SC2002 Object Oriented Design & Programming

Hospital Management System

AY24/25 Semester 1 | SCS4 | Group 6

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Github Repository Link: : https://github.com/AuroraVane/SC2002_Project.git
Project Video Link: http://youtube.com

Declaration of Original Work for SC2002/CE2002/CZ2002 Assignment

- We hereby declare that the attached group assignment has been researched, undertaken, completed, and submitted as a collective effort by the group members listed below.
- We have honoured the principles of academic integrity and have upheld Student Code of Academic Conduct in the completion of this work.
- We understand that if plagiarism is found in the assignment, then lower marks or no marks will be awarded for the assessed work. In addition, disciplinary actions may be taken.

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1. Design Considerations

1.1. Our Approach

Our HMS system is designed with its classes separated into controller, boundary, and entity categories to ensure high cohesion and loose coupling . When a user interacts with the system, they interact with the boundary classes, which in turn interact with controller classes to complete operations. These controllers, in turn, interact with the entity classes to manage and persist data. This layered architecture promotes a clean separation of concerns, making the system more maintainable and scalable.

Our system also operates in a continuous loop that makes it self sustainable - once initiated, it remains active until manually terminated**.** This allows for multiple users to log in and out sequentially without requiring the entire system to restart.

1.2. Assumptions

The HMS system is designed to operate in a single-user, single-instance environment. This assumption ensures data integrity and prevents conflicts that might arise from concurrent access, such as multiple users editing the same file simultaneously. Additionally, we assume that users can follow instructions to give logical and correct formatted inputs, and that there's no limit to the storage size of the system.

1.3. Applied Design Principles

1.3.1. Single Responsibility Principle(SRP)

Single Responsibility Principle states that each class assumes a single well-defined responsibility such that it does not have more than one reason for it to be changed. By assigning single responsibility to classes with Entity, Boundary, Controller, and more user specific roles we can minimise the ripple effects of changes, and improve code modularity and allow for easier testing and modification.

1.3.2. Open/Closed Principle(OCP)

Open Closed Principle states that software entities (classes, modules, functions, etc.) should be open for extension but closed for modification, meaning new features can be added without modifying existing code. OCP can be applied via abstraction, inheritance and polymorphism.

In our project, we applied OCP by creating an abstract class “User<Entity>” that is extended to different types of Users such as “Staff” and “Patient”. The subclasses override getRole(), displayUI(), allowing us to implement role specific displayUIs for new users without modifying the existing code. Hence, increasing the flexibility and maintainability of our HMS system.

1.3.3. Liskov Substitution Principle(LSP)

Liskov Substitution Principle states that the subtypes must be substitutable for the base types. In our system, ‘Staff’ class objects are substitutable by all its subclasses ‘Doctor’, ‘Administrator’ and ‘Pharmacist’, all while ensuring the methods behave correctly. When trying to get the role of different users, we use different instances of requests to call ‘getRole()’, and a method in the subclass will be called and returns the correct role of the user. This promotes code reusability and reduces the likelihood of introducing errors when adding new subclasses.

1.3.4. Interface Segregation Principle(ISP)

Interface segregation principle states that many specific interfaces are better than one general interface. In accordance with the Interface Segregation Principle (ISP), we decomposed our entity interfaces into ‘UserUI’ and ‘AppointmentUI’ interfaces. This strategy mitigates the risk of bloated interfaces and ensures that entity classes implement only the methods necessary for their respective functionalities. By promoting modularity and reducing coupling, we improve the overall maintainability and extensibility of our system.

1.3.5. Dependency Injection Principle(DIP)

Dependency injection principle suggests that higher modules must not depend on lower modules, but both should depend on abstraction. This means that we should depend on interfaces rather than directly depending on concrete classes to perform any same operations, this makes the system more maintainable because we do not have to individually edit every concrete class.

In our system, when navigating and displaying the menu for each type of user, we depend on the <UserUI> interface instead of individual concrete classes of ‘PatientUI’, ‘DoctorUI’ etc. Therefore, allowing us to introduce more UIs for different users with minimal effort later, making our system extendable.

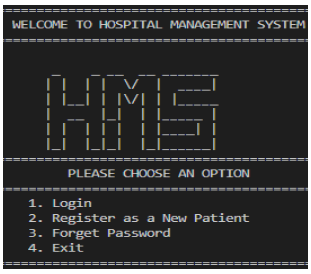
1.4. Boundary Controller Entity Framework (BCE)

BCE is a design pattern that organises software into 3 layers: Boundary (Handle Interactions), Controller, (Handle Logic) and Entity (Core Data Model). We made use of it by decoupling our classes to Boundary, Entity and Controller classes so that the classes would not be too cluttered and adhere to SRP and allow room for DIP.

1.5. Factory Pattern

The Factory Pattern specifically Factory Method is a design pattern that provides a way to create objects without specifying their exact class. We employed it in our project's login process to encapsulate object creation- the authenticate method can process different user types without explicit knowledge of their specific subclasses. This decoupling allows for a more flexible and extensible authentication system.

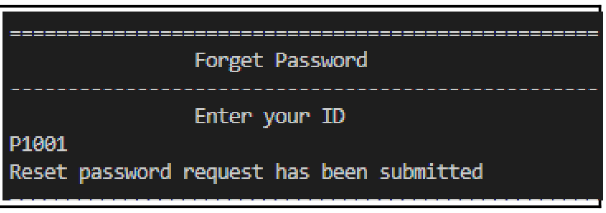
2. Additional Features & Functionality Implemented



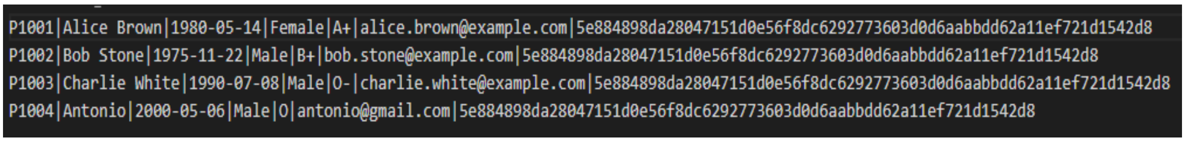
```
=====================================
 WELCOME TO HOSPITAL MANAGEMENT SYSTEM
=====================================

      _    _ __  __ _______
     | |  | |  V  | |  ____|
     | |__| | |V| | |_____
     |  __  |_|  | |_____  |
     | |  | | |  | |_____| |
     |_|  |_|_|  |_|_______|

=====================================
        PLEASE CHOOSE AN OPTION
=====================================
   1. Login
   2. Register as a New Patient
   3. Forget Password
   4. Exit
=====================================
```

Register New Patient : *Users* can self register at the Hospital start page

Forget Password : A reset password request can be made anytime if *Users* forget their password, an *Admin* can then approve the request,

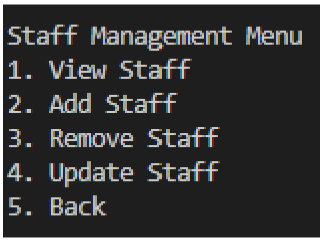


```
==================================================
                 Forget Password
--------------------------------------------------
                 Enter your ID
P1001
Reset password request has been submitted
--------------------------------------------------
```



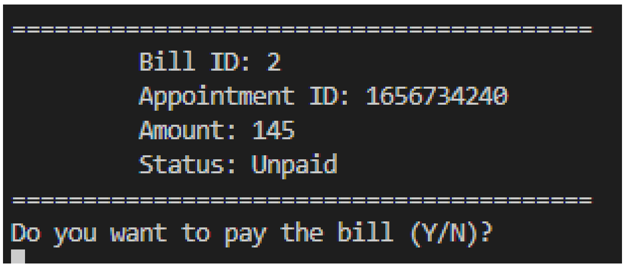
```
P1001|Alice Brown|1980-05-14|Female|A+|alice.brown@example.com|5e884898da28047151d0e56f8dc6292773603d0d6aabbdd62a11ef721d1542d8
P1002|Bob Stone|1975-11-22|Male|B+|bob.stone@example.com|5e884898da28047151d0e56f8dc6292773603d0d6aabbdd62a11ef721d1542d8
P1003|Charlie White|1990-07-08|Male|O-|charlie.white@example.com|5e884898da28047151d0e56f8dc6292773603d0d6aabbdd62a11ef721d1542d8
P1004|Antonio|2000-05-06|Male|O|antonio@gmail.com|5e884898da28047151d0e56f8dc6292773603d0d6aabbdd62a11ef721d1542d8
```

Password Hashing - SHA3-256 : Passwords are encrypted with SHA3-256 algorithm to enhance security



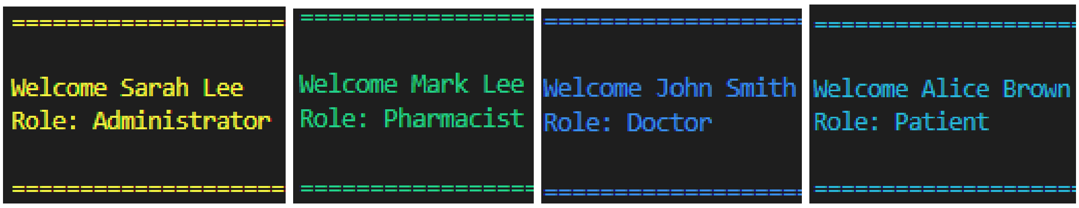
```
Staff Management Menu
1. View Staff
2. Add Staff
3. Remove Staff
4. Update Staff
5. Back
```

Backtracking - Allows *users* to return back to the menu at any point in time



```
=========================================
         Bill ID: 2
         Appointment ID: 1656734240
         Amount: 145
         Status: Unpaid
=========================================
Do you want to pay the bill (Y/N)?
```

Billing - When an appointment is completed, the patient is billed based on appointment and medicine.



```
====================

Welcome Sarah Lee
Role: Administrator

====================
```

```
=================

Welcome Mark Lee
Role: Pharmacist

=================
```

```
===================

Welcome John Smith
Role: Doctor

===================
```

```
====================

Welcome Alice Brown
Role: Patient

====================
```

Colour Code - Every different role has a different colour associated to its UI

3. Reflection

The initial phase of our Hospital Management System (HMS) project was marked by several challenges. One significant hurdle was the development of a comprehensive Unified Modeling Language (UML) diagram, as our team members had varying levels of understanding of object-oriented programming (OOP) concepts and the Boundary, Control, Entity (BCE) framework.

To overcome this, we opted for a pragmatic approach, focusing on building a functional skeleton first. This allowed us to iterate on the design and incorporate OOP principles as we progressed.

Another challenge was the distribution of work among team members. While dividing tasks based on roles seemed straightforward, the interdependencies between different components required careful coordination and collaboration. To address this, we implemented a pair-programming approach, which facilitated knowledge sharing and improved code quality.

In the second phase of the project, we focused on incorporating OOP principles such as inheritance, polymorphism, and the SOLID principles. While we faced some challenges in applying these principles strictly, we made significant strides in improving the design and maintainability of our code. However I feel that one thing we discovered should be addressed. Prior to JDK 8, which the syllabus is based on, interface cannot have static methods while for JDK 8 onwards interface can have static methods. Since we are taking OODP in the form of JDK 7, in the end we chose to not add static methods into interfaces as a form of respect to the syllabus.

Overall, this project has been a valuable learning experience. We have gained a deeper understanding of OOP concepts, software design principles, and teamwork. We believe that our project, while still under development, has the potential to be a robust and user-friendly hospital management system.

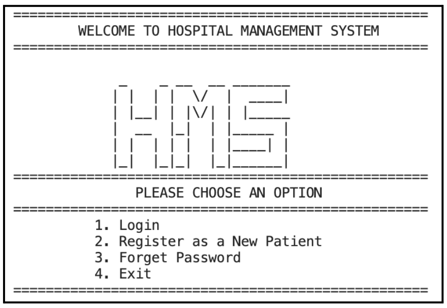
4. UML Diagram

Outside of report per Dr Li Fang Lecture on week12_lect2_fri (Timestamp: 40.21)

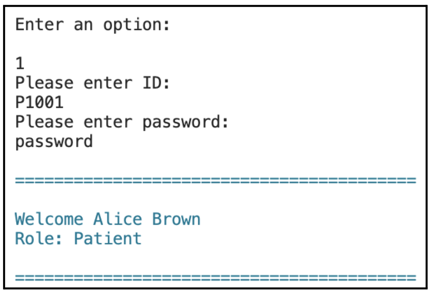
5. Testing

5.1 Login System and Password Management

5.1.1 First-Time Login & Password Change

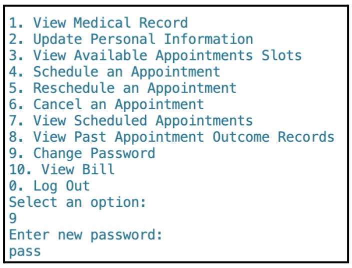


```
==================================================
         WELCOME TO HOSPITAL MANAGEMENT SYSTEM
==================================================

                _    _ __  __ _______
               | |  | |  \/  |  _____|
               | |__| | |\/| | |_____
               |  __  |_|  | |_____  |
               | |  | | |  | |_____| |
               |_|  |_|_|  |_|_______|
==================================================
              PLEASE CHOOSE AN OPTION
==================================================
             1. Login
             2. Register as a New Patient
             3. Forget Password
             4. Exit
==================================================
```

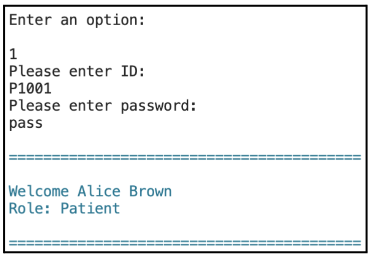


```
Enter an option:

1
Please enter ID:
P1001
Please enter password:
password

========================================

Welcome Alice Brown
Role: Patient

========================================
```

Upon entering the system, a user may login with their ID & password. A newly registered user may login with the default password: “password”. Here we use new patient Alice, as an example.



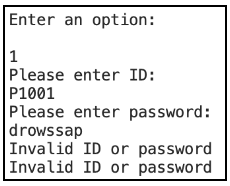
```
1. View Medical Record
2. Update Personal Information
3. View Available Appointments Slots
4. Schedule an Appointment
5. Reschedule an Appointment
6. Cancel an Appointment
7. View Scheduled Appointments
8. View Past Appointment Outcome Records
9. Change Password
10. View Bill
0. Log Out
Select an option:
9
Enter new password:
pass
```



```
Enter an option:

1
Please enter ID:
P1001
Please enter password:
pass

========================================

Welcome Alice Brown
Role: Patient

========================================
```

The user may then change their default password. The user is then able to login again with the updated password

5.1.2 Login with Incorrect Credentials

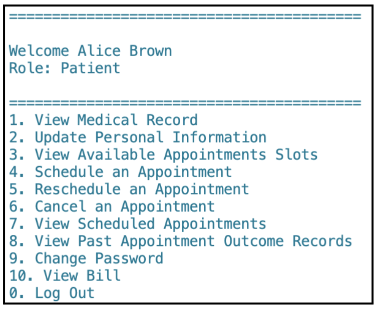


```
Enter an option:

1
Please enter ID:
P1001
Please enter password:
drowssap
Invalid ID or password
Invalid ID or password
```

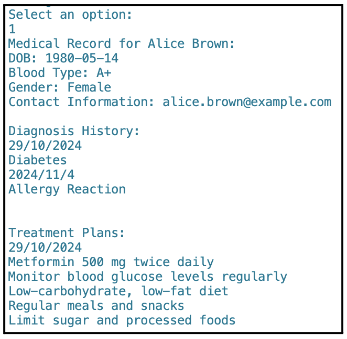
When a user attempts to log in with an incorrect password. The system displays an error message indicating invalid credentials, and login is denied.

5.2 Patient Actions

5.2.1 View Medical Record



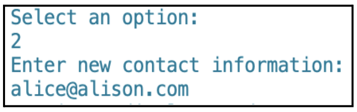
```
=========================================

Welcome Alice Brown
Role: Patient

=========================================
1. View Medical Record
2. Update Personal Information
3. View Available Appointments Slots
4. Schedule an Appointment
5. Reschedule an Appointment
6. Cancel an Appointment
7. View Scheduled Appointments
8. View Past Appointment Outcome Records
9. Change Password
10. View Bill
0. Log Out
```



```
Select an option:
1
Medical Record for Alice Brown:
DOB: 1980-05-14
Blood Type: A+
Gender: Female
Contact Information: alice.brown@example.com

Diagnosis History:
29/10/2024
Diabetes
2024/11/4
Allergy Reaction


Treatment Plans:
29/10/2024
Metformin 500 mg twice daily
Monitor blood glucose levels regularly
Low-carbohydrate, low-fat diet
Regular meals and snacks
Limit sugar and processed foods
```

When a patient logs in they view the following menu, and choose from 10 domains. Here they can view their own medical record. The system displays the Patient's ID, Name, Date of Birth, Gender, Contact Information, Blood Type, and Past Diagnoses and Treatments.

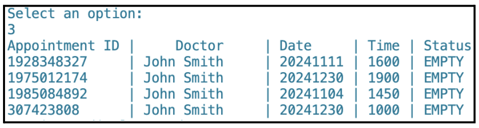
5.2.2 Update Personal Information



```
Select an option:
2
Enter new contact information:
alice@alison.com
```

Patients may update their email address. The patient's contact information is updated successfully, and the changes are reflected in the medical record.

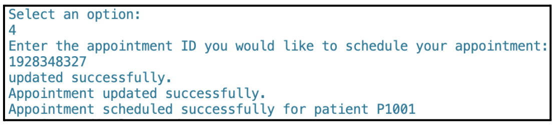
5.2.3 View Available Appointment Slots



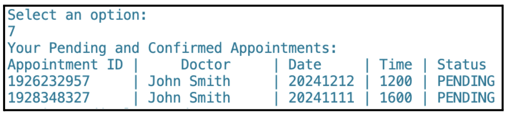
```
Select an option:
3
Appointment ID |     Doctor      | Date     | Time | Status
1928348327     | John Smith      | 20241111 | 1600 | EMPTY
1975012174     | John Smith      | 20241230 | 1900 | EMPTY
1985084892     | John Smith      | 20241104 | 1450 | EMPTY
307423808      | John Smith      | 20241230 | 1000 | EMPTY
```

Patient views available appointment slots with doctors. The system displays a list of available appointment slots, showing doctors' names, dates, and times.

5.2.4 Schedule an Appointment & View Scheduled Appointments

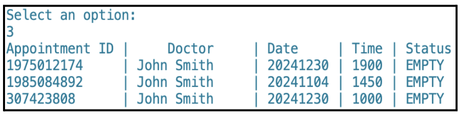


```
Select an option:
4
Enter the appointment ID you would like to schedule your appointment:
1928348327
updated successfully.
Appointment updated successfully.
Appointment scheduled successfully for patient P1001
```



```
Select an option:
7
Your Pending and Confirmed Appointments:
Appointment ID |     Doctor      | Date     | Time | Status
1926232957     | John Smith      | 20241212 | 1200 | PENDING
1928348327     | John Smith      | 20241111 | 1600 | PENDING
```

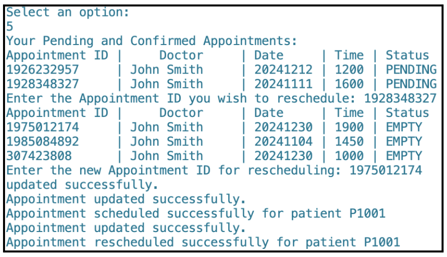
Patients may schedule a new appointment. The appointment is scheduled successfully, pending approval by the doctor. Patients may view their list of scheduled & pending appointments. The system displays all upcoming appointments with details like doctor name, date, time, and status.



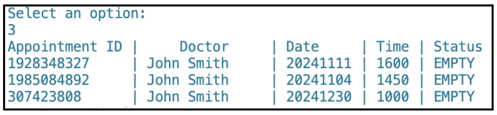
```
Select an option:
3
Appointment ID |     Doctor      | Date     | Time | Status
1975012174     | John Smith      | 20241230 | 1900 | EMPTY
1985084892     | John Smith      | 20241104 | 1450 | EMPTY
307423808      | John Smith      | 20241230 | 1000 | EMPTY
```

The selected time slot becomes unavailable to other patients. Patients are prevented from booking a time slot that is booked.

5.2.5 Reschedule an Appointment



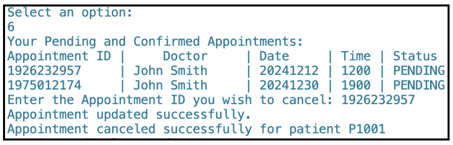
```
Select an option:
5
Your Pending and Confirmed Appointments:
Appointment ID |     Doctor      | Date     | Time | Status
1926232957     | John Smith      | 20241212 | 1200 | PENDING
1928348327     | John Smith      | 20241111 | 1600 | PENDING
Enter the Appointment ID you wish to reschedule: 1928348327
Appointment ID |     Doctor      | Date     | Time | Status
1975012174     | John Smith      | 20241230 | 1900 | EMPTY
1985084892     | John Smith      | 20241104 | 1450 | EMPTY
307423808      | John Smith      | 20241230 | 1000 | EMPTY
Enter the new Appointment ID for rescheduling: 1975012174
updated successfully.
Appointment updated successfully.
Appointment scheduled successfully for patient P1001
Appointment updated successfully.
Appointment rescheduled successfully for patient P1001
```



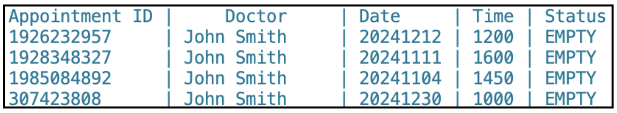
```
Select an option:
3
Appointment ID |     Doctor      | Date     | Time | Status
1928348327     | John Smith      | 20241111 | 1600 | EMPTY
1985084892     | John Smith      | 20241104 | 1450 | EMPTY
307423808      | John Smith      | 20241230 | 1000 | EMPTY
```

Patient reschedules an existing appointment to a new slot. The appointment is rescheduled successfully. We can see the previous time slot becomes available, and the new slot is reserved.

5.2.6 Cancel an Appointment



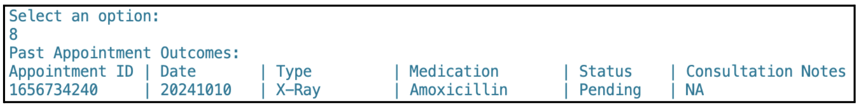
```
Select an option:
6
Your Pending and Confirmed Appointments:
Appointment ID |     Doctor     | Date     | Time | Status
1926232957     | John Smith     | 20241212 | 1200 | PENDING
1975012174     | John Smith     | 20241230 | 1900 | PENDING
Enter the Appointment ID you wish to cancel: 1926232957
Appointment updated successfully.
Appointment canceled successfully for patient P1001
```



```
Appointment ID |     Doctor     | Date     | Time | Status
1926232957     | John Smith     | 20241212 | 1200 | EMPTY
1928348327     | John Smith     | 20241111 | 1600 | EMPTY
1985084892     | John Smith     | 20241104 | 1450 | EMPTY
307423808      | John Smith     | 20241230 | 1000 | EMPTY
```

Patients may cancel an existing appointment. The appointment is cancelled successfully, and the time slot becomes available for others.

5.2.7 View Past Appointment Outcome Records

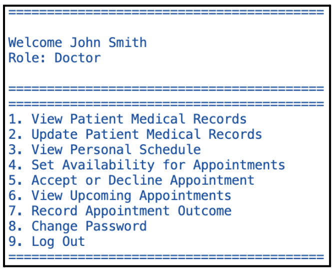


```
Select an option:
8
Past Appointment Outcomes:
Appointment ID | Date     | Type         | Medication     | Status   | Consultation Notes
1656734240     | 20241010 | X-Ray        | Amoxicillin    | Pending  | NA
```

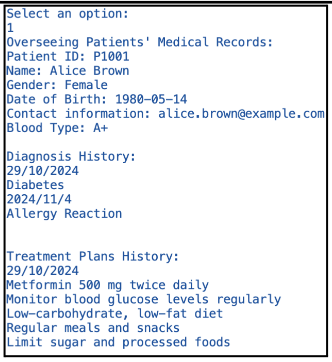
Patients may view past appointment record details including service, prescribed medications, and notes.

<u>5.3 Doctor Actions</u>

5.3.1 View Patient Medical Records



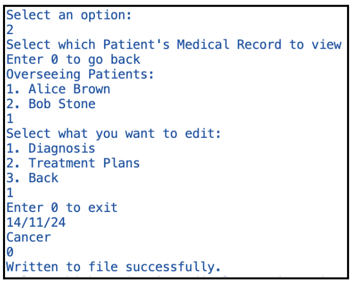
```
==========================================

Welcome John Smith
Role: Doctor

==========================================
==========================================
1. View Patient Medical Records
2. Update Patient Medical Records
3. View Personal Schedule
4. Set Availability for Appointments
5. Accept or Decline Appointment
6. View Upcoming Appointments
7. Record Appointment Outcome
8. Change Password
9. Log Out
==========================================
```



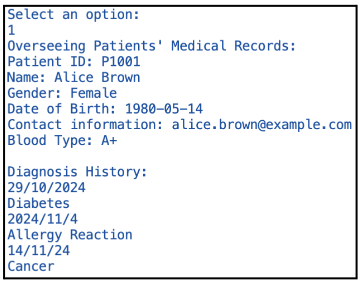
```
Select an option:
1
Overseeing Patients' Medical Records:
Patient ID: P1001
Name: Alice Brown
Gender: Female
Date of Birth: 1980-05-14
Contact information: alice.brown@example.com
Blood Type: A+

Diagnosis History:
29/10/2024
Diabetes
2024/11/4
Allergy Reaction


Treatment Plans History:
29/10/2024
Metformin 500 mg twice daily
Monitor blood glucose levels regularly
Low-carbohydrate, low-fat diet
Regular meals and snacks
Limit sugar and processed foods
```

When a Doctor logs in they see the following menu, where they can choose from 9 domains. Here they may view medical records of patients under their care.

5.3.2 Update Patient Medical Records



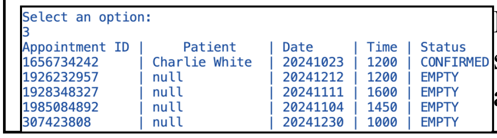
```
Select an option:
2
Select which Patient's Medical Record to view
Enter 0 to go back
Overseeing Patients:
1. Alice Brown
2. Bob Stone
1
Select what you want to edit:
1. Diagnosis
2. Treatment Plans
3. Back
1
Enter 0 to exit
14/11/24
Cancer
0
Written to file successfully.
```



```
Select an option:
1
Overseeing Patients' Medical Records:
Patient ID: P1001
Name: Alice Brown
Gender: Female
Date of Birth: 1980-05-14
Contact information: alice.brown@example.com
Blood Type: A+

Diagnosis History:
29/10/2024
Diabetes
2024/11/4
Allergy Reaction
14/11/24
Cancer
```

Doctors may add a new diagnosis and treatment plan to a patient's medical record. The medical record is updated successfully, reflecting the new information.

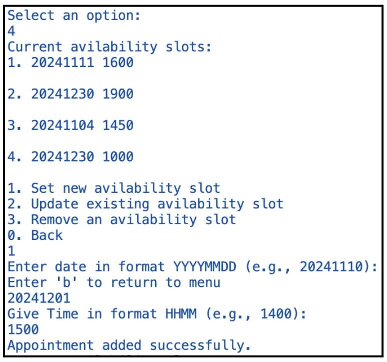
5.3.3 View Personal Schedule



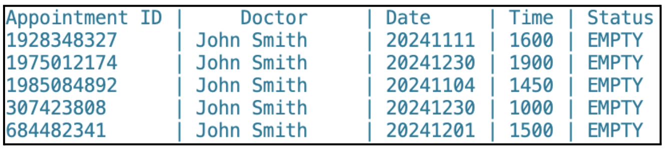
```
Select an option:
3
Appointment ID |     Patient     | Date     | Time | Status
1656734242     | Charlie White   | 20241023 | 1200 | CONFIRMED
1926232957     | null            | 20241212 | 1200 | EMPTY
1928348327     | null            | 20241111 | 1600 | EMPTY
1985084892     | null            | 20241104 | 1450 | EMPTY
307423808      | null            | 20241230 | 1000 | EMPTY
```

Doctors may view their personal appointment schedule. The system displays the doctor's upcoming appointments and availability slots (null patients).

5.3.4 Set Availability for Appointments



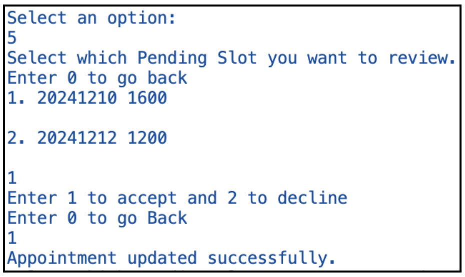
```
Select an option:
4
Current avilability slots:
1. 20241111 1600

2. 20241230 1900

3. 20241104 1450

4. 20241230 1000

1. Set new avilability slot
2. Update existing avilability slot
3. Remove an avilability slot
0. Back
1
Enter date in format YYYYMMDD (e.g., 20241110):
Enter 'b' to return to menu
20241201
Give Time in format HHMM (e.g., 1400):
1500
Appointment added successfully.
```



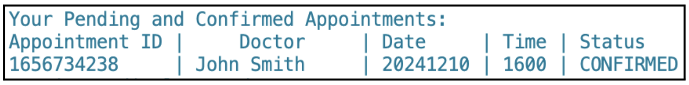
```
Appointment ID |      Doctor      | Date     | Time | Status
1928348327     | John Smith       | 20241111 | 1600 | EMPTY
1975012174     | John Smith       | 20241230 | 1900 | EMPTY
1985084892     | John Smith       | 20241104 | 1450 | EMPTY
307423808      | John Smith       | 20241230 | 1000 | EMPTY
684482341      | John Smith       | 20241201 | 1500 | EMPTY
```

Doctors set or update their availability for patient appointments. The doctor's availability is updated, and patients can see the new slots when scheduling appointments.

5.3.5 Accept or Decline Appointment Requests



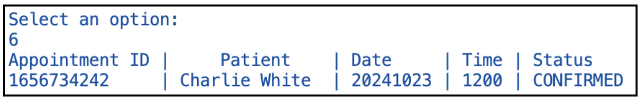
```
Select an option:
5
Select which Pending Slot you want to review.
Enter 0 to go back
1. 20241210 1600

2. 20241212 1200

1
Enter 1 to accept and 2 to decline
Enter 0 to go Back
1
Appointment updated successfully.
```



```
Your Pending and Confirmed Appointments:
Appointment ID |      Doctor      | Date     | Time | Status
1656734238     | John Smith       | 20241210 | 1600 | CONFIRMED
```

Doctor accepts or declines an appointment request from a patient. The appointment status changes to "confirmed" when accepted or “cancelled” when declined , and the patient is able to see the updated status of the appointment.

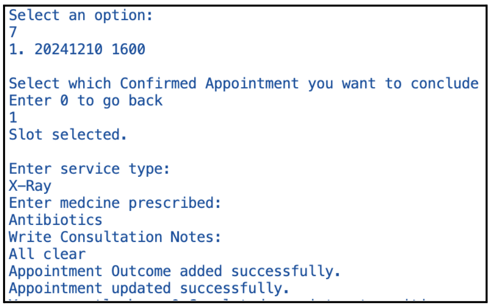
5.3.6 View Upcoming Appointments



```
Select an option:
6
Appointment ID |     Patient     | Date     | Time | Status
1656734242     | Charlie White   | 20241023 | 1200 | CONFIRMED
```

Doctors may view all ‘Confirmed’ appointment details.

5.3.7 Record Appointment Outcome

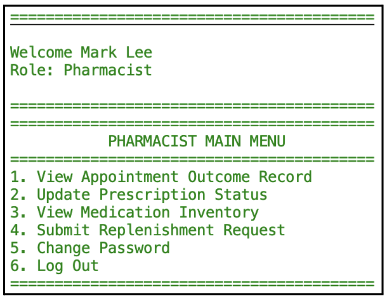


```
Select an option:
7
1. 20241210 1600

Select which Confirmed Appointment you want to conclude
Enter 0 to go back
1
Slot selected.

Enter service type:
X-Ray
Enter medcine prescribed:
Antibiotics
Write Consultation Notes:
All clear
Appointment Outcome added successfully.
Appointment updated successfully.
```

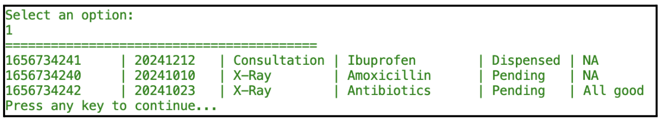
Doctors may record the outcome of a completed appointment, based on a selection of ‘CONFIRMED’ appointments. Appointment ID and appointment date can be transferred over without having to manually do so.

5.4 Pharmacist Actions

5.4.1 View Appointment Outcome Record



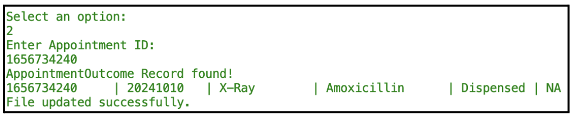
```
========================================

Welcome Mark Lee
Role: Pharmacist

========================================
========================================
           PHARMACIST MAIN MENU
========================================
1. View Appointment Outcome Record
2. Update Prescription Status
3. View Medication Inventory
4. Submit Replenishment Request
5. Change Password
6. Log Out
========================================
```



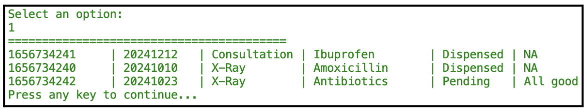
```
Select an option:
1
=========================================
1656734241     | 20241212   | Consultation | Ibuprofen        | Dispensed | NA
1656734240     | 20241010   | X-Ray        | Amoxicillin      | Pending   | NA
1656734242     | 20241023   | X-Ray        | Antibiotics      | Pending   | All good
Press any key to continue...
```

When a pharmacist logs in the view the following menu, where they can choose from 6 domains. Here, they may view appointment outcome records to process prescriptions. The system displays the appointment outcome details, including prescribed medications

5.4.2 Update Prescription Status



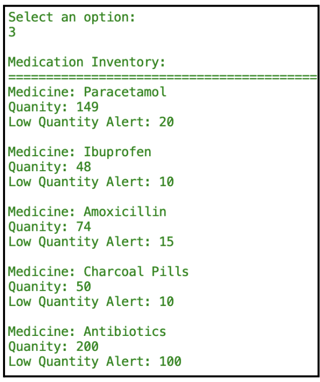
```
Select an option:
2
Enter Appointment ID:
1656734240
AppointmentOutcome Record found!
1656734240     | 20241010   | X-Ray        | Amoxicillin      | Dispensed | NA
File updated successfully.
```



```
Select an option:
1
=========================================
1656734241     | 20241212   | Consultation | Ibuprofen        | Dispensed | NA
1656734240     | 20241010   | X-Ray        | Amoxicillin      | Dispensed | NA
1656734242     | 20241023   | X-Ray        | Antibiotics      | Pending   | All good
Press any key to continue...
```

The pharmacist may update the status of a prescription to "dispensed." The prescription status is updated, and the change is reflected in the appointment outcome records.

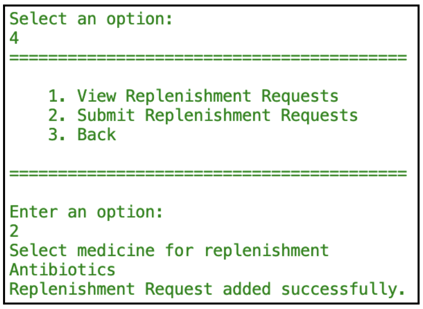
5.4.3 View Medication Inventory



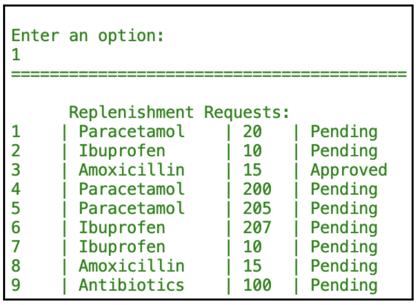
```
Select an option:
3

Medication Inventory:
========================================
Medicine: Paracetamol
Quanity: 149
Low Quantity Alert: 20

Medicine: Ibuprofen
Quanity: 48
Low Quantity Alert: 10

Medicine: Amoxicillin
Quanity: 74
Low Quantity Alert: 15

Medicine: Charcoal Pills
Quanity: 50
Low Quantity Alert: 10

Medicine: Antibiotics
Quanity: 200
Low Quantity Alert: 100
```

Pharmacists may view the current medication inventory. The system displays a list of medications, including stock levels.

5.4.4 Submit Replenishment Request



```
Select an option:
4
=========================================

    1. View Replenishment Requests
    2. Submit Replenishment Requests
    3. Back

=========================================

Enter an option:
2
Select medicine for replenishment
Antibiotics
Replenishment Request added successfully.
```

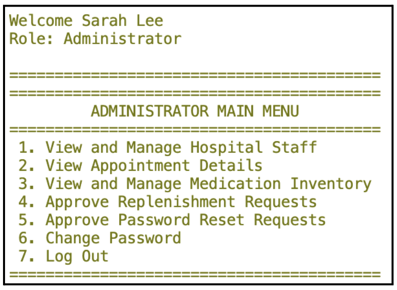


```
Enter an option:
1
=========================================

      Replenishment Requests:
1     | Paracetamol     | 20    | Pending
2     | Ibuprofen       | 10    | Pending
3     | Amoxicillin     | 15    | Approved
4     | Paracetamol     | 200   | Pending
5     | Paracetamol     | 205   | Pending
6     | Ibuprofen       | 207   | Pending
7     | Ibuprofen       | 10    | Pending
8     | Amoxicillin     | 15    | Pending
9     | Antibiotics     | 100   | Pending
```

Pharmacists may view the current medication inventory including the list of medications and stock levels. By viewing replenishment requests we can verify the request has been submitted.

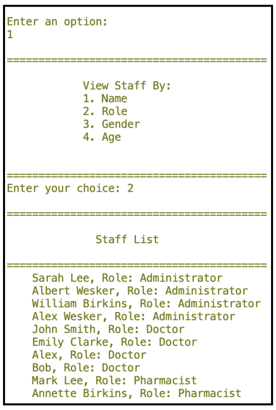
5.5 Administrator Actions

5.5.1 View & Manage Hospital Staff

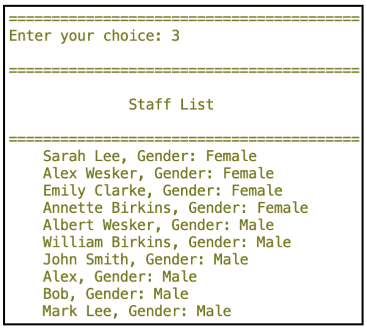


```
Welcome Sarah Lee
Role: Administrator

=========================================
=========================================
         ADMINISTRATOR MAIN MENU
=========================================
 1. View and Manage Hospital Staff
 2. View Appointment Details
 3. View and Manage Medication Inventory
 4. Approve Replenishment Requests
 5. Approve Password Reset Requests
 6. Change Password
 7. Log Out
=========================================
```

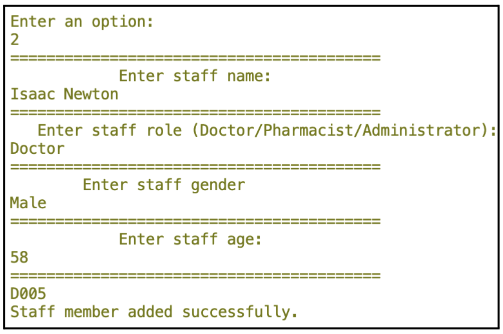
When an Administrator logs in the view the following menu, where they can choose from 7 domains.



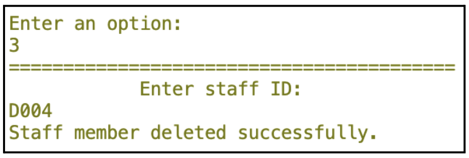
```
Enter an option:
1

=========================================

            View Staff By:
            1. Name
            2. Role
            3. Gender
            4. Age


=========================================
Enter your choice: 2

=========================================

              Staff List

=========================================
    Sarah Lee, Role: Administrator
    Albert Wesker, Role: Administrator
    William Birkins, Role: Administrator
    Alex Wesker, Role: Administrator
    John Smith, Role: Doctor
    Emily Clarke, Role: Doctor
    Alex, Role: Doctor
    Bob, Role: Doctor
    Mark Lee, Role: Pharmacist
    Annette Birkins, Role: Pharmacist
```



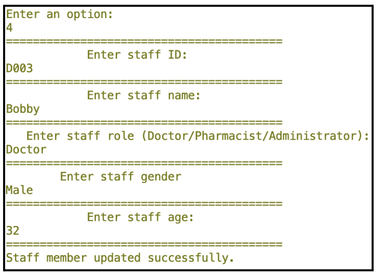
```
=========================================
Enter your choice: 3

=========================================

              Staff List

=========================================
    Sarah Lee, Gender: Female
    Alex Wesker, Gender: Female
    Emily Clarke, Gender: Female
    Annette Birkins, Gender: Female
    Albert Wesker, Gender: Male
    William Birkins, Gender: Male
    John Smith, Gender: Male
    Alex, Gender: Male
    Bob, Gender: Male
    Mark Lee, Gender: Male
```



```
Enter an option:
2
=========================================
            Enter staff name:
Isaac Newton
=========================================
   Enter staff role (Doctor/Pharmacist/Administrator):
Doctor
=========================================
        Enter staff gender
Male
=========================================
            Enter staff age:
58
=========================================
D005
Staff member added successfully.
```

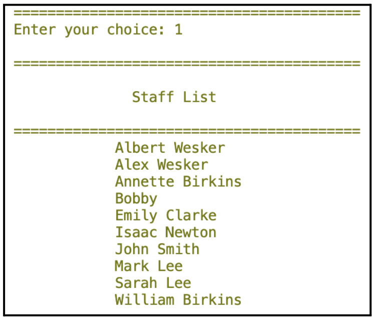


```
Enter an option:
3
=========================================
            Enter staff ID:
D004
Staff member deleted successfully.
```



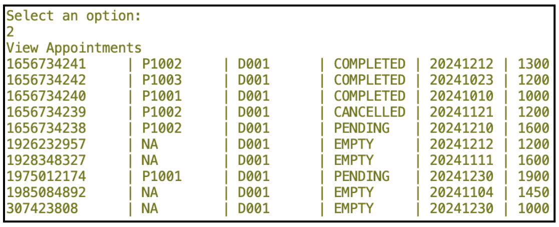
```
Enter an option:
4
=========================================
            Enter staff ID:
D003
=========================================
            Enter staff name:
Bobby
=========================================
   Enter staff role (Doctor/Pharmacist/Administrator):
Doctor
=========================================
        Enter staff gender
Male
=========================================
            Enter staff age:
32
=========================================
Staff member updated successfully.
```

They may view the list of hospital staff, add a new staff member, update staff details and remove staff members. This change is verified when we view the staff list again below:



```
=========================================
Enter your choice: 1

=========================================

              Staff List

=========================================
            Albert Wesker
            Alex Wesker
            Annette Birkins
            Bobby
            Emily Clarke
            Isaac Newton
            John Smith
            Mark Lee
            Sarah Lee
            William Birkins
```

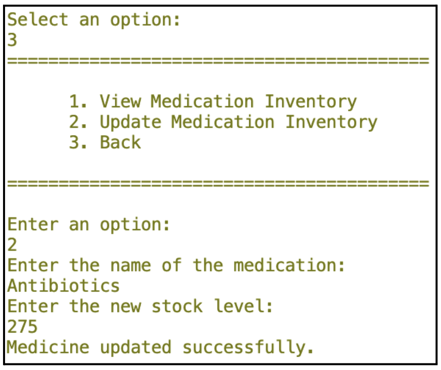
5.5.2 View Appointment Details



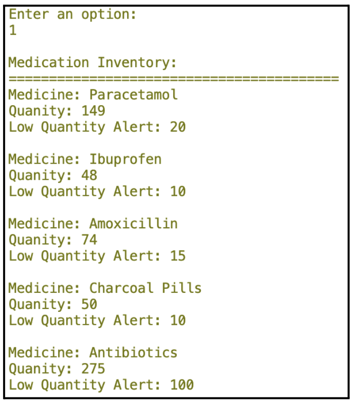
```
Select an option:
2
View Appointments
1656734241      | P1002     | D001      | COMPLETED | 20241212 | 1300
1656734242      | P1003     | D001      | COMPLETED | 20241023 | 1200
1656734240      | P1001     | D001      | COMPLETED | 20241010 | 1000
1656734239      | P1002     | D001      | CANCELLED | 20241121 | 1200
1656734238      | P1002     | D001      | PENDING   | 20241210 | 1600
1926232957      | NA        | D001      | EMPTY     | 20241212 | 1200
1928348327      | NA        | D001      | EMPTY     | 20241111 | 1600
1975012174      | P1001     | D001      | PENDING   | 20241230 | 1900
1985084892      | NA        | D001      | EMPTY     | 20241104 | 1450
307423808       | NA        | D001      | EMPTY     | 20241230 | 1000
```

Administrators may view all appointments. The system displays a list of appointments including details like Patient ID, Doctor ID, status, and date/time

5.5.3 View and Manage Medication Inventory



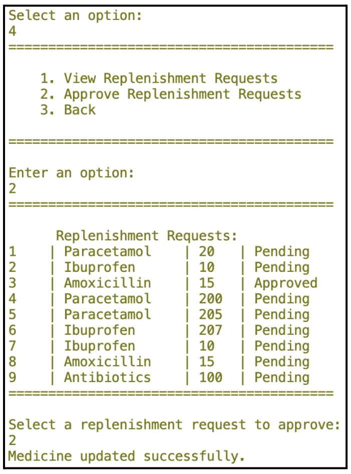
```
Select an option:
3
=========================================

      1. View Medication Inventory
      2. Update Medication Inventory
      3. Back

=========================================

Enter an option:
2
Enter the name of the medication:
Antibiotics
Enter the new stock level:
275
Medicine updated successfully.
```



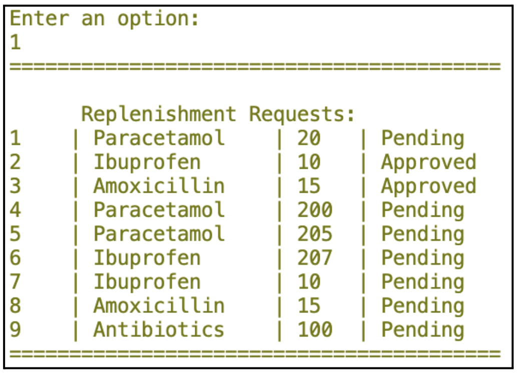
```
Enter an option:
1

Medication Inventory:
=========================================
Medicine: Paracetamol
Quanity: 149
Low Quantity Alert: 20

Medicine: Ibuprofen
Quanity: 48
Low Quantity Alert: 10

Medicine: Amoxicillin
Quanity: 74
Low Quantity Alert: 15

Medicine: Charcoal Pills
Quanity: 50
Low Quantity Alert: 10

Medicine: Antibiotics
Quanity: 275
Low Quantity Alert: 100
```

Administrators may update the stock level of a medication. By viewing the Medicine Inventory once again, we can verify that the medication's stock level is updated in the inventory.

5.5.4 Approve Replenishment Requests



```
Select an option:
4
=========================================

    1. View Replenishment Requests
    2. Approve Replenishment Requests
    3. Back

=========================================

Enter an option:
2
=========================================

      Replenishment Requests:
1    | Paracetamol    | 20   | Pending
2    | Ibuprofen      | 10   | Pending
3    | Amoxicillin    | 15   | Approved
4    | Paracetamol    | 200  | Pending
5    | Paracetamol    | 205  | Pending
6    | Ibuprofen      | 207  | Pending
7    | Ibuprofen      | 10   | Pending
8    | Amoxicillin    | 15   | Pending
9    | Antibiotics    | 100  | Pending
=========================================

Select a replenishment request to approve:
2
Medicine updated successfully.
```



```
Enter an option:
1
=========================================

      Replenishment Requests:
1    | Paracetamol    | 20   | Pending
2    | Ibuprofen      | 10   | Approved
3    | Amoxicillin    | 15   | Approved
4    | Paracetamol    | 200  | Pending
5    | Paracetamol    | 205  | Pending
6    | Ibuprofen      | 207  | Pending
7    | Ibuprofen      | 10   | Pending
8    | Amoxicillin    | 15   | Pending
9    | Antibiotics    | 100  | Pending
=========================================
```

Administrator can approve the replenishment request from a pharmacist. By viewing the requests again, we verify that the request status changes to "approved," and the medication inventory is updated accordingly.