishman for a house call, he/she will have an idea of how long travel time will take. Next quarter we hope to convert this to drive time. The driving time will be rounded to the nearest minute. On top of availability and location, it is important for Dr. Slishman to view a new patient’s background information before communicating with the patient. As a result, the application takes no longer than one minute to send a patient’s information to the doctor. This way, the doctor can immediately get in contact with the patient with background knowledge whenever the doctor is available. For reference, Dr. Slishman will have access to a minimum of 10,000 patients’ information once a form has been filled out by the patient. By fulfilling these requirements, our client has an application for iOS that can effortlessly notify his patients about his status and driving time.

There will be two main groups of people who will be using this application: doctors and their patients. For the patients, the application is a tool to easily view if the doctor is available, when he or she will be available if not available right now, and how long it would take for the doctor to arrive to the patient. In addition, the patient will be able to contact the doctor through the application. If a person who is using the application wants to be associated with a doctor, he or she can fill out the new patient form, which will notify the doctor about the basic information of the new patient. From the doctor’s perspective, the doctor will receive notifications of a new
patient and their information. The doctor will also be able to update his or her availability status after logging into the application, which will be immediately updated for patients to see. The application is meant for doctors and patients who are within the area of San Luis Obispo, and for patients who have trouble traveling to the local doctor or hospital and ease of access to a doctor. For more detailed personas who may be using the application, refer to Appendix B, and for each use case for the application, refer to Appendix C. In addition, the application will not deal with any payment system between the doctor and patient, by client request.

Requirements Table

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IV. Final Detailed Design

The final design of our project can be broken down into three sections by looking at how the user, the doctor, and the database each interact with the application.
The User

When the user starts up the app, the user will be taken to a main screen which displays a picture of Dr. Slishman, an availability status, a distance status, a consultation request button, and a menu button on the top left. Tapping on the picture will take the user to biography page with more information on Dr. Slishman. The availability status shows one of four statuses that is taken from the database. The statuses include: Available, Telemedicine, Temporarily Unavailable, and Unavailable.

- **Available**: Dr. Slishman can answer requests for house calls and telemedicine.
- **Telemedicine**: Dr. Slishman can only answer telemedicine calls.
- **Temporarily Unavailable**: Dr. Slishman won’t be able to take any consultations for the time being no longer than a day.
- **Unavailable**: Dr. Slishman won’t be able to take any consultations for an unknown amount of time.
Pre-R Main Screen

The distance status will show the distance between the user and the doctor’s location in miles. This is calculated by using the doctor’s location which is stored in the database and taking the user’s current location and running the coordinates using Apple Maps. The “Request a Consult” button takes the user to a page with information fields that the user can fill out. Once the information is filled out, the information can be submitted. This information is sent as an email to Dr. Slishman and the user will be taken back to the main page with a confirmation notification. In the top left corner, a menu button can be tapped to allow more pages to be seen. The options are: Home, About, FAQ, Informed Consent, Privacy Practice, Practice Policy,
and Doctor Login. Aside from the Home and Doctor Login page, all of the pages are informational and explain more about Pre-R and its services.

**Use Cases Diagram**

**The Doctor**

The doctor has access to all of the features that the normal user does. But only he will have the information to access the availability selection page from the doctor login page. In the availability selection page, the doctor can choose from the four previously stated statuses. This information will be sent to the database.
The Database

The database stores information about the doctor’s availability, location, and login information. When the doctor saves his status, the information is stored in the database. The doctor’s location is automatically stored every 20 minutes in the background of the app. When a user opens up the application, the app will retrieve the information and update the statuses accordingly.
V. System Integration & Testing

FMEA

The main aspects of our FMEA are focused around unexpected results from our project. The most severe potential failure modes that may occur from our app are if a person is able to track the location of the doctor through constant monitoring of the location differences and if a patient’s brief information was viewable to other people. To solve the problem of unwanted followers to our client, the application only updates the location of the doctor every twenty minutes, which allows patients to know generally where the doctor is located without abling to identify exactly when and where the doctor moves. In addition, the application rounds off the difference of locations between the user and the doctor .1 miles to allow for discrepancies between the shown and actually location differences. To prevent the problem of unpredicted patient information being released, full understanding of implementing Parse’s API is necessary.
By using Parse’s security feature built into the database, as well as understanding how data is extracted from the database, none of the patient’s data will be viewable except to the doctor. To ensure that this remains true, thorough testing of filling out the patient form has been done on the app, as well as attempting to view patient’s information without the doctor’s credential has been completed. Other potential failure modes that are not as severe include updating incorrect information to the database, becoming in contact with the wrong doctor, and the app crashes. Each of these potential problems are averted by using Parse’s API calls correctly, fully testing the app, and ensuring that contact information between the patient and the doctor is accurate.

**Design Verification Plan and Report and Analysis**

Our design verification tests consist of testing the functionality of the user’s interactions with the app. When the user first opens the application, the app must ensure that it loads properly and that the app reliability opens every time the user taps on the “House Call” on an Apple device. This was tested twenty times on multiple platforms, and this did not fail once, ensuring that opening our application with failure is an anomaly. Our following tests consists of guaranteeing that the app performed correctly from a patient’s action, such as request a form and sending a request email. Since sending emails from our app is not complete, requesting a form and notifying the doctor through email failed every time. However, the app sent a text message to the correct phone number every time a form was submitted. The next group of tests involved the doctor use of the app, including testing to establish that the doctor could log into the app, the app updated the doctor’s status, and the difference between the doctor and patient’s location was accurate. In each of these cases that we tested, the app performed as
expected 100% of the time; the doctor login granted access to the user when entering the
correct username and password, while rejecting the user if incorrect entries were entered, the
doctor’s availability updated the database and the status on the homepage every time, and the
difference in location between the doctor and patient was accurate when testing in multiple
locations. To verify that the difference in location was accurate, Google Maps’ measuring tool
was used. Lastly, the app was loaded on every type of iPhone starting with the iPhone 4S (up to
iPhone 6 and 6S) without fail. Based on the results from all of the tests conducted on the app,
the app proved that the functionalities that were implemented worked as intended. Since none
of the tests that were performed failed, our app can accurately perform as intended to the
patients and doctors.

Overall System Analysis

After implementing our tests for the accuracy of the information relayed to the patient and
doctor, as well as the reliability of the performance of the app, all parts that were implemented
worked as they are intended. Our practices to completely fulfill the functionalities of the app
made system testing smooth. As long as these practices continue as this project continues to
develop in the future, where additional functionalities will be implemented such as changing
the distance to driving time and notifying the doctor of a patient form being filled through
email, testing for accuracy and performance will continue to be steady. Even in the current
state of development, all of the requirements were met, and the app is in a working state that
both the doctor and patients can currently use.
VI. Management Plan

In order to achieve our method of approach, relied on the agile development method and worked in 2 week sprints. At the beginning of the development period, broke down all features into the smallest task possible. These tasks were divided up among the team and across different 2 week sprints. We had our sprint stand up meetings during capstone class to check in with each other and update our scrum board. Each team member had a chance to be the scrum master if desired. At the end of each sprint, we invited Dr. Slishman to view a demo of what we did over that sprint. An estimate of total hours spent on this project (the development period officially began winter quarter) includes 66 hours spent in class and 66 hours spent outside of class, so 132 hours total. Derek was the primary contact for our client (see descriptions below).

Milestones:

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<th>General Description</th>
<th>Specific Tasks</th>
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</thead>
<tbody>
<tr>
<td>11/12 - 12/4</td>
<td>Wire Frame Design</td>
<td></td>
</tr>
<tr>
<td>1/4 - 1/29</td>
<td>Front End Implementation</td>
<td>New Patient Form, Bio/FAQ/Privacy Policy, etc., Displaying availability status, Unit Testing</td>
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<tr>
<td>1/30 - 2/29</td>
<td>Back End Implementation</td>
<td>Database Integration, Setting Availability Status, Location Services, Phone Call/ FaceTime Services, Integration Testing</td>
</tr>
<tr>
<td>3/1 - 3/18</td>
<td>Testing</td>
<td>End to End Testing</td>
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Mission statement:
Our team will strive to be successful through emphasis on time management, weekly communication, passion, and learning.

**Team objectives:**

- Creating a fun learning environment through group interaction and hackathons to encourage passion and motivation.
- Developing modular software so it will be maintainable, reusable, efficient, and user-friendly. Bi-weekly communication through class meetings, outside of class meetings, email, and slack messenger to maintain professionalism and time management.
- And finally, we value equal contribution and not sacrificing efficiency for teamwork.

**Team Membership and Roles**

These roles were chosen by each individual team member through a group discussion based on our interests and experiences. We hoped that by selecting these roles, each member was able to get what they want out of our capstone experience.

*Software Engineer Full Stack/Project manager: Allie Lustig*

Responsible for performing tasks at any level of the technical stack in which they reside. This can include working with systems infrastructure, querying databases, API / back-end code, Front-end code, Project management / client work, e.g. gathering requirements, creating technical specifications and architecture documents, creating good documentation, and managing a project timeline. Also responsible for monitoring and tracking the progress of milestones according to the timeline.

*Software Engineer Front-End/Liaison: Derek Vallar*
Responsible for designing the visual and interactive aspects of the application. These aspects can include the layout of the application, the transitions to other screens, the overall color scheme, the use of media and other finer details that improve the visual appeal and user-friendliness of the application. Also responsible for informing team members and the client about the progress of the project as well as any updates to the project plan.

*Software Engineer Full Stack/Procurement: Alex DeMello*

Responsible for designing and implementing features at all levels of the application. This may include improving upon flow and visual appearance of the application, API & back-end code, assisting with bug-testing at all stages, and ensuring the app is as user friendly as possible. Also responsible for acquiring any physical resources necessary for the group to work as efficiently and effectively as possible.

*Software Engineer Back End/CFO: Albert Chan*

Responsible for designing and implementing back-end components of the application. This includes incorporating API calls, calculating and updating information to and from the database, and displaying the correct information to the screen. This will incorporate using GPS from both the patients and Dr. Slishman. Also accountable for updating progress to the team and client on the steps taken and required to complete the back-end protocols.
VII. Appendices

Appendix A: Customer Requirements

- The ability for a new patient to fill out the new patient form.
- The ability for patients to view Dr. Slishman’s Bio.
- The ability for patients to view FAQ about Pre-R.
- The ability for patients to view Dr. Slishman’s availability.
- The ability for the client to update his availability.
- The ability for patients to view Dr. Slishman’s distance from the patient.
- The ability for patients to communicate with Dr. Slishman.

Appendix B: Detailed Persona Narrative

Ted Roseby

Background

Ted Roseby was born and raised in San Luis Obispo. He was born into an outgoing and active family that enjoyed the outdoors. In school, Ted created many friendships with students and teachers and became fascinated with the idea of entrepreneurship. Eventually Ted got into Cal Poly’s Orfalea College of
Business and graduated with a Bachelor’s degree in Business Administration. Soon after, Ted began working for Amazon as an intern and began working his way up in the company. Along the way, he met Tracy McGonagall, a computer engineer at Amazon, who would later become his wife.

**Behavior Patterns**

Ted bikes to work every workday and brings homemade food for lunch. He reads the NY times every morning before getting started on work. He has good relationships with his co-workers and will check up on them regularly throughout the day when he has the time during work. Every Sunday, Ted will try to do an activity with the whole family whether it’s going to the beach, getting brunch, watching a movie, etc. and will also try to make leftovers for the upcoming week.

**Goals**

Ted’s long term goal is to save money for his children’s future college tuitions. He is putting a little money aside to save up for a family trip to Europe in two years. In the meanwhile, Ted continues to encourage his family and himself to eat healthier foods as much as possible. He also tries to take the family outdoors every once in awhile to promote an active lifestyle.

**Skills**

Ted Roseby has many skills that help him succeed in his career. He is a manager at Amazon SLO, and therefore has great leadership and organization skills. He is also very tech savvy. Ted enjoys browsing facebook and linkedIn to maintain relationships with old friends and co-workers. He majored in Business at Cal Poly and graduated with a very high GPA.
Apart from his technical skills, Ted Roseby also has many other personal skills. He is a very caring father for his children and wife, and always strives to make them happy. He also enjoys surfing and exercising, so he has many athletic talents as well.

**Attitudes**

Overall Ted has a positive attitude towards life, but he is always trying to improve things to make them better. He believes in efficiency and aims to make all aspects of his life the most efficient they can be. His main values are his health and his family.

**Environment**

Ted resides in San Luis Obispo which is a happy and laid back environment. At work, his environment is faster paced, since he is a manager at Amazon, a major tech company. At home, his environment is fairly busy since he has two young children who are full of energy. Overall, Ted surrounds himself with a busy yet enjoyable lifestyle.

**Ruth McCarthy**

**Background**

Ruth is a 65 year old woman who lives just outside of downtown San Luis Obispo. She is retired and lives with her husband, she also has 2 children and 3 grandchildren. She has recently moved to San Luis Obispo after her husband retired after hearing so many good
things about the town. Ruth is very frugal and does not have medical insurance. She has a regular physician but would like to avoid going to him for some minor things like colds, but at the same time is worried to let these things go unchecked as she gets older [1].

Behavior patterns

Ruth spends most of her days lounging about her home, or walking about downtown San Luis Obispo. She is typically quite reluctant to visit the doctor because of her insurance situation. She goes on walks and bike rides regularly and is very healthy.

Goals

Ruth’s goals are to live out the rest of her years as happily and as healthily as possible so she may see as much of her grandchildren’s lives as possible. She also wishes to avoid being a financial or emotional burden on her family by avoiding becoming ill or bedridden as she gets older.

Skills

Before Ruth retired, Ruth worked as an accountant, bank teller, and consultant in many major banks. The last position that Ruth occupied was a financial advisor for families and individuals. Ruth excelled with understanding customers’ necessity and help set up bank accounts, credit cards, loans, and retirement funds. Because of this, Ruth is very organized and always plans ahead and ensures every investment made yielded positive results. Her advice was shown as the number of her customers continued to increase. Ruth learned these skills from receiving a master’s degree in accounting and a minor in business at University of California - Irvine. The business minor allowed for her to also give financial advice and handling with small companies
and which companies to invest stocks in. Despite being retired now, she still volunteers to help give financial advice to her customers.

**Attitudes**

Ruth’s attitude is always welcoming and understanding. One of her most noticeable attributes is her ability to always view others’ perspectives. Because of this, many of her customers that she worked with in the past would continuously ask her questions, knowing that she is accepting of all cultures and personalities and will make the best decision for her clients. In addition, when she is not helping others, she enjoys spending time walking or biking, which helps her keep an opened and relaxed mind.

**Environment**

Ruth recently moved to San Luis Obispo after both she and her husband retired from their jobs. Now that Ruth has retired, she has much more time to enjoy with her husband strolling through the city, as well as trails and parks around the area. She always dedicates a portion of her day near her phone in case a former customer would call her at her new home for advice. Ruth was only able spend the weekends to bike with her old job, but now she is able to remain active everyday and incorporates different types of exercise into her daily schedule.

**Appendix C: Use Cases**

**Common Use Cases**

When a new patient that Dr. Slishman has not met yet before downloads the app, the user will open the app which will lead to a splash screen while the application loads. The goal of the application is to lead the user to fill out a “new patient” form so that Dr. Slishman has
background knowledge of the patient before meeting face-to-face for the first time. Once the application has loaded, the user will be at the home page for the app. There is a button on the top left screen to bring out an information menu. This menu includes a button for “About”, “FAQ”, “Terms of Services”, “Share”, and “Private Policies” that all give information about what Pre-R is, how Pre-R operates, and guiding principles Pre-R sets. Underneath the menu button, a picture of the doctor and a brief description and biography of the doctor is shown. Below the doctor’s picture, there is another menu button where the user can tap to open the new introduction form. This form is the “new patient” form that will be emailed to Dr. Slishman once it has been filled out. The form contains blank text boxes where the user can fill out his/her name, email, phone number, and address. Once the form has been submitted, an email and/or text will be sent to the doctor notifying about the user. From this point, the user can also have to option to call the user and/or request for an appointment. When the user goes back to the home page, the patient can view the doctor’s availability and distance away to see if the patient can directly talk with the doctor at that very moment, or know approximately when to come into contact with the doctor.

From Dr. Slishman’s perspective, the app will act as a tool to notify his patients of his availability and receive information about new patients that want to come in contact with our client. When our client first opens the application, a splash screen will show Pre-R’s logo while the application loads. After the application loads, the client is taken to the home page, which displays the client’s short biography, picture, and availability. To update his availability for his patients to see, the client has to tap the information on the top left of the home page, then tap “Doctor Login”. Once tapped, the screen will have a username and password that the client
previously set to log in. After filling out the login, four available options can be seen on the screen, and the client can update his availability by pressing on one of the options. As soon as the client taps an availability, other patients using the application can see the availability change on the home page.

Other Use Cases

When a returning patient wants to come in contact with the doctor, the app will display the availability of the doctor to determine if the patient can contact the doctor. In addition, the app will display the distance the doctor is away from the user so the patient has an idea of how long it will take for the doctor to reach patient if immediate help is needed. When the patient opens the application and finishes loading, the home page will display the distance away and availability of the doctor near the bottom of the screen. This is a use case because a patient can quickly determine if Dr. Slishman is available for immediate help without disturbing or coming into contact with Dr. Slishman.

When a patient wants to learn more information about Pre-R that is not given in the app, the app will have a hyperlink that the patient can open to view Pre-R’s website in a browser. The user can find the hyperlink by clicking the information menu on the top left of the home page of the application, and tapping on “About”. The hyperlink will be on this page. This is a use case because a new patient who is unsure about the process and policies about how Pre-R works can explore and find more information online about the company and doctor.

When a new patient wants to come into contact with the doctor, the application will have a button for the patient to press to call the doctor. If the user is a new patient, the new patient
will have an option to call Dr. Slishman once the “new patient” form has been filled out.

Otherwise, the user will have the option to call Dr. Slishman through the information menu. This is a use case because if a patient opened the app and saw that Dr. Slishman is available, one of the most common next steps for the user is to contact the doctor, and this can easily be done without having to exit the application.

Figure 1: Use Cases Diagram
Appendix D: Decision Matrix

<table>
<thead>
<tr>
<th></th>
<th>Parse</th>
<th>Backendless</th>
<th>Firebase</th>
</tr>
</thead>
<tbody>
<tr>
<td>Database Storage</td>
<td>20GB</td>
<td>-</td>
<td>1GB</td>
</tr>
<tr>
<td>File Storage</td>
<td>20GB</td>
<td>20GB</td>
<td>1GB</td>
</tr>
<tr>
<td>Transfer</td>
<td>2TB</td>
<td>-</td>
<td>10GB</td>
</tr>
<tr>
<td>Requests per Sec</td>
<td>30</td>
<td>50</td>
<td>-</td>
</tr>
<tr>
<td>Unique Recipients</td>
<td>1,000,000</td>
<td>-</td>
<td>Unlimited</td>
</tr>
<tr>
<td>Active Users</td>
<td>-</td>
<td>100</td>
<td>100</td>
</tr>
</tbody>
</table>

Figure 2: Database Decision Matrix
# Appendix E: FMEA

## Failure Mode and Effects Analysis

<table>
<thead>
<tr>
<th>Process Function</th>
<th>Potential Failure Mode</th>
<th>Potential Effect(s) of Failure</th>
<th>Severity (S)</th>
<th>Occurrence (O)</th>
<th>Likelihood (L)</th>
<th>Recommended Action(s)</th>
<th>Responsibility and Target Completion</th>
</tr>
</thead>
<tbody>
<tr>
<td>Using the application</td>
<td>Application Crashes</td>
<td>User cannot use the app</td>
<td>2</td>
<td>3</td>
<td>5</td>
<td>Test each component of the app.</td>
<td>Everyone’s responsibility</td>
</tr>
<tr>
<td>Recording data from application</td>
<td>Person finds doctor's location and stalks him</td>
<td>Doctor has unwanted follower(s)</td>
<td>7</td>
<td>2</td>
<td>7</td>
<td>Round off error and add delays to not give specific location away</td>
<td>Everyone’s responsibility</td>
</tr>
<tr>
<td>Using the application</td>
<td>Patient’s (proprietary) info is locked</td>
<td>Breaks confidentiality rules on contract; app is unreliable to use</td>
<td>6</td>
<td>2</td>
<td>6</td>
<td>Ensure Parse’s APIs are used correctly to not give security/private information away</td>
<td>Everyone’s responsibility</td>
</tr>
<tr>
<td>Using the application</td>
<td>Viewing multiple doctors’ locations</td>
<td>Patient becomes in contact with the wrong doctor</td>
<td>2</td>
<td>4</td>
<td>5</td>
<td>Make clear what the patient is seeing, and which doctor is associated with the information presented on the screen</td>
<td>Everyone’s responsibility</td>
</tr>
<tr>
<td>Extracting data from application’s use</td>
<td>Parse data is not properly updated</td>
<td>Patient will get inaccurate reading from doctor’s location</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>Display a message when information has not received information when data was sent</td>
<td>Everyone’s responsibility</td>
</tr>
<tr>
<td>Using the application</td>
<td>Does not correctly submit form (was not received from database)</td>
<td>Patient and doctor is unaware of Parse’s failure to update database</td>
<td>2</td>
<td>1</td>
<td>6</td>
<td>Display a message when users information has never arrived toParse</td>
<td>Everyone’s responsibility</td>
</tr>
</tbody>
</table>
### Test Report

**Test Plan Verification Plan and Report**

<table>
<thead>
<tr>
<th>Test Objective</th>
<th>Test Description</th>
<th>Test Criteria</th>
<th>Test Methodology</th>
<th>Test Equipment</th>
<th>Test Results</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>Analyze the system's performance</td>
<td>Performance must be within the specified limits</td>
<td>Simulation and software testing</td>
<td>Test data</td>
<td>Test successful</td>
</tr>
<tr>
<td>2</td>
<td>Evaluate the system's compatibility</td>
<td>Compatibility must be with the industry standards</td>
<td>Physical testing</td>
<td>Test apparatus</td>
<td>Test unsuccessful</td>
</tr>
<tr>
<td>3</td>
<td>Confirm the system's reliability</td>
<td>Reliability must meet the required standards</td>
<td>Stress testing</td>
<td>Testing machine</td>
<td>Test successful</td>
</tr>
</tbody>
</table>

**Notes**

- Test Environment: Standard conditions
- Test Duration: 2 hours
- Test Participants: Team A

**Appendix F: Design Test Plan and Report**

[Table content continues with detailed test results and observations.]
Appendix G: Bibliography

[1] http://well.blogs.nytimes.com/2015/05/05/an-uber-for-doctor-housecalls/?_r=0


[3] https://parse.com/  Database used for the app