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IT 314 Software Engineering
Healthcare Monitoring System
Group 20

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Group Members

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Introduction

Problem Statement

Here we are using an idea for continuous monitoring of a patient's health conditions. The health care scheme is focused on the measurement and monitoring of various biological parameters of a patient's body like heart rate, oxygen saturation level in the blood, and temperature, where a doctor can continuously monitor the patient's condition. And any kind of emergency doctor will get immediately notified about the situation.

Purpose

The purpose of this document is to provide a detailed design of the Health Care Monitoring System project. This involves:

I. Presenting and understanding the original problem statement.
II. The analysis of the project requirements and specifications through various group member meetings.
III. Detailed design for the various functionalities provided to the user.
IV. Other details of the project such as functional and non-functional requirements.
V. Testing the various functionalities of the application.

Product Scope

This product is identified as a Health Care Monitoring System as it is primarily concerned with the monitoring of various parameters of patients and reporting them back to the Doctor or the Medical Staff at the Hospital. This facilitates the doctor to keep a better eye on patients that aren’t admitted to the hospital and this will also provide a much better medical history when the patient is admitted. This will also provide a way for the patients to have a better understanding of their medical records.

General Description

Generally, a patient's medical history is kept by the patient themselves in a file/folder, this method over time becomes burdening for the patients as it becomes hard to keep track of things in the folder, and for doctors, it becomes difficult to search for old records. To combat this problem, the Health Care Monitoring System aims to provide a way to store and keep track of various medical parameters and reports online in an easy-to-access manner. Our aim is to develop a platform where doctors can track the patient's vitals and also get feedback from them.

Product Perspective

The product requires the user to have access to the web browser either on the desktop, tablet or phone with an internet connection. Apart from this, to input parameters by themselves they should have the respective device needed to record it, for example, an oximeter to measure SpO2%.

Stakeholders and Users of System

- Patient
- Doctor
- Web page Designers
- Database managers
- Admin

Requirement Elicitation

We primarily focused on two methods for Requirements Elicitation. Interviews for Doctors and Survey Forms for patients.

Interviews

- Purpose of Interviews:
  Preliminary meeting to identify Functional and Non-Functional requirements from the Doctor’s side.
- Agenda for interviews:

- Gaining ideas about the workflow of the individual Doctor.
- Understanding the importance of the type of data being handled.
- Identifying what medical parameters are important to be kept track to daily.
- Identifying other needs for the website such as limits of each individual parameter.

Key points from the Interview with Dr. Aditya Dave

- The staff usually has to make sure that relevant data has been procured by the patient if he/she is visiting for the first time
- Data security is a major concern
- The patient should have restricted access so that they don't delete some data by mistake or anything of this sort
- It should be clear as to what parameter is being asked so that wrong data isn't being inserted
- An alert should be sent to either the doctor in charge or the staff if any input parameters are abnormal
- Among the various parameters, blood pressure, blood sugar, heart rate, and oxygen saturation are the most relevant and can be kept track of easily by an individual
- There should also be a way to report some other distress, something like a journal

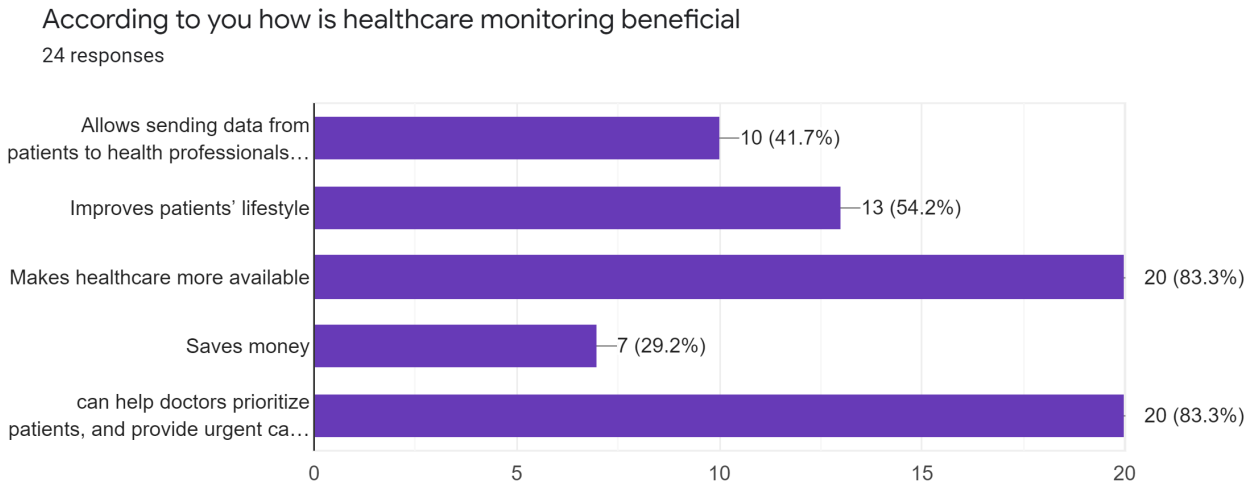
Key points from the Interview with Dr. Divya Dixit

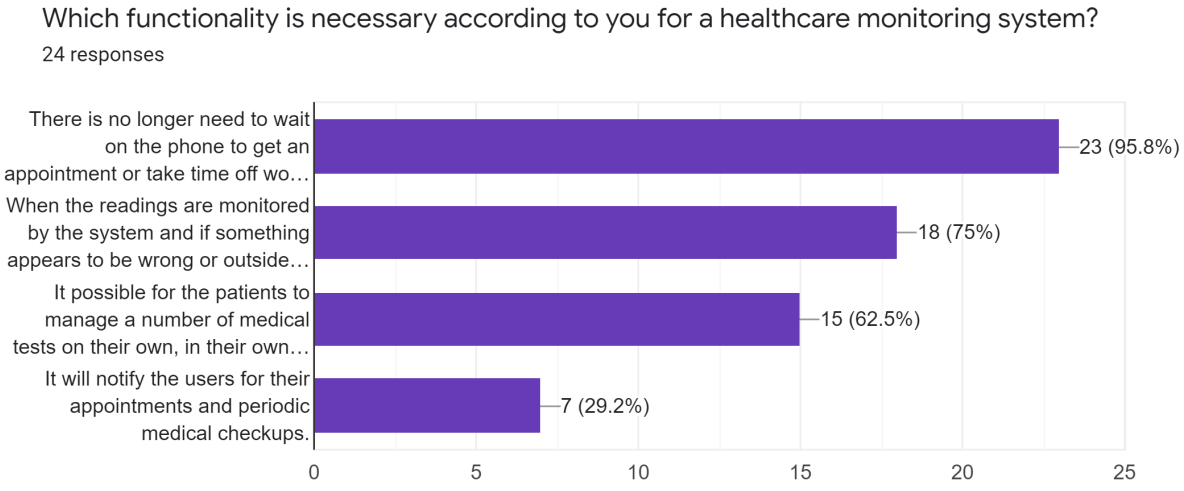
- Doctors should be able to see their appointments.
- Patients should be able to see the availability of different doctors in order to book an appointment.
- Patients and doctors should be added to the system without any complex procedures.
- A patient can see only his/her details in order to maintain patient confidentiality.
- Doctors can see the medical details (i.e prescribed medicines, different reports, medical history, etc) of patients assigned to him only.
- Blood pressure, blood sugar, heart rate, a saturation of oxygen in the blood are some of the important parameters which should be kept track of.
- If any abnormalities are detected in these parameters concerned doctors should get notified.
- The system should be working 24 X 7.

- The patient's medical details are very important, so even if the system crashes the data should remain unchanged.

Survey Forms

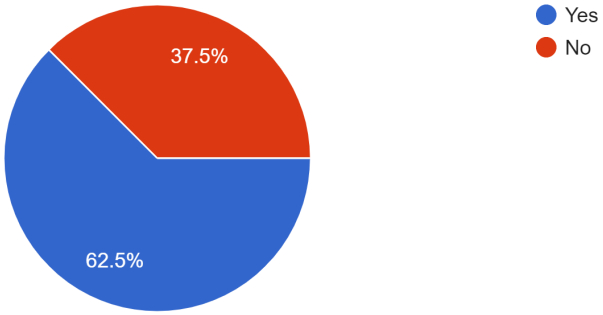
The following are the responses from the Survey we sent out:





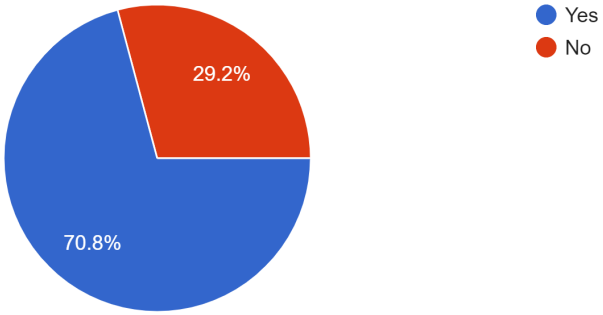
Are you comfortable in sharing your medical data with hospital staff online?

24 responses



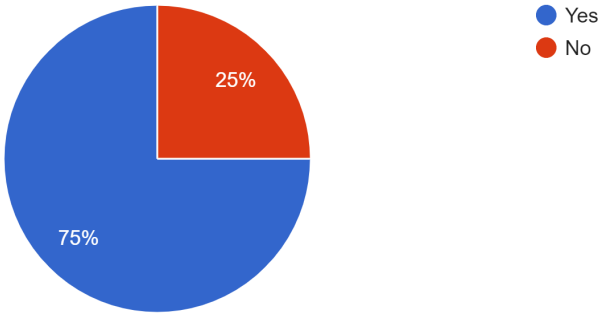
Do you think you'll be able to take frequent measurements of some important medical parameters?

24 responses



Do you think that looking at doctor's expertise before booking an appointment is helpful?

24 responses



Functional requirement

1. One can register his/herself by ‘login -> sign up’ to the website.
    a. Non-registered users**:** Non-registered users will only be able to see the homepage of the website, which provides basic information like different articles, nearby hospitals and their emergency contacts, and also details related to website functionalities.
    b. Registered users: Any registered user(either patient/doctor) can sign in from the main page, based on the credentials they will be able to see the patient’s page or doctor’s page.
2. Booking an appointment**:** Any registered user can book an appointment from the website to any doctor.
3. Accept/reject an appointment**:** Doctors can accept/reject their appointments.
4. View Medical details **:**
    a. Doctors: The doctors can see the medical details of all patients.
    b. Patients**:** The patients can see medical details pertaining to only him/her.
5. Report about any new medicines**:** Doctors can add any new medicines prescribed to a particular patient.
6. Tracking parameters daily**:** For each patient, Parameters like blood pressure, heart rate, the temperature will be monitored daily and will be updated on the website by the patients
7. Notification :
    a. Doctor’s notification: Doctors will be notified in case of emergency (i.e abnormal changes in parameters of any of his/her patients) and also about his/her appointments.
    b. Patient’s notification: Patients will be notified for their appointments and periodic medical checkups.
8. Upload/View Previous medical history**:** While admitting, patients need to upload their previous medical history, and later the doctor can see it through the website.

Non-functional requirement

1. Security: Any user who makes use of the system needs to hold a Login ID and password (i.e has a verified account). Otherwise, they will be able to see the front page of the website which provides basic information like different articles, nearby hospitals and their emergency contacts, and also details related to website functionalities.
2. Privacy:

   a. Doctors: Doctors can check and update medical data only of his/her patients.
   b. Patients: Patients can see their medical data only.
3. Durability: In case the system gets crashed, the data should remain unchanged.
4. Capacity: The website should be able to handle more than 1000 patients.
5. Scalability: There should be no complex procedures in adding more doctors/patients to the records.
6. Compatibility: This website should run on operating systems like windows, android, macOS.
7. Performance: For higher workload scenarios the system should still meet the basic performance requirements.
8. Availability: The system should be available 24/7.
9. Reliability: The system should perform consistently without failure.

Estimation of Sprints

Cost and time to complete play large roles in various estimating techniques in which the larger the number assigned to a user story, the more it costs, and/or the longer it takes. The estimation of the following sprints is based on the time to complete the user story and the number of developers working on it.

Classification of Sprints

We followed MoSCoW prioritization technique to reach a common understanding of the importance of all the different requirements.

- Mo: Must Have
  - Non-negotiable needs that are mandatory to implement
- S: Should Have
  - Needs that are important but not critical for the release
- Co: Could have
  - Needs that are desirable but not mandatory for the release
- W: Will Not Have
  - Needs that can be ignored and can be considered for future releases

Sprint 1

Functionalities taken up

- User registration and login

- Select doctors
- Book Appointment

User Stories

Must have

- As a patient, I should be able to register on the website.
- As a doctor, I should be able to register to the website via a secret key.
- As a user, I should be able to log in to the website so that I can use the personalized services of the site.
    - User enters ID and Password.
    - ID and Password gets verified.
    - If everything is fine, the user is taken to his/her profile.

Should have

- As a patient, I want to look at the list of the doctors, so that I can book appointments with any of them.
- As a patient, I want to send requests to the doctor whenever I book an appointment so that I can get a mutual agreement.
- As a doctor, I want to get a list of appointments that are requested to me.

Could have

- As a patient, I want to look into a doctor's expertise before booking an appointment.
    - Patients are shown areas of expertise for different doctors.
    - Patients then choose a doctor according to his/her requirement.
- As a non-registered visitor of the website, I want to get details about the website so that I can check whether it fits my requirements and if I should register myself with thy system.
    - If a user is not registered, the website shows general information about the monitoring system.
    - If the features fit the requirement one can register him/herself.
- As an admin, I want to be able to add/remove hospitals and doctors from the system.
    - Admin is shown current hospitals and doctors working for these hospitals.
    - Admin can add/remove hospitals as well as doctors from the system if needed.

Class Diagram

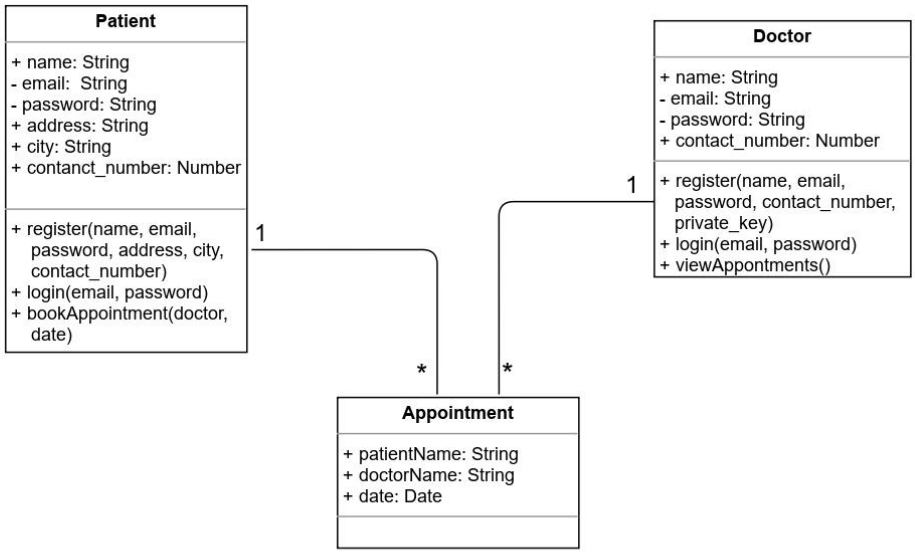


Figure: Class Diagram

Activity Diagram

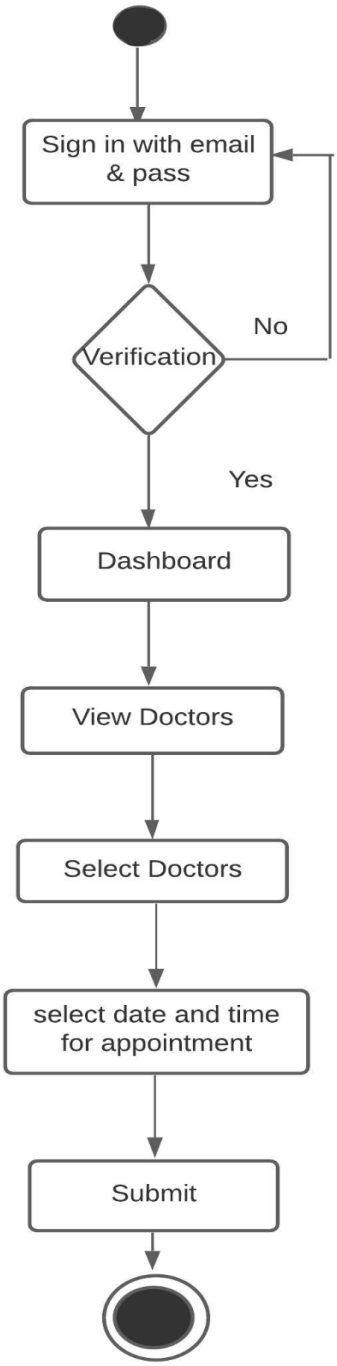


Figure: Patients Login

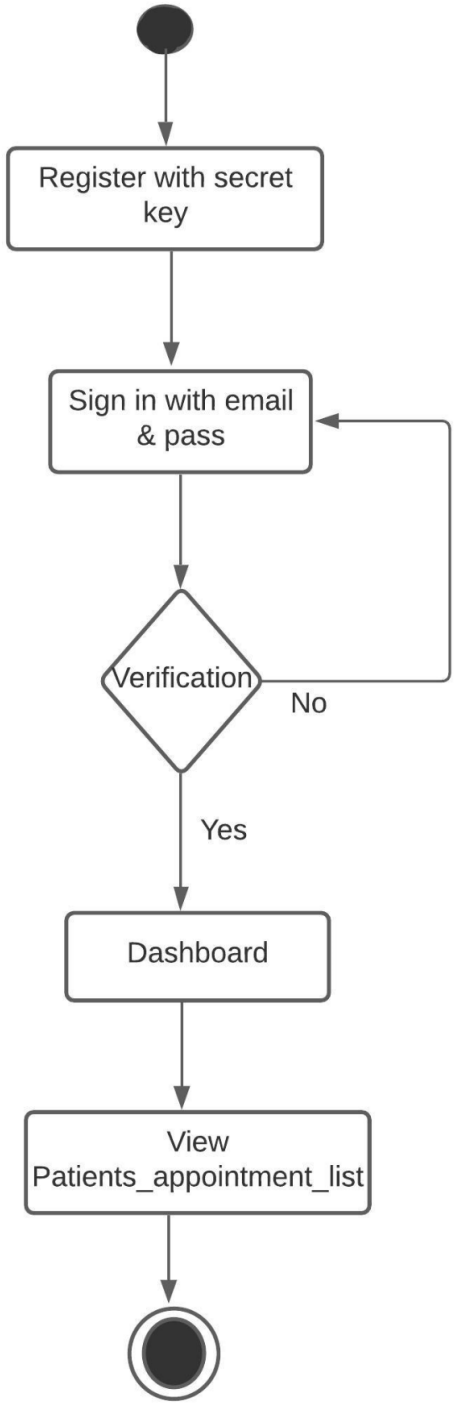


Figure: Doctors Login

Sequence Diagram

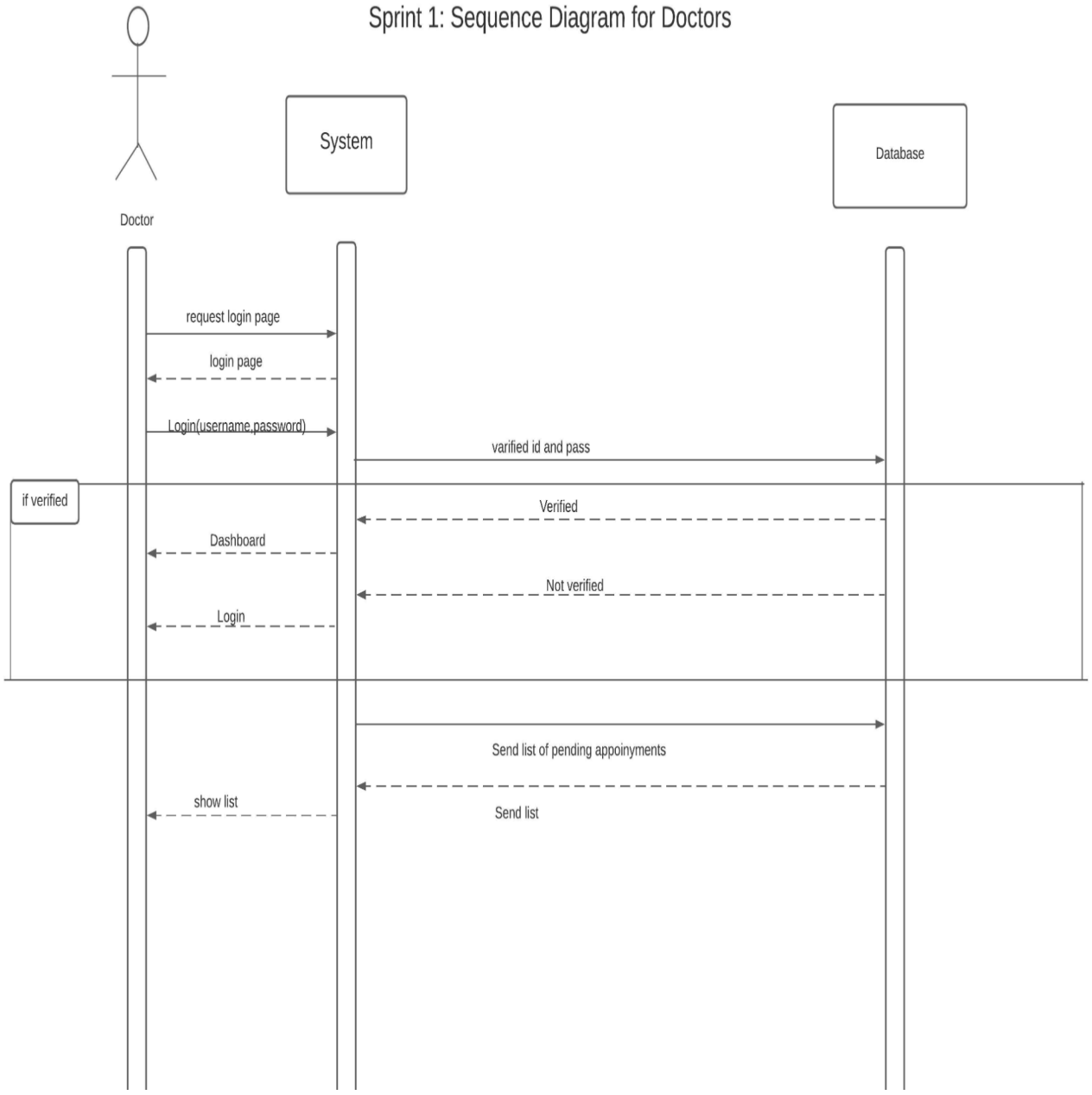


Figure: Doctor

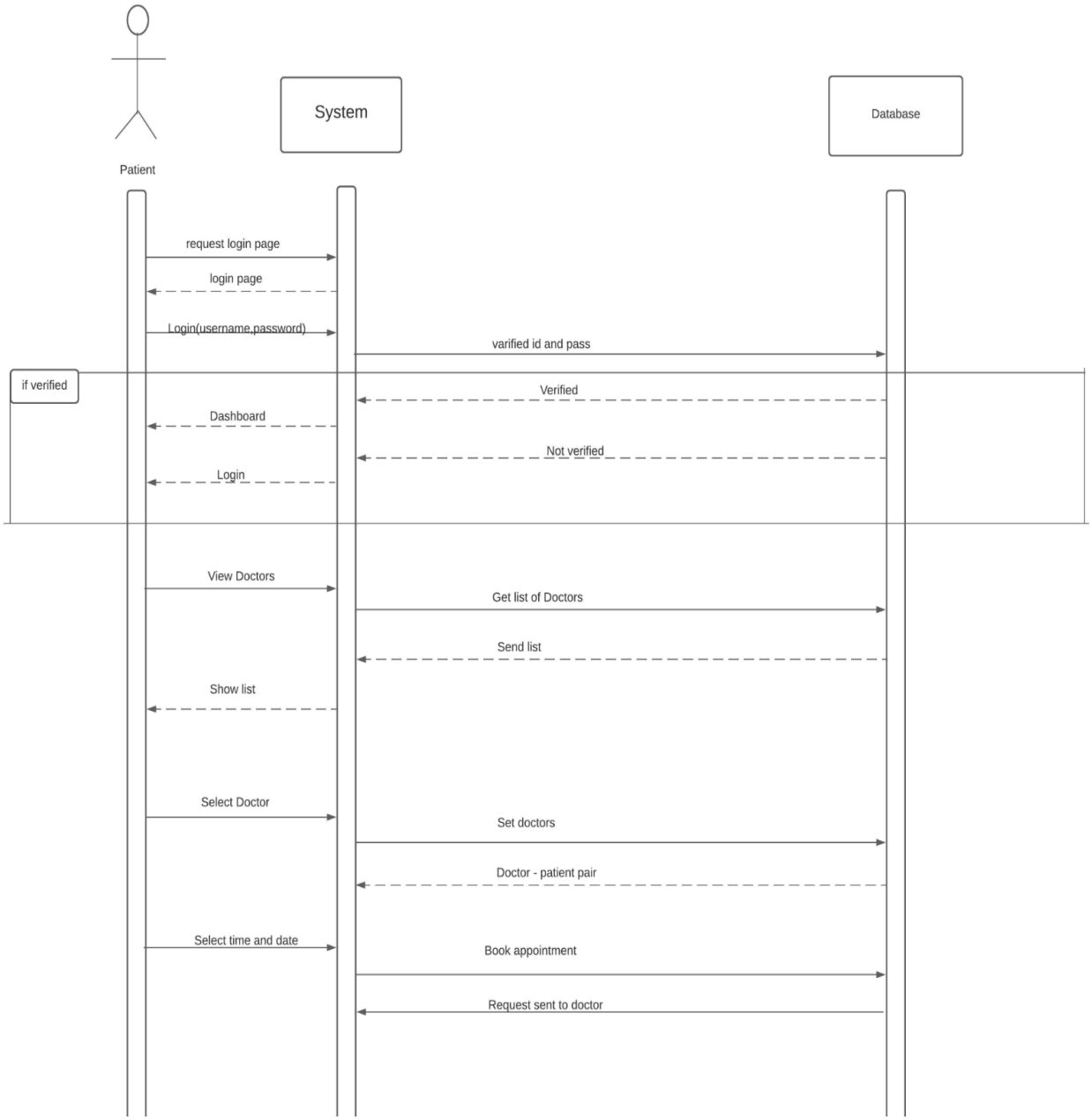


Figure: Patient

Sprint 2

Functionalities Taken Up

- Add a report with parameters like blood sugar, blood pressure, temperature, etc.
- Appointment accept/reject
- View medical prescriptions
- Add medical prescriptions
- Data privacy

User Stories

Must have

- As a doctor, I want to get the list of pending appointments so that I can accept or reject them if they are not convenient.
    - Doctor is shown the list of patients.
    - Doctors can accept appointments according to his/her schedule.
    - Doctors can reject appointments according to his/her schedule.
- As a patient, I want to be able to add reports with different parameters such as blood pressure, blood sugar, temperature, etc.
    - The patient enters a value for the specified parameter
    - The value is then stored in the database with the email of the user and the date of input
- As a doctor, I want to be able to add medical prescriptions to patients.
    - Doctor enters medicine and time when the patient has to take it
    - The data is then stored with the email of the user and the date of input
- As a patient, I want to be able to view medical prescriptions given to me.
- As a patient, I want my health data to be visible only to me and my doctors so that my data remains private.
    - Patient logs into the site
    - The site searches for data entries with only the logged-in user's email in them
    - The site then shows these filtered data entries

Could have

- As a patient, I want to get a list of my appointments and periodic checkups so that I don't miss out on any.
    - The site checks for upcoming appointments for the logged-in patient

- As a doctor, I want to get a list of my appointments so that I don't accidentally miss any appointments.
    - The site checks for appointments that the logged-in doctor has today
    - The site then displays these appointments

Class Diagram

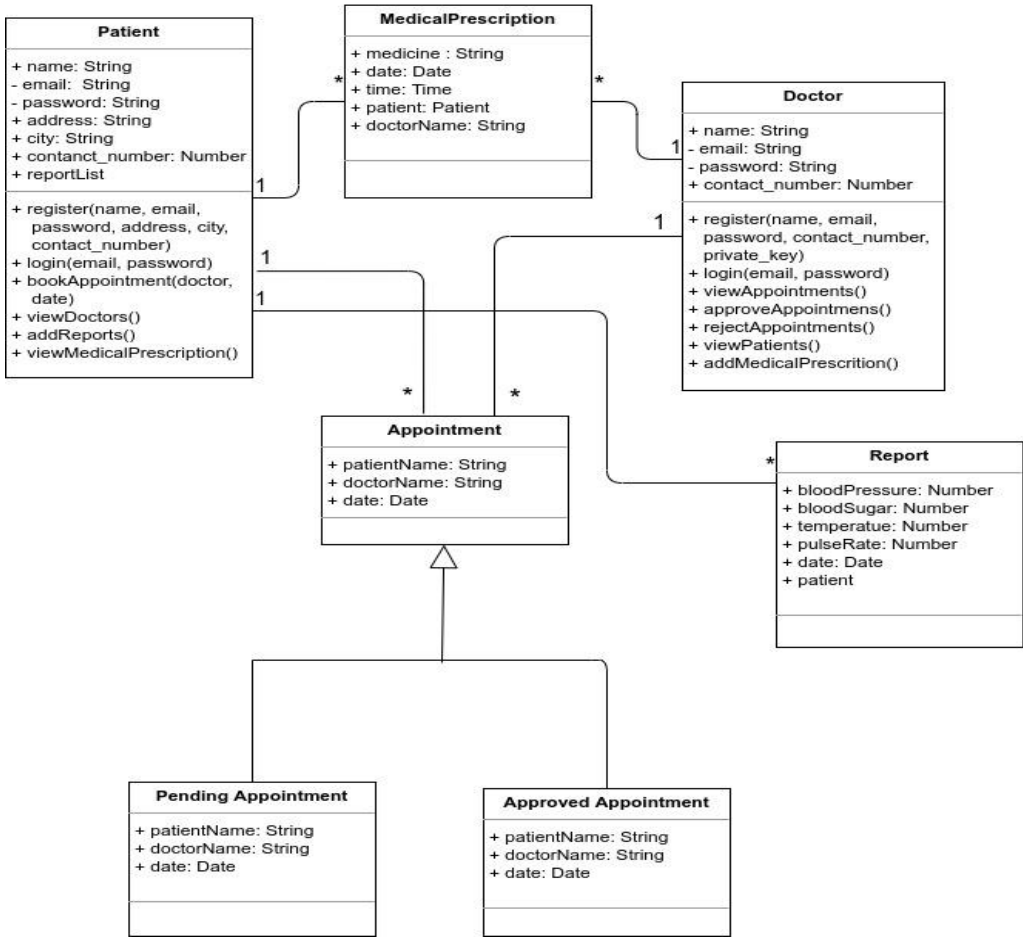


Figure: Class diagram

Activity diagram

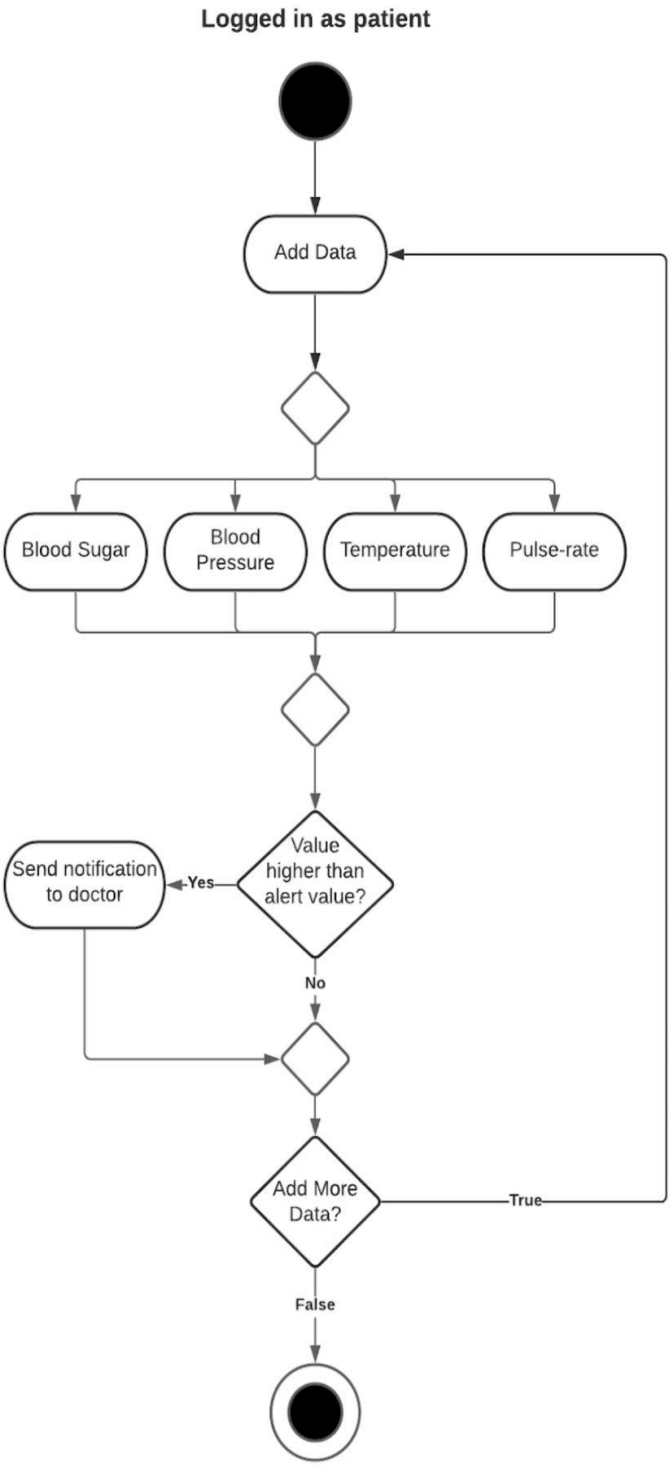


Figure: Add a report with parameters like blood sugar, blood pressure, temperature, etc.

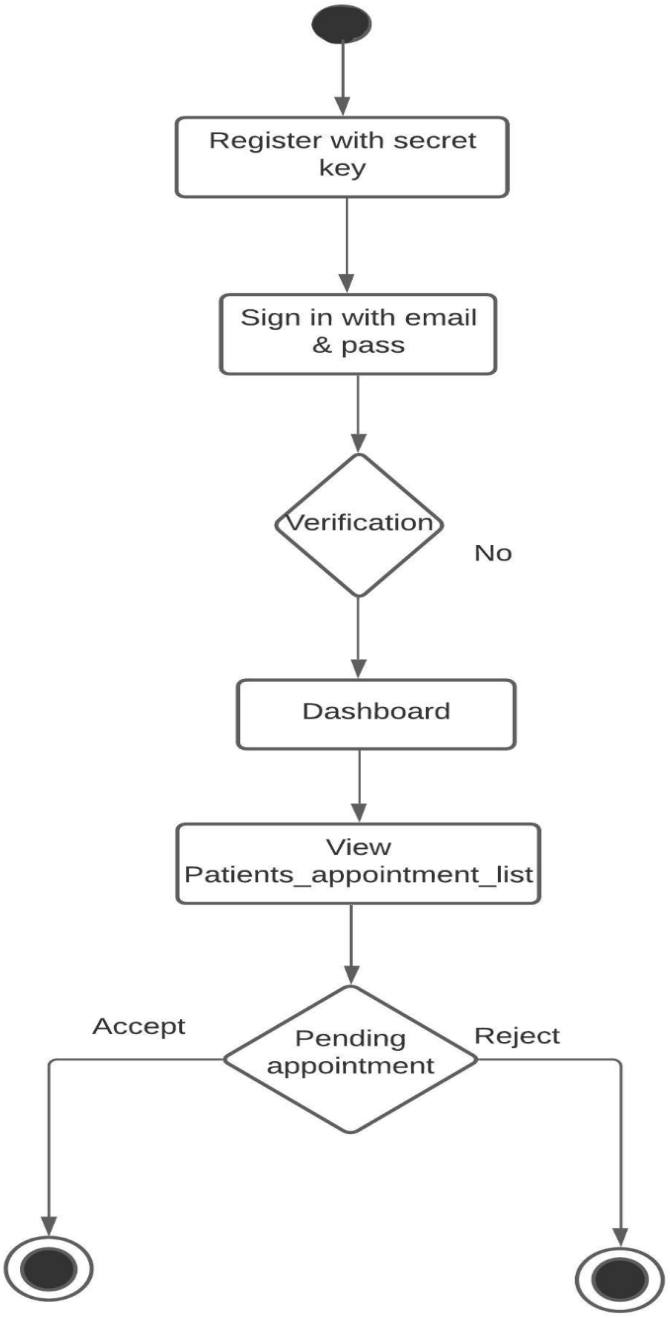


Figure: Accept / Reject appointment (doctor)

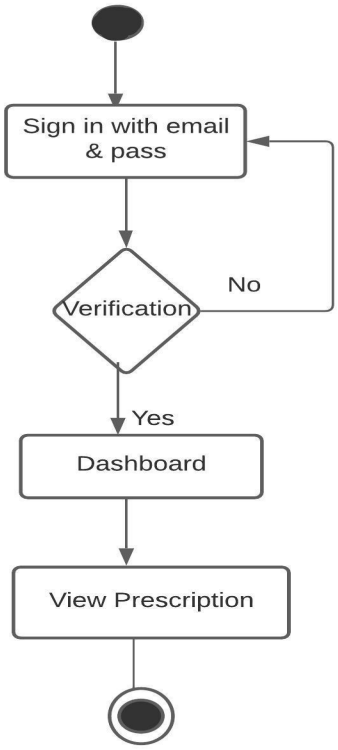


Figure: View prescriptions

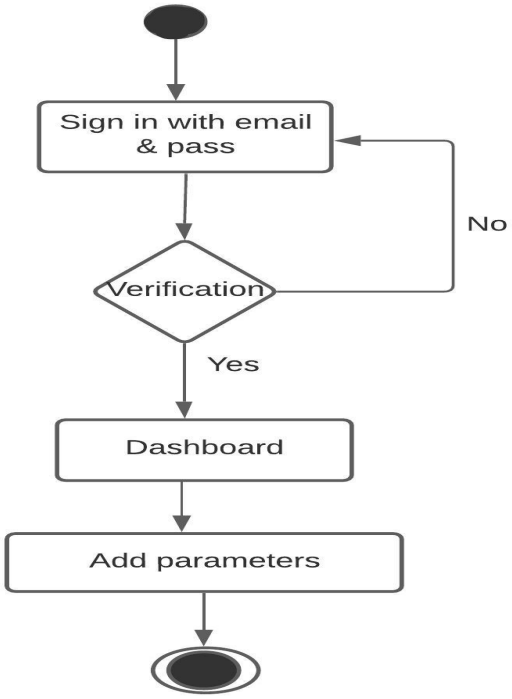


Figure: Add previous reports/medical history (patient)

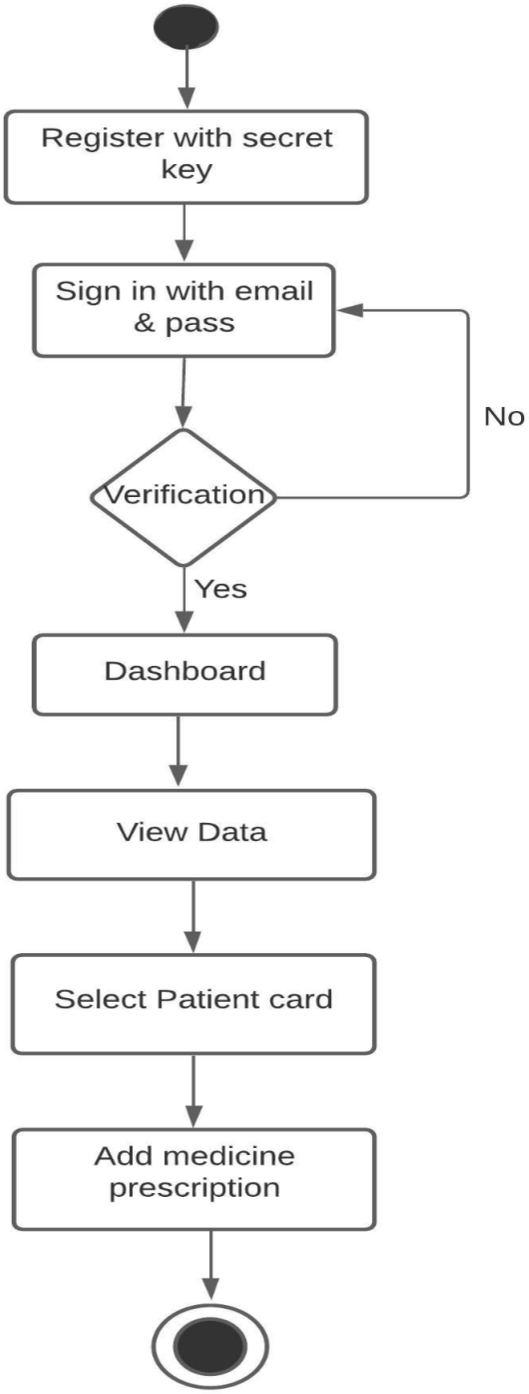


Figure: Add medical prescriptions (doctor)

Sequence Diagram

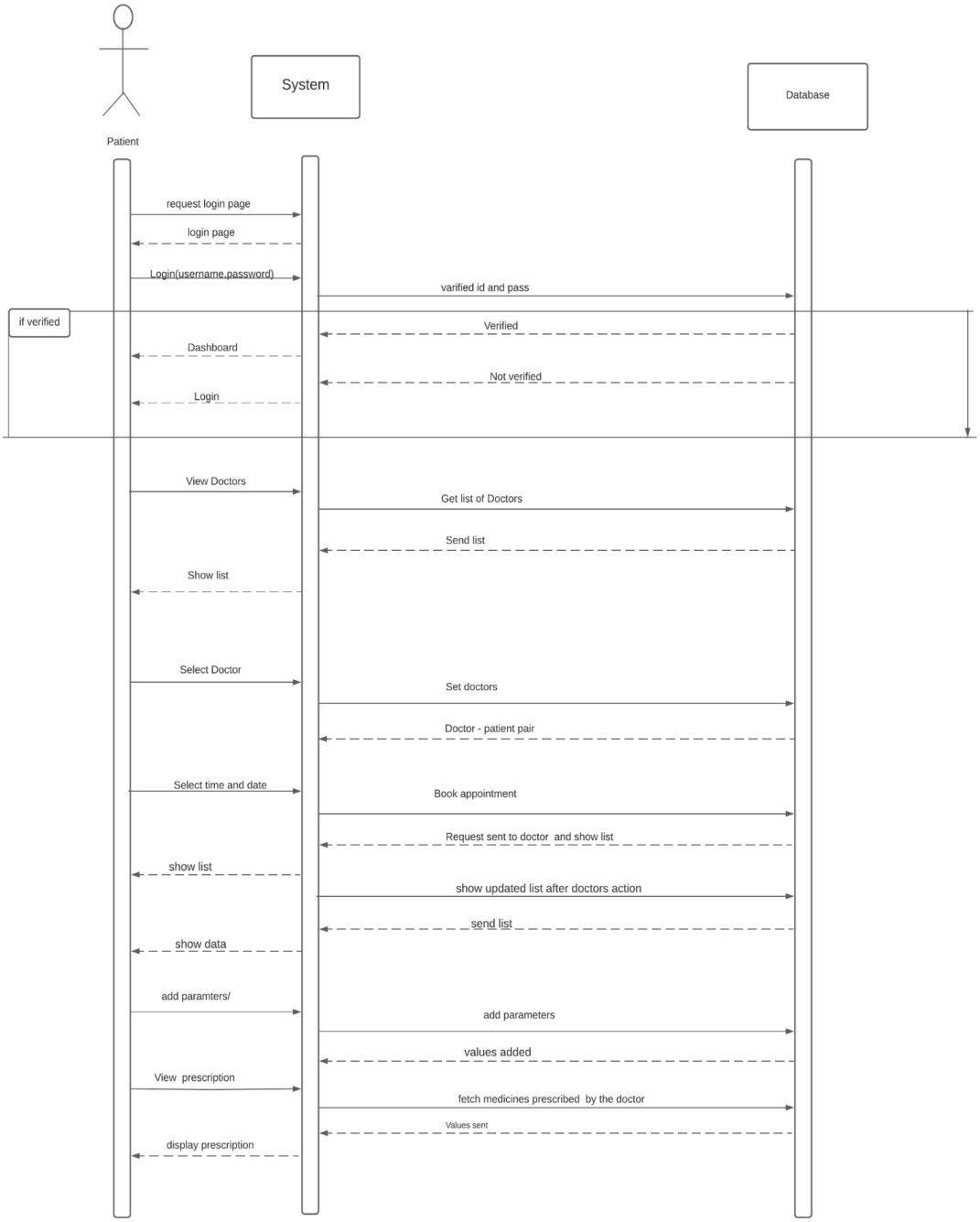


Figure: Patient

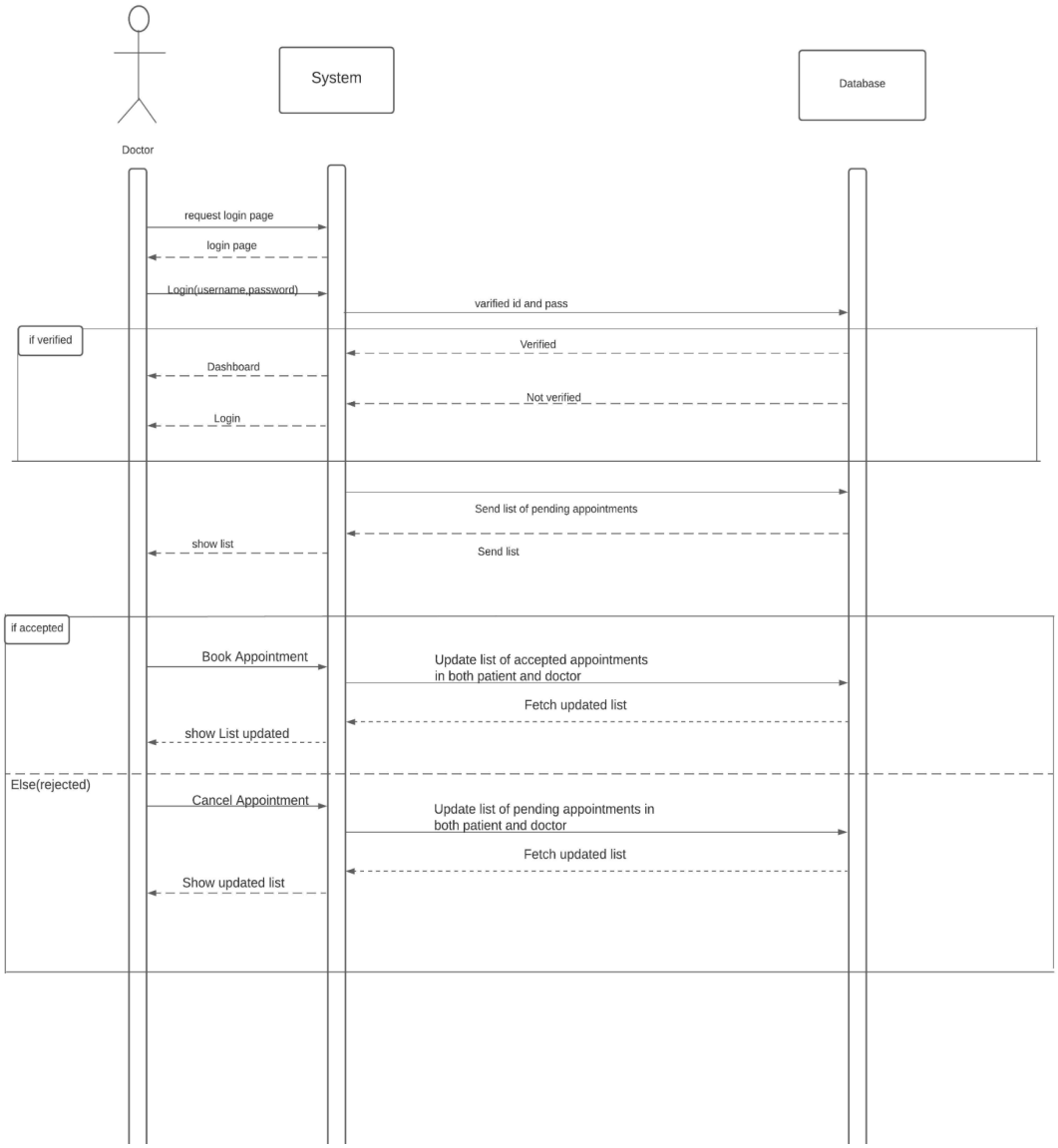


Figure: Doctor

Sprint 3

Functionalities Taken Up

- Display different parameters in form of charts/diagrams
- Notification in case of Abnormalities
- Update medical details
- System compatibility
- System availability

User Stories

Must have

- As a doctor, I want to be able to add new medicines to the patient's report so that they can be useful for future checkups.
    - Doctor logs into the site
    - After the appointment doctor can add new medicines if noticed in the patient's report
    - It will be displayed in the report and can be read by the doctors for a future checkup
- As a doctor, I want to see charts/diagrams related to medical parameters like blood pressure, temperature, etc so that I can keep track of them.
    - Doctors logs into the site
    - The site shows the graphs based on the medical data added by the patients
- As a user, I want to access the website from Google Chrome, Mozilla Firefox, or Internet explorer.
    - The site should be available for the user in the browsers mentioned above
- As a user, I want the site to be available 99 percent of the time I try to access it so that I don't get frustrated and find another site to use.
    - The site should be available for the user in the browsers mentioned above at all times
- As a doctor, I want to get notified if any of the parameters undergo abnormal changes so that patients can have immediate treatment.
    - Doctor checks his mail to see if any patients have any abnormalities.

Should have

- As a patient, I want to see charts/diagrams related to medical parameters like blood pressure, temperature, etc so that I can keep track of them.

    - Patient logs into the site
    - The site shows the graphs based on the medical data added by the patients
- As a user, I want the site to be fast so that I can access it quickly.
    - The site should be optimized and run smoothly

Class Diagram

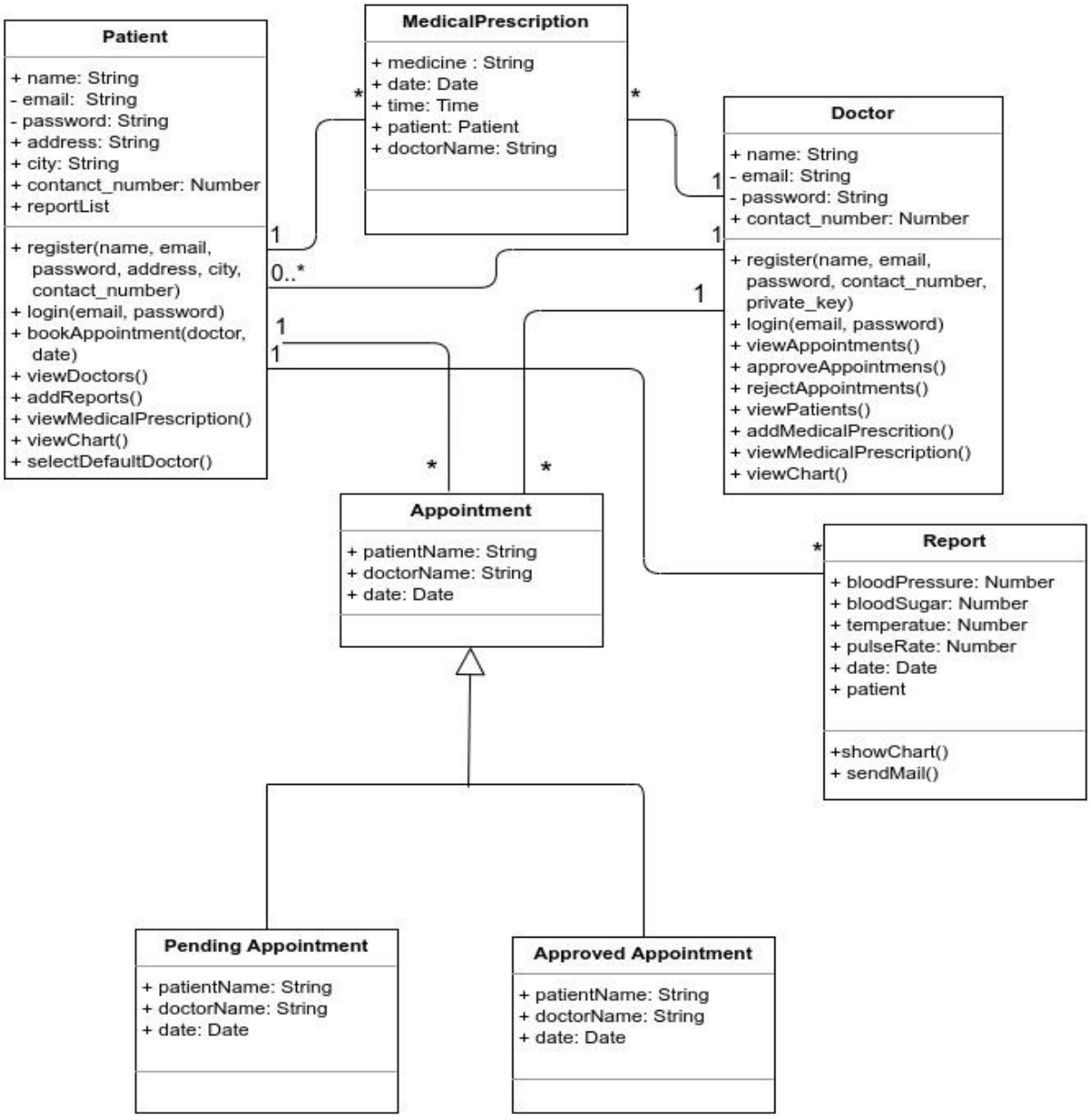


Figure: Class Diagram

Activity Diagram

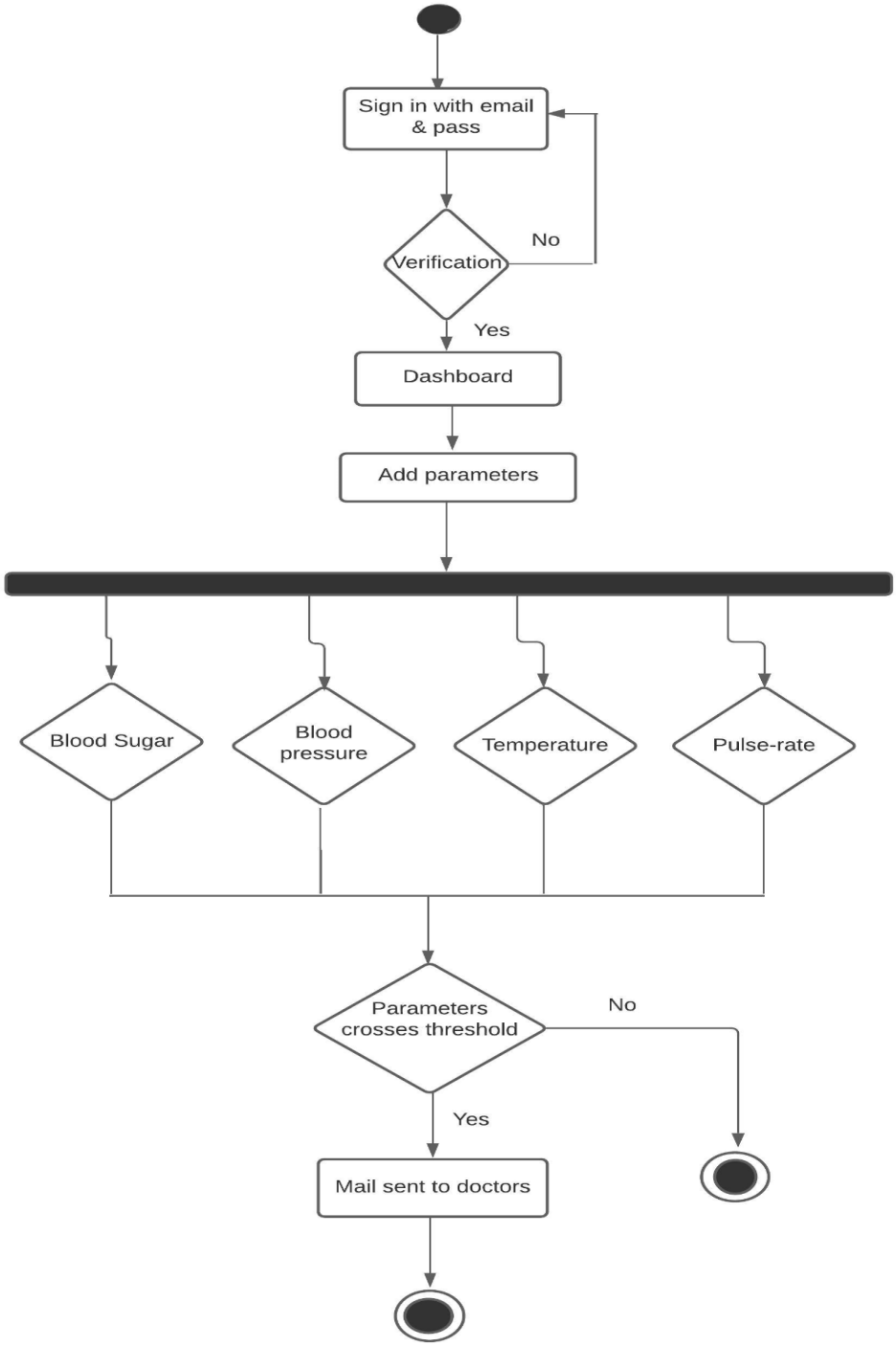


Figure: Notification in case of Abnormality

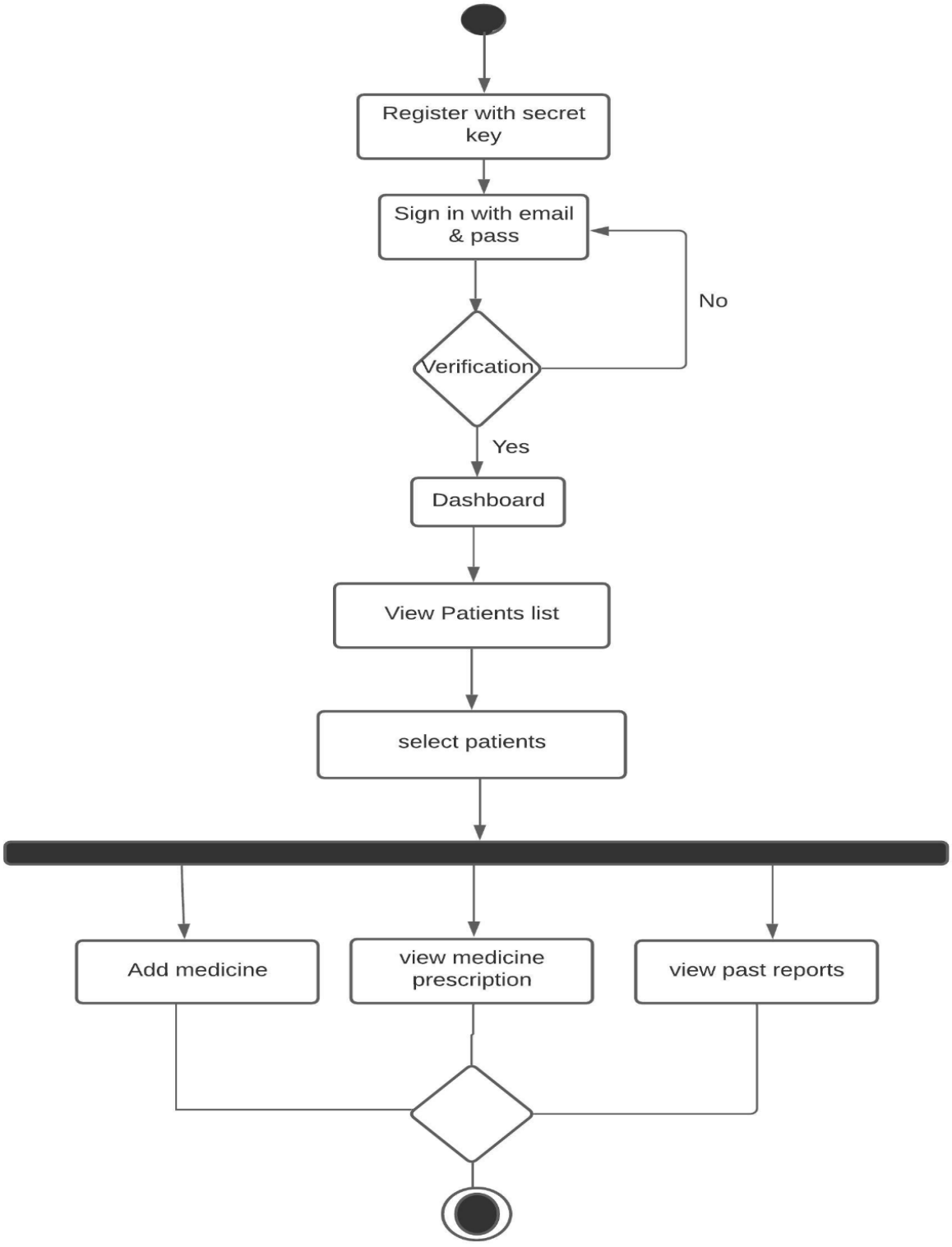


Figure: Add Medicines

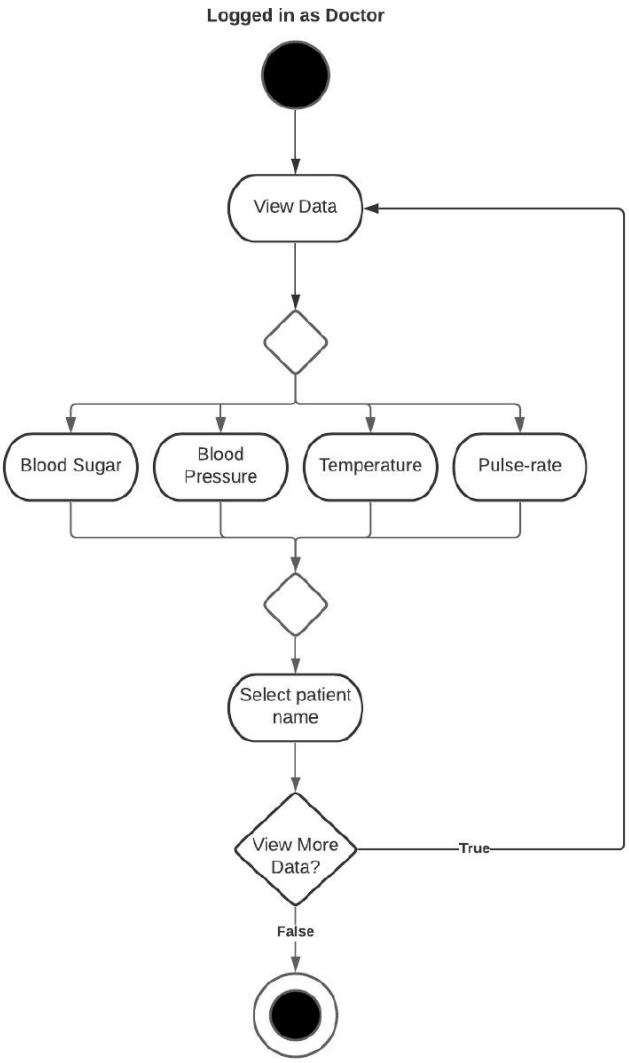


Figure: View Data(Doctor)

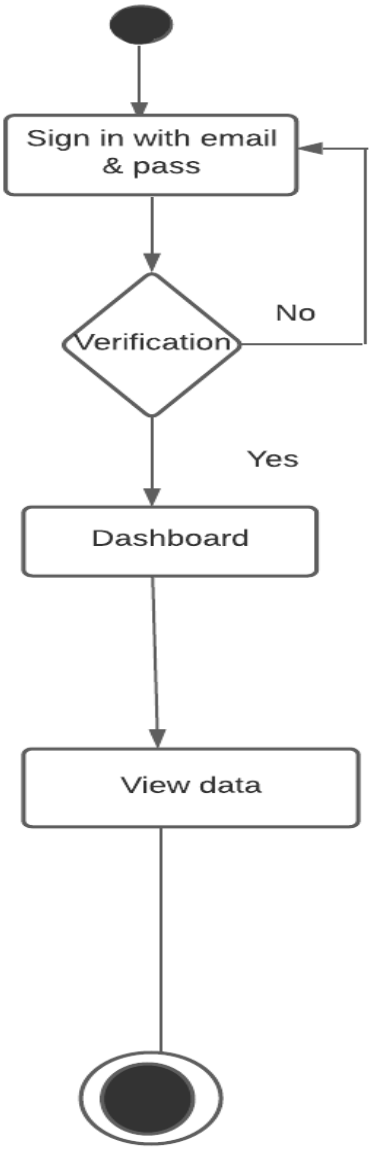


Figure: View Data(Patient)

Sequence Diagram

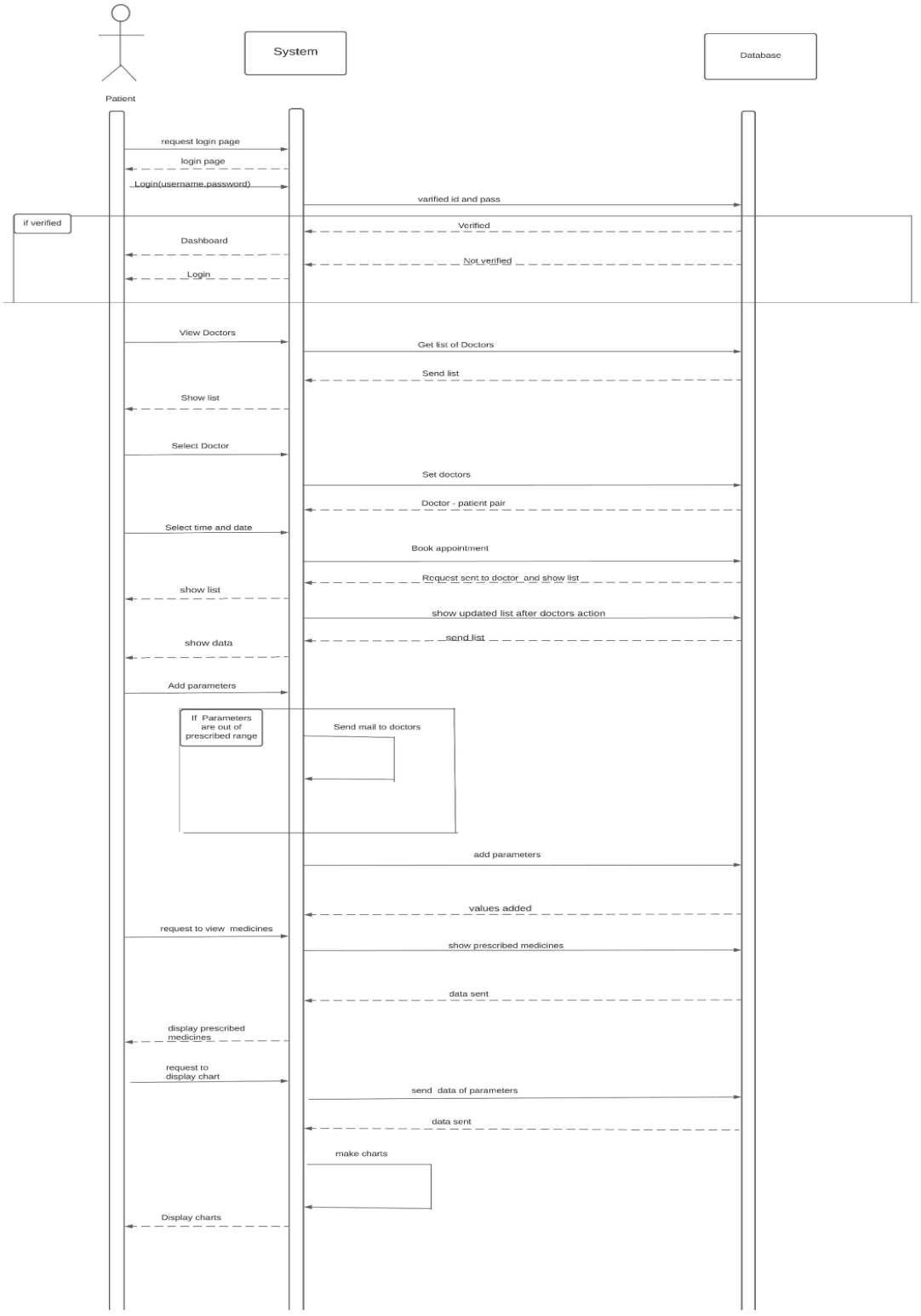


Figure: Patient

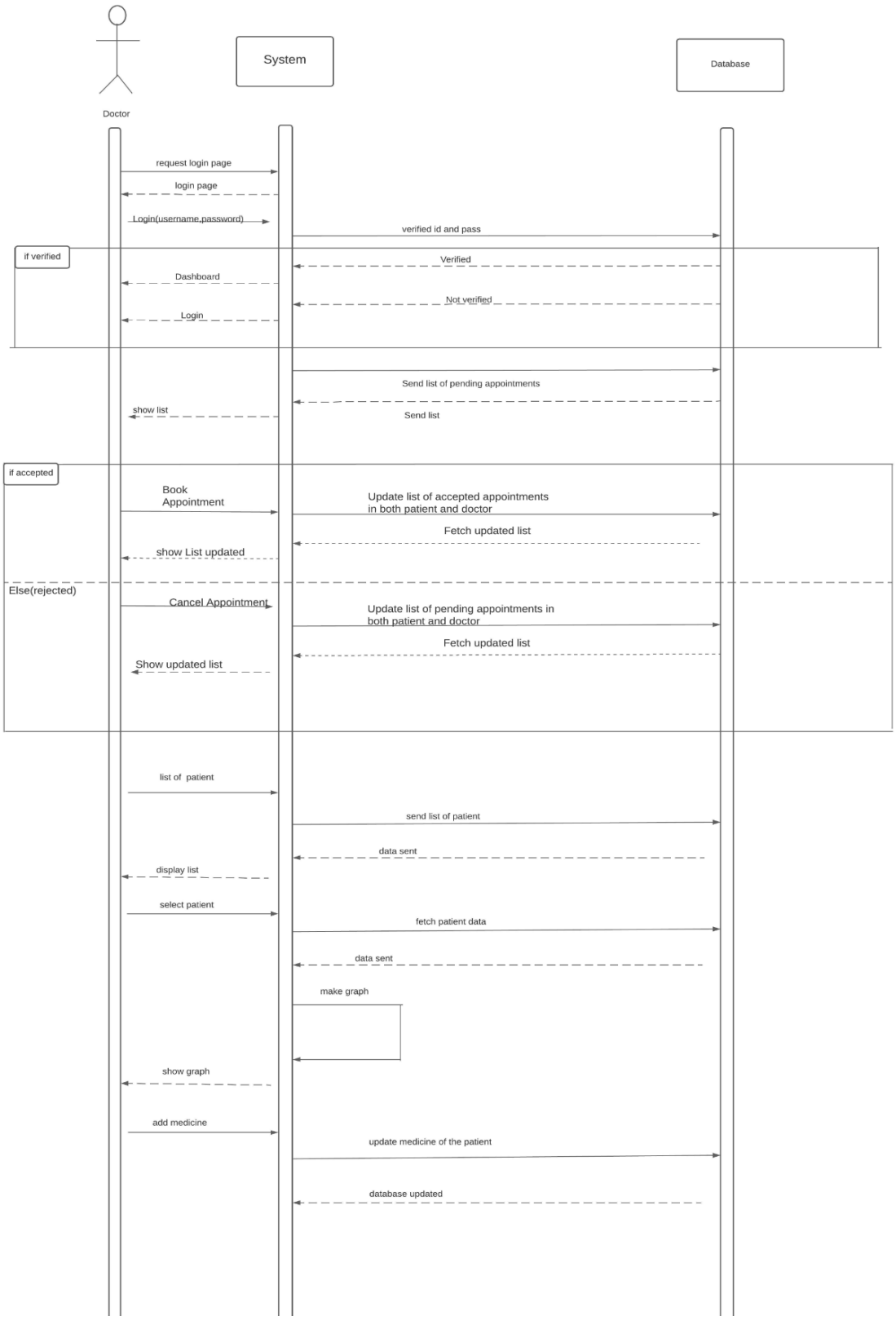


Figure: Doctor

Deployment Diagram

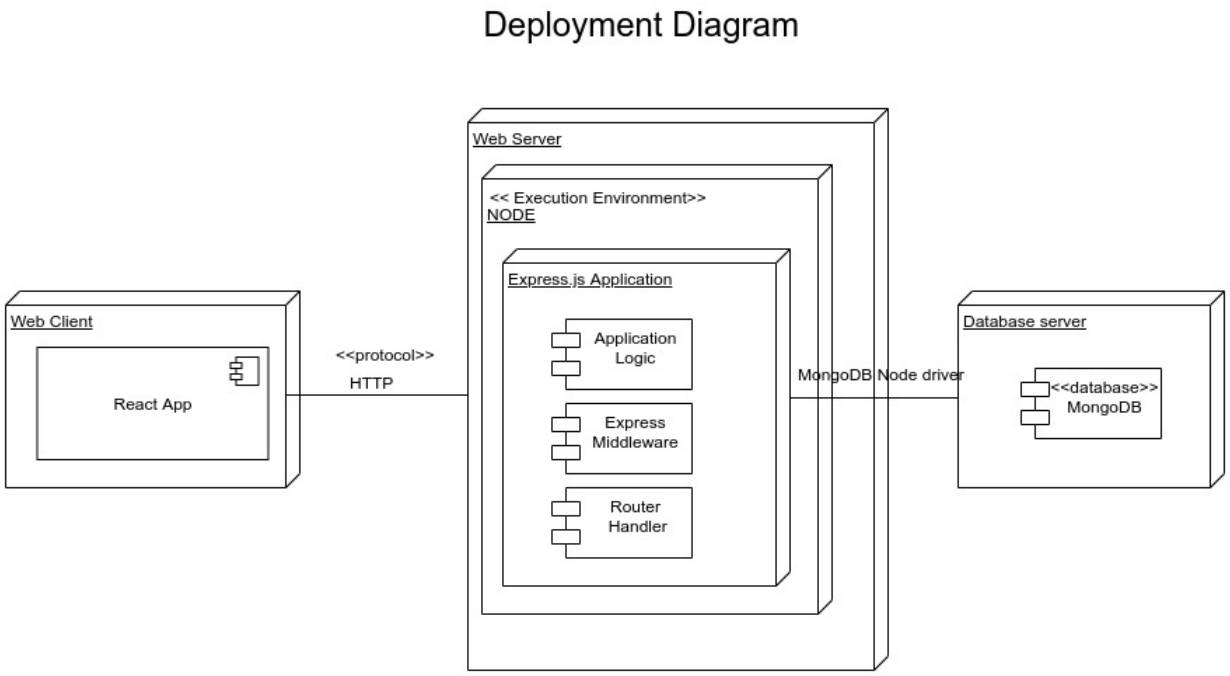


Figure: Deployment Diagram

Future Scope

Some of the functionalities were not implemented due to a lack of time. They are listed below:

- Currently, Doctors can see the medical data of all the patients registered on the website. In the future, it should be changed so that only the data of the patient registered under him is shown.
- Currently, notifications are only sent when there is an abnormality in the report submitted by the patient. In the future, notifications should also be sent for upcoming appointments.
- Currently, the site hasn't been tested in terms of its max capacity. This should also be a point to be tested in the future.

Minutes of Meetings

Documentation 1

8 March 2021 / 9:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142, 201801433, 201801132, 201801203, 201801409, 201801191, 201801120, 201801020

Agenda

- Last Meeting Follow-up
- Finalisation of Documents

Action Items

Assignment of Tasks and Review a\Added Items

1. Review - all
2. Deployment Diagram -

Next Meeting Agenda

- Evaluate the weekly progress

Sprint 1

Duration: 2 weeks
21 March 2021 / 4:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191, 201801120, 201801020

Agenda

- Last Meeting Follow-up
- Assign User Stories
- Decide the weekly targets for front-end and back-end developers.

Action Items

Assignment of User Stories

1. User registration - Kirtan, Smit
2. User Login -Smit
3. Select Doctor - Rishabh
4. Book Appointment - Kirtan, Devyani

Assignment of Specific Functionalities

1. Authentication - Kirtan and Smit
2. SignUp and SignIn pages - Smit
3. Home Page - Devyani
4. Backend Database - Smit, Hardik, Kirtan, Ayushi

Next Meeting Agenda

- Evaluate the weekly progress

Sprint Review 1

02 April 2021 / 4:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191

Agenda

- Last Meeting Follow-up
- Discuss the suggestions

Action Items

Assignment of Changes

1. Change UI - Devyani
2. Add Precautions In Home page - Devyani
3. Changes for Doctor List - Dhrumit

Next Meeting Agenda

- Evaluate the weekly progress.

Sprint 2

Duration: 2 weeks
06 April 2021 / 6:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191

Agenda

- Last Meeting Follow-up
- Assign User Stories
- Discuss the suggestions given in the mid-term evaluation.
- Decide the weekly targets for front-end and back-end developers

Action Items

Assignment of User Stories

1. Add a report with parameters like blood sugar, blood pressure, temperature, etc. - Pavan
2. Appointment Accept/ Reject - Kirtan, Smit
3. View and Add Medical Prescriptions - Devyani, Kirtan

Assignment of Specific Functionalities

1. APIs for Medical data - Devyani
2. Available resources for mail notifications - Hardik, Ayushi, Saketh
3. Doctor's Cards and list - Rishabh
4. Patient 's Cards and lists - Dhrumit
5. Database Models - Kirtan
6. Database Queries - Hardik, Smit

Next Meeting Agenda

- Evaluate the weekly progress

Sprint Review 2

20 April 2021 / 2:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191

Agenda

- Last Meeting Follow-up
- Discuss the suggestions

Action Items

Assignment of Changes

1. Change Text for Mail - Saketh
2. Changes for Doctor Card - Rishabh

Next Meeting Agenda

- Evaluate the weekly progress.

Sprint 3

Duration: 2 weeks
21 April 2021 / 5:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191, 201801120, 201801020

Agenda

- Last Meeting Follow-up
- Assign User Stories
- Decide the weekly targets for front-end and back-end developers.

Action Items

Assignment of User Stories

1. Display Parameters in form of diagrams/charts - Kirtan
2. Notifications in case of Abnormalities - Kirtan, Smit
3. Update medical details (i,e. medicines) - Devyani, Kirtan

Assignment of Specific Functionalities

1. Website Integration - Smit
2. UI design - Kirtan, Devyani, Smit

Next Meeting Agenda

- Evaluate the weekly progress

Documentation 2

24 April 2021 / 10:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191, 201801120, 201801020

Agenda

- Last Meeting Follow-up
- Finalisation of Documents

Action Items

Assignment of Tasks and Review a\Added Items

1. Purpose, scope, introduction - Pavan
2. Sequence Diagrams - Achal, Hardik, Dhrumit
3. Activity Diagrams - Achal, Hardik, Dhrumit
4. Class Diagrams - Achal, Dhrumit
5. Requirements - Ayushi, Pavan
6.
7. Prioritization of Requirements - pavan, ayushi
8. Estimation of Requirements - devyani
9. Interviews, Forms - Pavan, Ayushi, Dhrumit

Next Meeting Agenda

- Evaluate the weekly progress

Sprint Review 3

20 April 2021 / 2:00 PM / Google Meet

Attendees

201801087, 201801187, 201801142201801433, 201801132, 201801203, 201801409, 201801191

Agenda

- Last Meeting Follow-up
- Discuss the suggestions

Action Items

Assignment of Changes

1. Changes in Graphs - Kirtan
2. Minor Changes in UI - Devyani

Next Meeting Agenda

- Evaluate the weekly progress.