1. Inception Report of Online Doctor

1.1 Introduction

Online Doctor refers to the digital system of healthcare that will provide a platform where anyone can get registered doctors appointments and get identified his/her disease & medicines. This document will serve as a stepping stone for further activities regarding the project and will contain the identities and necessities of stakeholders.

1.2 Working Towards Collaboration

Successful completion of a project depends on the correct understanding of the project, which depends on two things.

1. Strong understanding, bonding and mutual respect.
2. Overcoming the communication barrier between the stakeholders and the team.

To develop the understanding between us, first we removed self-egos and increased mutual respect which helped us to overcome the initial hesitation. Then we arranged a meeting with a renowned doctor. Overcoming the communication barrier was not difficult because the professional was hospitable. After that we went to DMC multiple times to communicate with the patients who came to get doctors appointments. They gave us enough information to continue our project.

1.3 Identifying the Stakeholders

A stakeholder is anyone who has an interest or degree of involvement in the successful outcome of the project, eg. Business managers, end users, software engineers, support people, etc. The stakeholders include people who would be affected directly(such as end users) and also indirectly(such as a clerk who may not directly use the software but usage of the software would create an impact on his work). By gathering information from the aforementioned place, we were able to identify the stakeholders of our project, who are:

- Doctors
- Patients

1.4 Stakeholder Viewpoints

Doctor Viewpoints:

1. A portal to update her/her bio and appointment cost.
2. List of appointed patients.
3. Patients' previous records.

Patients Viewpoints:

1. A tutorial that demonstrates the how-tos' of the software.

2. Try to keep it in Bangla Language.
3. Try to get all registered honest doctors who will suggest medicine for patients' purposes.
4. Try to keep Ayurvedic and Organic medicine in web based suggestions.
5. Keep it simple as much as possible.

2. Elicitation of Online Doctor

The main task of the elicitation phase is to combine the elements of problem solving, elaboration, negotiation and specification. The collaborative working approach of the stakeholders are required to elicit the requirements. The following tasks have been finished for eliciting requirements of Online Doctor:

- Collaborative Requirements Gathering
- Quality Function Deployment
- Usage Scenarios

2.1 Collaborative Requirements Gathering

We have met with the stakeholders in the inception phase such as the doctors and patients(in DMC). These meetings created an indecisive state for us to elicit the requirements. To solve this problem, we have met with the stakeholders (who are playing a vital role in the whole process) a few times to elicit the requirements.

2.2 Quality Function Deployment

Quality Function Deployment (QFD) is a technique that translates the needs of the customers into technical requirements for software. Ultimately the goal of QFD is to translate subjective quality criteria into objective ones that can be quantified and measured, and can then be used to design and manufacture the product. It is a methodology that concentrates on maximizing customer satisfaction from the software engineering process. So, we have followed this methodology to identify the requirements for the project. The requirements which are given below, are identified successfully by the QFD.

2.2.1 Normal Requirements

Normal Requirements are generally the objectives and goals that are stated for a product or system during meetings with the customer. The presence of these requirements fulfills customers' satisfaction. The normal requirements are given below:

- Patients will create an account by providing their name, age, gender and mobile number or email account to track them.
- Doctors will get registered by providing their name, registration number and associate information.
- A predefined account will be given to the admin.
- Doctors will be verified by Admin.
- Online **Appointment System**.
- User feedback system.
- Keep **Ayurvedic and Organic Medicine** suggestions in web based lists.
- Admin will update disease and their syndrome list.
- Every dashboard will have a notification panel.

2.2.2 Expected Requirements

These requirements are intrinsic to the product or system and may be so elementary that the customer does not explicitly state them. Their absence will be a cause for significant dissatisfaction. Below are the expected requirements for this software:

- User friendly interface.
- **Data security**.
- Users can recover their password if forgotten.
- Patients' **records** will automatically be integrated into their profile.

2.2.3 Exciting Requirements

These requirements are for features that go beyond the customer's expectations and prove to be very satisfying. These are the exciting features of our project:

- Two step verification.
- Patients can see the Doctor's profile.
- Admin can delete any accounts (doctors/patients) if necessary.
- **Disease Prediction** will be available for limited diseases only.

3. Usage Scenario of Online Doctor

The system consists of eight major modules, which are:

1. User Account Creation
2. Login Process
3. Password Recovery
4. Change Password
5. 2-Factor Authentication
6. Dashboard
7. Appointment System
8. Disease Prediction

3.1 User Account Creation

Since “Online Doctor” is an automated system, all the people who receive service have to hold a designated unique profile or a guest profile, which will be considered as their account through which they can continue and communicate with the system for any type of procedures. The profile will be of four types according to users’ perspective in this system: doctors, patients, admin and guest user.

3.1.1 Doctors Profile Sign Up

A doctor will initially visit the website. S/he must first register if this is his/her first time accessing as a doctor. S/he will enter a username, name, parent name, doctor's registration number, his/her doctor's degree (certificate), specialization, photo, gender, phone number, email address, address, and chamber address etc. and then press the submit button, which will direct him/her to an interface where s/he must provide OTP (sent to the phone number/email address) and then provide a strong password, which needs to contain the followings:

- At least 8 characters
- A combination of uppercase and lowercase letters, numbers and symbols.

Once a doctor provides all information correctly, then his/her verification will be performed by admin. After verification his/her sign up will be completed and a notification will be sent to his/her email address that s/she is a registered doctor now.

3.1.2 Patients Profile Sign Up

A patient can access the website in two ways. First as a registered patent, second as a guest user. If a patient login as a guest user then s/he will only have access to disease prediction option and all doctors list. But if s/he wanna be registered, then s/he will enter a username, name, father name, mother name, photo, phone number or email address, gender, age and then press the submit button, which will direct him/her to an interface where s/he must provide OTP (sent to the phone number or email address) and then provide a strong password. Once a

patient provides all information correctly, his/her sign up will be completed and s/he will be redirected to the dashboard.

3.1.3 Admin Profile Setup

The developer team will create an account for the first admin with an username and a one-time password. Admin also has to provide a new password and a phone number, email address when he logs in the first time. If the admin is changed later, the previous admin will hand over his account credentials to the new admin.

3.2 Login Process

Going to the “Login” section, a user has to enter his/her username & password and select the user type from the dropdown box in the login interface, and then press the Sign In button. If the provided credentials do not match the account credentials stored in the database, a message stating that “Given credentials do not match” will be displayed, and he will be asked to provide valid credentials. If the provided credentials match, the system will check in the database whether the account’s 2 factor authentication is ON or OFF. If it is ON, an OTP will be sent to the registered phone number. Upon providing OTP correctly, the user will be redirected to the dashboard but if the 2 factor authentication is OFF then the user will be redirected to the dashboard without any OTP check.

3.3 Password Recovery

When a user forgets the password of his/her account, s/he can click on the ‘Forget Password?’ button. It will redirect him/her to an interface where s/he will provide the username and then an OTP will be sent to the registered phone number/email address. When s/he enters the correct OTP in the interface, a password reset interface will appear where s/he will be asked to provide a new password and confirm this newly provided password. The provided password will then be matched with the password strength criteria. If the password matches the criteria then the system will store the new password in the corresponding database. Once the password reset is completed, a message saying “Password reset successfully” will be displayed, and the user will be redirected to the login interface.

3.4 Change Password

After successful login, If a user wants to change his password from the dashboard, s/he will go to the change password section where the system will ask him/her to provide the old password. After providing the password the system will check whether the provided password is valid or not. If valid then the system will allow the user to change his password according to the password strength criteria and store the new password in the corresponding database.

3.5 2-Factor Authentication

After Successful Login a user will be directed to his account's dashboard from where s/he can ON/OFF his 2 factor authentication.

If user wants to ON 2 factor authentication s/he will press turn on 2 factor authentication.Then system will send an OTP to the registered phone number and redirect the user to an interface where the user will provide the OTP.If the provided OTP is correct, system will turn on the 2 factor authentication, save the authentication status in the corresponding database and send a notification to the user's dashboard.

If the user wants to turn off 2 factor authentication s/he will press the turn off 2 factor authentication option. Then the system will ask the user to provide his account's password. On successful authentication,the system will send an OTP to the registered phone number and redirect the user to an interface where the user will provide the OTP. If the provided OTP is correct, the system will turn off the 2 factor authentication, save the authentication status in the corresponding database and send a notification to the user's dashboard.

3.6 Appointment System

A patient will book an appointment from the dashboard. For this s/he has to click on the book appointment button and then s/he redirect the user to an interface where s/he will provide the type of doctor s/he wants to get an appointment. Then a list of doctors available on the criteria will be shown with their degree. The patient will select a doctor which will redirect him/her to that doctor's profile and there s/he can see the appointment related information and can get an appointment by providing his/her authentication. This appointment notification will be sent to the doctors notification box.

A Doctor can see all his/her appointment list in the appointment section where if s/he wants to refuse an appointment, s/he can do that and the appointment refused notification will be sent to the patient notification box.

A patient can see all his/her appointment records in the appointment section where if s/he wants to cancel an appointment, s/he can do that and the appointment cancel notification will be sent to the doctor notification box. There will be a reminder for the patient for his appointment.

3.7 Dashboard

3.7.1 Doctor Dashboard

1. **Edit Information**

A doctor can update his information, upload a photo, and change his password in this section.

2. **Complaints & Feedback**
   A doctor will find two types of complaint options: patients and system. His/her complaint will be received by the admin and if any complaint submitted by a doctor is resolved, that doctor will be able to view it in the Feedback section.

3. **Two-Factor Authentication**
   S/he can turn on or off two-factor authentication in this section.

4. **Appointments**
   Here a doctor can see all his/her appointments in a list format which will be sorted by date and his/her chamber and if s/he wants to refuse an appointment s/he can do this in this section by providing his/her verification.

5. **View All Doctor**
   Here a doctor can see all doctors registered on this website.

6. **Patients Records**
   A doctor can his appointed patients previous records from the appointment list.

7. **Delete Account**
   A doctor can delete his/her account by providing his her verification.

3.7.2 Patient Dashboard

1. **Edit Information**, **Complaints & Feedback, Two-Factor Authentication, Appointments, View All Doctor, Delete Account**

   Same as a doctor.

3.7.3 Admin Dashboard

1. **Edit Information**
   Admin can update his /her email and password in this section.

2. **Complaints & Feedback**
   Admin can see all complaints and if any complaint is resolved, then s/he will post that complaint feedback which will be notified to the user via notification box in his/her dashboard and email.

3. **Two-Factor Authentication**

Admin can turn on or off two-factor authentication in this section.

4. **View Records**
   Admin can view all patients and doctor lists in the database.

5. **Remove User Account**
   If the admin finds any dishonest or frequently complained account, s/he can take a decision to remove that user account.

6. **Upload and Update Disease and Syndrome List**
   Admin can update and upload Disease and Syndrome list through this section.

7. **Upload and Update Medicine Suggestion List**
   Admin can update and upload medicine suggestion lists through this section.

8. **Verify User Account**
   Admin will verify a doctor registration manually and System will send a notification to the doctor that his/her account is Verified. So that only authenticated doctors can be registered.

3.8 Disease Prediction

A patient or guest user can predict his/her disease and get medicine suggestions by providing his/her current health conditions, gender and age. System will try to detect his/her disease and give a list of medicines associated with the disease. System will also store the records (for registered patients) for further prediction.

4. Use Case Diagram

A use case is a list of actions or event steps typically defining the interactions between a role (actor) and a system to achieve a goal. The actor can be a human or other external system. In this modeling, use case diagram is a graphical depiction of a user's possible interactions with a system. A use case diagram shows various use cases and different types of users the system has and will often be accompanied by other types of diagrams as well. Use case diagrams are a blueprint for the system. Due to their simplistic nature, use case diagrams can be a good communication tool for stakeholders. The drawings attempt to mimic the real world and provide a view for the stakeholder to understand how the system is going to be designed. Use case diagrams consist of actors, use cases and their relationships. The diagram is used to model the system/subsystem of an application. A single use case diagram captures a particular functionality of a system.

Primary Actor
Primary actors interact to achieve required system function and derive the intended benefit from the system. They work directly and frequently with the software.

Secondary Actor
Secondary actors support the system so that primary actors can do their work. They either produce or consume information.

4.1 Level-0: Online Doctor(Overview)

Name: Online Doctor(Overview)
Primary Actor: Doctor, Patient, Admin
Secondary Actor: Email/SMS, Database

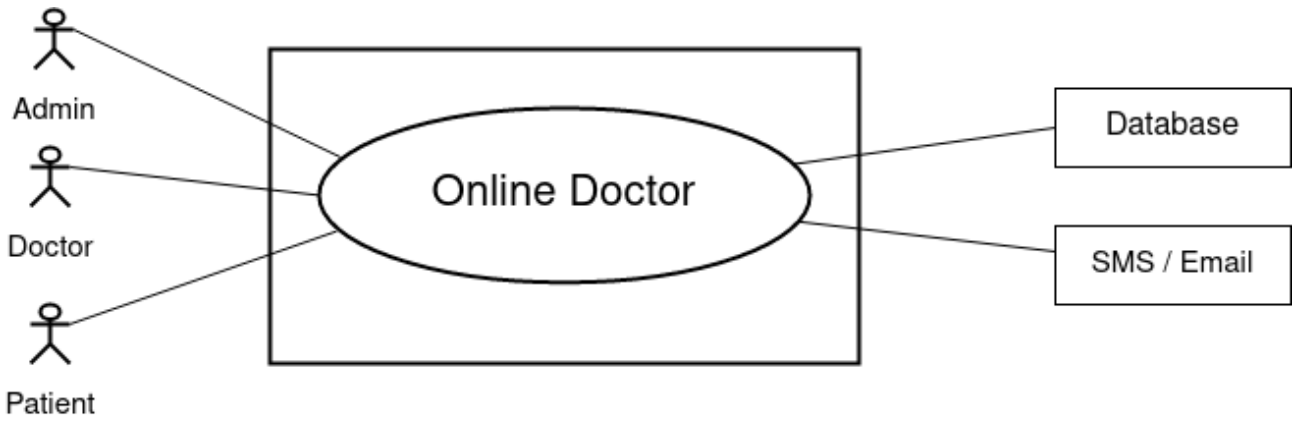

Figure-1: Level-0 Online Doctor(Overview)

4.2 Level-1: Online Doctor (Detailed)

Name: Online Doctor (Detailed)
Primary Actor: Doctor, Patient, Admin, User(Doctor, Patient, Admin)
Secondary Actor: Email/SMS, Database

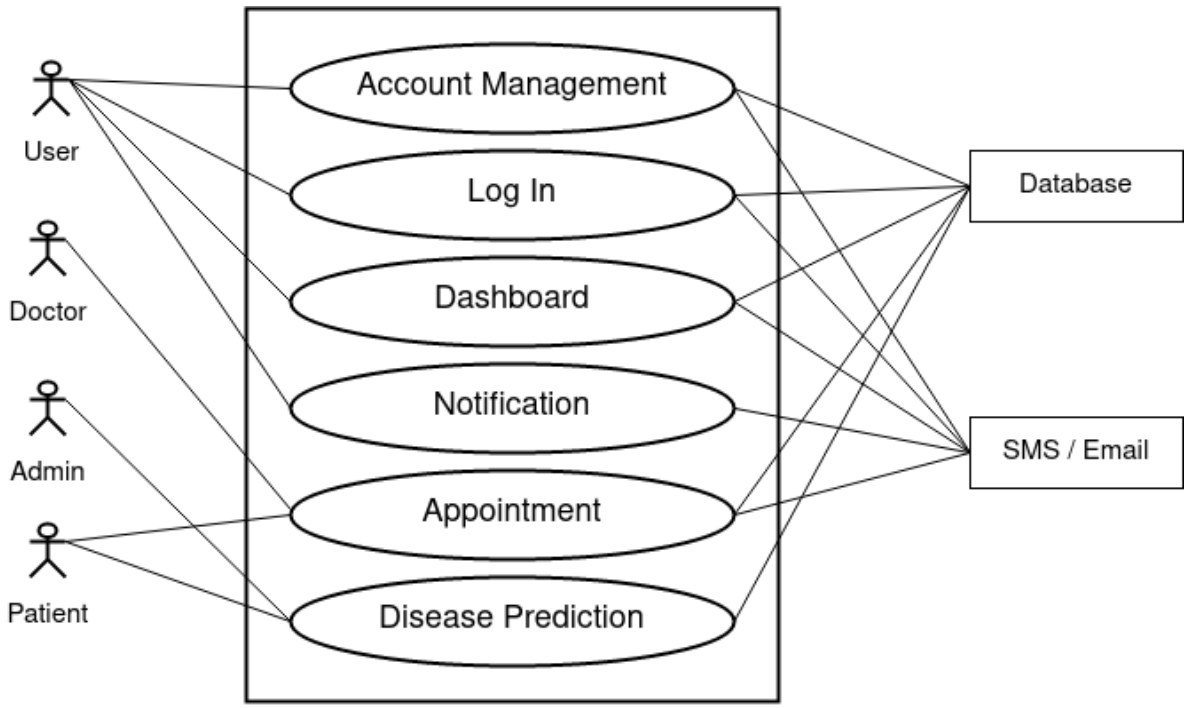

Figure-2: Level-1 Online Doctor(Detailed)

Description:

1. Account Management: A doctor or patient can create an account and Admin have to update the developer's given password. A user can set/change/recover the password if forgotten. A user can edit his profile information.

2. Login: All users need to be logged into the system. All users can login by providing required information.

3. Dashboard: All users can view information and go to different services from the dashboard.

4. Notification: All the users will receive notifications via SMS or Email in the provided contact number or email in the provided email address along with their dashboard.

5. Appointment: A patient can book or cancel his/her appointment and a doctor can refuse an appointment.

6. Disease Prediction: A patient or guest user can predict his/her disease and get medicine suggestions by his/her current health conditions.

Action & Response:

1. Account Management:
A1: Doctor and patient will provide necessary information to open an account and other users will direct login using a given username and OTP. Every user can add/edit their information, set/update/recover their password in this portion.
R1: System will store information to the corresponded database

2. Login
A1: User will provide username and password to login.
R1: System will verify the information and send response to corresponding user.

A2: If the user's 2- factor authentication is off then the system will let him login, else the system will send an OTP to the registered email or phone number and redirect him/her to an interface where s/he will provide the OTP.
R2: User will provide the system given OTP.

3. Dashboard
A1: User will press the information section that he wants to see.
R1: System will direct him to the related interface and then fetch data from the database for viewing.

4. Notification
A1: System will send notification to the user dashboard
R1: User will be able to view that notification in his dashboard
A2: System will send an sms to the registered phone number
R2: User will be able to see the message in his phone or email.

5. Appointment
A1: A patient can book an appointment by providing his verification.
R1: System will store information to the corresponding database and send notification to the doctor notification box.

6. Disease Prediction
A1: A patient or guest user will provide his health conditions.
R1: SHS will predict the disease and show him the name of the disease along with medicines.

4.3 Level-1.1: Account Management

Name: Account Management
Primary Actor: User (Doctor, Patient, Admin)
Secondary Actor: Email/SMS, Database

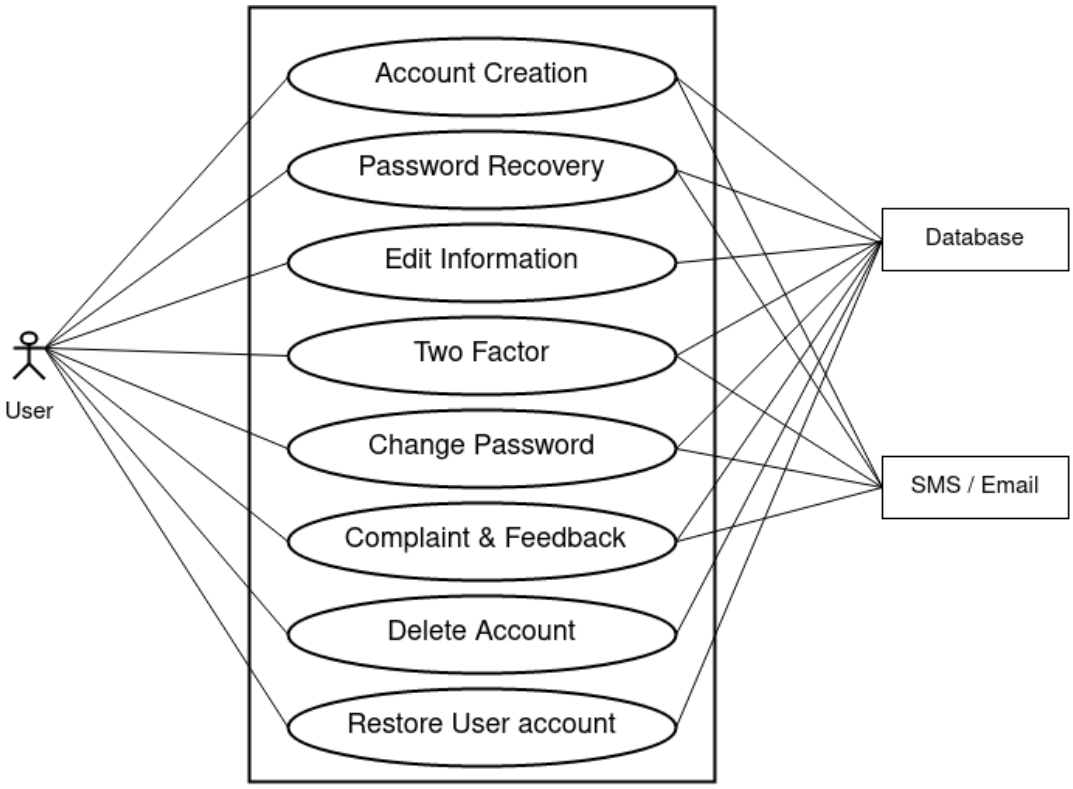

Figure-3: Level-1.1 Account Management

Description:

1. Account Creation: A Doctor or Patient has to provide necessary information to create an account. Admin have to update the developer's given password and add email for verification.

2. Password Recovery: A user can reset the password after forgetting it.

3. Edit Information: A user can edit his profile information.

4. Two Factor Authentication: A user can on/off his account's 2 factor authentication in this section by doing password check and OTP verification.

5. Change Password: A user can change their password by providing the previous password correctly.
6. Complaint and Feedback: A doctor and patient can complain about the system, patients or doctor. Admin will give feedback corresponding to the complaint.

7. Delete Account: A user(doctor/patient) can delete his/her account by providing his her verification.

8. Restore User Account: If any user applies for restoring his/her account by providing the correct username and password.

Action & Response:

1. Account Creation:
A1: Doctor and patient will provide necessary information and press the “submit” button.
R1: System will direct him to an interface and send a OTP to the email or phone number.

A2: User will provide OTP (sent to the phone number/email address) and then provide a strong password.
R2: System will create an account at that username and store the information. A pop up view will open as a successful account creation.

A3: Admin will provide his type of account and password to login the system for the first time.
R3: System will let him login.

A4: Then the system will ask for an email and phone number.
R4: Admin will add an email and phone number.

A5: Then the system will ask to update the password.
R5: Admin will update the password.

2. Password Recovery:
A1: User will request for password recovery.
R1: System will ask for username for verification.

A2: User will provide his username.
R2: If the provided username matches with any of the username in the related database then the system will send an OTP to the user’s registered phone number or else a message stating that “Username not found.Try again” will be displayed.

A3: User will input the OTP.
R3: System will verify the OTP. If verified, the system will let the user recover his password and allow him to enter his dashboard or else, a notification stating that “Incorrect OTP” will be sent to the user’s dashboard.

3. Edit Information:
A1: User can edit his provided information.
R1: System will store it into the related database.

4. Two Factor Authentication
A1: User will select the type (turn on/off) of 2-factor authentication.
R1: System will ask the user to provide the account password first.

A2: User will give his account password to the system.
R2: If the given password is correct then the system will send an OTP to the registered phone number and redirect him/her to an interface where s/he will provide the OTP or else the system will send a notification to the user that the given password is Incorrect.

A3: User will provide the received OTP to the system.
R3: If the given OTP is correct then the system will turn on/off the 2-factor authentication and store the 2-factor authentication status in the user database or else the system will send a notification to the user that the given OTP is incorrect.

5. Change Password
A1: User will press change password.
R1: System will ask for previous password for verification.

A2: User will input his previous password
R2: If the given password is correct, the system will send OTP to the verified user's phone number and redirect him/her to an interface where s/he will provide the OTP or else the system will send a notification to the user that the given password is incorrect.

A3: User will input the OTP
R3: System will verify the OTP and will let the user change the password if the correct OTP is given or else the system will send a notification to the user that the given OTP is incorrect.

A4: User will enter a new password.
R4: System will check if the password is strong or not.If it fulfills the criteria of a strong password the system will store the new password in the student database, otherwise the system sends notification about the criteria to be a strong password to the user dashboard.

6. Complaint and Feedback:
A1: A doctor and patient can complain about the system.
R1: System will store the complaint and send a notification to the admin notification box.
A2: Admin will upload the feedback.
R2: System will send notification to the Doctor or patient Feedback section.

7. Delete Account:
A1: A user(doctor/patient) will click on the “Delete Account” button in his/her dashboard.
R1: System will redirect him/her to an interface.

A2: User will provide his/her verification.
R2: System will remove (archived) the account from the database.

8. Restore User Account:
A1: User will apply to restore the user account.
R1: System will redirect the user to an interface to provide username and password.

A2: User will provide username and password.
R2: System will restore the user account if all information is correct and the application is provided within 30 days.

4.4 Level-1.3: Dashboard

Name: Dashboard
Primary Actor: Doctor, Patient, Admin
Secondary Actor: Database

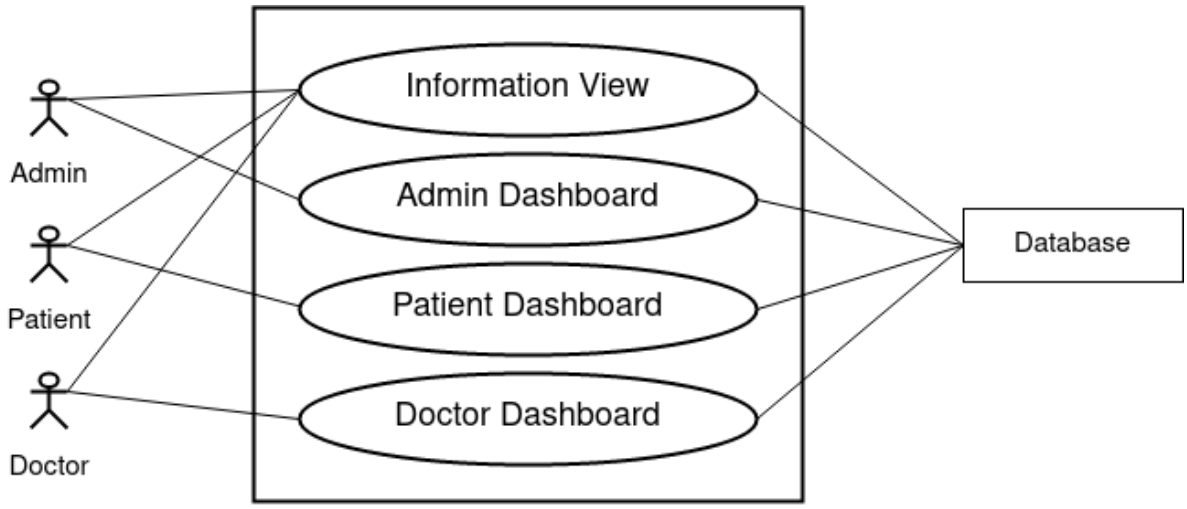

Figure-4: Level-1.3 Dashboard

Description:

1. Information View: Users can see their related information in this section.
2. Admin Dashboard: The administrator uses the dashboard to edit his own profile information. Afterwards, the admin uses the dashboard to remove user accounts, doctor account verification or give feedback.

3. Patient Dashboard: A patient can edit his/her information, make an appointment, cancel an appointment, see his records and can get more service through his/her dashboard.

4. Doctor Dashboard: A doctor can edit his/her information, cancel an appointment, see his/her appointment list and can get more service through his/her dashboard.

4.5 Level-1.5: Appointment

Name: Appointment
Primary Actor: Doctor, Patient
Secondary Actor: Database, SMS/Email

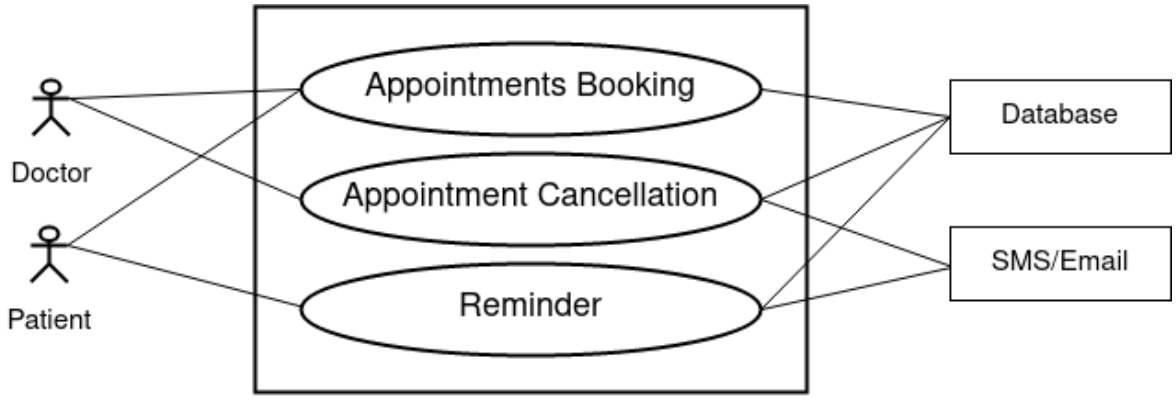

Figure-5: Level-1.5 Appointment

Description:

1. Appointment Booking: A patient can book an appointment through this section.
2. Appointment Cancellation: A patient can cancel his/her appointment and a doctor can refuse any appointment.
3. Reminder: A reminder will remind the patient that s/he has an appointment before a fixed time set by the patient at the time of appointment booking.

Action & Response:

1. Appointment Booking:
A1: Patient will click on the “Book Appointment” button.
R1: System will redirect the patient to an interface where he will provide the type of doctor s/he wants to get an appointment.
A2: Patient will provide doctor type.

R2: System will show a list of doctors in the given type.

A3: Patient will select a doctor and book an appointment by providing his/her verification.
R3: System will store the appointment details in patient records and the doctor's appointment list and send a notification to the doctor's notification box.

2. Appointment Cancellation:

A1: A patient can cancel his appointment from his/her records.
R1: System will update that patient's appointment status and send a notification to the doctor's notification box.

A2: A doctor can refuse an appointment.
R2: System will update that patient's appointment status and send a notification to the patient via phone number or email.

3. Reminder:

A1: Patient will set a reminder during the appointment.
R1: System will store the reminder along with the appointment and remind him/her before that fixed time.

4.6 Level-1.6: Disease Prediction

Name: Disease Prediction
Primary Actor: Admin, Patient
Secondary Actor: Database

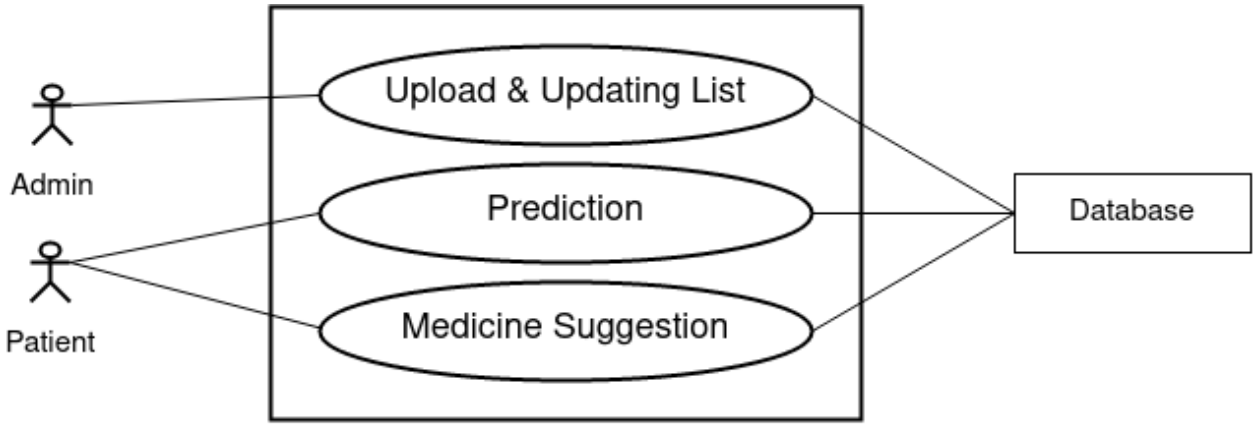

Figure-6: Level-1.6 Disease Prediction

Description:

1. Upload & Update: Admin can upload and update Disease & Syndrome List and Medicine Suggestions List.

2. Prediction: A patient can predict his/her disease by providing his/her current health conditions, gender and age.
3. Medicine Suggestion: System will provide a list of medicine as a suggestion to get rid from the disease to the patient.

Action & Response:

1. Upload & Update:
A1: Admin will upload & update list in the system.
R1: System will ask to provide password for verification.

A2: User will input his previous password
R2: If the given password is correct, the system will send OTP to the verified admin's phone Number or email and redirect him/her to an interface where s/he will provide the OTP or else the system will send a notification to the user that the given password is incorrect.

A3: User will input the OTP
R3: System will verify the OTP and upload or update the list if the correct OTP is given or else the system will send a notification to the user that the given OTP is incorrect.

2. Prediction:
A1: Patient will provide his/her current health conditions, gender and age.
R1: System will predict his/her disease.

3. Medicine Suggestion:
A1: A Decision tree will predict the disease.
R1: Then the system will provide a list of medicine as a suggestion to get rid from the disease to the patient.

4.7 Level-1.1.6: Complaint & Feedback

Name: Complaint & Feedback
Primary Actor: Admin, Patient, Doctor
Secondary Actor: Database, SMS/Email

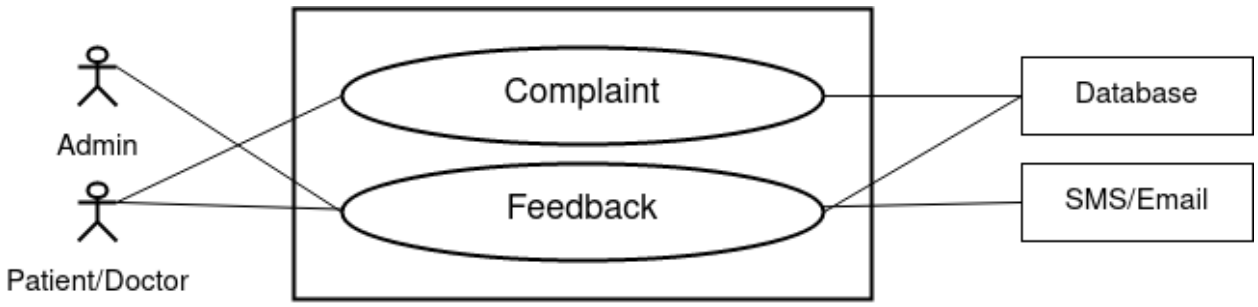

Figure-7: Level-1.1.6 Complaint & Feedback

Description:

1. Complaint: A doctor or patient will find two types of complaint options: patients and system. His/her complaint will be received by the admin**.**

2. Feedback: If any complaint submitted by a doctor is resolved, the complainer will be able to view it in the Feedback section.

Action & Response:

1. Complaint:
A1: User will click on the “Complaint” button in his/her dashboard.
R1: System will redirect him/her to an interface where s/he will provide his/her complaint and press the submit button.

2. Feedback:
A1: Admin will upload the feedback to the system.
R1: System will send notification to the complainer that his/her complaint has been resolved.

4.8 Level-1.3.1: Information View

Primary Actor: Admin, Patient, Doctor
Secondary Actor: Database

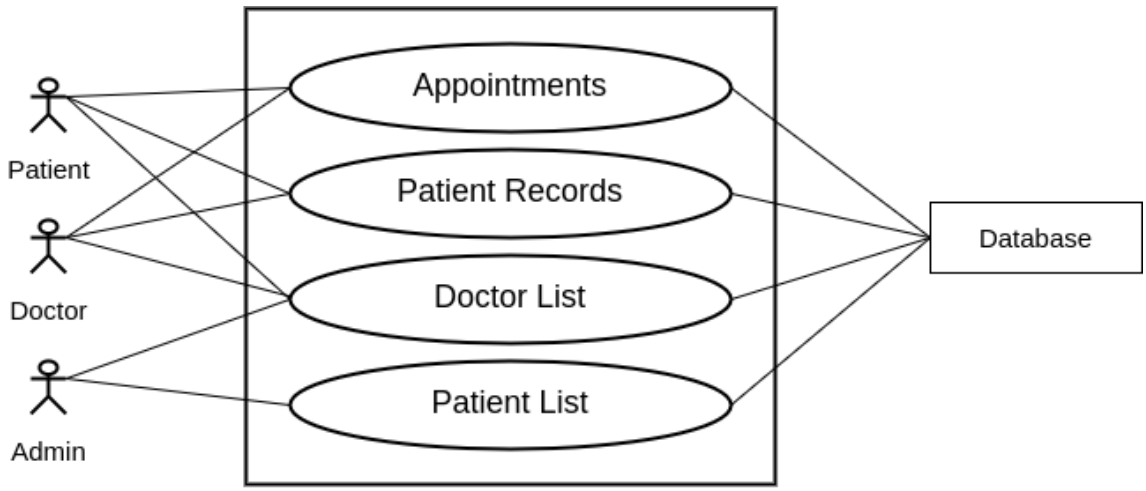

Figure-8: Level-1.3.1 Information View

Description:

1. Appointment List: A doctor can see his/her all appointment list which will be sorted by date and chamber.

2. Patient Records: A patient & a doctor also can see his/her previous records (appointments, predicted disease etc).

3. Doctors List: Everyone (even guest users) can see all doctors registered in the system.
4. Patients List: Only admin can see all patients list.

Action & Response:

1. Appointment List:
A1: Doctor will click on the “Appointment List” button in his/her dashboard.
R1: System will redirect him/her to an interface where s/he will provide his/her appointment list.

2. Patient Records:
A1: A doctor will click "See Records" in his/her appointment list or dashboards(for patient).
R1: System will redirect him/her to an interface where s/he will see that patient's previous records.
3. Doctors List:

A1: Every user will see a “Doctor List” button in their dashboard and they can click on it.
R1: System will redirect them to an interface where they can see all doctors registered in the system.

4. Patients List:
A1: Admin will click on the “Patients List” button in his/her dashboard.
R1: System will redirect them to an interface where they can see all patients registered in the system.

4.9 Level-1.3.2: Admin Dashboard

Name: Admin Dashboard
Primary Actor: Admin
Secondary Actor: Database, SMS/Email

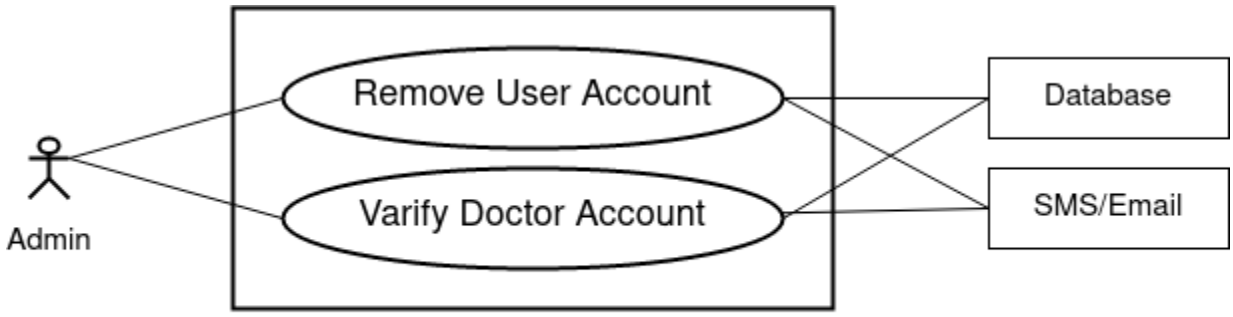

Figure-9: Level-1.3.2 Admin Dashboard

Description:

1. Remove User Account: If the admin finds any dishonest or frequently complained account, he can take a decision to remove that user account.

2. Verify Doctor Account: Admin will verify a doctor registration manually and System will send a notification to the doctor that his/her account is Verified.

Action & Response:

1. Remove User Account:
A1: Admin will click on the “Remove User Account” button in his/her dashboard.
R1: System will redirect him/her to an interface where s/he will provide the username of the user.

A2: Then Admin will click remove user account.
R2: System will ask for verification.

A3: Admin will provide his/her verification.
R3: System will remove (archived) the account from the database and a notification will be sent to the user via email.

2. Verify Doctor Account:
A1: Admin will verify the doctor account manually and submit that this is a verified account.
R1: System will send a notification to the doctor via email that the account is verified and store the account in the database.

4. Activity Diagram

Activity diagram is an important behavioral diagram in UML diagram to describe dynamic aspects of the system. Activity diagram is essentially an advanced version of flowchart that models the flow from one activity to another activity.

Activity Diagram-1 Online Doctor:

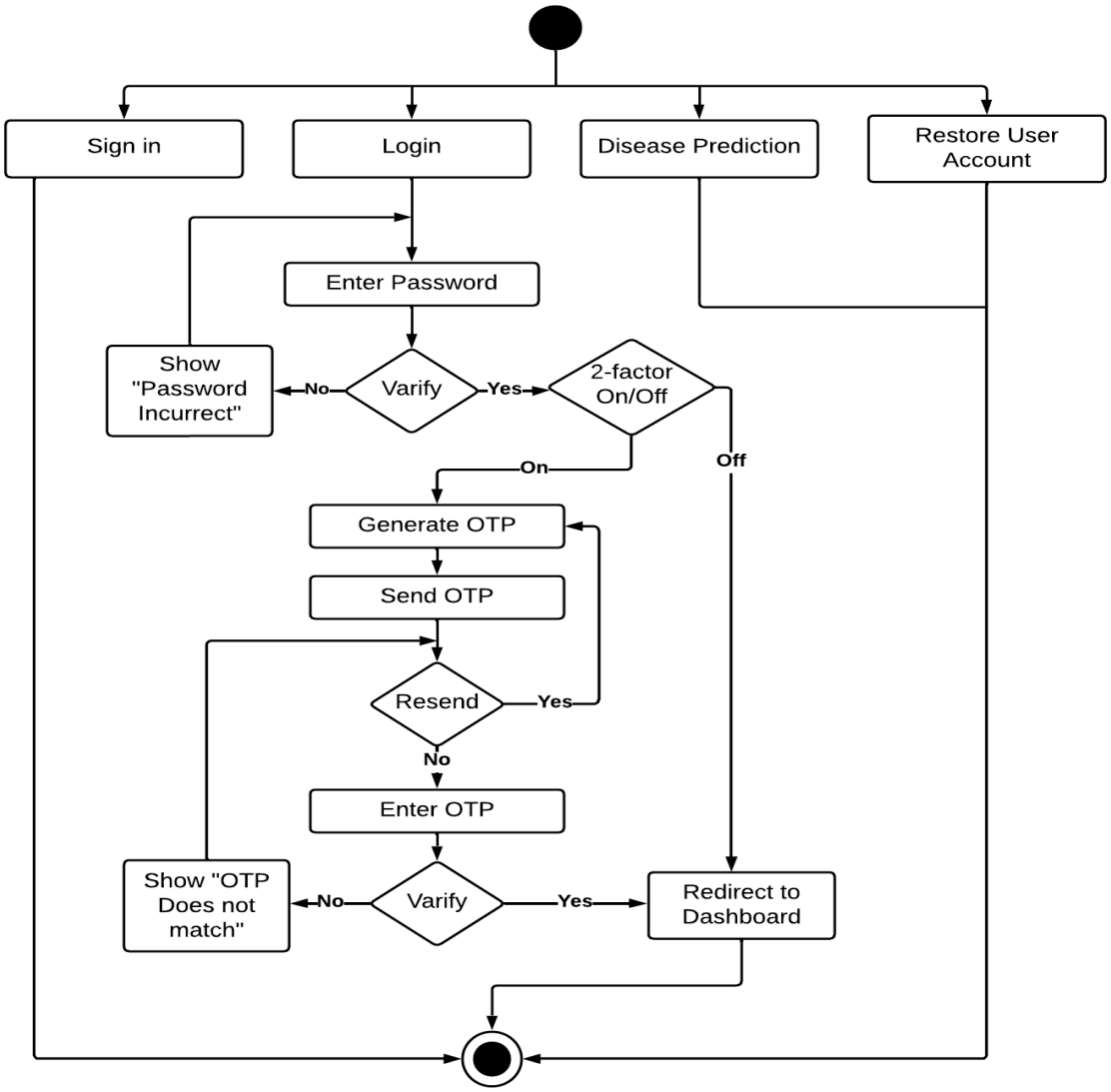

Figure-10 : Activity Diagram-1 (Online Doctor)

Activity Diagram-1.1 Account Management:

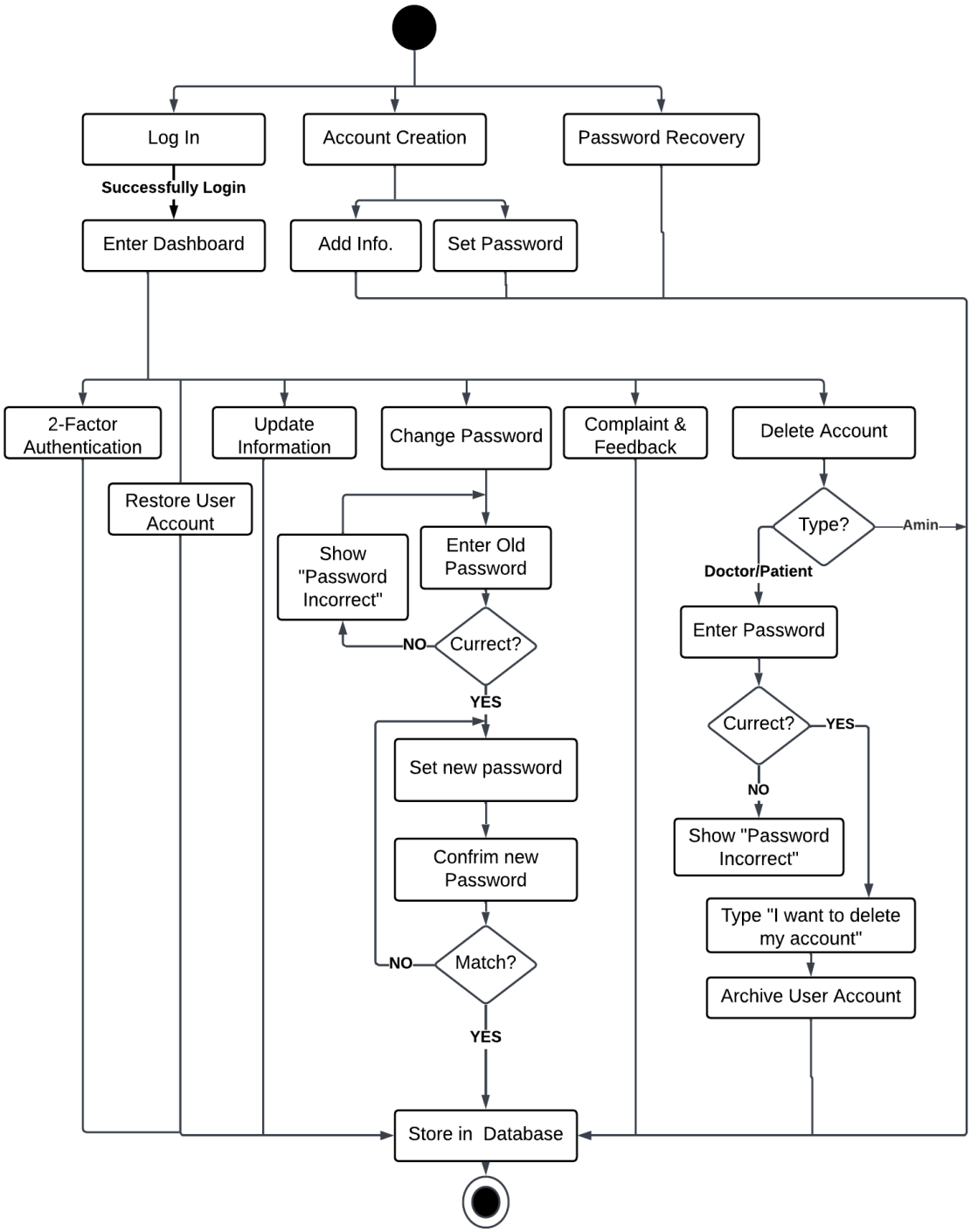

Figure-11 : Activity Diagram-1.1 (Account Management)

Activity Diagram-1.1.1 Account Creation:

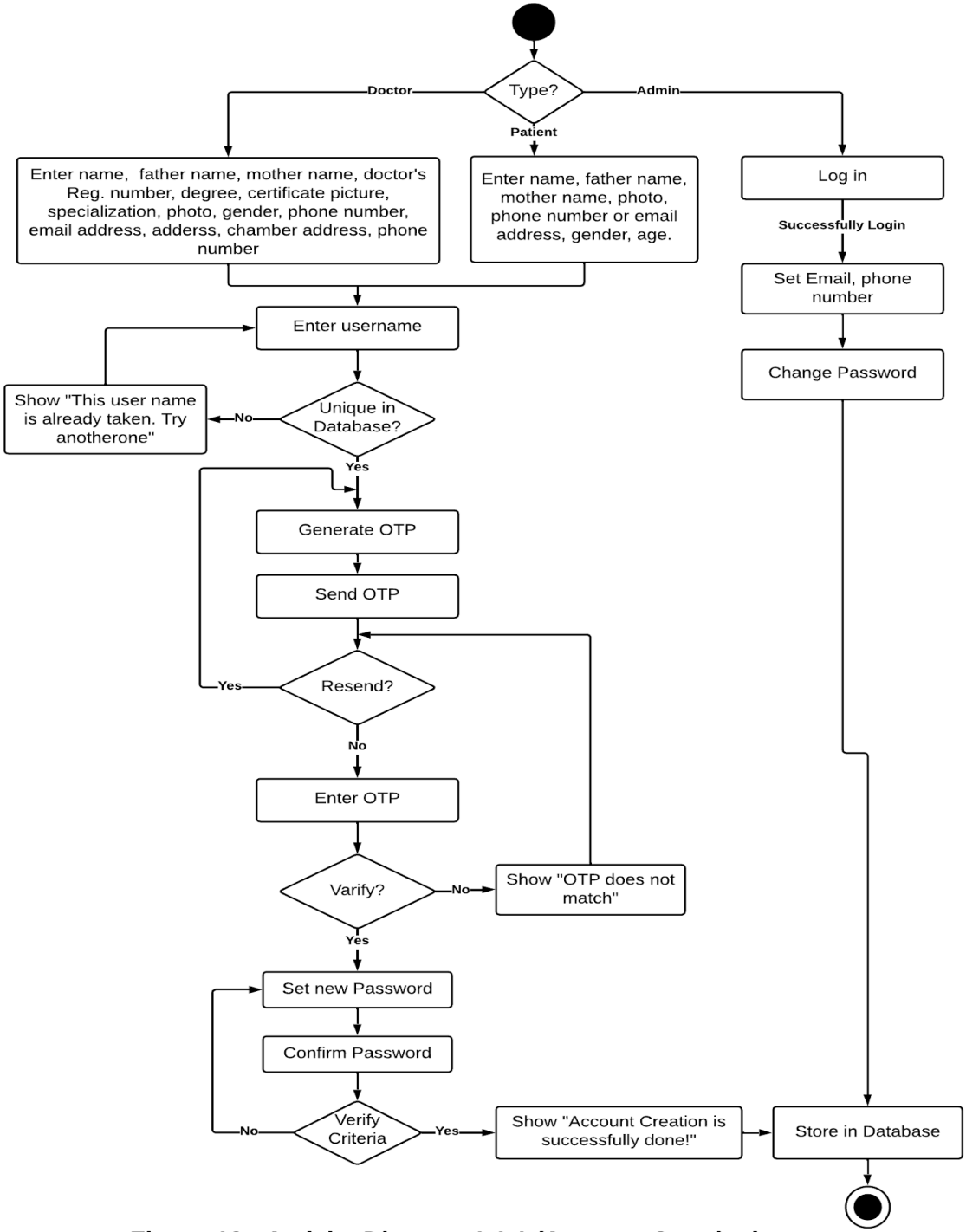

Figure-12 : Activity Diagram-1.1.1 (Account Creation)

Activity Diagram-1.1.2 Password Recovery

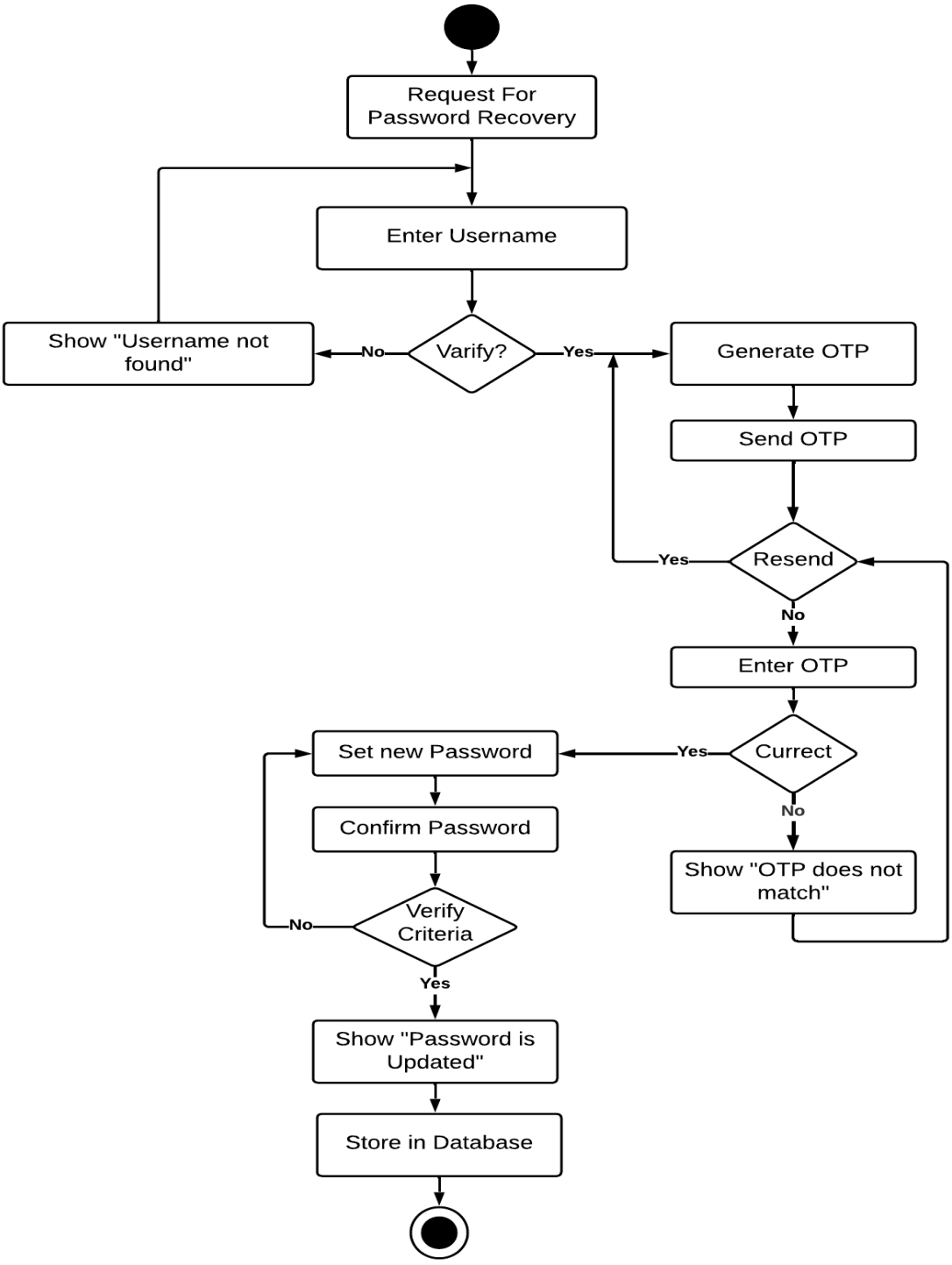

Figure-13 : Activity Diagram-1.1.2 (Password Recovery)

Activity Diagram-1.1.4 Two-Factor Authentication:

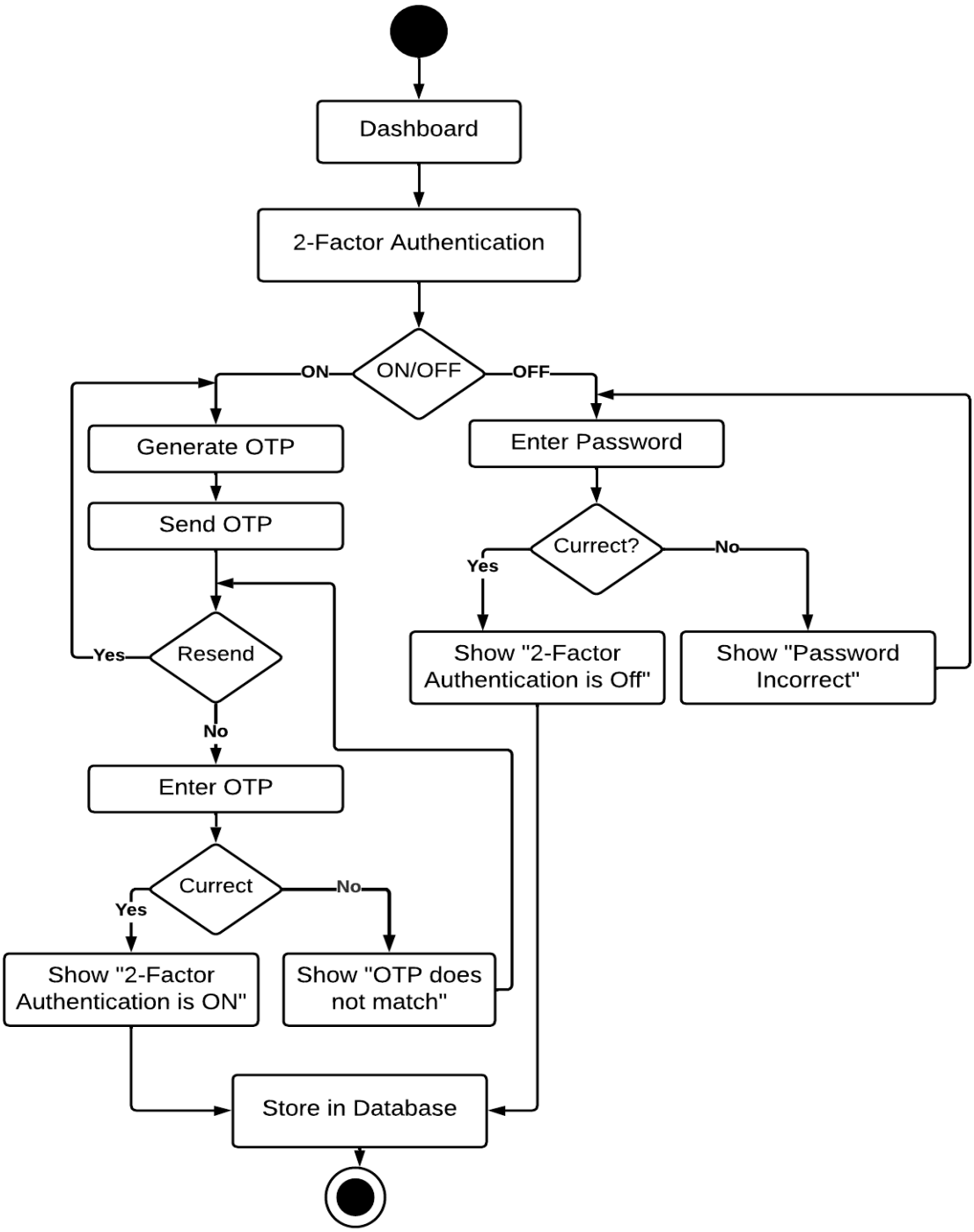

Figure-14 : Activity Diagram-1.1.4 (2-Factor Authentication)

Activity Diagram-1.1.6 Complaint & Feedback

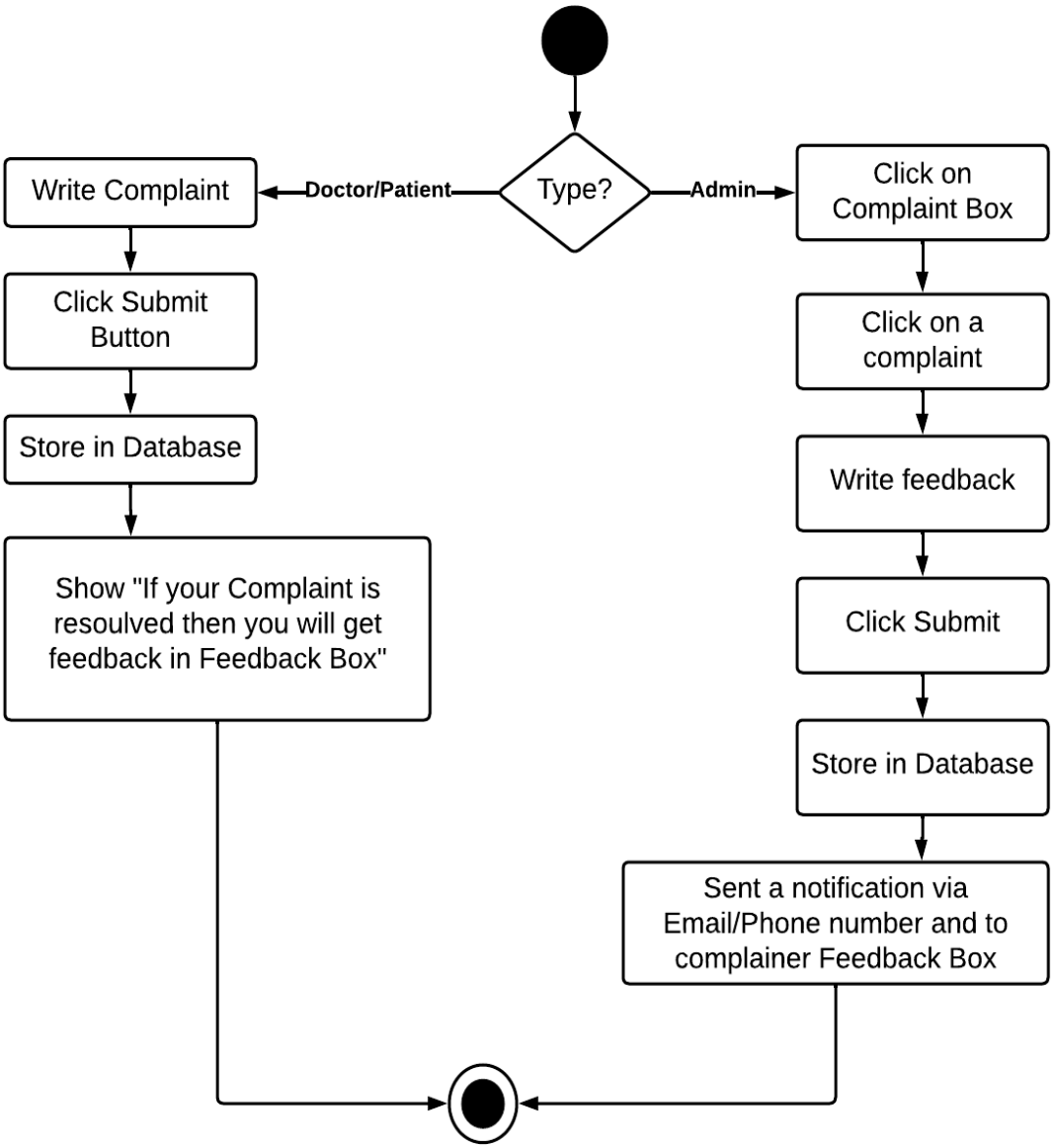

Figure-15 : Activity Diagram-1.1.6 (Complaint & Feedback)

Activity Diagram-1.1.8 Restore User Account:

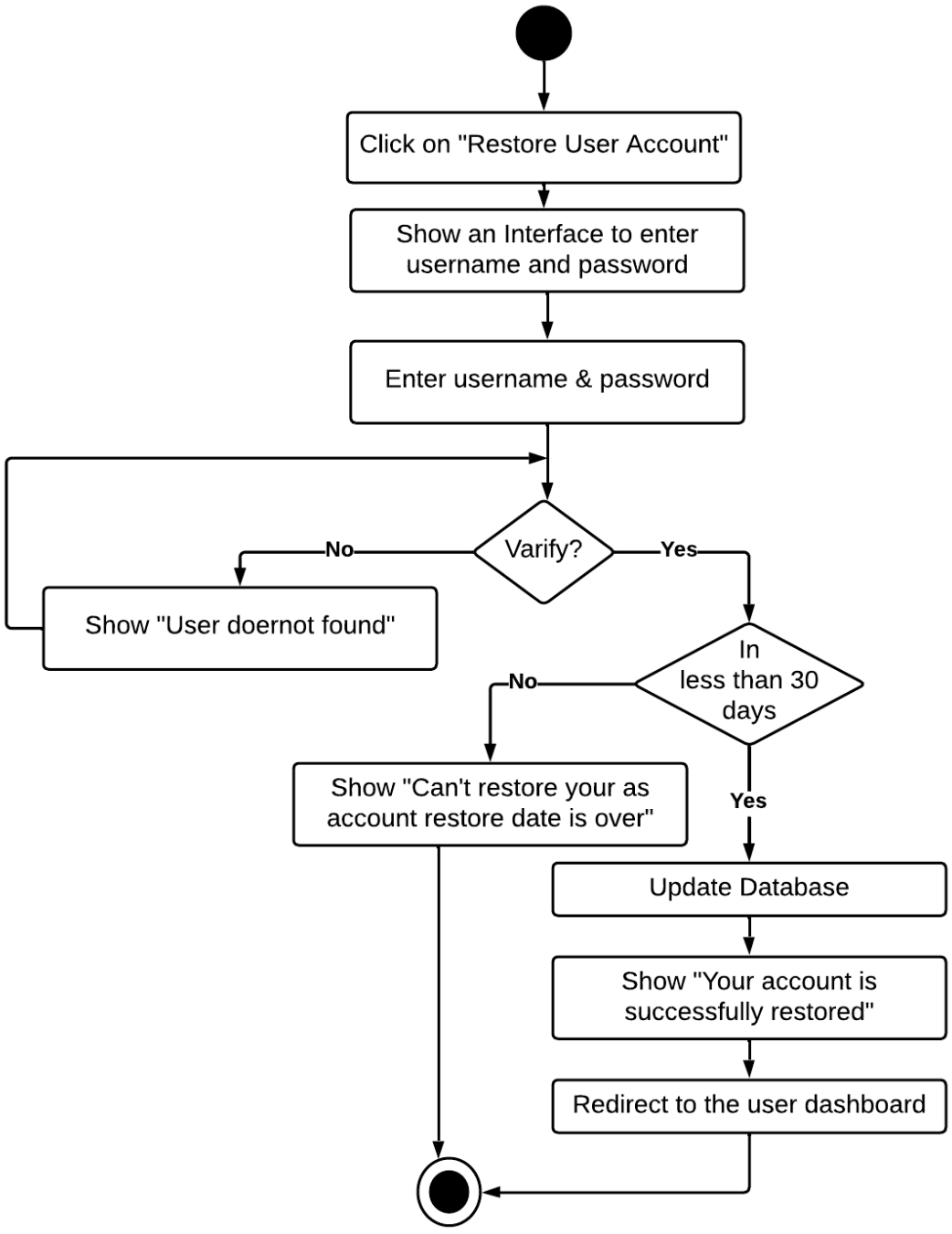

Figure-16 : Activity Diagram-1.1.8 (Restore User Account)

Activity Diagram-1.3 Dashboard:

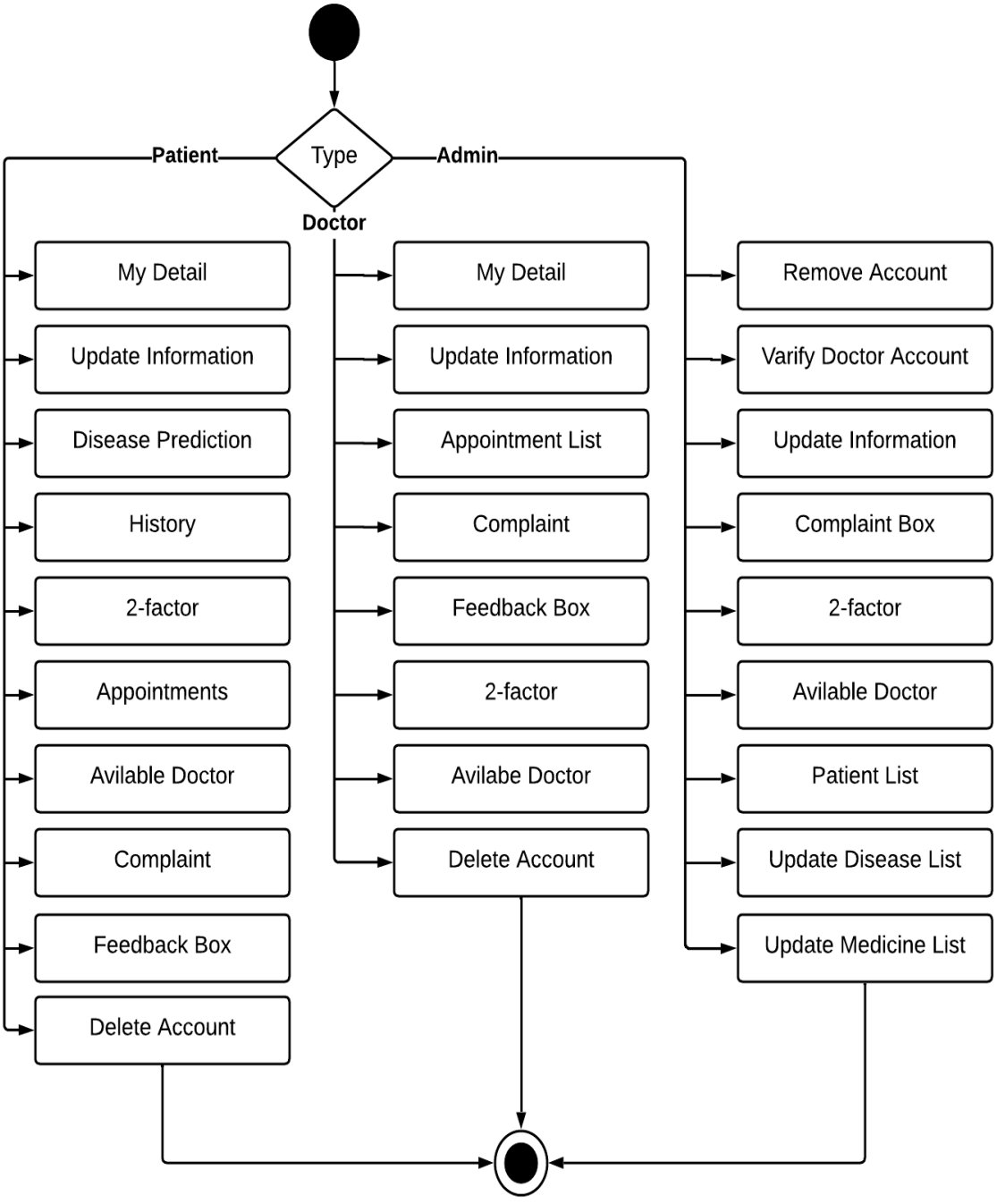

Figure-17 : Activity Diagram-1.3 (Dashboard)

Activity Diagram-1.3.2 Admin Dashboard:

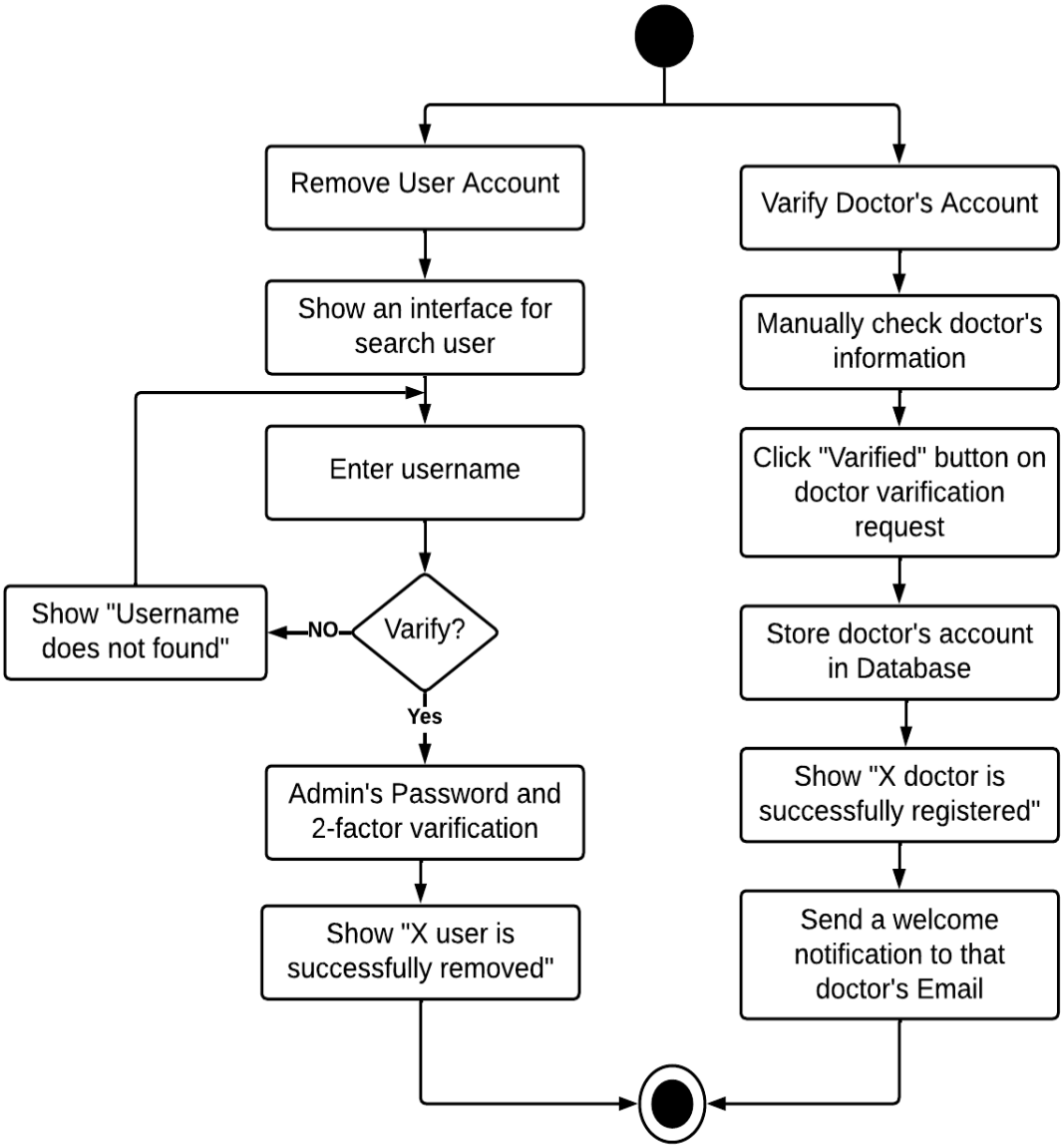

Figure-18 : Activity Diagram-1.3.2 (Admin's Dashboard)

Activity Diagram-1.5 Appointment:

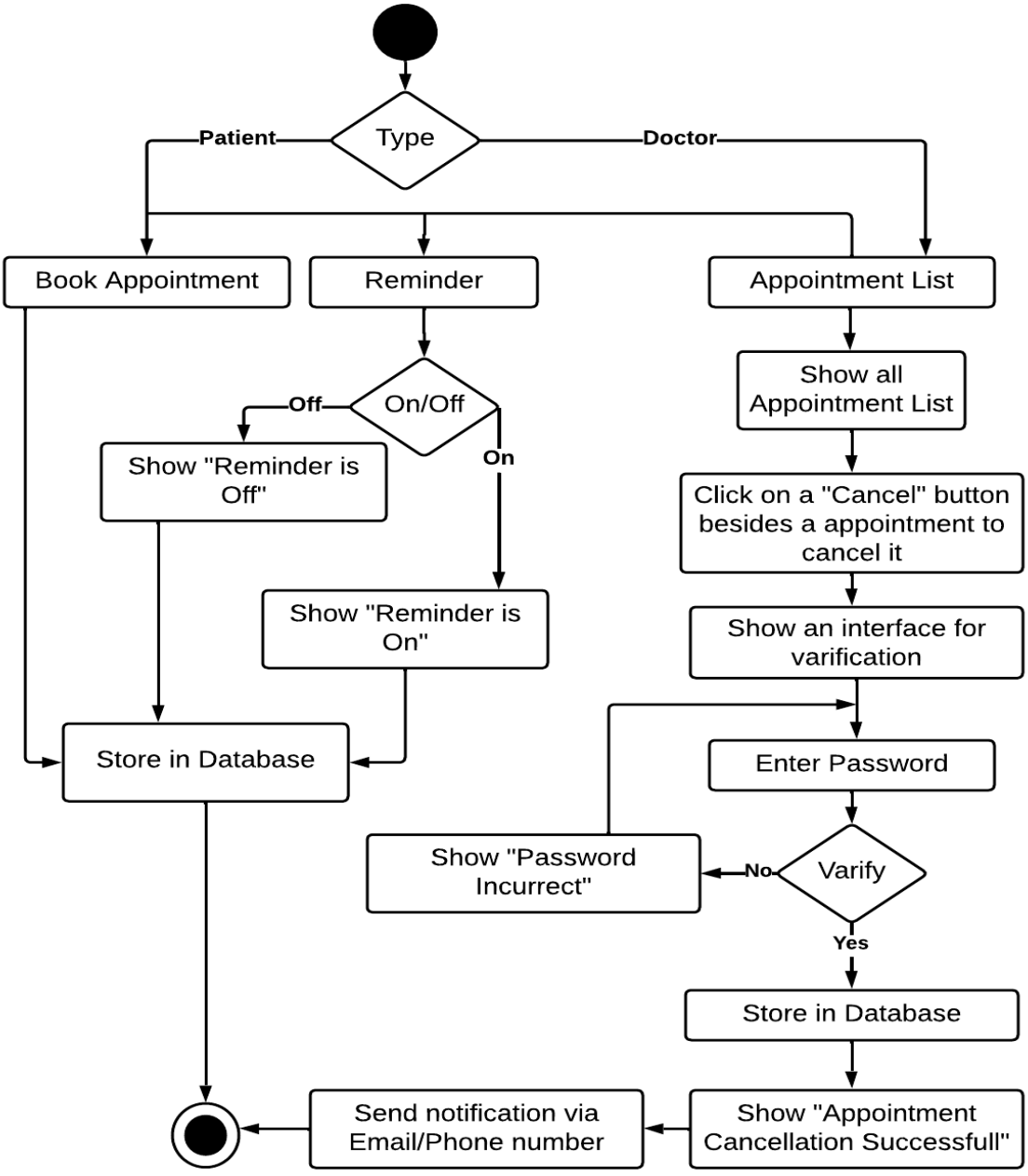

Figure-19 : Activity Diagram-1.5 (Appointment)

Activity Diagram-1.5.1 Appointment Booking:

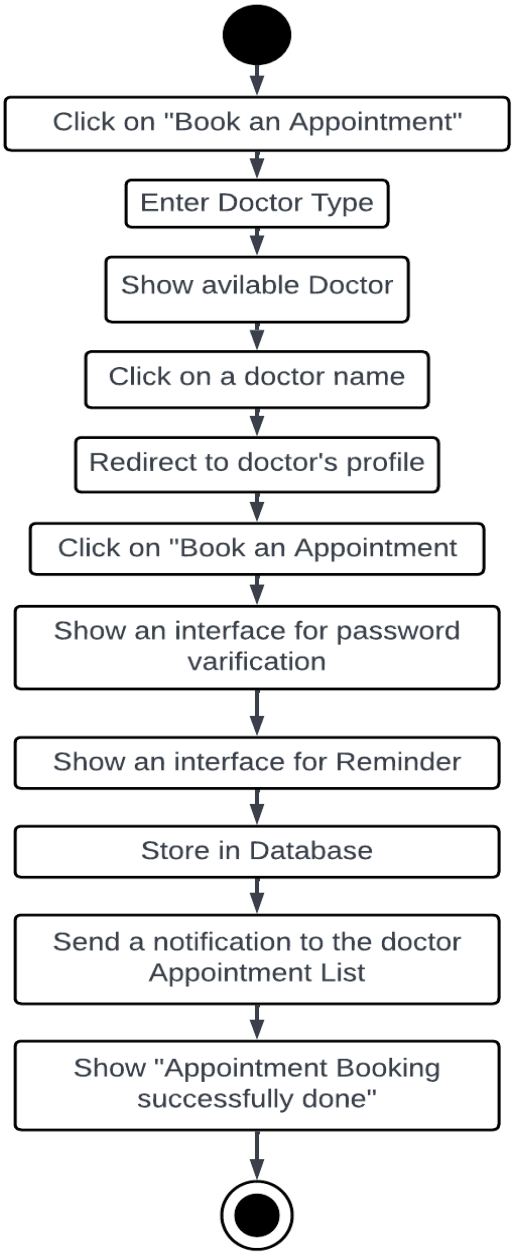

Figure-20 : Activity Diagram-1.5.1 (Appointment Booking)

Activity Diagram-1.6 Disease Prediction:

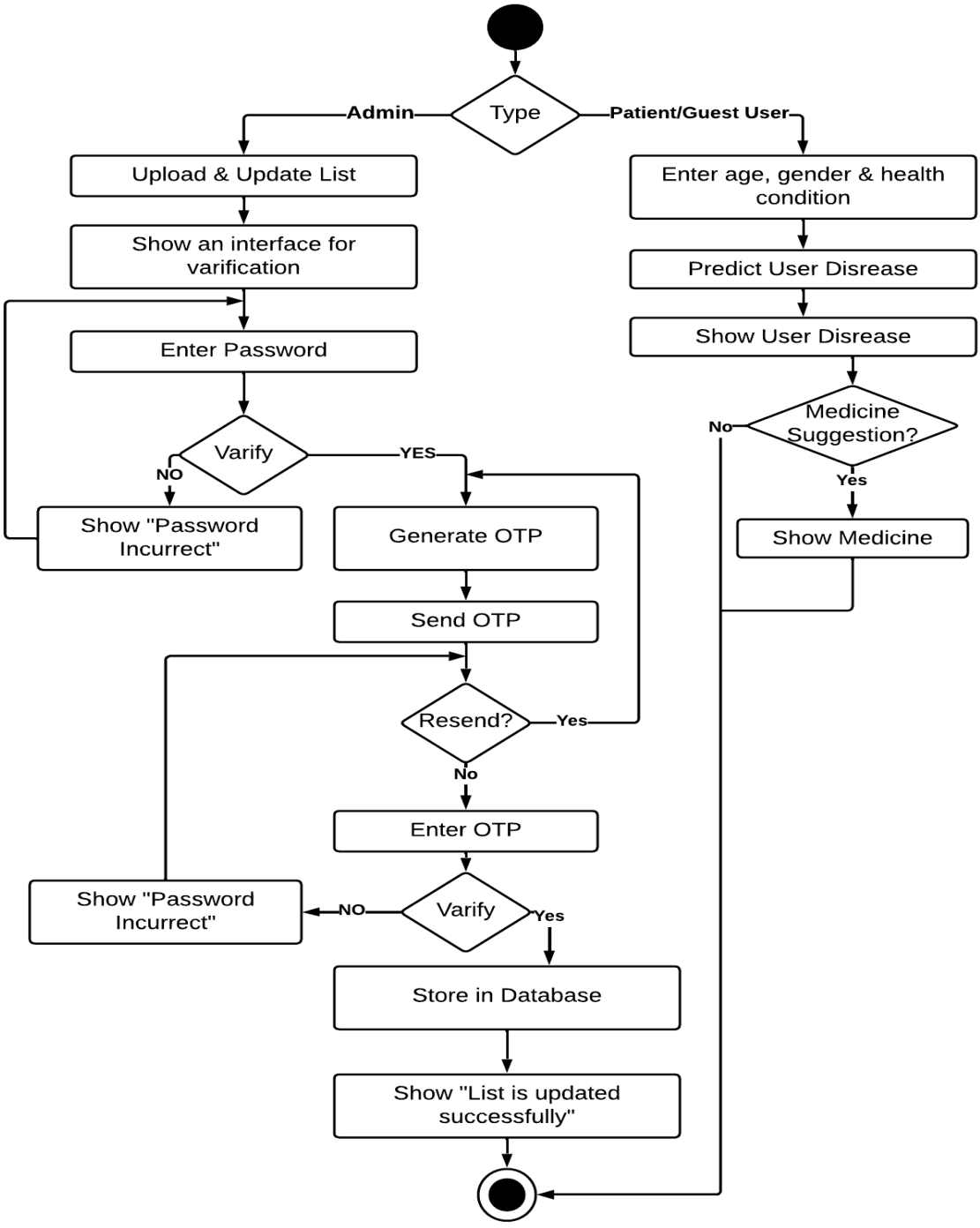

Figure-21 : Activity Diagram-1.6 (Disease Prediction)

6. Class Based Modeling

Class based modeling represents the objects that the system will manipulate, the operations that will be applied to the objects to affect the manipulation, relationships between the objects, and the collaborations that occur between the classes that are defined. The elements of a class based model include classes and objects, attributes, operations, Class Responsibility Collaborator or CRC models, collaboration diagrams and packages.

6.1 List of Nouns in “Online Doctor” System

1. Doctor	21. Number	41. Account
2. Website	22. Symbol	42. Login
3. Username	23. Information	43. User Type
4. Name	24. Verification	44. Dropdown box
5. Parent Name	25. Admin	45. Database
6. Registration Number	26. Sign Up	46. Message
7. Degree	27. Notification	47. System
8. Certificate	28. Registration	48. TwoFactor Authentication
9. Specialization	29. Sign In	49. Reset
10. Photo	30. Credentials	50. Creation
11. Gender	31. Patient	51. Criteria
12. Phone Number	32. Guest User	52. Notification Box
13. Email Address	33. Disease	53. Appointment List
14. Address	34. Prediction	54. Appointment
15. Chamber Address	35. User	55. Section
16. Interface	36. Profile	56. Records
17. OTP	37. Dashboard	57. Reminder
18. Password	38. Setup	58. Information
19. Combination	39. Doctor List	59. Complaint
20. Letter	40. Developers	60. Feedback

61. Verification	65. Medicine	69. Deletion
62. Decision	66. Suggestion	
63. Disease	67 Prediction	
64. Syndrome	68. Health	

6.2 List of Solution Space

1. Doctor	11. Patient	21. TwoFactor Authentication
2. Website	12. Guest User	22. Medicine
3. Interface	13. Disease	23. Appointment
4. OTP	14. Dashboard	24. Record
5. Information	15. Profile	25. Reminder
6. Verification	16. Account	26. Complaint
7. Admin	17. Log in	27. Feedback
8. Notification	18. Database	28. Syndrome
9. Registration	19. Message	29. Prediction
10. User	20. System	

6.3 General Classification

Candidate classes are categorized based on the seven general classification. The analysis classes manifest themselves in one of the following ways:

1. External entities
2. Things
3. Events
4. Roles
5. Organizational units
6. Places
7. Structures

A candidate class is selected for special classification if it fulfills three or more characteristics.

Serial No.	Noun	General Criteria
01	**Doctor**	4,5,7
02	Website	6
03	Interface	6
04	OTP	2
05	Information	2
06	**Verification**	2,3,7
07	**Admin**	4,5,7
08	**Notification**	1,2,3,5,7
09	Registration	3
10	**User**	4,5,7
11	**Patient**	4,5,7
12	**Guest User**	4,5,7
13	Disease	7
14	Dashboard	6
15	Profile	2,7
16	Account	5,7
17	**Log in**	3,5,7
18	**Database**	1,2,5,7
19	Message	2
20	System	4,5
21	**Two Factor Authentication**	2,3,7
22	Medicine	7
23	**Appointment**	2,3,7
24	Record	2
25	Reminder	2,3

26	Complaint	2,3
27	Feedback	2,3
28	Syndrome	7
29	**Prediction**	2,3,7

Potential To Be Classes:

1. User
2. Admin
3. Patient
4. Doctor
5. Guest User
6. Verification
7. Notification
8. Log In
9. Database
10. Two Factor Authentication
11. Appointment
12. Prediction

6.4 Selection Criteria

The candidate classes are then selected as classes by six Selection Criteria:

1. Retain information
2. Needed services
3. Multiple attributes
4. Common attributes
5. Common operations
6. Essential requirements

A candidate class generally becomes a class when it fulfills around three characteristics.

Serial No.	Potential Class Noun	Selection Criteria
1	**User**	1,2,3
2	Admin	1,2,3,4,5
3	Patient	1,2,3,4,5,6
4	Doctor	1,2,3,4,5,6
5	Guest User	2,6

6	**Verification**	1
7	Notification	1,4,5,6
8	Login	1,3,6
9	Database	1,2,6
10	**Two Factor Authentication**	1
11	Appointment	6
12	Prediction	6

Selected Classes:

1. Admin
2. Patient
3. Doctor
4. Guest User
5. Notification
6. Login
7. Database
8. Appointment
9. Prediction

6.5 Attribute and Method Identification

6.5 Attribute and Method Identification

Class Name	**Attribute**	**Method**
Admin	-userName -phoneNumber -email -password	+login() +recover_password() +change_password() +change_2FA_status() +edit_information() +get_details() +remove_userAccount() +uploadList() +varify_doctorAccount() +get_complaint() +send_feedback() +see_doctorList() +see_patientList()

Patient	-userName -phoneNumber -email -password -name -fatherName -motherName -photo -gender -age	+login() +createAccount() +recover_password() +change_password() +change_2FA_status() +edit_information() +get_details() +deleteAccount() +restore_userAccount() +make_complaint() +check_feedbackBox() +see_doctorList() +get_history() +predict_disease()
Doctor	-userName -phoneNumber -email -password -name -fatherName -motherName -photo -gender -age -registrationNumber -specialization -degree -address -chamberAddresses -chamberVisitingTimes -certificate	+login() +createAccount() +recover_password() +change_password() +change_2FA_status() +edit_information() +get_details() +deleteAccount() +restore_userAccount() +make_complaint() +check_feedbackBox() +see_doctorList()
Guest User		+predict_disease() +see_doctorList()
Notification	-message	+generate_OTP() +send_email() +show_notification() +check_2FA_status() +two_FA()
Login	-OTP	+get_password() +get_userName() +get_OTP_from_system() +check_OTP() +check_varificaiton()
Database		+check_varificaiton() +check_userName()

		+get_userDatiels() +update_userDatiels() +get_2FA_status() +update_2FA_status() +get_patientList() +get_doctorList() +get_avilable_doctor() +get_doctors_appointmentList() +get_patient_appointmentList() +update_appointment_status() +update_reminder_status() +get_medicineList() +update_medicineList() +update_diseaseAndsyndrome() +store_complaint() +get_complaint() +store_feedback() +get_feedback()
Appointment	-doctor_username -patient_username -date -time -reminderStatus	+book-appointment() +change_reminder_status() +change_reminder_time() +get_available_doctor() +get_doctors_appointmentList() +get_my_appointmentList() +cancel_appointment() +refuse_appointment()
Prediction	-patientUsername	+getSyndromes() +getAge() +getGender() +make_prediction() +get_medicine_suggestion() +update_medicine_suggestion_list() +update_diseaseAndSyndrome_list()

6.6 Analysis

By analyzing the above table we can see that most of the methods and attributes of Admin, Doctor, Patient are similar. So we can make a super "Account" which will be inherited by Admin and User. Farther then that "User" class will be inherited by the Doctor and Patient.

Class Name	Attributes	Methods
Account	-userName -phoneNumber -email -password	+login() +recover_password() +change_password() +change_2FA_status() +edit_information() +get_details() +see_doctorList()
Admin		+remove_userAccount() +uploadList() +varify_doctorAccount() +get_complaint() +send_feedback() +see_patientList()
User	-name -fatherName -motherName -photo -gender -age	+createAccount() +deleteAccount() +restore_userAccount() +make_complaint() +check_feedbackBox()
Patient		+get_history() +predict_disease()
Doctor	-registrationNumber -specialization -degree -address -chamberAddresses -chamberVisitingTimes -certificate	

Also the "Database" class is a very large class, we can divide it into two subclasses named Database Reader and Database Writer.

Class Name	Attributes	Methods
Database Reader		+check_varificaiton() +check_userName() +get_userDatiels() +get_2FA_status() +get_patientList() +get_doctorList() +get_avilable_doctor() +get_doctors_appointmentList() +get_patient_appointmentList() +get_medicineList() +get_complaint() +get_feedback()
Database Writer		+update_userDatiels() +update_2FA_status() +update_appointment_status() +update_reminder_status() +update_medicineList() +update_diseaseAndsyndrome() +store_complaint() +store_feedback()

Final Classes

1. Account
2. User
3. Admin
4. Doctor
5. Patient
6. Guest User
7. Notification
8. Login
9. Database Reader
10. Database Writer
11. Appointment
12. Prediction

6.7 Class Cards

Class: Account	
Attributes	**Method**
-userName -phoneNumber -email -password	+login() +recover_password() +change_password() +change_2FA_status() +edit_information() +get_details() +see_doctorList()
Responsibilities	**Collaborator**
Logging in	Login
Recovering Password	Notification, Database Writer
Change Password	Database Reader, Database Writer
Change 2-FA status	Notification, Database Writer
Edit Information	Database Writer
My information	Database Reader
See All registered doctor in the system	Database Reader

Class: Admin	
Attributes	**Method**
	+remove_userAccount() +uploadList() +varify_doctorAccount() +get_complaint() +send_feedback()
Responsibilities	**Collaborator**
Remove an user Account	Notification, Database Reader, Database Writer
Upload/update Diseases & Syndrome	Prediction
Approve a Doctor account Request	Database Writer

Complaint & Feedback	Database Reader, Database Writer
See All registered patient in the system	Database Reader

Class: User	
Attributes	**Method**
-name -fatherName -motherName -photo -gender -age	+createAccount() +deleteAccount() +restore_userAccount() +make_complaint() +check_feedbackBox()
Responsibilities	**Collaborator**
Create or delete an account	Notification, Database Writer
Restore an account	Database Reader, Database Reader
Complaint	Database Writer
Feedback	Notification, Database Reader

Class: Patient	
Attributes	**Method**
	+get_history() +predict_disease()
Responsibilities	**Collaborator**
Get Previous Records	Database Reader
Predict disease and get medicine suggestion	Prediction

Class: Doctor	
Attributes	**Method**
-registrationNumber -specialization -degree -address -chamberAddresses -chamberVisitingTime -certificate	
Responsibilities	**Collaborator**
Update chamber addresses and academic information	Database Writer

Class: Guest User	
Attributes	**Method**
	+predict_disease() +see_doctorList()
Responsibilities	**Collaborator**
See All registered doctor in the system	Database Reader
Predict disease and get medicine suggestion	Prediction

Class: Notification	
Attributes	**Method**
-message	+generate_OTP() +send_email() +show_notification() +check_2FA_status() +two_FA()
Responsibilities	**Collaborator**
Two factor authentication	Database Reader

Class: Login	
Attributes	**Method**
-OTP	+get_password() +get_userName() +get_OTP_from_system() +check_OTP() +check_varificaiton()
Responsibilities	**Collaborator**
Verification	Database Reader
Get OTP	Notification
Redirect to User account After successful login	Account

Class: Database Writer	
Attributes	**Method**
	+update_userDatiels() +update_2FA_status() +update_appointment_status() +update_reminder_status() +update_medicineList() +update_diseaseAndsyndrome() +store_complaint() +store_feedback()
Responsibilities	**Collaborator**
Update user details and 2-FA status	Account
Update appointment and reminder status	Appointment
Update medicine list, disease & syndrome list	Prediction
Store complaint	User
Store feedback	Admin

Class: Database Reader	
Attributes	**Method**
	+check_varificaiton() +check_userName() +get_userDatiels() +get_2FA_status() +get_patientList() +get_doctorList() +get_avilable_doctor() +get_doctors_appointmentList() +get_patient_appointmentList() +get_medicineList() +get_complaint() +get_feedback()
Responsibilities	**Collaborator**
Send User Details	Account
Send Verification	Notification, Appointment, Account, Login
Send 2-FA status	Account, Notification
Send all Doctors list	Account, Guest User
Send all patients list	Admin
Send available Doctors list	Appointment
Send appointments list	Appointment
Send medicine list	Prediction
Send complaints	Admin
Send feedback	User

Class: Appointment	
Attributes	**Method**
-doctor_username -patient_username -date -time -reminderStatus	+book-appointment() +change_reminder_status() +change_reminder_time() +get_available_doctor() +get_doctors_appointmentList() +get_my_appointmentList() +cancel_appointment() +refuse_appointment()
Responsibilities	**Collaborator**
Booking an appointment	Notification, Database Writer
Cancel or refuse an appointment	Notification, Database Writer
Change reminder	Database Writer
See all available doctor	Database Reader
See all appointments	Database Reader

Class: Prediction	
Attributes	**Method**
-patientUsername	+getSyndromes() +getAge() +getGender() +make_prediction() +get_medicine_suggestion() +update_medicine_suggestion_list() +update_diseaseAndSyndrome_list()
Responsibilities	**Collaborator**
Update List	Notification, Database Writer
Medicine suggestion	Database Reader

6.8 CRC Diagrams

6.8.1 Account Class:

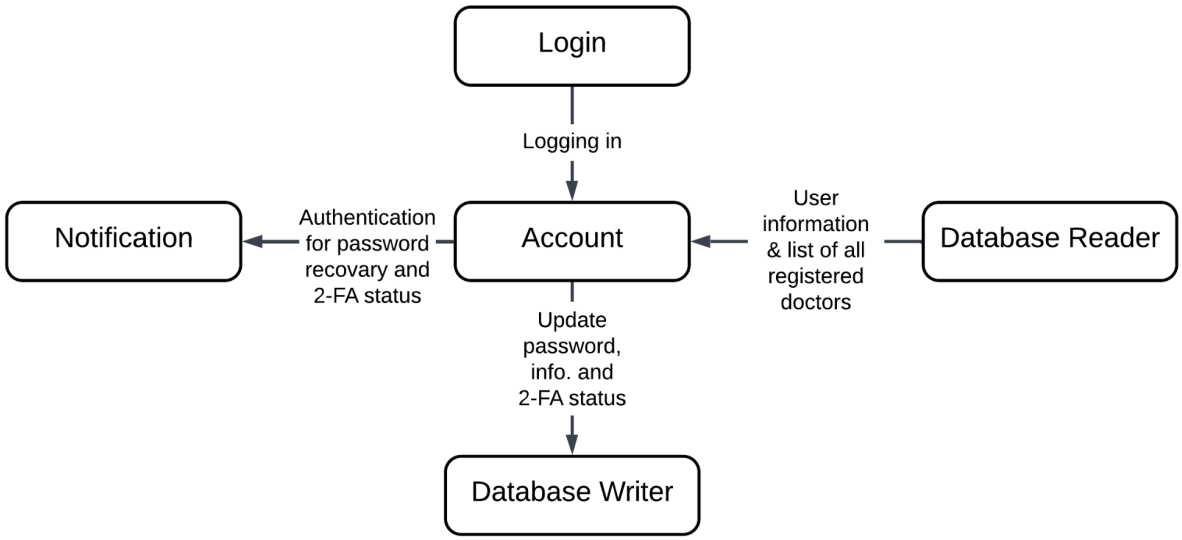

Figure-34: CRC diagram for Account class

6.8.2 User Class:

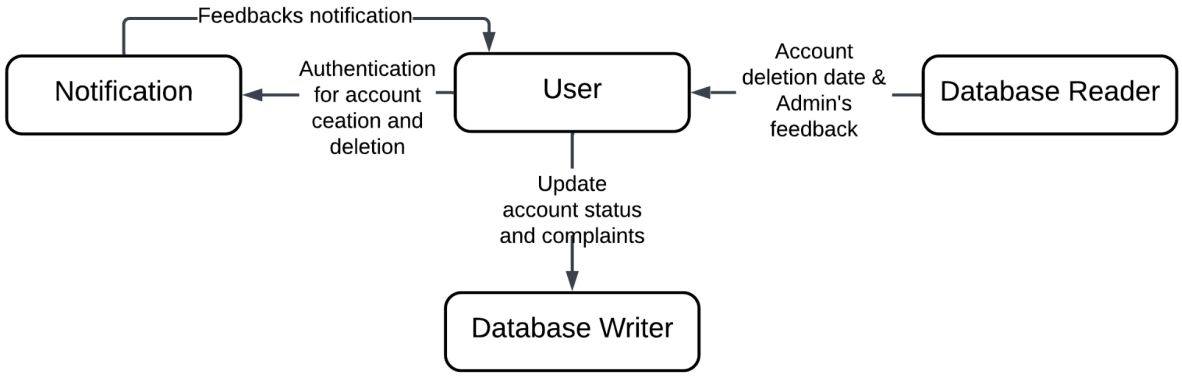

Figure-35: CRC diagram for User class

6.8.3 Admin Class:

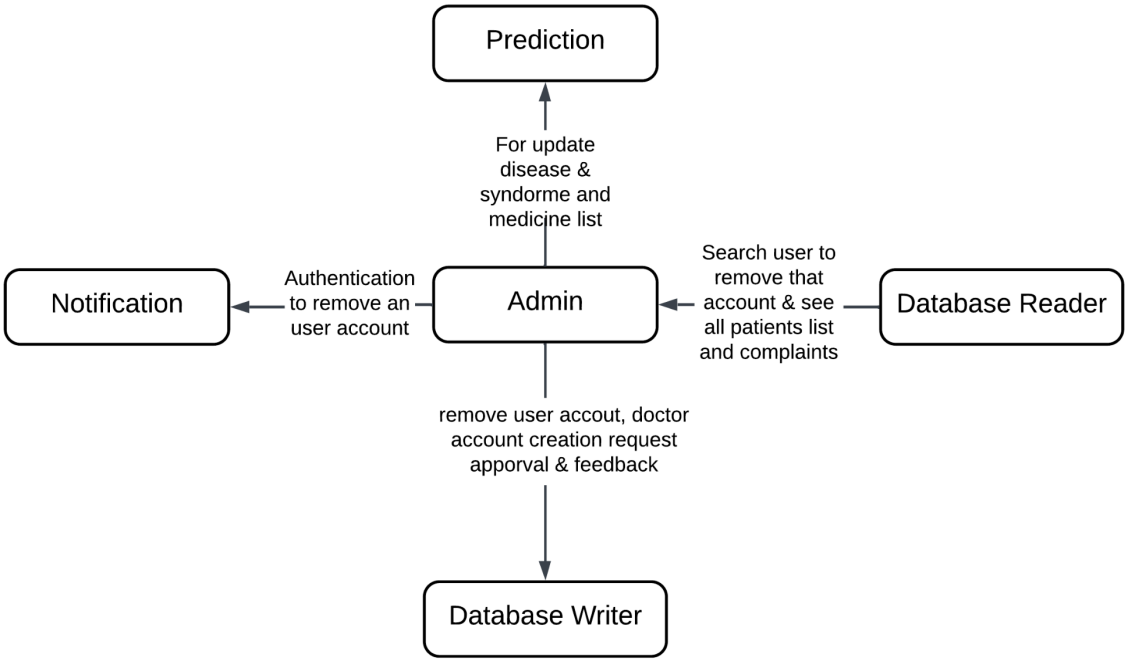

Figure-36: CRC diagram for Admin class

6.8.4 Doctor Class:

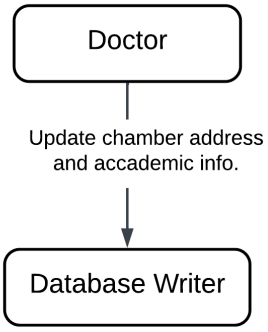

Figure-37: CRC diagram for Doctor class

6.8.5 Patient Class:

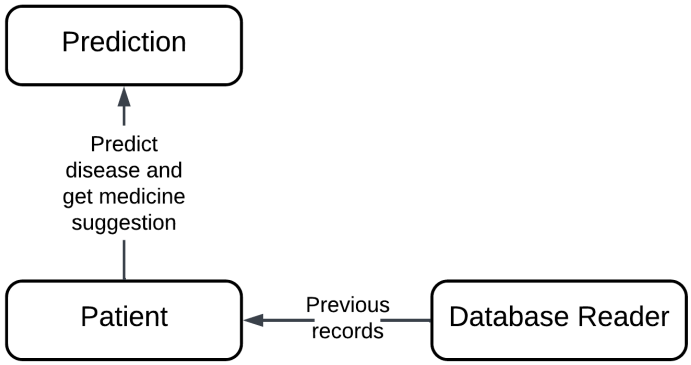

Figure-38: CRC diagram for Patient class

6.8.6 Guest User Class:

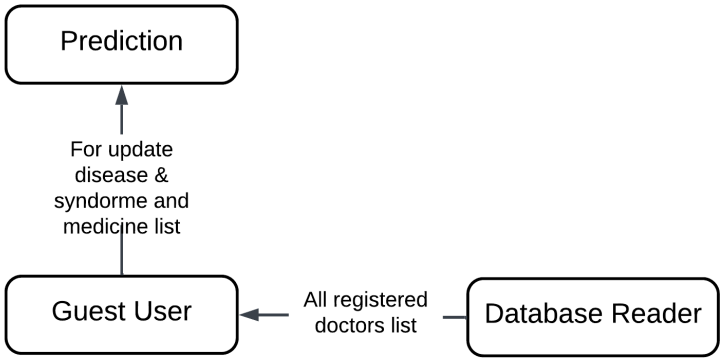

Figure-39: CRC diagram for Guest User class

6.8.7 Notification Class:

Figure-40: CRC diagram for Notification class

6.8.8 Login Class:

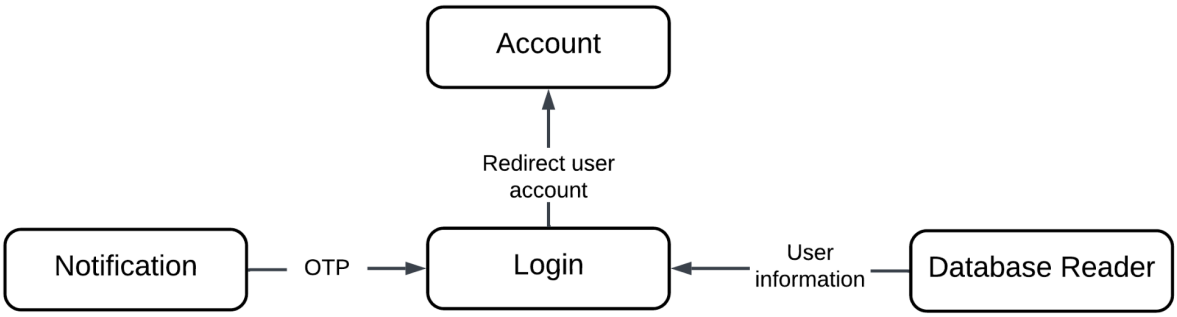

Figure-41: CRC diagram for Login class

6.8.9 Database Writer Class:

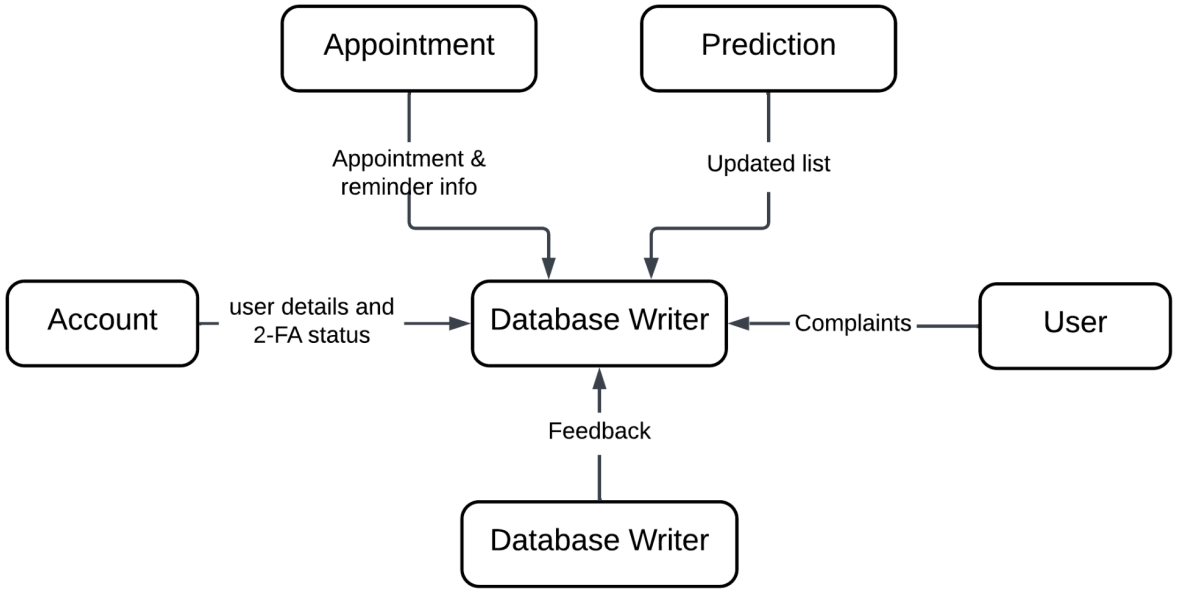

Figure-42: CRC diagram for Database Writer class

6.8.10 Database Reader:

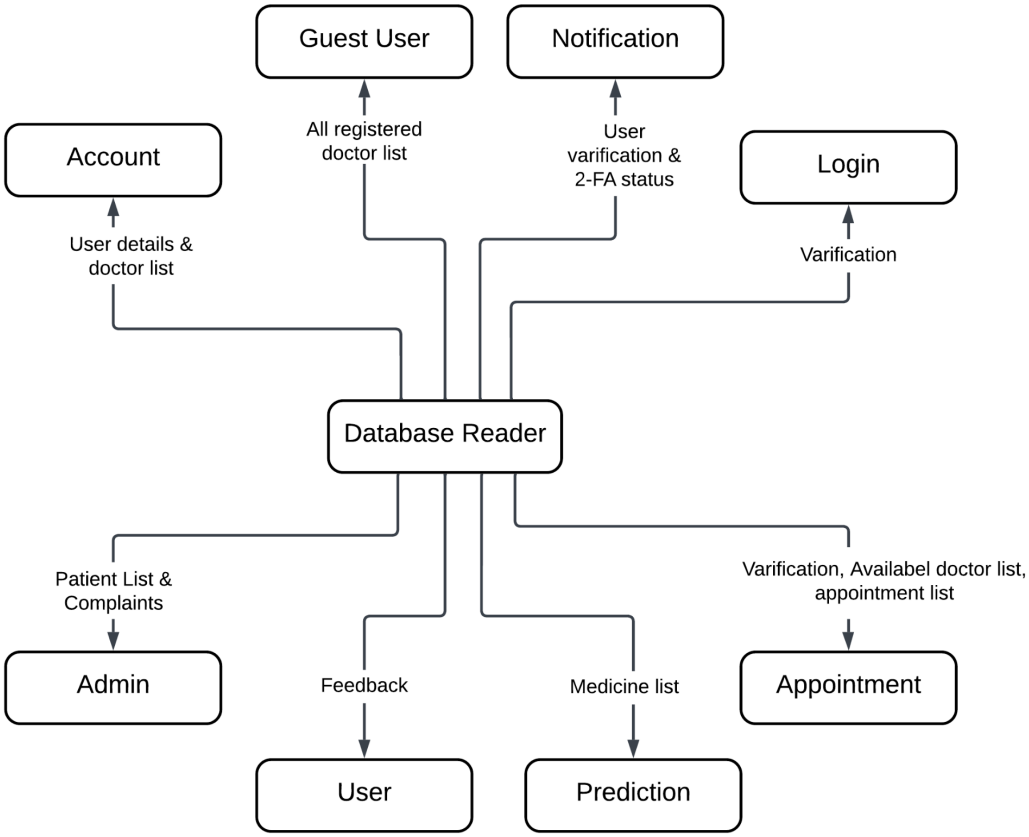

Figure-43: CRC diagram for Database Reader class

6.8.11 Appointment Class:

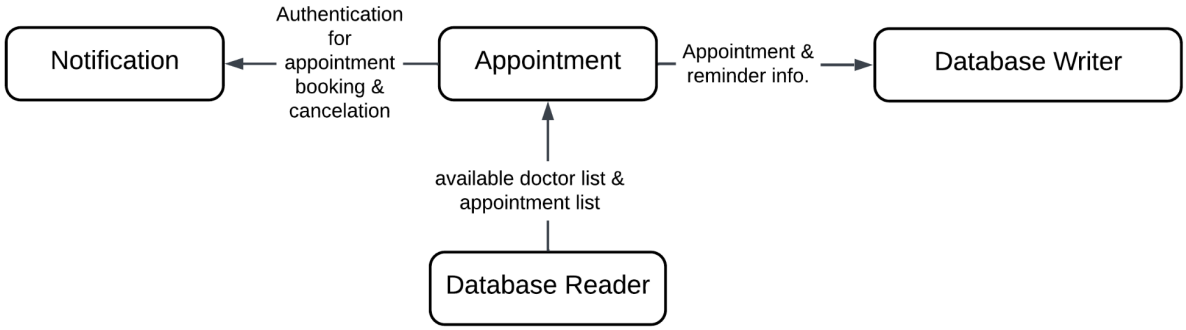

Figure-44: CRC diagram for Appointment class

6.8.12 Prediction

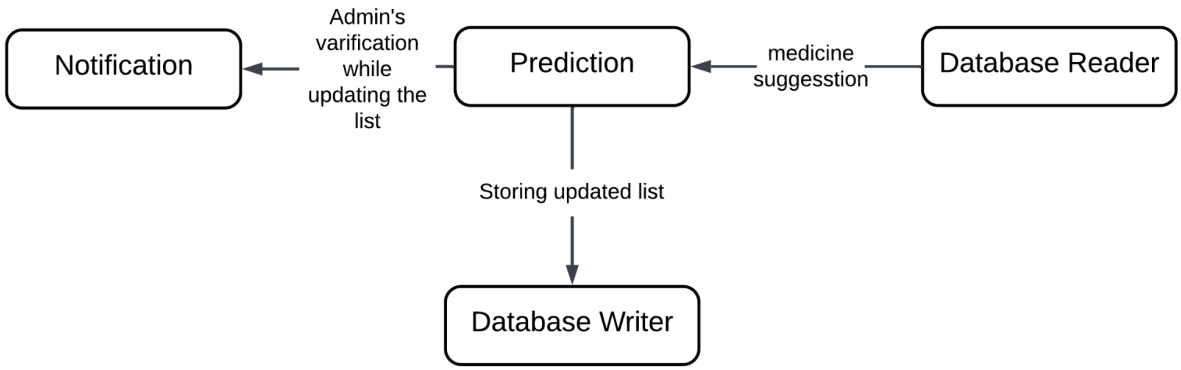

Figure-45: CRC diagram for Prediction class