

VIETNAM NATIONAL UNIVERSITY, HO CHI MINH CITY  
UNIVERSITY OF TECHNOLOGY  
FACULTY OF COMPUTER SCIENCE AND ENGINEERING



# DATABASE SYSTEM (CO2014)

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Assignment 2

## HOSPITAL MANAGEMENT SYSTEM

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## 1 Member list & Workload

| No. | Fullname             | Student ID | Task   | Contribution |
|-----|----------------------|------------|--|--------------|
| 1   | Dinh Ba Khanh        | 2252323    | Frontend development, backend development, define user groups and permissions, define app architecture, compare database and website | 100%         |
| 2   | Nguyen Minh Khoi     | 2252377    | Do functions, procedures, triggers and assertions, define detailed specifications, develop database, create data for application     | 100%         |
| 3   | Tran Nguyen Anh Khoi | 2252383    | Backend development, normalize schema to BCNF, indexing  | 100%         |

## 2 Functions, Procedures, Assertions, Triggers

### 2.1 Functions

#### 2.1.1 GetPatientCountAtRoom:

- Accepts a room ID and returns the count of patients currently admitted in that room.
- Ensures the calculation respects admission and discharge dates.

```
1 DELIMITER $$  
2  
3 CREATE FUNCTION HMS.GetPatientCountAtRoom(roomIDInput CHAR(3))  
4 RETURNS INT  
5 DETERMINISTIC  
6 BEGIN  
7     DECLARE patientCount INT;  
8  
9     -- Calculate the number of patients currently in the room  
10    SELECT  
11        COUNT(patientID)  
12        INTO  
13        patientCount  
14    FROM  
15        HMS.Admitted_to  
16    WHERE  
17        roomID = roomIDInput  
18        AND admittedDate <= NOW()  
19        AND (dischargedDate > NOW() OR dischargedDate IS NULL);  
20  
21    RETURN patientCount;  
22 END$$  
23  
24 DELIMITER ;
```

5 • **SELECT HMS.GetPatientCountAtRoom('101');**

| HMS.GetPatientCountAtRoom('101') |
|----------------------------------|
| 1                                |

Figure 1: Number of patient in a specific room in today (01/12/2024)

### 2.1.2 GetRoomIDByPatientID

- Accepts a patient ID as input.
- Checks the HMS.Admitted\_to table for a matching patientID.
- Ensures that the current date falls between the admittedDate and dischargedDate.
- Returns the roomID if the patient is currently admitted.
- Returns NULL if no matching record is found or the patient is not currently admitted.

```
1 DELIMITER $$  
2  
3 CREATE FUNCTION GetRoomIDByPatientID(inPatientID CHAR(7))  
4 RETURNS CHAR(3)  
5 DETERMINISTIC  
6 BEGIN  
7     DECLARE roomID CHAR(3);  
8  
9     SELECT a.roomID  
10    INTO roomID  
11   FROM HMS.Admitted_to a  
12  WHERE a.patientID = inPatientID  
13      AND CURRENT_DATE BETWEEN a.admittedDate AND a.dischargedDate  
14      LIMIT 1;  
15  
16      RETURN roomID;  
17 END $$  
18  
19 DELIMITER ;
```

21 •     **SELECT getRoomIDByPatientID('P000001') AS roomID;**

| roomID |
|--------|
| 101    |

Figure 2: In which room a specific patient admitted to in current date



### 2.1.3 GetDoctorCountInDepartment:

- Accepts a department ID and returns the count of doctors associated with that department.
- Identifies doctors based on their staffID starting with 'D'.
- Useful for resource planning and departmental analysis.

```
1 DELIMITER $$  
2  
3 CREATE FUNCTION HMS.GetDoctorCountInDepartment(departmentNameInput VARCHAR(50))  
4 RETURNS INT  
5 DETERMINISTIC  
6 BEGIN  
7     DECLARE doctorCount INT;  
8  
9     -- Calculate the number of doctor in the department  
10    SELECT COUNT(*)  
11        INTO doctorCount  
12    FROM HMS.Medical_Staff , HMS.Department  
13    WHERE departmentName = departmentNameInput AND Medical_Staff.departmentID =  
14        Department.departmentID AND staffID LIKE 'D%';  
15    RETURN doctorCount;  
16 END$$  
17 DELIMITER ;
```

The screenshot shows the MySQL Workbench interface. A query window contains the following SQL command:

```
5 •   SELECT HMS.GetDoctorCountInDepartment('Cardiology');
```

The results grid displays a single row of data:

|   | HMS.GetDoctorCountInDepartment('Cardiology') |
|---|--|
| ▶ | 4  |

Figure 3: Number of doctor in a specific department



#### 2.1.4 GetNurseCountInDepartment:

- Accepts a department ID and returns the count of nurses associated with that department.
- Identifies doctors based on their staffID starting with 'N'.
- Useful for resource planning and departmental analysis.

```
1 DELIMITER $$  
2  
3 CREATE FUNCTION HMS.GetNurseCountInDepartment(departmentNameInput VARCHAR(50))  
4 RETURNS INT  
5 DETERMINISTIC  
6 BEGIN  
7     DECLARE nurseCount INT;  
8  
9     -- Calculate the number of doctor in the department  
10    SELECT COUNT(*)  
11        INTO nurseCount  
12    FROM HMS.Medical_Staff , HMS.Department  
13    WHERE departmentName = departmentNameInput AND Medical_Staff.departmentID =  
14        Department.departmentID AND staffID LIKE 'N%';  
15    RETURN nurseCount;  
16  
17 END$$  
18  
19 DELIMITER ;
```

17 • **SELECT HMS.GetNurseCountInDepartment('Cardiology');**

| Result Grid |   | Filter Rows: | Export: | Wrap Cell Content |
|-------------|---|--------------|---------|-------------------|
|             | HMS.GetNurseCountInDepartment('Cardiology') |              |         |                   |
| ▶           | 3   |              |         |                   |

Figure 4: Number of nurse in a specific department

### 2.1.5 GetPatientIDByName

- Accepts a patient's full name (first name, middle name, and last name) as input.
- Searches the `HMS.Patient` table for a match based on the provided name.
- Considers cases where the middle name may be `NULL` or not provided.
- Returns the corresponding `patientID` if the patient exists in the database.
- Returns `NULL` if no matching record is found.

```
1 DELIMITER $$  
2  
3 CREATE FUNCTION GetPatientIDByName(  
4     inFirstName VARCHAR(20),  
5     inMidName VARCHAR(50),  
6     inLastName VARCHAR(20)  
7 ) RETURNS CHAR(7)  
8 DETERMINISTIC  
9 BEGIN  
10     DECLARE patientID CHAR(7);  
11  
12     SELECT p.patientID  
13         INTO patientID  
14     FROM HMS.Patient p  
15     WHERE p.firstName = inFirstName  
16         AND (p.midName = inMidName OR (inMidName IS NULL AND p.midName IS NULL))  
17         AND p.lastName = inLastName  
18     LIMIT 1;  
19  
20     RETURN patientID;  
21 END $$  
22  
23 DELIMITER ;
```

19 • `SELECT GetPatientIDByName('Alice', 'Marie', 'Smith') AS patientID;`



The screenshot shows the MySQL Workbench interface. At the top, there is a toolbar with various icons. Below the toolbar, the text of the query is displayed. The result set is shown in a "Result Grid" table. The table has one column labeled "patientID". There is one row with the value "P000002".

| patientID |
|-----------|
| P000002   |

Figure 5: Check Patient by Full Name

## 2.2 Procedures

### 2.2.1 GetPatientCountInRoomAtDate:

- Generates a report of the number of patients in each room for a specified date.
- Useful for historical or daily summaries.

```
1 DELIMITER $$  
2  
3 CREATE PROCEDURE HMS.GetPatientCountInRoomAtDate(atDate DATE)  
4 BEGIN  
5     SELECT  
6         a.roomID,  
7         COUNT(patientID) AS patientCount,  
8         capacity  
9     FROM HMS.Admitted_to a, HMS.Room r  
10    WHERE a.roomID = r.roomID  
11    AND admittedDate <= atDate  
12    AND (dischargedDate > atDate OR dischargedDate IS NULL)  
13    GROUP BY a.roomID  
14    ORDER BY a.roomID;  
15 END$$  
16  
17 DELIMITER ;
```

28 • **CALL GetPatientCountInRoomAtDate('2024-12-08');**

The screenshot shows the MySQL Workbench interface. At the top, there is a command line with the executed SQL statement: **CALL GetPatientCountInRoomAtDate('2024-12-08');**. Below the command line is a result grid. The grid has four columns: roomID, patientCount, and capacity. There are six rows of data, each corresponding to a room ID and its patient count and capacity. The data is as follows:

|   | roomID | patientCount | capacity |
|---|--------|--------------|----------|
| ▶ | 102    | 1            | 1        |
|   | 103    | 1            | 3        |
|   | 105    | 1            | 2        |
|   | 106    | 2            | 4        |
|   | 108    | 1            | 3        |
|   | 110    | 1            | 4        |

Figure 6: Rooms have patients at a specific date

### 2.2.2 CountMedicalStaffGroupbyDepartment:

- Provides a summary of medical staff grouped by department.
- Returns the department name, the count of doctors (identified by staffID starting with 'D'), and the count of nurses (identified by staffID starting with 'N').
- Useful for high-level resource allocation and departmental performance assessments.

```
1 DELIMITER $$  
2  
3 CREATE PROCEDURE HMS.CountMedicalStaffGroupbyDepartment()  
4 BEGIN  
5     SELECT  
6         Department.departmentName,  
7         SUM(CASE WHEN Medical_Staff.staffID LIKE 'D%' THEN 1 ELSE 0 END) AS  
8             numberDoctor,  
9         SUM(CASE WHEN Medical_Staff.staffID LIKE 'N%' THEN 1 ELSE 0 END) AS  
10            numberNurse  
11    FROM HMS.Medical_Staff  
12    JOIN HMS.Department ON Medical_Staff.departmentID = Department.departmentID  
13    GROUP BY Department.departmentName;  
14 END$$  
15  
16 DELIMITER ;
```

11 • **CALL HMS.CountMedicalStaffGroupbyDepartment();**

The screenshot shows the MySQL Workbench interface with the following details:

- Result Grid:** The results of the executed query are displayed in a grid format.
- Columns:** The columns are labeled `departmentName`, `numberDoctor`, and `numberNurse`.
- Data:** The table contains 10 rows of data corresponding to different medical departments and their staff counts.

|   | departmentName   | numberDoctor | numberNurse |
|---|------------------|--------------|-------------|
| ▶ | Cardiology       | 4            | 3           |
|   | Neurology        | 1            | 2           |
|   | Orthopedics      | 2            | 2           |
|   | Pediatrics       | 3            | 2           |
|   | Oncology         | 1            | 2           |
|   | Dermatology      | 2            | 2           |
|   | Radiology        | 1            | 2           |
|   | Surgery          | 1            | 2           |
|   | Psychiatry       | 3            | 2           |
|   | Gastroenterology | 2            | 1           |

Figure 7: Summary of medical staff grouped by department

### 2.2.3 GetDoctorInDepartment:

- Accepts a department name and retrieves all doctors associated with that department.
- Identifies doctors based on their staffID starting with 'D'.
- Returns detailed information about doctors in the department.

```
1 DELIMITER $$  
2  
3 CREATE PROCEDURE HMS.GetDoctorInDepartment(departmentNameInput VARCHAR(50))  
4 BEGIN  
5     SELECT staffID, firstName, midName, lastName, gender, staffDoB, phoneNumber,  
       salary, departmentName  
    FROM HMS.Medical_Staff, HMS.Department  
   WHERE departmentName = departmentNameInput AND Medical_Staff.departmentID =  
         Department.departmentID AND staffID LIKE 'D%';  
8 END$$  
9  
10 DELIMITER ;
```

```
15 • CALL HMS.GetDoctorInDepartment('Cardiology');
```

| Result Grid   Filter Rows: <input type="text"/> Export:  Wrap Cell Content:  |         |           |           |          |        |            |             |        |                |
|--|---------|-----------|-----------|----------|--------|------------|-------------|--------|----------------|
|  | staffID | firstName | midName   | lastName | gender | staffDoB   | phoneNumber | salary | departmentName |
| ▶  | D100001 | Alice     | Marie     | Johnson  | F      | 1980-05-15 | 9998887776  | 70000  | Cardiology     |
|  | D100011 | Emily     | Charlotte | Adams    | F      | 1983-02-17 | 9876543210  | 72000  | Cardiology     |
|  | D100012 | Nathan    | James     | Carter   | M      | 1977-10-14 | 8765432109  | 80000  | Cardiology     |
|  | D100016 | Liam      | Benjamin  | Scott    | M      | 1979-12-19 | 4321098765  | 76000  | Cardiology     |

Figure 8: Doctor information in a specific department

#### 2.2.4 GetNurseInDepartment:

- Accepts a department name and retrieves all nurses associated with that department.
- Identifies doctors based on their staffID starting with 'N'.
- Returns detailed information about nurses in the department.

```
1 DELIMITER $$  
2  
3 CREATE PROCEDURE HMS.GetNurseInDepartment(departmentNameInput VARCHAR(50))  
4 BEGIN  
5     SELECT staffID, firstName, midName, lastName, gender, staffDoB, phoneNumber,  
       salary, departmentName  
    FROM HMS.Medical_Staff, HMS.Department  
   WHERE departmentName = departmentNameInput AND Medical_Staff.departmentID =  
         Department.departmentID AND staffID LIKE 'N%';  
8 END$$  
9  
10 DELIMITER ;
```

9 • CALL HMS.GetNurseInDepartment('Cardiology');

| Result Grid |         |           |         |          |        |            |             |        |                |
|-------------|---------|-----------|---------|----------|--------|------------|-------------|--------|----------------|
|             | staffID | firstName | midName | lastName | gender | staffDoB   | phoneNumber | salary | departmentName |
| ▶           | N100001 | Karen     | Anne    | Anderson | F      | 1985-04-10 | 1112223334  | 50000  | Cardiology     |
|             | N100011 | Ava       | Emily   | Nelson   | F      | 1994-03-14 | 1112223335  | 50000  | Cardiology     |
|             | N100020 | Liam      | George  | Harris   | M      | 1988-10-25 | 0001112224  | 48000  | Cardiology     |

Figure 9: Nurse information in a specific department



#### 2.2.5 ShowDoctorAppointments:

- Accepts a doctorID as input, which is the unique identifier of the doctor whose appointments are to be retrieved.
- Retrieves all appointments from the HMS.Appointment table for the specified doctorID.
- Returns detailed information including appointmentID, patientID, doctorID, appointmentDate, and appointmentTime.
- Ensures the results are ordered by appointmentDate and appointmentTime for clarity.

```
1 DELIMITER $$  
2  
3 CREATE PROCEDURE ShowDoctorAppointments(IN doctorIDInput CHAR(7))  
4 BEGIN  
5     SELECT  
6         appointmentID,  
7         patientID,  
8         doctorID,  
9         appointmentDate,  
10        appointmentTime  
11    FROM HMS.Appointment  
12    WHERE doctorID = doctorIDInput  
13    ORDER BY appointmentDate, appointmentTime;  
14 END $$  
15  
16 DELIMITER ;
```

15 • CALL ShowDoctorAppointments('D100002');

| Result Grid |               |           |          |                 |                 |
|-------------|---------------|-----------|----------|-----------------|-----------------|
|             | appointmentID | patientID | doctorID | appointmentDate | appointmentTime |
| 2           |               | P000002   | D100002  | 2024-12-01      | 09:30:00        |
| 4           |               | P000007   | D100002  | 2024-12-10      | 11:30:00        |
| 24          |               | P000022   | D100002  | 2024-12-11      | 09:30:00        |
| 44          |               | P000012   | D100002  | 2024-12-21      | 13:30:00        |

Figure 10: Appointments of a specific doctor

#### 2.2.6 ShowPatientAppointments:

- Accepts a patientID as input, which is the unique identifier of the patient whose appointments are to be retrieved.
- Retrieves all appointments from the HMS.Appointment table for the specified patientID.
- Returns detailed information including appointmentID, patientID, doctorID, appointmentDate, and appointmentTime.
- Ensures the results are ordered by appointmentDate and appointmentTime for clarity.

```
1 DELIMITER $$  
2  
3 CREATE PROCEDURE ShowPatientAppointments(IN patientIDInput CHAR(7))  
4 BEGIN  
5     SELECT  
6         appointmentID,  
7         patientID,  
8         doctorID,  
9         appointmentDate,  
10        appointmentTime  
11    FROM HMS.Appointment  
12    WHERE patientID = patientIDInput  
13    ORDER BY appointmentDate, appointmentTime;  
14 END $$  
15  
16 DELIMITER ;
```

23 • **CALL ShowPatientAppointments('P000002')**

| Result Grid   Filter Rows: Export: Wrap Cell Content: |               |           |          |                 |                 |
|---|---------------|-----------|----------|-----------------|-----------------|
|   | appointmentID | patientID | doctorID | appointmentDate | appointmentTime |
| ▶   | 2             | P000002   | D100002  | 2024-12-01      | 09:30:00        |
|   | 34            | P000002   | D100012  | 2024-12-16      | 08:30:00        |

Figure 11: Appointments of a specific patient



## 2.3 Assertion, Triggers

### 2.3.1 CheckRoomCapacity:

- Ensures room capacity is not exceeded before admitting a new patient.
- Raises an error if the room is already full.

```
1 DELIMITER $$  
2  
3 CREATE TRIGGER HMS.CheckRoomCapacity  
4 BEFORE INSERT ON HMS.Admitted_to  
5 FOR EACH ROW  
6 BEGIN  
7     DECLARE currentCount INT;  
8     DECLARE roomCapacity INT;  
9  
10    SELECT COUNT(patientID)  
11        INTO currentCount  
12        FROM HMS.Admitted_to  
13        WHERE roomID = NEW.roomID  
14        AND admittedDate <= NEW.admittedDate  
15        AND (dischargedDate > NEW.admittedDate OR dischargedDate IS NULL);  
16  
17    SELECT capacity  
18        INTO roomCapacity  
19        FROM HMS.Room  
20        WHERE roomID = NEW.roomID;  
21  
22    IF currentCount >= roomCapacity THEN  
23        SIGNAL SQLSTATE '45000'  
24        SET MESSAGE_TEXT = 'Room capacity exceeded';  
25    END IF;  
26 END$$  
27  
28 DELIMITER ;
```



Display the number of patient and room capacity before proceeding

28 • CALL GetPatientCountInRoomAtDate('2024-12-08');

Result Grid | Filter Rows: \_\_\_\_\_ | Export: | Wrap Cell Content

|   | roomID | patientCount | capacity |
|---|--------|--------------|----------|
| ▶ | 102    | 1            | 1        |
|   | 103    | 1            | 3        |
|   | 105    | 1            | 2        |
|   | 106    | 2            | 4        |
|   | 108    | 1            | 3        |
|   | 110    | 1            | 4        |

Baka Hospital Logout

Admin Khoi

Room List

| Room ID | Capacity | Room Type         | Current Number of Patients | Add Patient                  | List of Patients                  |
|---------|----------|-------------------|----------------------------|------------------------------|-----------------------------------|
| 101     | 2        | General Ward      | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 102     | 1        | ICU               | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 103     | 3        | General Ward      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 104     | 1        | ICU               | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 105     | 2        | Private Room      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 106     | 4        | General Ward      | 2                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 107     | 1        | ICU               | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 108     | 3        | Semi-Private Room | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 109     | 2        | Private Room      | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 110     | 4        | General Ward      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |

Figure 12: The number of patient and room capacity on a date 08/12/2024



Try adding a patient to room 102 that is already full

```
20 • INSERT INTO HMS.Admitted_to VALUES ('P000020', '102', '2024-12-05', '2024-12-10');
```

| Output |          |  |
|--------|----------|--|
| #      | Time     | Action   |
| 4488   | 16:41:56 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '102', '2024-12-05', ... Error Code: 1644. Room capacity exceeded |

Baka Hospital

Logout

Admin Khoi

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

Add New Patient into Room 102

Patient ID:

Nurse ID:

Admitted Date:

Discharged Date:

An unexpected error occurred: (1644, 'Room capacity exceeded')

Figure 13: Invalid: Room capacity exceeded

Add a patient to room 103 that has available space

```
20 • INSERT INTO HMS.Admitted_to VALUES ('P000020', '102', '2024-12-05', '2024-12-10');
21 • INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-10');
```

| Output |          |  |
|--------|----------|--|
| #      | Time     | Action   |
| 4490   | 16:46:44 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '102', '2024-12-05', ... Error Code: 1644. Room capacity exceeded |
| 4491   | 16:52:41 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', ... 1 row(s) affected)                       |

Figure 14: Valid: Patient admitted to available room



Baka Hospital

Logout

Admin Khoi

Patient List in Room 103

| ID      | Full Name              | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P000005 | Michael James Williams | 5738291046 | May 10, 1980  | 5678901234   | M      | Dec. 3, 2024  | Dec. 9, 2024    |

Back To Room List

Dashboard  
Doctor  
Nurse  
Patient  
Medical Record and Treatment  
Department  
Appointment  
Room

Figure 15: Patient list in room 103 before the patient admission

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Logout

Admin Khoi

Patient List in Room 103

| ID      | Full Name              | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P000005 | Michael James Williams | 5738291046 | May 10, 1980  | 5678901234   | M      | Dec. 3, 2024  | Dec. 9, 2024    |
| P000020 | Harper Anne Lee        | 1122334455 | Oct. 28, 1986 | 1122334455   | F      | Dec. 5, 2024  | Dec. 10, 2024   |

Back To Room List

Dashboard  
Doctor  
Nurse  
Patient  
Medical Record and Treatment  
Department  
Appointment  
Room

Figure 16: Patient list in room 103 after the patient admission



### 2.3.2 CheckDateValidity

- Ensure dischargedDate is later than or equal to admittedDate

```
1 ALTER TABLE HMS.Admitted_to
2 ADD CONSTRAINT CheckDateValidity
3 CHECK (dischargedDate >= admittedDate);
```

Try adding an appointment where the discharge date is earlier than the admission date

```
17 • INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-02');
```

The screenshot shows a web-based application for managing patient admissions. On the left, a sidebar menu for 'Admin Khoi' lists various roles: Dashboard, Doctor, Nurse, Patient, Medical Record and Treatment, Department, Appointment, and Room. The main area is titled 'Baka Hospital' and contains a modal window for 'Add New Patient into Room 103'. The modal has fields for Patient ID, Nurse ID, Admitted Date (dd/mm/yyyy), and Discharged Date (dd/mm/yyyy). A red error message at the bottom of the modal states: 'An unexpected error occurred: (3819, 'Check constraint 'CheckDateValidity' is violated.')'. Below the modal, the application's output log shows two entries: one for a failed insertion due to the constraint violation and another for a successful insertion with a different date.

| #    | Time     | Action   | Message   |
|------|----------|--|---|
| 4900 | 17:03:33 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-02'); | Error Code: 3819. Check constraint 'CheckDateValidity' is violated. |
| 2044 | 21:03:28 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-02')  | Error Code: 3819. Check constraint 'CheckDateValidity' is violated. |
| 2045 | 21:03:35 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-09')  | 1 row(s) affected   |

Figure 17: Invalid: dischargedDate is earlier than admittedDate

Add a valid appointment where the admission date is earlier than the discharge date

```
23 • INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-02');
24 • INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-09');
```

This screenshot shows the same application interface as Figure 17. The user has entered valid dates for the appointment: 'Admitted Date' as '2024-12-05' and 'Discharged Date' as '2024-12-09'. The application successfully inserts the record, as indicated by the log entry '1 row(s) affected'.

| #    | Time     | Action  | Message   |
|------|----------|---|---|
| 2044 | 21:03:28 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-02') | Error Code: 3819. Check constraint 'CheckDateValidity' is violated. |
| 2045 | 21:03:35 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-09') | 1 row(s) affected   |

Figure 18: Valid: admittedDate is earlier than dischargedDate



Baka Hospital      Logout

Admin Khoi

- Dashboard
- Doctor
- Nurse
- Patient
- Medical Record and Treatment
- Department
- Appointment
- Room

### Room List

| Room ID | Capacity | Room Type         | Current Number of Patients | Add Patient                  | List of Patients                  |
|---------|----------|-------------------|----------------------------|------------------------------|-----------------------------------|
| 101     | 2        | General Ward      | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 102     | 1        | ICU               | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 103     | 3        | General Ward      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 104     | 1        | ICU               | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 105     | 2        | Private Room      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 106     | 4        | General Ward      | 2                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 107     | 1        | ICU               | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 108     | 3        | Semi-Private Room | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 109     | 2        | Private Room      | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 110     | 4        | General Ward      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |

Baka Hospital      Logout

Admin Khoi

- Dashboard
- Doctor
- Nurse
- Patient
- Medical Record and Treatment
- Department
- Appointment
- Room

### Patient List in Room 103

| ID     | Full Name              | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|--------|------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P00005 | Michael James Williams | 5738291046 | May 10, 1980  | 5678901234   | M      | Dec. 3, 2024  | Dec. 9, 2024    |

[Back To Room List](#)

Figure 19: Room list and Patient list in room 103 before admission



Admin  
Khoi

Baka Hospital Logout

### Room List

| Room ID | Capacity | Room Type         | Current Number of Patients | Add Patient                  | List of Patients                  |
|---------|----------|-------------------|----------------------------|------------------------------|-----------------------------------|
| 101     | 2        | General Ward      | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 102     | 1        | ICU               | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 103     | 3        | General Ward      | 2                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 104     | 1        | ICU               | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 105     | 2        | Private Room      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 106     | 4        | General Ward      | 2                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 107     | 1        | ICU               | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 108     | 3        | Semi-Private Room | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 109     | 2        | Private Room      | 0                          | <button>Add Patient</button> | <button>List of Patients</button> |
| 110     | 4        | General Ward      | 1                          | <button>Add Patient</button> | <button>List of Patients</button> |

Baka Hospital Logout

### Patient List in Room 103

| ID      | Full Name              | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P000005 | Michael James Williams | 5738291046 | May 10, 1980  | 5678901234   | M      | Dec. 3, 2024  | Dec. 9, 2024    |
| P000020 | Harper Anne Lee        | 1122334455 | Oct. 28, 1986 | 1122334455   | F      | Dec. 5, 2024  | Dec. 9, 2024    |

[Back To Room List](#)

Figure 20: Room list and Patient list in room 103 after admission



### 2.3.3 EnsureUniqueRoomForPatient:

- Ensures a patient cannot be admitted to multiple rooms simultaneously or during overlapping periods.
- Raises an error if such an overlap is detected.

```
1 DELIMITER $$  
2  
3 CREATE TRIGGER HMS.EnsureUniqueRoomForPatient  
4 BEFORE INSERT ON HMS.Admitted_to  
5 FOR EACH ROW  
6 BEGIN  
7     DECLARE overlappingAdmissions INT;  
8  
9     -- Check if the patient is already admitted to another room during the new  
10    admission period  
11    SELECT  
12        COUNT(*)  
13        INTO overlappingAdmissions  
14        FROM HMS.Admitted_to  
15        WHERE patientID = NEW.patientID  
16        AND (  
17            (NEW.admittedDate BETWEEN admittedDate AND IFNULL(dischargedDate, NOW()))  
18            OR (admittedDate BETWEEN NEW.admittedDate AND IFNULL(NEW.dischargedDate,  
19                NOW())))
20    );  
21  
22    -- If overlapping admissions exist, raise an error  
23    IF overlappingAdmissions > 0 THEN  
24        SIGNAL SQLSTATE '45000'  
25        SET MESSAGE_TEXT = 'Patient is already admitted to another room during  
this time period';  
26    END IF;  
27 END$$  
28  
29 DELIMITER ;
```



Try assigning a room, but the patient is already admitted to another room during the specified admission period

24 • INSERT INTO HMS.Admitted\_to VALUES ('P000020', '103', '2024-12-05', '2024-12-08');  
25 • INSERT INTO HMS.Admitted\_to VALUES ('P000020', '110', '2024-12-07', '2024-12-09');

Output

| #    | Time     | Action   | Message   |
|------|----------|--|---|
| 4510 | 23:06:03 | INSERT INTO HMS.Admitted_to VALUES ('P000020','103','2024-12-05','2024-12-08') | 1 row(s) affected   |
| 4511 | 23:06:08 | INSERT INTO HMS.Admitted_to VALUES ('P000020','110','2024-12-07','2024-12-09') | Error Code: 1644. Patient is already admitted to another room during this time period |

The screenshot shows a hospital management system interface. On the left, there's a sidebar with a user profile for 'Admin Khoi' and links to 'Dashboard', 'Doctor', 'Nurse', 'Patient', 'Medical Record and Treatment', 'Department', 'Appointment', and 'Room'. The main area has a blue header 'Baka Hospital' and a 'Logout' link. A central modal window titled 'Add New Patient into Room 110' contains fields for 'Patient ID' (dropdown), 'Nurse ID' (dropdown), 'Admitted Date' (date picker), and 'Discharged Date' (date picker). A red error message box at the bottom states: 'An unexpected error occurred: (1644, Patient is already admitted to another room during this time period)'. At the bottom right of the modal are 'Close' and 'Add New Room Information' buttons.

Figure 21: Invalid: Patient is already admitted to another room during the new admission period



Assign the room as the patient was previously admitted to another room but was discharged before the start of the new admission period.

```
24 • INSERT INTO HNS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-08');  
25 • INSERT INTO HNS.Admitted_to VALUES ('P000020', '110', '2024-12-07', '2024-12-09');  
26 • INSERT INTO HNS.Admitted_to VALUES ('P000020', '110', '2024-12-09', '2024-12-10');  
27
```

| Output : |          |   |
|----------|----------|---|
| #        | Time     | Action  |
| 4510     | 23:06:03 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '103', '2024-12-05', '2024-12-08') |
| 4511     | 23:06:08 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '110', '2024-12-07', '2024-12-09') |
| 4512     | 23:06:15 | INSERT INTO HMS.Admitted_to VALUES ('P000020', '110', '2024-12-09', '2024-12-10') |

Message  
1 row(s) affected  
Error Code: 1644. Patient is already admitted to another room during this time period  
1 row(s) affected

Figure 22: Valid: Patient P000020 is already discharged from room 103 before the new admission period to room 110

Baka Hospital

Logout

Admin Khoi

Dashboard

Doctor

Nurse

Patient

Medical Record and Treatment

Department

Appointment

Room

Patient List in Room 103

| ID      | Full Name              | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P00005  | Michael James Williams | 5738291046 | May 10, 1980  | 5678901234   | M      | Dec. 3, 2024  | Dec. 9, 2024    |
| P000020 | Harper Anne Lee        | 1122334455 | Oct. 28, 1986 | 1122334455   | F      | Dec. 5, 2024  | Dec. 9, 2024    |

Back To Room List

Figure 23: Patient P000020 is discharged from room 103 on 09/12/2024



Baka Hospital Logout

**Patient List in Room 110**

| ID      | Full Name               | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|-------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P000015 | Alexander John Thompson | 6677889900 | May 25, 1977  | 6677889900   | M      | Dec. 5, 2024  | Dec. 12, 2024   |

[Back To Room List](#)

Admin  
Khoi

Dashboard  
Doctor  
Nurse  
Patient  
Medical Record and Treatment  
Department  
Appointment  
Room

Figure 24: Room 110 before patient P000020 is admitted to

Baka Hospital Logout

**Patient List in Room 110**

| ID      | Full Name               | SSN        | Date of Birth | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|-------------------------|------------|---------------|--------------|--------|---------------|-----------------|
| P000015 | Alexander John Thompson | 6677889900 | May 25, 1977  | 6677889900   | M      | Dec. 5, 2024  | Dec. 12, 2024   |
| P000020 | Harper Anne Lee         | 1122334455 | Oct. 28, 1986 | 1122334455   | F      | Dec. 9, 2024  | Dec. 10, 2024   |

[Back To Room List](#)

Admin  
Khoi

Dashboard  
Doctor  
Nurse  
Patient  
Medical Record and Treatment  
Department  
Appointment  
Room

Figure 25: Room 110 after patient P000020 admission on 09/12/2024



#### 2.3.4 EnsureFutureAppointment

- Ensures that the appointment date and time are in the future.
- Prevents the insertion of appointments scheduled in the past or at the current time.
- Raises an error with a custom message if the validation fails.

```
1 DELIMITER $$  
2  
3 CREATE TRIGGER EnsureFutureAppointment  
4 BEFORE INSERT ON HMS.Appointment  
5 FOR EACH ROW  
6 BEGIN  
7     -- Check if the appointment date and time are in the future  
8     IF NEW.appointmentDate < CURDATE() OR  
9         (NEW.appointmentDate = CURDATE() AND NEW.appointmentTime <= CURTIME()) THEN  
10        SIGNAL SQLSTATE '45000'  
11        SET MESSAGE_TEXT = 'Appointment date and time must be in the future.';  
12    END IF;  
13 END$$  
14  
15 DELIMITER ;
```

Attempt to add an appointment with a date and time that is not in the future

The screenshot shows a MySQL Workbench interface. In the SQL tab, a query is run: `44 • INSERT INTO HMS.Appointment VALUES (53, 'P000001', 'D100001', '2024-11-10', '10:05:00');`. In the Output tab, under Action Output, there is a single row of data:

| #    | Time     | Action  | Message  |
|------|----------|---|--|
| 7545 | 04:28:37 | INSERT INTO HMS.Appointment VALUES (53, 'P000001', 'D100001', '2024-11-10', '10:05:00') | Error Code: 1644. Appointment date and time must be in the future. |



Baka Hospital

Logout

Admin Khanh

Dashboard

Doctor

Nurse

Patient

Medical Record and Treatment

Department

Appointment

Room

Add New Appointment

ID: 53

Patient ID: P000001

Doctor ID: D100001

Date: 10/11/2024

Time: 10:05 SA

**Add Appointment**

Baka Hospital

Logout

Admin Khanh

Dashboard

Doctor

Nurse

Patient

Medical Record and Treatment

Department

Appointment

Room

Add New Appointment

ID:

Patient ID: -----

Doctor ID: -----

Date: dd/mm/yyyy

Time: --:-- --

An unexpected error occurred: (1644, 'Appointment date and time must be in the future.')

**Add Appointment**

Figure 26: Invalid: Appointment date and time must be in the future



### 2.3.5 EnsurePatientAvailability:

- Prevents overlapping appointments for a single patient.
- Ensures no double-booking within a 30-minute window.

```
1 DELIMITER $$  
2  
3 CREATE TRIGGER HMS.EnsurePatientAvailability  
4 BEFORE INSERT ON HMS.Appointment  
5 FOR EACH ROW  
6 BEGIN  
7     DECLARE overlappingAppointments INT;  
8  
9     SELECT COUNT(*)  
10    INTO overlappingAppointments  
11    FROM HMS.Appointment  
12    WHERE  
13        patientID = NEW.patientID  
14        AND appointmentDate = NEW.appointmentDate  
15        AND ((NEW.appointmentTime BETWEEN appointmentTime AND ADDTIME(  
16            appointmentTime, '00:30:00'))  
17            OR (appointmentTime BETWEEN NEW.appointmentTime AND ADDTIME(NEW.  
18            appointmentTime, '00:30:00')));  
19  
20    IF overlappingAppointments > 0 THEN  
21        SIGNAL SQLSTATE '45000'  
22        SET MESSAGE_TEXT = 'Patient is already scheduled for another appointment  
23        at this time';  
24    END IF;  
25 END$$  
26  
27 DELIMITER ;
```



Display the appointments already set up for the patient 'P000002'

23 • CALL ShowPatientAppointments('P000002')

The screenshot shows a web application interface for managing medical appointments. On the left, a sidebar menu lists administrative roles: Admin, Doctor, Nurse, Patient, Medical Record and Treatment, Department, Appointment, and Room. The 'Patient' option is selected. The main content area displays a grid of patient appointments. At the top of the grid are buttons for 'Result Grid', 'Filter Rows', 'Export', and 'Wrap Cell Content'. The grid has columns for appointmentID, patientID, doctorID, appointmentDate, and appointmentTime. Two rows of data are visible:

|   | appointmentID | patientID | doctorID | appointmentDate | appointmentTime |
|---|---------------|-----------|----------|-----------------|-----------------|
| ▶ | 2             | P000002   | D100002  | 2024-12-01      | 09:30:00        |
|   | 34            | P000002   | D100012  | 2024-12-16      | 08:30:00        |

Below the grid, there is a table with columns: Appointment ID, Doctor ID, Patient ID, Date, Time, Edit Appointment, and Delete Appointment. It contains two rows of data corresponding to the appointments listed above:

| Appointment ID | Doctor ID | Patient ID | Date          | Time      | Edit Appointment      | Delete Appointment      |
|----------------|-----------|------------|---------------|-----------|-----------------------|-------------------------|
| 2              | D100002   | P000002    | Dec. 1, 2024  | 9:30 a.m. | <button>Edit</button> | <button>Delete</button> |
| 34             | D100012   | P000002    | Dec. 16, 2024 | 8:30 a.m. | <button>Edit</button> | <button>Delete</button> |

At the bottom right of the main content area is a green button labeled 'Add Appointment'.

Figure 27: Appointments already set up of the patient 'P000002'



Try adding an appointment that intersects with and ends later than the existing appointment

```
23 • CALL ShowPatientAppointments('P000002');  
24 • INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00');
```

| Output |          |  | Message   |
|--------|----------|--|---|
| #      | Time     | Action   |   |
| ✓ 6144 | 18:09:41 | CALL ShowPatientAppointments('P000002') -- INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00') | 2 row(s) returned   |
| ✗ 6145 | 18:12:41 | INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00')  | Error Code: 1644. Patient is already scheduled for another appointment at this time |

Figure 28: Invalid: Patient is already scheduled for another appointment from 09:30 to 10:00 on 01/12/2024 so the new appointment can not be set up from 09:15 to 9:45

Try adding an appointment that intersects with and occurs earlier than the existing appointment

```
23 • CALL ShowPatientAppointments('P000002');  
24 • INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00');  
25 • INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:50:00');
```

| Output |          |  | Message   |
|--------|----------|--|---|
| #      | Time     | Action   |   |
| ✓ 6144 | 18:09:41 | CALL ShowPatientAppointments('P000002') -- INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00') | 2 row(s) returned   |
| ✗ 6145 | 18:12:41 | INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00')  | Error Code: 1644. Patient is already scheduled for another appointment at this time |
| ✗ 6146 | 18:22:34 | INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:50:00')  | Error Code: 1644. Patient is already scheduled for another appointment at this time |

Figure 29: Invalid: Patient is already scheduled for another appointment from 09:30 to 10:00 on 01/12/2024 so the new appointment can not be set up from 09:50 to 10:10



Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Add New Appointment

ID: 53

Patient ID: P000002

Doctor ID: D100005

Date: 01/12/2024

Time: 09:50 SA

**Add Appointment**

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Add New Appointment

ID:

Patient ID: -----

Doctor ID: -----

Date: dd/mm/yyyy

Time: --:-- --

An unexpected error occurred: (1644, 'Patient is already scheduled for another appointment at this time')

**Add Appointment**

Figure 30: Invalid: Patient is already scheduled for another appointment



Add a valid appointment that does not intersect any existing appointment 'P000002' then display the appointments of patient P000002 after successfully scheduling the new appointment

```
23 • CALL ShowPatientAppointments('P000002');
24 • INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00');
25 • INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:50:00');
26 • INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '10:05:00');
27 • CALL ShowPatientAppointments('P000002');
```

Result Grid | Filter Rows: Export: Wrap Cell Content:

|   | appointmentID | patientID | doctorID | appointmentDate | appointmentTime |
|---|---------------|-----------|----------|-----------------|-----------------|
| ▶ | 2             | P000002   | D100002  | 2024-12-01      | 09:30:00        |
|   | 53            | P000002   | D100005  | 2024-12-01      | 10:05:00        |
|   | 34            | P000002   | D100012  | 2024-12-16      | 08:30:00        |

Result 15 ×

Output:

Action Output

| # | Time          | Action  | Message   |
|---|---------------|---|---|
| ✖ | 7376 18:27:06 | INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:15:00') | Error Code: 1644. Patient is already scheduled for another appointment at this time |
| ✖ | 7377 18:27:15 | INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '09:50:00') | Error Code: 1644. Patient is already scheduled for another appointment at this time |
| ✓ | 7378 18:27:18 | INSERT INTO HMS.Appointment VALUES (53, 'P000002', 'D100005', '2024-12-01', '10:05:00') | 1 row(s) affected   |
| ✓ | 7379 18:34:36 | CALL ShowPatientAppointments('P000002')   | 3 row(s) returned   |

Baka Hospital

Logout

Admin Khoi

Dashboard

Doctor

Nurse

Patient

Medical Record and Treatment

Department

Appointment

Room

| Appointment ID | Doctor ID | Patient ID | Date          | Time       | Edit Appointment      | Delete Appointment      |
|----------------|-----------|------------|---------------|------------|-----------------------|-------------------------|
| 2              | D100002   | P000002    | Dec. 1, 2024  | 9:30 a.m.  | <button>Edit</button> | <button>Delete</button> |
| 34             | D100012   | P000002    | Dec. 16, 2024 | 8:30 a.m.  | <button>Edit</button> | <button>Delete</button> |
| 53             | D100005   | P000002    | Dec. 1, 2024  | 10:05 a.m. | <button>Edit</button> | <button>Delete</button> |

Add Appointment

Figure 31: The appointment is successfully scheduled for patient 'P000002'



### 2.3.6 EnsureDoctorAvailability:

- Ensures a doctor does not have overlapping appointments within a 10-minute window.
- Provides an additional safeguard for appointment scheduling.

```
1 DELIMITER $$  
2  
3 CREATE TRIGGER HMS.EnsureDoctorAvailability  
4 BEFORE INSERT ON HMS.Appointment  
5 FOR EACH ROW  
6 BEGIN  
7     DECLARE conflictingCount INT;  
8  
9     -- Check if the doctor already has an overlapping appointment  
10    SELECT COUNT(*)  
11        INTO conflictingCount  
12        FROM HMS.Appointment  
13        WHERE  
14            doctorID = NEW.doctorID  
15            AND appointmentDate = NEW.appointmentDate  
16            AND (  
17                (NEW.appointmentTime >= appointmentTime AND NEW.appointmentTime <  
18                    ADDTIME(appointmentTime, '00:10:00'))  
19                    OR  
20                    (ADDTIME(NEW.appointmentTime, '00:10:00') > appointmentTime AND  
21                    ADDTIME(NEW.appointmentTime, '00:10:00') <= ADDTIME(appointmentTime,  
22                    '00:10:00'))  
23                );  
24  
25    -- If there is a conflict, raise an error  
26    IF conflictingCount > 0 THEN  
27        SIGNAL SQLSTATE '45000'  
28        SET MESSAGE_TEXT = 'A doctor can be scheduled for at most one appointment  
29        every 10 minutes.';  
30    END IF;  
31 END$$  
32  
33 DELIMITER ;
```



Display the appointments already set up for the doctor D100003

26 • CALL ShowDoctorAppointments('D100003');

| Result Grid   Filter Rows: <input type="text"/> Export:  Wrap Cell Content: |               |           |          |                 |                 |
|---|---------------|-----------|----------|-----------------|-----------------|
|   | appointmentID | patientID | doctorID | appointmentDate | appointmentTime |
| ▶   | 1             | P000003   | D100003  | 2024-12-01      | 10:00:00        |
|   | 5             | P000004   | D100003  | 2024-12-09      | 10:00:00        |
|   | 25            | P000023   | D100003  | 2024-12-12      | 10:00:00        |
|   | 45            | P000013   | D100003  | 2024-12-22      | 14:00:00        |

Baka Hospital Logout

Admin  
Khoi

- Dashboard
- Doctor
- Nurse
- Patient
- Medical Record and Treatment
- Department
- Appointment
- Room

| Appointment ID | Doctor ID | Patient ID | Date          | Time    | Edit Appointment   | Delete Appointment  |
|----------------|-----------|------------|---------------|---------|--|---|
| 1              | D100003   | P000003    | Dec. 1, 2024  | 10 a.m. | <button style="border: 1px solid green; padding: 2px;">Edit</button> | <button style="border: 1px solid red; background-color: red; color: white; padding: 2px;">Delete</button> |
| 5              | D100003   | P000004    | Dec. 9, 2024  | 10 a.m. | <button style="border: 1px solid green; padding: 2px;">Edit</button> | <button style="border: 1px solid red; background-color: red; color: white; padding: 2px;">Delete</button> |
| 15             | D100013   | P000013    | Dec. 6, 2024  | 3 p.m.  | <button style="border: 1px solid green; padding: 2px;">Edit</button> | <button style="border: 1px solid red; background-color: red; color: white; padding: 2px;">Delete</button> |
| 25             | D100003   | P000023    | Dec. 12, 2024 | 10 a.m. | <button style="border: 1px solid green; padding: 2px;">Edit</button> | <button style="border: 1px solid red; background-color: red; color: white; padding: 2px;">Delete</button> |

[Add Appointment](#)

Figure 32: Appointments already set up of the doctor D100003



Try adding an appointment that intersects with and ends later than the existing appointment

```
26 • CALL ShowDoctorAppointments('D100003');
27 • INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '09:55:00');

Output
Action Output
# Time Action
Message
4 row(s) returned
Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes.
```

| #    | Time     | Action  | Message   |
|------|----------|---|---|
| 3717 | 18:02:36 | CALL ShowDoctorAppointments('D100003')  | 4 row(s) returned   |
| 3718 | 18:02:36 | INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '09:55:00') | Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes. |

Figure 33: Invalid: Doctor is already scheduled for another appointment from 10:00 to 10:10 on 09/12/2024 so the new appointment can not be set up from 09:55 to 10:05

Try adding an appointment that intersects with and occurs earlier than the existing appointment

```
26 • CALL ShowDoctorAppointments('D100003');
27 • INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '09:55:00');
28 • INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '10:05:00');

Output
Action Output
# Time Action
Message
4 row(s) returned
Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes.
Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes.

Message
4 row(s) returned
Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes.
Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes.
```

| #    | Time     | Action  | Message   |
|------|----------|---|---|
| 3720 | 18:09:03 | CALL ShowDoctorAppointments('D100003')  | 4 row(s) returned   |
| 3721 | 18:09:07 | INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '09:55:00') | Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes. |
| 3722 | 18:09:11 | INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '10:05:00') | Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes. |

Figure 34: Invalid: Doctor is already scheduled for another appointment from 10:00 to 10:10 on 09/12/2024 so the new appointment can not be set up from 10:05 to 10:15



Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Add New Appointment

ID: 54

Patient ID: P000007

Doctor ID: D100003

Date: 09/12/2024

Time: 09:55 SA

**Close** **Add Appointment**

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Add New Appointment

ID:

Patient ID: -----

Doctor ID: -----

Date: dd/mm/yyyy

Time: --:-- --

An unexpected error occurred: (1644, 'A doctor can be scheduled for at most one appointment every 10 minutes.')

**Close** **Add Appointment**

Figure 35: Invalid: A doctor can be scheduled for at most one appointment every 10 minutes



Add a valid appointment that does not intersect any existing appointment D100003 then display the appointments of doctor D100003 after successfully scheduling the new appointment

```
26 • CALL ShowDoctorAppointments('D100003');
27 • INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '09:55:00');
28 • INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '10:05:00');
29 • INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '10:15:00');
30 • CALL ShowDoctorAppointments('D100003');
```

Result Grid | Filter Rows: Export: Wrap Cell Content:

| appointmentID | patientID | doctorID | appointmentDate | appointmentTime |
|---------------|-----------|----------|-----------------|-----------------|
| 1             | P000003   | D100003  | 2024-12-01      | 10:00:00        |
| 5             | P000004   | D100003  | 2024-12-09      | 10:00:00        |
| 54            | P000007   | D100003  | 2024-12-09      | 10:15:00        |
| 25            | P000023   | D100003  | 2024-12-12      | 10:00:00        |
| 45            | P000013   | D100003  | 2024-12-22      | 14:00:00        |

Result 16 ×

Output:

Action Output

| #    | Time     | Action  | Message   |
|------|----------|---|---|
| 3726 | 18:11:46 | INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '09:55:00') | Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes. |
| 3727 | 18:11:49 | INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '10:05:00') | Error Code: 1644. A doctor can be scheduled for at most one appointment every 10 minutes. |
| 3728 | 18:11:53 | INSERT INTO HMS.Appointment VALUES (54, 'P000007', 'D100003', '2024-12-09', '10:15:00') | 1 row(s) affected   |
| 3729 | 18:15:35 | CALL ShowDoctorAppointments('D100003')  | 5 row(s) returned   |

Baka Hospital

Logout

Admin Khoi

Dashboard

Doctor

Nurse

Patient

Medical Record and Treatment

Department

Appointment

Room

| Appointment ID | Doctor ID | Patient ID | Date          | Time       | Edit Appointment      | Delete Appointment      |
|----------------|-----------|------------|---------------|------------|-----------------------|-------------------------|
| 1              | D100003   | P000003    | Dec. 1, 2024  | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |
| 5              | D100003   | P000004    | Dec. 9, 2024  | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |
| 15             | D100013   | P000013    | Dec. 6, 2024  | 3 p.m.     | <button>Edit</button> | <button>Delete</button> |
| 25             | D100003   | P000023    | Dec. 12, 2024 | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |
| 54             | D100003   | P000007    | Dec. 9, 2024  | 10:15 a.m. | <button>Edit</button> | <button>Delete</button> |

Add Appointment

Figure 36: The appointment has been successfully scheduled for doctor D100003

### 3 User Groups and Set Application-level Permissions



Figure 37: Hospital Staff and Patient

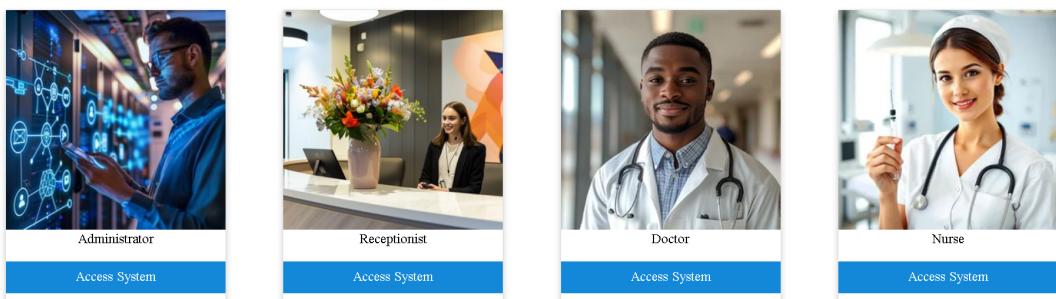


Figure 38: Hospital Staff roles

| User Group   | Application-level Permissions   |
|--------------|---|
| Admin        | Manage entire system  |
| Doctor       | Handle patient records. They can see the list of all patients, all doctors, all nurses, all departments, all rooms and list of patients of each room, their personal information and appointments.  |
| Nurse        | Support patient care, edit patient records. They can see the list of all patients, all doctors, all nurses, all departments, their information, all rooms and list of patients of each room   |
| Receptionist | Assist patients with completing necessary forms and documentation. They can handle appointments, help patient to form appointment, manage the room, update the list of patients in each room, update patient list. They can see list of doctor, nurses and departments. |
| Patient      | Access personal health information, personal information. They can see list of doctors, nurses, departments, their own appointments and can book an appointment.  |

Table 1: User Groups and Application-level Permissions



```
1 CREATE ROLE 'admin_role';
2 GRANT ALL PRIVILEGES ON HMS.* TO 'admin_role';
3
4 CREATE ROLE 'doctor_role';
5 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Appointment TO 'doctor_role';
6 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Medical_Record TO 'doctor_role';
7 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Treatment TO 'doctor_role';
8 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Prescribes TO 'doctor_role';
9 GRANT SELECT ON HMS.Patient TO 'doctor_role';
10 GRANT SELECT ON HMS.Doctor TO 'doctor_role';
11 GRANT SELECT ON HMS.Nurse TO 'doctor_role';
12 GRANT SELECT ON HMS.Room TO 'doctor_role';
13 GRANT SELECT ON HMS.Admitted_to TO 'doctor_role';
14 GRANT SELECT ON HMS.Medicine TO 'doctor_role';
15
16 CREATE ROLE 'nurse_role';
17 GRANT SELECT, UPDATE ON HMS.Patient TO 'nurse_role';
18 GRANT SELECT ON HMS.Room TO 'nurse_role';
19 GRANT SELECT ON HMS.Admitted_to TO 'nurse_role';
20 GRANT SELECT ON HMS.Treatment TO 'nurse_role';
21 GRANT SELECT ON HMS.Prescribes TO 'nurse_role';
22
23 CREATE ROLE 'receptionist_role';
24 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Patient TO 'receptionist_role';
25 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Patients_Family TO 'receptionist_role'
   ;
26 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Appointment TO 'receptionist_role';
27 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Admitted_to TO 'receptionist_role';
28 GRANT SELECT, INSERT, UPDATE, DELETE ON HMS.Bill TO 'receptionist_role';
29
30 CREATE ROLE 'patient_role';
31 CREATE VIEW HMS.Patient_View AS
32     SELECT * FROM HMS.Patient WHERE patientID = SUBSTRING_INDEX(USER(), '@', 1);
33 CREATE VIEW HMS.Patients_Family_View AS
34     SELECT * FROM HMS.Patients_Family WHERE patientID = SUBSTRING_INDEX(USER(), '@',
   ', 1);
35 CREATE VIEW HMS.Appointment_View AS
36     SELECT * FROM HMS.Appointment WHERE patientID = SUBSTRING_INDEX(USER(), '@',
   1);
37 CREATE VIEW HMS.Medical_Record_View AS
38     SELECT * FROM HMS.Medical_Record WHERE patientID = SUBSTRING_INDEX(USER(), '@',
   1);
39 CREATE VIEW HMS.Prescribes_View AS
40     SELECT * FROM HMS.Prescribes WHERE patientID = SUBSTRING_INDEX(USER(), '@', 1)
   ;
41 CREATE VIEW HMS.Bill_View AS
42     SELECT * FROM HMS.Bill WHERE patientID = SUBSTRING_INDEX(USER(), '@', 1);
43 GRANT SELECT ON HMS.Patient_View TO 'patient_role';
44 GRANT SELECT ON HMS.Patients_Family_View TO 'patient_role';
45 GRANT SELECT ON HMS.Appointment_View TO 'patient_role';
46 GRANT SELECT ON HMS.Medical_Record_View TO 'patient_role';
47 GRANT SELECT ON HMS.Prescribes_View TO 'patient_role';
48 GRANT SELECT ON HMS.Bill_View TO 'patient_role';
49
50 FLUSH PRIVILEGES;
```

## 4 Application Architecture

### 4.1 Presentation Layer (UI Layer):

The frontend layer where we interact with users (patients, doctors, admins, nurses, receptionists). Here we are using technologies like Django templates, HTML, CSS, Bootstrap.



Figure 39: Presentation Layer

### 4.2 Application Layer:

The backend layer where we made logics of the system, navigations. Here we mainly use Django which has Model View Templates architecture. Model represents the data that we want to present, which is from the database. View represents the request handler that returns the relevant templates and content. Template represents the HTML file (layout of the application).

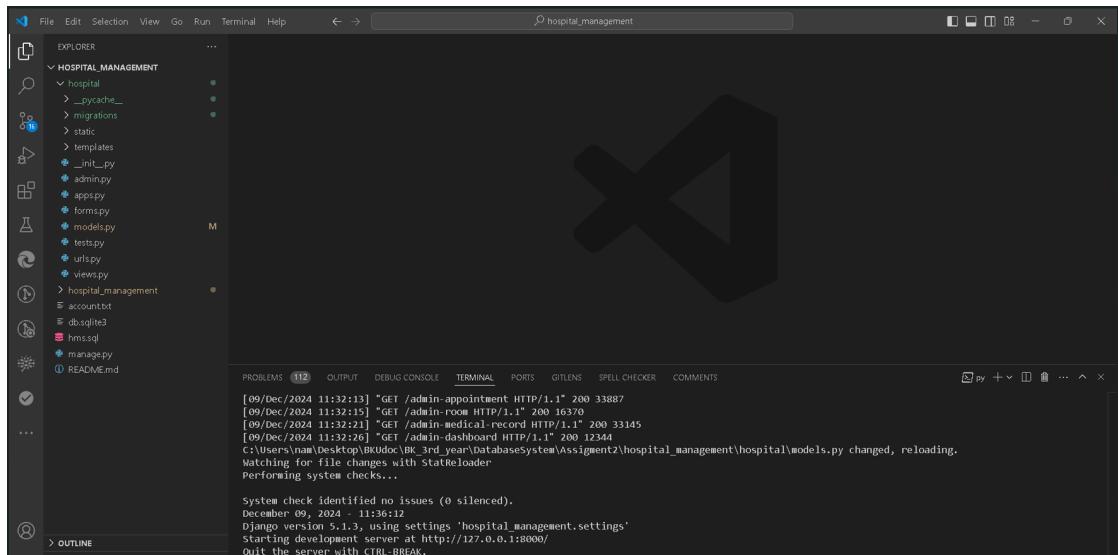


Figure 40: Application Layer



### 4.3 Database Layer:

The layer where data is stored and functions, triggers, views and procedures are created. We used MySQL here for our application.

The screenshot shows the MySQL Workbench interface. The left sidebar displays the Navigator with the 'Schemas' tab selected, showing the 'hms' schema which contains tables, triggers, and stored procedures. The main area is a query editor titled 'testtrigger' containing the following SQL code:

```
1 • DROP SCHEMA IF EXISTS hms;
2 • CREATE SCHEMA hms;
3 • USE hms;
4
5 • CREATE TABLE HMS.Department (
6     departmentID CHAR(2),
7     departmentName VARCHAR(50),
8     PRIMARY KEY (departmentID)
9 );
10
11 • INSERT INTO HMS.Department VALUES ('01', 'Cardiology');
12 • INSERT INTO HMS.Department VALUES ('02', 'Neurology');
13 • INSERT INTO HMS.Department VALUES ('03', 'Orthopedics');
14 • INSERT INTO HMS.Department VALUES ('04', 'Pediatrics');
15 • INSERT INTO HMS.Department VALUES ('05', 'Oncology');
16 • INSERT INTO HMS.Department VALUES ('06', 'Dermatology');
17 • INSERT INTO HMS.Department VALUES ('07', 'Radiology');
18 • INSERT INTO HMS.Department VALUES ('08', 'Surgery');
19 • INSERT INTO HMS.Department VALUES ('09', 'Psychiatry');
20 • INSERT INTO HMS.Department VALUES ('10', 'Gastroenterology');
21
22
```

The bottom right pane shows the 'Action Output' log with three entries:

| Action  | Time | Message         | Duration / Fetch |
|---|------|-----------------|------------------|
| CREATE TRIGGER BeforeInsertDoctorManages BEFORE INSERT ON HMS_Managers FOR EACH ROW BEGIN | 1971 | 0 rows affected | 0.016 sec        |
| CREATE TRIGGER BeforeUpdateDoctorManages BEFORE UPDATE ON HMS_Managers FOR EACH ROW BEGIN | 1972 | 0 rows affected | 0.000 sec        |
| CREATE TRIGGER Prevent_HeadDoctor_Delete BEFORE DELETE ON Doctor FOR EACH ROW BEGIN       | 1973 | 0 rows affected | 0.000 sec        |

Figure 41: Database Layer



## 5 Application Specifications

Hospital Management System (HMS) is a comprehensive application designed to manage hospital operations, including staff management, patient care, appointments and rooms. It ensures seamless interaction among various roles while maintaining data security and role-based access.

### 5.1 Key Modules

- **Patient Management:** Handles patient registration, health records, and personal details in a secure manner.
- **Department Management:** Allows administrators to manage hospital departments, including assigning heads and monitoring departmental activities.
- **Doctor Management:** Enables administrators to manage doctor profiles, licenses, while facilitating the assignment of doctors to departments and tracking their performance.
- **Nurse Management:** Manages nurse profiles, shift scheduling, and task assignments, ensuring effective resource allocation and integration with patient care.
- **Appointment Management:** Facilitates patient booking with preferred doctors for upcoming appointments.
- **Room Management:** Manages room assignments, tracks patient occupancy, and ensures efficient use of hospital resources.
- **Medical Records:** Maintains detailed records of diagnoses, test results and treatments for every patient.

### 5.2 Non-Functional Requirements

- **Security:** Role-based access control, data encryption, and secure login.
- **Performance:** Scalability to support high traffic, response time under 1 second.
- **Reliability:** Backup and disaster recovery plans with 99.9% uptime.
- **Usability:** Intuitive interface and multi-language support.
- **Compliance:** Adherence to healthcare regulations.

### 5.3 Security and Compliance

- Implements secure authentication mechanisms, including hashed passwords and session management.
- Ensures data privacy and compliance with healthcare regulations.
- Incorporates database encryption and role-based access controls for sensitive information.



## 5.4 Deliverables

- Fully functioning HMS application.
- Documentation (user manual, API documentation).
- Test cases and test reports.
- Deployment scripts and configurations.

## 5.5 Technology Stack

The Hospital Management System (HMS) will be developed using the following technologies, ensuring a reliable and efficient system:

- **Programming Language:** Python
- **Framework:** Django for backend development
- **Frontend:** HTML, CSS Bootstrap for creating a responsive and user-friendly interface
- **Database:** MySQL for structured and scalable data management
- **Version Control:** Git for source code management and collaboration
- **Repository Hosting:** GitHub for centralized code storage and project management
- **Deployment:** Docker containers for consistency across development and production environments

## 5.6 System Design

The HMS application is designed using a layered architecture to enhance modularity and maintainability:

### 5.6.1 Frontend (Presentation Layer)

- Utilizes HTML, CSS, and Django Templates to create interactive user interfaces.
- Offers role-based dashboards for administrators, doctors, nurses, and patients.
- Ensures cross-platform compatibility with responsive design.

### 5.6.2 Backend (Business Logic Layer)

- Developed using Django, following the Model-View-Template (MVT) design pattern.
- Implements application logic, role-based access control, and session management.

### 5.6.3 Database Layer

- Uses MySQL to store and manage HMS data efficiently.
- Incorporates a well-structured schema with relationships, constraints, and optimized indexing.
- Utilizes Django's Object-Relational Mapping (ORM) system and raw MySQL using cursor for database queries and transactions.



#### 5.6.4 Version Control and Collaboration

- Employs Git for source code versioning, enabling effective tracking of changes and collaboration.
- Hosts the project repository on GitHub for centralized access and project management.
- Integrates GitHub Issues and Pull Requests for streamlined team workflows.

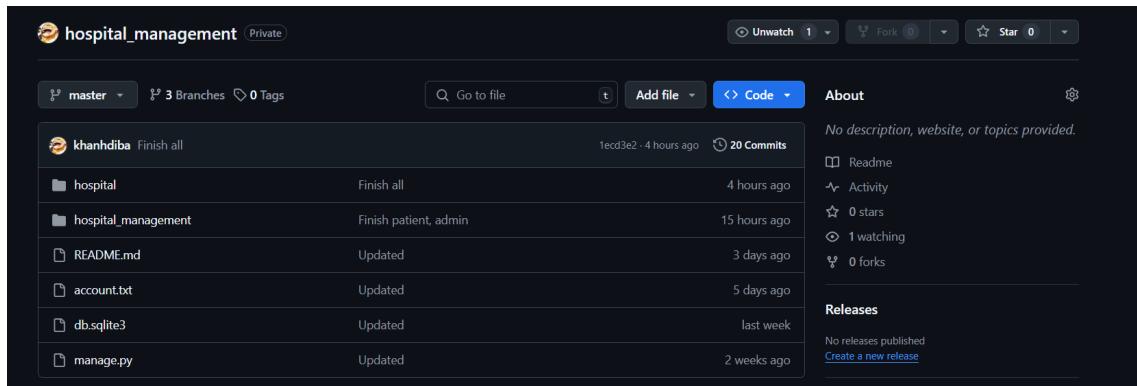


Figure 42: Project Github

#### 5.7 Advantages of the Technology Stack

- **Python and Django:** Django's scalability and Python's simplicity accelerate development and maintenance.
- **HTML and CSS:** Enables interactive and responsive user interfaces.
- **MySQL:** Ensures secure and efficient data storage and retrieval.
- **Git and GitHub:** Enhances collaboration, version control, and code review processes.

#### 5.8 Development Workflow

The development process will follow an agile methodology, comprising the following stages:

1. Requirement Gathering and Prototyping
2. Database Design and Backend Development
3. Frontend Development and Integration
4. Version Control Management using Git and GitHub
5. Testing (Unit, Integration, and User Acceptance)
6. Deployment and Continuous Monitoring



## 6 BCNF normalization for the database schema

After thorough analysis of our relational schema, we have decided that they have met the requirement of BCNF. Below are the functional dependencies of all the relationships.

**Department** (departmentID, departmentName)

departmentID → departmentName

**Medical\_staff** (staffID, staffSSN, firstName, midName, lastName, staffDoB, gender, phoneNumber, salary, departmentID)

staffID → {staffSSN, firstName, midName, lastName, staffDoB, gender, phoneNumber, salary, departmentID}

**Doctor** (doctorID, license)

doctorID → license

**Specialization** (doctorID, aSpecialization)

{doctorID, aSpecialization}

**Nurse** (nurseID, yearExperience)

nurseID → yearExperience

**Manages** (departmentID, doctorID, startDate)

departmentID → {doctorID, startDate}

**Room** (roomID, capacity, roomType)

roomID → {capacity, roomType}

**Patient** (patientID, patientSSN, firstName, midName, lastName, patientDoB, gender, phoneNumber, street, district, city)

patientID → {patientSSN, firstName, midName, lastName, patientDoB, gender, phoneNumber, street, district, city}

**Admitted\_to** (patientID, roomID, admittedDate, dischargedDate)

{patientID, roomID} → {admittedDate, dischargedDate}

**Appointment** (appointmentID, appointmentDate, appointmentTime, doctorID, patientID)

appointmentID → {appointmentDate, appointmentTime, doctorID, patientID}

**Pharmacy** (pharmacyID, pharmacyName)



pharmacyID → pharmacyName

**Medicine** (medicineID, medicineName, dosage, pharmacyID)  
medicineID → {medicineName, dosage, pharmacyID}

**Payment\_Approach** (PAID, PAType)

PAID → PAType

**Cash** (cashierID, cashierName, PAID)  
cashierID → {cashierName, PAID}  
**Bank** (bankID, bankName, PAID)  
bankID → {bankName, PAID}  
**Ewallet** (ewalletID, ewalletName, PAID)  
ewalletID → {ewalletName, PAID}

**Bill** (billID, patientID, amount, createdDate, paymentStatus, paidDate, PAID)  
billID → {patientID, amount, createdDate, paymentStatus, paidDate, PAID}

**Treatment** (treatmentID, treatmentDate, treatmentProcedure, patientID)  
treatmentID → {treatmentDate, treatmentProcedure, patientID}

**Medical\_Record** (recordID, patientID, recordDate, diagnosis, testResult, treatmentID)  
{recordID, patientID} → {recordDate, diagnosis, testResult, treatmentID}

**Performs** (doctorID, treatmentID)  
{doctorID, treatmentID}

**Assists** (nurseID, treatmentID)  
{nurseID, treatmentID}

**Takes\_care** (nurseID, roomID)  
{nurseID, roomID}

**Prescribes** (medicineID, patientID, doctorID, prescribesDate)  
{medicineID, patientID, doctorID} → prescribesDate

**Patient's\_Family** (familyID, patientID, relationship, name, phoneNumber)  
{familyID, patientID} → {relationship, name, phoneNumber}

## 7 Compare Data between website and database when insert, delete or edit

### 7.1 Insert

First, I inserted a new patient into our system:

Add New Patient

|               |            |
|---------------|------------|
| ID            | P000031    |
| SSN           | 1299211282 |
| First Name    | Rudeus     |
| Middle Name   | Notous     |
| Last Name     | Greyrat    |
| Date of Birth | 01/01/1992 |
| Gender        | Male       |

Figure 43: Insert new patient

Then this is the result on our website:

|                              |                          |              |   |            |                 |                       |                         |
|------------------------------|--------------------------|--------------|---|------------|-----------------|-----------------------|-------------------------|
| P000031                      | Rudeus Notous<br>Greyrat | Jan. 1, 1992 | M | 0129291928 | St Paul 2 CityN | <button>Edit</button> | <button>Delete</button> |
| <button>Add Patient</button> |                          |              |   |            |                 |                       |                         |

Figure 44: Result on website

Then, go to our database, we can check if there is a change in database:



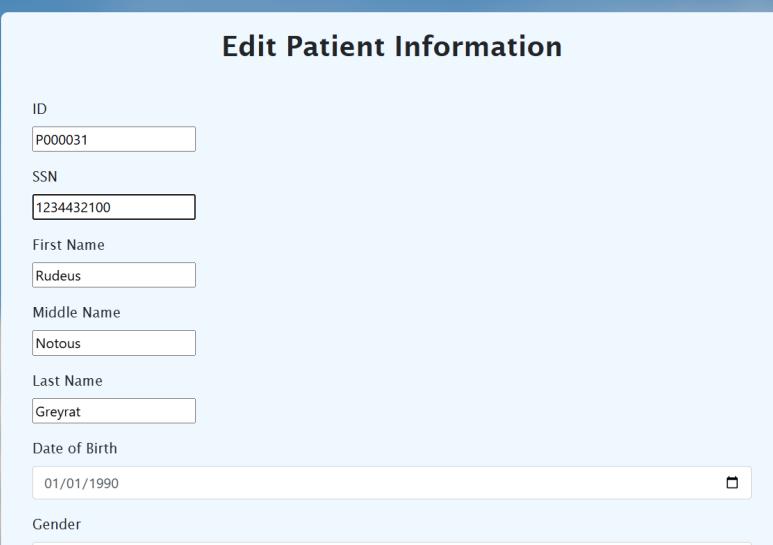
| patientID | patientSSN | firstName | midName  | lastName | patientDoB | gender | phoneNumber | street         | district  | city  |
|-----------|------------|-----------|----------|----------|------------|--------|-------------|----------------|-----------|-------|
| P000025   | 6677889901 | Logan     | David    | King     | 2003-05-07 | M      | 6677889900  | 789 Palm Ct    | Lakeside  | CityR |
| P000026   | 7788990012 | Ava       | Emily    | Scott    | 1997-09-21 | F      | 7788990011  | 654 Dogwood Rd | Northside | CityS |
| P000027   | 8899001123 | Mason     | Henry    | Wright   | 1991-03-09 | M      | 8899001122  | 321 Juniper St | Southside | CityT |
| P000028   | 9900112234 | Grace     | Isabelle | Green    | 1982-02-13 | F      | 9900112233  | 123 Willow Dr  | Eastside  | CityU |
| P000029   | 0011223345 | Oliver    | Nathan   | Adams    | 1987-12-30 | M      | 0011223344  | 456 Maple Ct   | Downtown  | CityV |
| P000030   | 1122334456 | Emily     | Victoria | Baker    | 1992-08-18 | F      | 1122334455  | 789 Elm Blvd   | Suburb    | CityW |
| P000031   | 1299211282 | Rudeus    | Notous   | Greylat  | 1992-01-01 | M      | 0129291928  | St Paul        | 2         | CityN |
| *         | HULL       | HULL      | HULL     | HULL     | HULL       | HULL   | HULL        | HULL           | HULL      | HULL  |

Figure 45: Result in database

We can conclude that the result when inserting on website can affect to the database.

## 7.2 Edit

Subsequently, when there are some mistakes when recording patient information, for instance in this case, patient Rudeus was born in 1990 not 1992, so I will fix it by editing on this website:



The form is titled "Edit Patient Information". It contains fields for ID (P000031), SSN (1234432100), First Name (Rudeus), Middle Name (Notous), Last Name (Greylat), Date of Birth (01/01/1990), and Gender (M).

Figure 46: Edit patient information

Then this is the result on our website:

|                    |                          |              |   |            |                 |                       |                         |
|--------------------|--------------------------|--------------|---|------------|-----------------|-----------------------|-------------------------|
| P000031            | Rudeus Notous<br>Greylat | Jan. 1, 1990 | M | 0129291928 | St Paul 2 CityN | <button>Edit</button> | <button>Delete</button> |
| <b>Add Patient</b> |                          |              |   |            |                 |                       |                         |

Figure 47: Result on website



Go to the database, we can see:

| patientID | patientSSN | firstName | midName  | lastName | patientDoB | gender | phoneNumber | street         | district  | city  |
|-----------|------------|-----------|----------|----------|------------|--------|-------------|----------------|-----------|-------|
| P000025   | 6677889901 | Logan     | David    | King     | 2003-05-07 | M      | 6677889900  | 789 Palm Ct    | Lakeside  | CityR |
| P000026   | 7788990012 | Ava       | Emily    | Scott    | 1997-09-21 | F      | 7788990011  | 654 Dogwood Rd | Northside | CityS |
| P000027   | 8899001123 | Mason     | Henry    | Wright   | 1991-03-09 | M      | 8899001122  | 321 Juniper St | Southside | CityT |
| P000028   | 9900112234 | Grace     | Isabelle | Green    | 1982-02-13 | F      | 9900112233  | 123 Willow Dr  | Eastside  | CityU |
| P000029   | 0011223345 | Oliver    | Nathan   | Adams    | 1987-12-30 | M      | 0011223344  | 456 Maple Ct   | Downtown  | CityV |
| P000030   | 1122334456 | Emily     | Victoria | Baker    | 1992-08-18 | F      | 1122334455  | 789 Elm Blvd   | Suburb    | CityW |
| P000031   | 1234432100 | Rudeus    | Notous   | Greyrat  | 1990-01-01 | M      | 0129291928  | St Paul        | 2         | CityN |
| *         | NULL       | NULL      | NULL     | NULL     | NULL       | NULL   | NULL        | NULL           | NULL      | NULL  |

Figure 48: Result in database

We can conclude that the result when editing on website can affect to the database.

### 7.3 Delete

Finally, when this man Rudeus recognize that he has to go to Eris Hospital, not Baka Hospital, so we have to delete him from the list:

#### Confirm Deletion

Are you sure you want to delete the following patient?

Name: Rudeus Notous Greyrat

SSN: 1234432100

[Delete Patient](#) [Cancel](#)

Figure 49: Delete patient

Then we receive the result on our website:



|                             |                      |               |   |            |                           |                      |                        |
|-----------------------------|----------------------|---------------|---|------------|---------------------------|----------------------|------------------------|
| P000030                     | Emily Victoria Baker | Aug. 18, 1992 | F | 1122334455 | 789 Elm Blvd Suburb CityW | <a href="#">Edit</a> | <a href="#">Delete</a> |
| <a href="#">Add Patient</a> |                      |               |   |            |                           |                      |                        |

Figure 50: Result on website

Then we recheck in our database:

| patientID | patientSSN | firstName | midName   | lastName | patientDoB | gender | phoneNumber | street         | district  | city  |
|-----------|------------|-----------|-----------|----------|------------|--------|-------------|----------------|-----------|-------|
| P000024   | 5566778890 | Sofia     | Elizabeth | Allen    | 1984-11-29 | F      | 5566778899  | 456 Cherry Ave | Woodside  | CityQ |
| P000025   | 6677889901 | Logan     | David     | King     | 2003-05-07 | M      | 6677889900  | 789 Palm Ct    | Lakeside  | CityR |
| P000026   | 7788990012 | Ava       | Emily     | Scott    | 1997-09-21 | F      | 7788990011  | 654 Dogwood Rd | Northside | CityS |
| P000027   | 8899001123 | Mason     | Henry     | Wright   | 1991-03-09 | M      | 8899001122  | 321 Juniper St | Southside | CityT |
| P000028   | 9900112234 | Grace     | Isabelle  | Green    | 1982-02-13 | F      | 9900112233  | 123 Willow Dr  | Eastside  | CityU |
| P000029   | 0011223345 | Oliver    | Nathan    | Adams    | 1987-12-30 | M      | 0011223344  | 456 Maple Ct   | Downtown  | CityV |
| P000030   | 1122334456 | Emily     | Victoria  | Baker    | 1992-08-18 | F      | 1122334455  | 789 Elm Blvd   | Suburb    | CityW |
| *         | NULL       | NULL      | NULL      | NULL     | NULL       | NULL   | NULL        | NULL           | NULL      | NULL  |

Figure 51: Result in database

We can conclude that the result when deleting patient from website can affect to the database.



## 8 Indexing

The index structures are additional files on disk that provide secondary access paths, which provide alternative ways to access the records without affecting the physical placement of records in the primary data file on disk. They enable efficient access to records based on the indexing fields that are used to construct the index. Basically, any field of the file can be used to create an index, and multiple indexes on different fields - as well as indexes on multiple fields - can be constructed on the same file. A variety of indexes are possible; each of them uses a particular data structure to speed up the search.

The most prevalent types of indexes are based on ordered files (single-level indexes) and use tree data structures (multilevel indexes, B+-trees) to organize the index. Indexes can also be constructed based on hashing or other search data structures.

According to the research of our group, MySQL, which is the database of our choice, has already supported this kind of structure in its query operation. For detailed information, you can take a look at **refman-8.0-en.a4.pdf** file which we submit along with our report. This is the MySQL 8.0 Reference Manual which is installed along with the database and a thorough and well-rounded documentation of the functions and the operations of MySQL. You can also access this link <https://dev.mysql.com/doc/> for similar information in the Reference Manual.

As regards the types of indexes used by MySQL, section 10.3 of Chapter 10 and subsection 17.6.2 of Chapter 17 have all the information relevant to how indexes are utilized in MySQL and InnoDB.

This section demonstrates the performance improvement achieved by implementing indexing in the **HMS.Medical\_Staff** table with a large dataset. We will compare the query execution time for a query without an index and with an index on the **departmentID** column.

### 8.1 Setup and Table Creation

The following table schema represents the **HMS.Medical\_Staff** table, which is used to store information about medical staff members, such as their ID, SSN, name, phone number, salary, and department affiliation.

```
1 CREATE TABLE HMS.Medical_Staff (
2     staffID CHAR(7),
3     staffSSN CHAR(10) NOT NULL UNIQUE,
4     firstName VARCHAR(20) NOT NULL,
5     midName VARCHAR(50),
6     lastName VARCHAR(20),
7     staffDoB DATE,
8     gender ENUM ('F', 'M'),
9     phoneNumber CHAR(10),
10    salary INT UNSIGNED,
11    departmentID CHAR(2),
12
13    PRIMARY KEY (staffID),
14    FOREIGN KEY (departmentID) REFERENCES Department (departmentID)
15 );
```

We populate the table with a large number of rows for the demo. A sample population script might look like this:

```
1 -- Procedure to populate the table
2 DELIMITER //
3 CREATE PROCEDURE PopulateMedicalStaff()
4 BEGIN
5     DECLARE i INT DEFAULT 1;
```



```
6 WHILE i <= 1000000 DO
7     INSERT INTO HMS.Medical_Staff (staffID, staffSSN, firstName, midName,
8         lastName, staffDoB, gender, phoneNumber, salary, departmentID)
9         VALUES (CONCAT('S', LPAD(i, 6, '0')), CONCAT('SSN', i), CONCAT('First', i),
10            , CONCAT('Mid', i), CONCAT('Last', i),
11            DATE_ADD('1980-01-01', INTERVAL (i MOD 30) YEAR), IF(i MOD 2 = 0, 'M', 'F
12            ), CONCAT('555', LPAD(i, 6, '0')), 50000 + (i MOD 10000),
13            CONCAT('D', LPAD((i MOD 5) + 1, 2, '0')));
14     SET i = i + 1;
15 END WHILE;
16
17 CALL PopulateMedicalStaff();
```

## 8.2 Query Without an Index

Without indexing, the database performs a full scan of the table to retrieve all medical staff members belonging to a specific department (e.g., department '01').

```
1 SET @start_time = NOW(3);
2 SELECT * FROM HMS.Medical_Staff WHERE departmentID = '01';
3 SET @end_time = NOW(3);
4 SELECT TIMEDIFF(@end_time, @start_time) AS ExecutionTimeWithoutIndex;
```

This query retrieves all records where the `departmentID` is '01'. The execution time is measured using the `TIMEDIFF` function.

## 8.3 Creating an Index

To optimize this query, an index is created on the `departmentID` column:

```
1 CREATE INDEX idx_departmentID ON HMS.Medical_Staff(departmentID);
```

This index helps the database quickly locate the rows corresponding to a specific department, thus improving query performance.

## 8.4 Query With an Index

After the index is created, we execute the same query again to measure the performance improvement:

```
1 SET @start_time = NOW(3);
2 SELECT * FROM HMS.Medical_Staff WHERE departmentID = '01';
3 SET @end_time = NOW(3);
4 SELECT TIMEDIFF(@end_time, @start_time) AS ExecutionTimeWithIndex;
```

This query retrieves the same records, but now the database can use the index to speed up the search process.

## 8.5 Results Comparison

The following table summarizes the execution times for the query before and after indexing:



| Scenario      | Execution Time (Example) |
|---------------|--------------------------|
| Without Index | 4.2 seconds              |
| With Index    | 0.05 seconds             |

Table 2: Execution Time Comparison for HMS.Medical\_Staff Table

## 8.6 Python Automation

The process can be automated using a Python script, which connects to the MySQL database, executes the queries, and measures the execution time:

```
1 import mysql.connector
2 import time
3
4 # Connect to the database
5 conn = mysql.connector.connect(
6     host="localhost",
7     user="root",
8     password="123456789",
9     database="HMS"
10 )
11 cursor = conn.cursor()
12
13 # Query without index
14 start_time = time.time()
15 cursor.execute("SELECT * FROM HMS.Medical_Staff WHERE departmentID = '01'")
16 data = cursor.fetchall()
17 end_time = time.time()
18 print(f"Execution Time Without Index: {end_time - start_time:.2f} seconds")
19
20 # Create index
21 cursor.execute("CREATE INDEX idx_departmentID ON HMS.Medical_Staff(departmentID)")
22
23 # Query with index
24 start_time = time.time()
25 cursor.execute("SELECT * FROM HMS.Medical_Staff WHERE departmentID = '01'")
26 data = cursor.fetchall()
27 end_time = time.time()
28 print(f"Execution Time With Index: {end_time - start_time:.2f} seconds")
29
30 # Close connection
31 cursor.close()
32 conn.close()
```

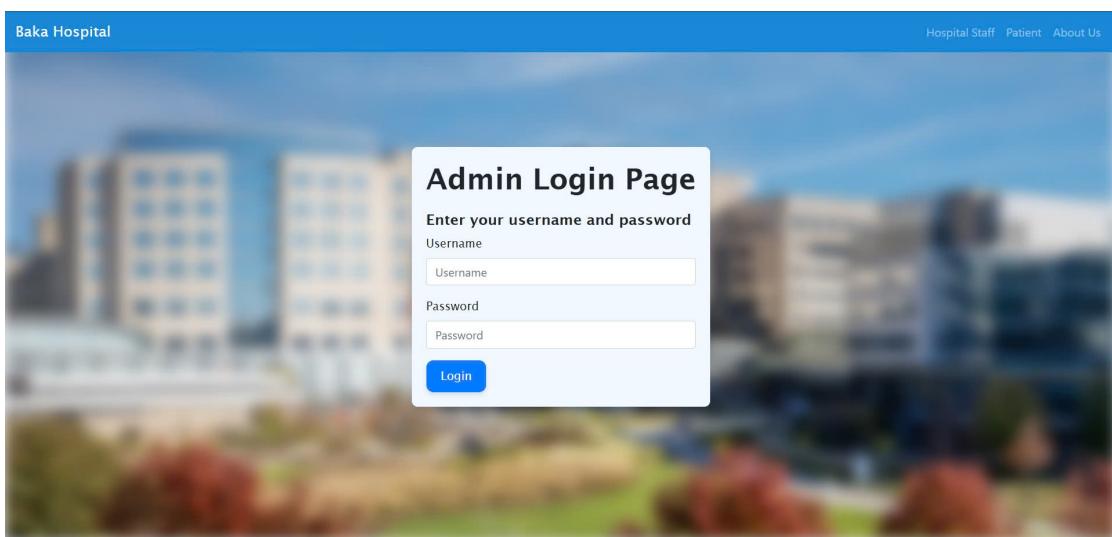
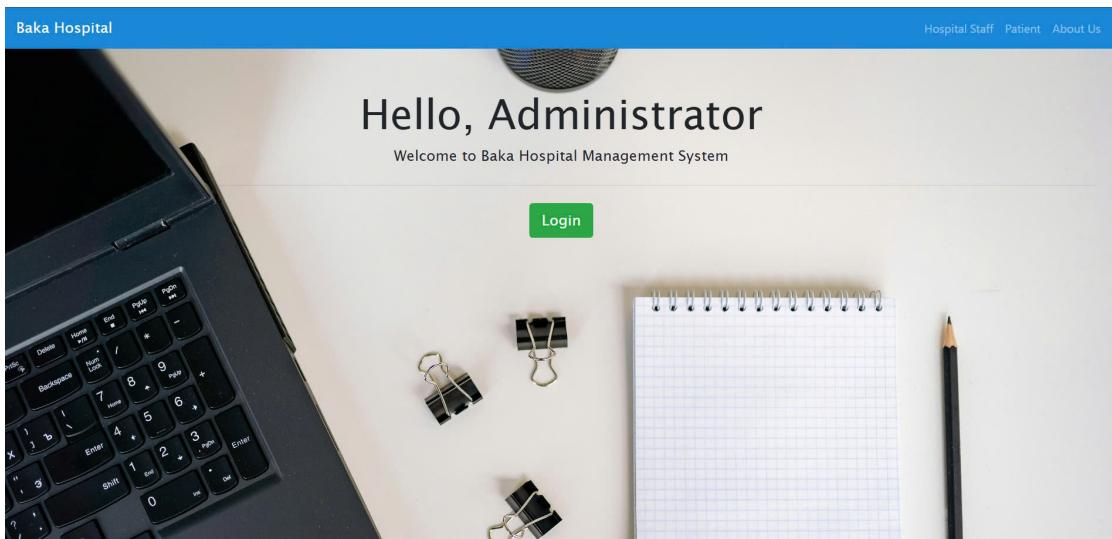
## 8.7 Conclusion

The experiment demonstrates a significant performance improvement when using indexing. Without an index, the query scans the entire table, which can be slow for large datasets. By creating an index on the `departmentID` column, the query performance improves drastically, making it more efficient for large-scale applications. This shows the importance of indexing for optimizing database performance in real-world scenarios.



## 9 Complete Application

### 9.1 Admin





| Doctor List |                      |            |                |        |              |        |             |             |                       |                         |
|-------------|----------------------|------------|----------------|--------|--------------|--------|-------------|-------------|-----------------------|-------------------------|
| ID          | Full Name            | SSN        | Date of Birth  | Gender | Phone Number | Salary | Department  | License     | Edit Information      | Delete Doctor           |
| D100001     | Alice Marie Johnson  | 1111111111 | May 15, 1980   | F      | 9998887776   | 70000  | Cardiology  | LIC00000001 | <button>Edit</button> | <button>Delete</button> |
| D100002     | Bob Andrew Smith     | 2222222222 | Sept. 23, 1975 | M      | 8887776665   | 80000  | Neurology   | LIC00000002 | <button>Edit</button> | <button>Delete</button> |
| D100003     | Clara Louise Brown   | 3333333333 | Nov. 10, 1990  | F      | 7776665554   | 75000  | Orthopedics | LIC00000003 | <button>Edit</button> | <button>Delete</button> |
| D100004     | David Michael Taylor | 4444444444 | Jan. 22, 1982  | M      | 6665554443   | 72000  | Pediatrics  | LIC00000004 | <button>Edit</button> | <button>Delete</button> |
| D100005     | Ella Grace Davis     | 5555555555 | April 30, 1995 | F      | 5554443332   | 71000  | Oncology    | LIC00000005 | <button>Edit</button> | <button>Delete</button> |
|             | Frank                |            | June           |        |              |        |             |             |                       |                         |

| Add New Doctor |                                 |  |  |  |  |  |  |  |  |  |
|----------------|---------------------------------|--|--|--|--|--|--|--|--|--|
| ID             | <input type="text"/>            |  |  |  |  |  |  |  |  |  |
| SSN            | <input type="text"/>            |  |  |  |  |  |  |  |  |  |
| First Name     | <input type="text"/>            |  |  |  |  |  |  |  |  |  |
| Middle Name    | <input type="text"/>            |  |  |  |  |  |  |  |  |  |
| Last Name      | <input type="text"/>            |  |  |  |  |  |  |  |  |  |
| Date of Birth  | <input type="text"/> dd/mm/yyyy |  |  |  |  |  |  |  |  |  |
| Gender         | <input type="text"/>            |  |  |  |  |  |  |  |  |  |



Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Edit Doctor Information

ID: D100001

SSN: 1111111111

First Name: Alice

Middle Name: Marie

Last Name: Johnson

Date of Birth: 15/05/1980

Gender:

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Confirm Deletion

Are you sure you want to delete the following doctor?

Name: Alice Marie Johnson

SSN: 1111111111

Department ID: Cardiology

**Delete Doctor** **Cancel**



| Admin<br>Khanh |                     | Baka Hospital |                |        |              |        |             |                 |                       |                         |  | Logout |  |
|----------------|---------------------|---------------|----------------|--------|--------------|--------|-------------|-----------------|-----------------------|-------------------------|--|--------|--|
|                |                     | Nurse List    |                |        |              |        |             |                 |                       |                         |  |        |  |
| ID             | Full Name           | SSN           | Date of Birth  | Gender | Phone Number | Salary | Department  | Year Experience | Edit Information      | Delete Nurse            |  |        |  |
| N100001        | Karen Anne Anderson | 1212121212    | April 10, 1985 | F      | 1112223334   | 50000  | Cardiology  | 5               | <button>Edit</button> | <button>Delete</button> |  |        |  |
| N100002        | Louis Edward Brooks | 1313131313    | June 15, 1990  | M      | 2223334445   | 48000  | Neurology   | 3               | <button>Edit</button> | <button>Delete</button> |  |        |  |
| N100003        | Mia Sophia Clark    | 1414141414    | Sept. 20, 1992 | F      | 3334445556   | 51000  | Orthopedics | 8               | <button>Edit</button> | <button>Delete</button> |  |        |  |
| N100004        | Noah James Evans    | 1515151515    | March 8, 1988  | M      | 4445556667   | 52000  | Pediatrics  | 2               | <button>Edit</button> | <button>Delete</button> |  |        |  |
| N100005        | Olivia Grace Green  | 1616161616    | Dec. 1, 1995   | F      | 5556667778   | 50000  | Oncology    | 6               | <button>Edit</button> | <button>Delete</button> |  |        |  |

| Admin<br>Khanh |  | Baka Hospital |            |             |           |               |        |  |  |  |  | Logout |  |  |  |  |
|----------------|--|---------------|------------|-------------|-----------|---------------|--------|--|--|--|--|--------|--|--|--|--|
|                |  | Add New Nurse |            |             |           |               |        |  |  |  |  |        |  |  |  |  |
|                |  |               |            |             |           |               |        |  |  |  |  |        |  |  |  |  |
| ID             |  | SSN           | First Name | Middle Name | Last Name | Date of Birth | Gender |  |  |  |  |        |  |  |  |  |
|                |  |               |            |             |           | dd/mm/yyyy    |        |  |  |  |  |        |  |  |  |  |



Baka Hospital

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Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Edit Nurse Information

ID: N100001

SSN: 1212121212

First Name: Karen

Middle Name: Anne

Last Name: Anderson

Date of Birth: 10/04/1985

Gender:

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Confirm Deletion

Are you sure you want to delete the following nurse?

Name: Karen Anne Anderson

SSN: 1212121212

Department ID: Cardiology

**Delete Nurse** **Cancel**



AdminKhanh

Baka HospitalLogout

DashboardDoctorNursePatientMedical Record and TreatmentDepartmentAppointmentRoom

| ID      | Full Name              | Date of Birth  | Gender | Phone Number | Address                        | Edit Information   | Delete Patient   |
|---------|------------------------|----------------|--------|--------------|--------------------------------|--|--|
| P000001 | John Michael Doe       | Jan. 15, 1990  | M      | 1234567890   | 123 Oak St Downtown CityA      | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000002 | Alice Marie Smith      | July 23, 1985  | F      | 2345678901   | 456 Maple Ave Uptown CityB     | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000003 | Robert Lee Johnson     | Dec. 2, 1978   | M      | 3456789012   | 789 Pine Rd Suburb CityC       | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000004 | Linda Ann Brown        | Sept. 17, 1992 | F      | 4567890123   | 321 Birch Ln Westside CityA    | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000005 | Michael James Williams | May 10, 1980   | M      | 5678901234   | 654 Cedar Dr Eastside CityB    | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000006 | Sophia Grace Taylor    | April 20, 2000 | F      | 6789012345   | 123 Elm St Northside CityC     | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000007 | David Charles Miller   | Nov. 5, 1995   | M      | 7890123456   | 987 Oak St Southside CityA     | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |
| P000008 | Emma Rose Davis        | March 13, 1989 | F      | 8901234567   | 654 Willow Ave Riverside CityB | <button style="border: none; background-color: #0070C0; color: white; padding: 2px 5px;">Edit</button> | <button style="border: none; background-color: #DC3545; color: white; padding: 2px 5px;">Delete</button> |

AdminKhanh

Baka HospitalLogout

DashboardDoctorNursePatientMedical Record and TreatmentDepartmentAppointmentRoom

### Add New Patient

ID

SSN

First Name

Middle Name

Last Name

Date of Birth dd/mm/yyyy

Gender



Baka Hospital

Logout

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Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

## Edit Record

### Medical Record

Record ID: 1

Patient ID: P000001

Recorddate: 02/11/2024

Diagnosis: Normal chest X-ray

Test Results: No abnormalities detected

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

## Confirm Deletion

Are you sure you want to delete the following Record?

**Record ID:** 1

**Treatment ID:**

**Diagnosis:** Normal chest X-ray

**Result:** No abnormalities detected

**Procedure:** X-ray for chest examination

**Delete Record** **Cancel**



| Medical Records |            |                        |              |              |                         |                             |                |                                   |                       |                         |
|-----------------|------------|------------------------|--------------|--------------|-------------------------|-----------------------------|----------------|-----------------------------------|-----------------------|-------------------------|
| Record ID       | Patient ID | Patient Name           | Record Date  | Treatment ID | Diagnosis               | Result                      | Treatment Date | Treatment Procedure               | Edit Record           | Delete Record           |
| 1               | P000001    | John Michael Doe       | Nov. 2, 2024 | 1            | Normal chest X-ray      | No abnormalities detected   | Nov. 1, 2024   | X-ray for chest examination       | <button>Edit</button> | <button>Delete</button> |
| 2               | P000002    | Alice Marie Smith      | Nov. 3, 2024 | 2            | Pre-diabetes            | Blood sugar levels elevated | Nov. 2, 2024   | Blood test for diabetes screening | <button>Edit</button> | <button>Delete</button> |
| 3               | P000003    | Robert Lee Johnson     | Nov. 4, 2024 | 3            | Torn meniscus           | MRI confirmed damage        | Nov. 3, 2024   | MRI for knee injury               | <button>Edit</button> | <button>Delete</button> |
| 4               | P000004    | Linda Ann Brown        | Nov. 5, 2024 | 4            | Normal ECG              | No irregular heartbeats     | Nov. 4, 2024   | ECG for heart health check-up     | <button>Edit</button> | <button>Delete</button> |
| 5               | P000005    | Michael James Williams | Nov. 6, 2024 | 5            | No significant findings | Ultrasound showed no issues | Nov. 5, 2024   | Ultrasound for abdominal pain     | <button>Edit</button> | <button>Delete</button> |
| 6               | P000006    | Sophia Grace           | Nov. 7, 2024 | 6            | Gastritis               | Endoscopy revealed          | Nov. 6,        | Endoscopy for gastrointestinal    | <button>Edit</button> | <button>Delete</button> |

### Add New Record

#### Medical Record

Record ID:

Patient ID:

Record date:  dd/mm/yyyy

Diagnosis:

Test Results:



Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

## Edit Record

### Medical Record

Record ID: 1

Patient ID: P000001

Recorddate: 02/11/2024

Diagnosis: Normal chest X-ray

Test Results: No abnormalities detected

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

## Confirm Deletion

Are you sure you want to delete the following Record?

**Record ID:** 1

**Treatment ID:**

**Diagnosis:** Normal chest X-ray

**Result:** No abnormalities detected

**Procedure:** X-ray for chest examination

**Delete Record** **Cancel**



Baka Hospital Logout

Admin Khanh

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- [Doctor](#)
- [Nurse](#)
- [Patient](#)
- [Medical Record and Treatment](#)
- [Department](#)
- [Appointment](#)
- [Room](#)

### Department List

| Department ID | Department Name  | Head Doctor            | Period               |
|---------------|------------------|------------------------|----------------------|
| 01            | Cardiology       | Alice Marie Johnson    | 2015-06-01 - Present |
| 02            | Neurology        | Bob Andrew Smith       | 2017-09-15 - Present |
| 03            | Orthopedics      | Clara Louise Brown     | 2016-01-20 - Present |
| 04            | Pediatrics       | David Michael Taylor   | 2018-04-10 - Present |
| 05            | Oncology         | Ella Grace Davis       | 2019-11-05 - Present |
| 06            | Dermatology      | Frank John Miller      | 2014-07-23 - Present |
| 07            | Radiology        | Grace Emily Wilson     | 2020-03-18 - Present |
| 08            | Surgery          | Henry Arthur Moore     | 2021-12-01 - Present |
| 09            | Psychiatry       | Isabella Sophia Harris | 2022-05-15 - Present |
| 10            | Gastroenterology | Jack Thomas Martinez   | 2023-02-10 - Present |

Baka Hospital Logout

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- [Nurse](#)
- [Patient](#)
- [Medical Record and Treatment](#)
- [Department](#)
- [Appointment](#)
- [Room](#)

### Appointment List

| Appointment ID | Doctor ID | Patient ID | Date          | Time       | Edit Appointment      | Delete Appointment      |
|----------------|-----------|------------|---------------|------------|-----------------------|-------------------------|
| 1              | D100003   | P000003    | Dec. 1, 2024  | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |
| 2              | D100002   | P000002    | Dec. 1, 2024  | 9:30 a.m.  | <button>Edit</button> | <button>Delete</button> |
| 3              | D100001   | P000001    | Dec. 1, 2024  | 9 a.m.     | <button>Edit</button> | <button>Delete</button> |
| 4              | D100002   | P000007    | Dec. 10, 2024 | 11:30 a.m. | <button>Edit</button> | <button>Delete</button> |
| 5              | D100003   | P000004    | Dec. 9, 2024  | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |
| 6              | D100004   | P000004    | Dec. 2, 2024  | 10:30 a.m. | <button>Edit</button> | <button>Delete</button> |
| 7              | D100005   | P000005    | Dec. 2, 2024  | 11 a.m.    | <button>Edit</button> | <button>Delete</button> |
| 8              | D100006   | P000006    | Dec. 3, 2024  | 11:30 a.m. | <button>Edit</button> | <button>Delete</button> |
| 9              | D100007   | P000007    | Dec. 3, 2024  | noon       | <button>Edit</button> | <button>Delete</button> |
| 10             | D100008   | P000008    | Dec. 4, 2024  | 12:30 p.m. | <button>Edit</button> | <button>Delete</button> |
| 11             | D100009   | P000009    | Dec. 4, 2024  | 1 p.m.     | <button>Edit</button> | <button>Delete</button> |



Baka Hospital

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Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Add New Appointment

ID:

Patient ID:

Doctor ID:

Date:

Time:

**Close** **Add Appointment**

Baka Hospital

Logout

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Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Edit Appointment Information

ID:

Patient ID:

Doctor ID:

Date:

Time:

**Close** **Save Changes**



Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Confirm Deletion

Are you sure you want to delete the following appointment?

ID: 1  
Doctor ID: D100003  
Patient ID: P000003  
Date: Dec. 1, 2024  
Time: 10 a.m.

Delete Appointment Cancel

Baka Hospital

Logout

Admin Khanh

Dashboard Doctor Nurse Patient Medical Record and Treatment Department Appointment Room

### Room List

| Room ID | Capacity | Room Type         | Current Number of Patients | Add Patient | List of Patients |
|---------|----------|-------------------|----------------------------|-------------|------------------|
| 101     | 2        | General Ward      | 0                          | Add Patient | List of Patients |
| 102     | 1        | ICU               | 1                          | Add Patient | List of Patients |
| 103     | 3        | General Ward      | 0                          | Add Patient | List of Patients |
| 104     | 1        | ICU               | 0                          | Add Patient | List of Patients |
| 105     | 2        | Private Room      | 1                          | Add Patient | List of Patients |
| 106     | 4        | General Ward      | 3                          | Add Patient | List of Patients |
| 107     | 1        | ICU               | 0                          | Add Patient | List of Patients |
| 108     | 3        | Semi-Private Room | 0                          | Add Patient | List of Patients |
| 109     | 2        | Private Room      | 0                          | Add Patient | List of Patients |
| 110     | 4        | General Ward      | 0                          | Add Patient | List of Patients |



Baka Hospital

Logout

Admin  
Khanh

Dashboard  
Doctor  
Nurse  
Patient  
Medical Record and Treatment  
Department  
Appointment  
Room

### Add New Patient into Room 101

Patient ID:  
-----

Nurse ID:  
-----

Admitted Date:  
dd/mm/yyyy

Discharged Date:  
dd/mm/yyyy

[Close](#) [Add New Room Information](#)

Baka Hospital

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Dashboard  
Doctor  
Nurse  
Patient  
Medical Record and Treatment  
Department  
Appointment  
Room

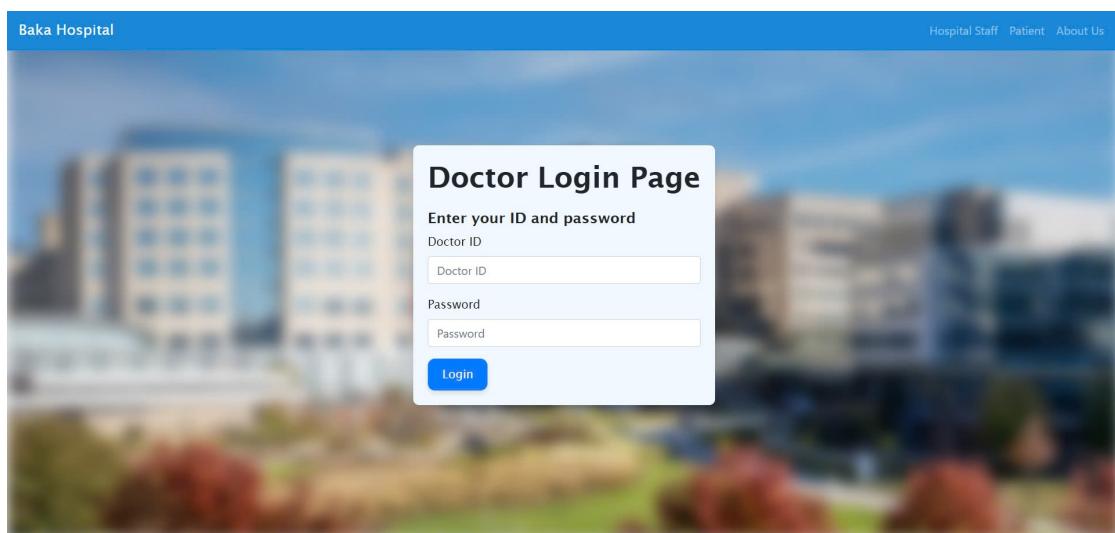
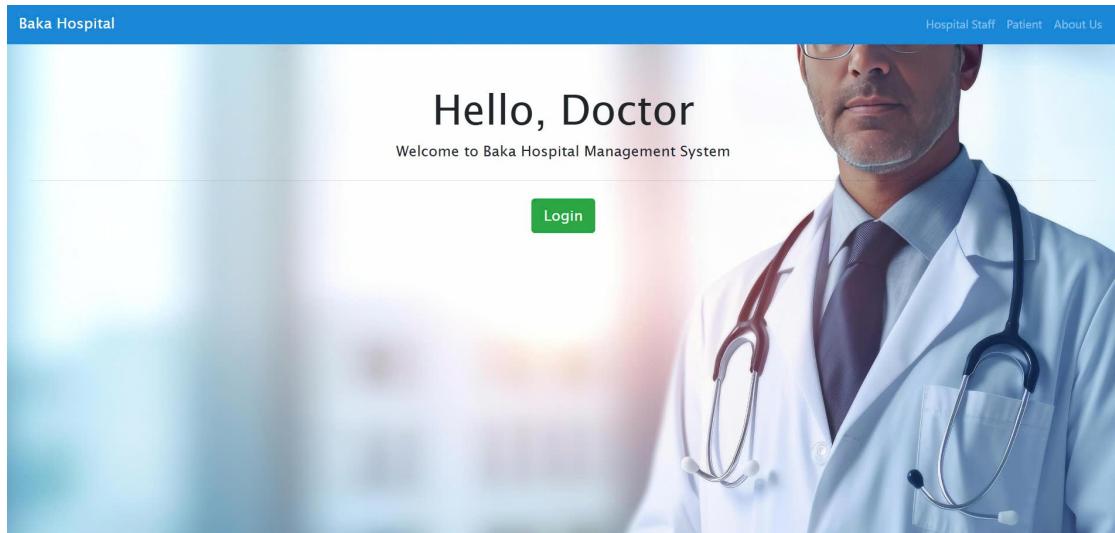
### Patient List in Room 106

| ID      | Full Name           | SSN        | Date of Birth  | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|---------------------|------------|----------------|--------------|--------|---------------|-----------------|
| P000004 | Linda Ann Brown     | 1928374650 | Sept. 17, 1992 | 4567890123   | F      | Dec. 1, 2024  | Dec. 10, 2024   |
| P000006 | Sophia Grace Taylor | 2847361820 | April 20, 2000 | 6789012345   | F      | Dec. 5, 2024  | Dec. 12, 2024   |
| P000029 | Oliver Nathan Adams | 0011223345 | Dec. 30, 1987  | 0011223344   | M      | Dec. 9, 2024  | Dec. 15, 2024   |

[Back To Room List](#)



## 9.2 Doctor





Baka Hospital

Logout

Doctor  
D100001

Dashboard  
Doctor Information  
Medical Record and Treatment  
Doctor  
Patient  
Nurse  
Department  
Room  
Appointment

**Doctor Information**

ID: D100001  
SSN: 1111111111  
First Name: Alice  
Middle Name: Marie  
Last Name: Johnson  
Date of Birth: May 15, 1980  
Gender: F  
Phone Number: 9998887776  
Salary: 70000  
Department: Cardiology

Baka Hospital

Logout

Doctor  
D100001

Dashboard  
Doctor Information  
Medical Record and Treatment  
Doctor  
Patient  
Nurse  
Department  
Room  
Appointment

**Medical Records**

| Record ID | Patient ID | Patient Name           | Record Date  | Treatment ID | Diagnosis               | Result                          | Treatment Date | Treatment Procedure                        | Edit Record           | Delete Record           |
|-----------|------------|------------------------|--------------|--------------|-------------------------|---------------------------------|----------------|--|-----------------------|-------------------------|
| 1         | P00001     | John Michael Doe       | Nov. 2, 2024 | 1            | Normal chest X-ray      | No abnormalities detected       | Nov. 1, 2024   | X-ray for chest examination                | <button>Edit</button> | <button>Delete</button> |
| 2         | P00002     | Alice Marie Smith      | Nov. 3, 2024 | 2            | Pre-diabetes            | Blood sugar levels elevated     | Nov. 2, 2024   | Blood test for diabetes screening          | <button>Edit</button> | <button>Delete</button> |
| 3         | P00003     | Robert Lee Johnson     | Nov. 4, 2024 | 3            | Torn meniscus           | MRI confirmed damage            | Nov. 3, 2024   | MRI for knee injury                        | <button>Edit</button> | <button>Delete</button> |
| 4         | P00004     | Linda Ann Brown        | Nov. 5, 2024 | 4            | Normal ECG              | No irregular heartbeats         | Nov. 4, 2024   | ECG for heart health check-up              | <button>Edit</button> | <button>Delete</button> |
| 5         | P00005     | Michael James Williams | Nov. 6, 2024 | 5            | No significant findings | Ultrasound showed no issues     | Nov. 5, 2024   | Ultrasound for abdominal pain              | <button>Edit</button> | <button>Delete</button> |
| 6         | P00006     | Sophia Grace Taylor    | Nov. 7, 2024 | 6            | Gastritis               | Endoscopy revealed inflammation | Nov. 6, 2024   | Endoscopy for gastrointestinal examination | <button>Edit</button> | <button>Delete</button> |
| 7         | P00007     | David                  | Nov. 8, 2024 | 7            | Fractured               | X-ray confirmed                 | Nov. 7, 2024   | X-ray for fractured arm                    | <button>Edit</button> | <button>Delete</button> |



Baka Hospital

Logout

Doctor  
D100001

Dashboard  
Doctor Information  
Medical Record and Treatment  
Doctor  
Patient  
Nurse  
Department  
Room  
Appointment

## Add New Record

### Medical Record

Record ID:

Patient ID:

Recorddate:  
 dd/mm/yyyy

Diagnosis:

Test Results:

Baka Hospital

Logout

Doctor  
D100001

Dashboard  
Doctor Information  
Medical Record and Treatment  
Doctor  
Patient  
Nurse  
Department  
Room  
Appointment

## Edit Record

### Medical Record

Record ID:  
 1

Patient ID:  
 P000001

Recorddate:  
 02/11/2024

Diagnosis:  
 Normal chest X-ray

Test Results:  
 No abnormalities detected



Baka Hospital

Logout

Doctor  
D100001

Dashboard  
Doctor Information  
Medical Record and Treatment  
Doctor  
Patient  
Nurse  
Department  
Room  
Appointment

**Confirm Deletion**

Are you sure you want to delete the following Record?

Record ID: 1  
Treatment ID: 1  
Diagnosis: Normal chest X-ray  
Result: No abnormalities detected  
Procedure: X-ray for chest examination

**Delete Record** **Cancel**

Baka Hospital

Logout

Doctor  
D100001

Dashboard  
Doctor Information  
Medical Record and Treatment  
Doctor  
Patient  
Nurse  
Department  
Room  
Appointment

**Doctor List**

| ID      | Full Name              | Date of Birth  | Gender | Phone Number | Department       | License     |
|---------|------------------------|----------------|--------|--------------|------------------|-------------|
| D100001 | Alice Marie Johnson    | May 15, 1980   | F      | 9998887776   | Cardiology       | LIC00000001 |
| D100002 | Bob Andrew Smith       | Sept. 23, 1975 | M      | 8887776665   | Neurology        | LIC00000002 |
| D100003 | Clara Louise Brown     | Nov. 10, 1990  | F      | 7776665554   | Orthopedics      | LIC00000003 |
| D100004 | David Michael Taylor   | Jan. 22, 1982  | M      | 6665554443   | Pediatrics       | LIC00000004 |
| D100005 | Ella Grace Davis       | April 30, 1995 | F      | 5554443332   | Oncology         | LIC00000005 |
| D100006 | Frank John Miller      | June 18, 1978  | M      | 4443332221   | Dermatology      | LIC00000006 |
| D100007 | Grace Emily Wilson     | Aug. 5, 1987   | F      | 3332221110   | Radiology        | LIC00000007 |
| D100008 | Henry Arthur Moore     | March 12, 1985 | M      | 2221110009   | Surgery          | LIC00000008 |
| D100009 | Isabella Sophia Harris | Dec. 20, 1992  | F      | 1110009998   | Psychiatry       | LIC00000009 |
| D100010 | Jack Thomas Martinez   | July 1, 1989   | M      | 0009998887   | Gastroenterology | LIC00000010 |
| D100011 | Emily Charlotte Adams  | Feb. 17, 1983  | F      | 9876543210   | Cardiology       | LIC00000011 |



| Patient List |            |                        |                |        |              |                                |
|--------------|------------|------------------------|----------------|--------|--------------|--------------------------------|
| ID           | SSN        | Full Name              | Date of Birth  | Gender | Phone Number | Address                        |
| P000001      | 1234567890 | John Michael Doe       | Jan. 15, 1990  | M      | 1234567890   | 123 Oak St Downtown CityA      |
| P000002      | 9876543210 | Alice Marie Smith      | July 23, 1985  | F      | 2345678901   | 456 Maple Ave Uptown CityB     |
| P000003      | 5647382910 | Robert Lee Johnson     | Dec. 2, 1978   | M      | 3456789012   | 789 Pine Rd Suburb CityC       |
| P000004      | 1928374650 | Linda Ann Brown        | Sept. 17, 1992 | F      | 4567890123   | 321 Birch Ln Westside CityA    |
| P000005      | 5738291046 | Michael James Williams | May 10, 1980   | M      | 5678901234   | 654 Cedar Dr Eastside CityB    |
| P000006      | 2847361820 | Sophia Grace Taylor    | April 20, 2000 | F      | 6789012345   | 123 Elm St Northside CityC     |
| P000007      | 3746281930 | David Charles Miller   | Nov. 5, 1995   | M      | 7890123456   | 987 Oak St Southside CityA     |
| P000008      | 8745629301 | Emma Rose Davis        | March 13, 1989 | F      | 8901234567   | 654 Willow Ave Riverside CityB |
| P000009      | 8475620193 | William Henry Moore    | Feb. 25, 2002  | M      | 9012345678   | 321 Pine Rd Lakeside CityC     |
| P000010      | 2738491012 | Olivia Lynn Garcia     | June 30, 1994  | F      | 0123456789   | 987 Birch Ln Valley CityA      |
| P000011      | 1827364556 | James Edward Anderson  | Aug. 18, 1988  | M      | 2233445566   | 789 Walnut St Hillside CityD   |

| Nurse List |                      |                |        |              |                  |                 |
|------------|----------------------|----------------|--------|--------------|------------------|-----------------|
| ID         | Full Name            | Date of Birth  | Gender | Phone Number | Department       | Year Experience |
| N100001    | Karen Anne Anderson  | April 10, 1985 | F      | 1112223334   | Cardiology       | 5               |
| N100002    | Louis Edward Brooks  | June 15, 1990  | M      | 2223334445   | Neurology        | 3               |
| N100003    | Mia Sophia Clark     | Sept. 20, 1992 | F      | 3334445556   | Orthopedics      | 8               |
| N100004    | Noah James Evans     | March 8, 1988  | M      | 4445556667   | Pediatrics       | 2               |
| N100005    | Olivia Grace Green   | Dec. 1, 1995   | F      | 5556667778   | Oncology         | 6               |
| N100006    | Peter George Hill    | July 18, 1991  | M      | 6667778889   | Dermatology      | 4               |
| N100007    | Quinn Diana Jones    | Nov. 25, 1983  | F      | 7778889990   | Radiology        | 7               |
| N100008    | Ryan William King    | Aug. 30, 1987  | M      | 8889990001   | Surgery          | 10              |
| N100009    | Sophia Charlotte Lee | May 12, 1990   | F      | 9990001112   | Psychiatry       | 1               |
| N100010    | Thomas Henry Moore   | Oct. 3, 1985   | M      | 0001112223   | Gastroenterology | 9               |
| N100011    | Ava Emily Nelson     | March 14, 1994 | F      | 1112223335   | Cardiology       | 9               |



| Doctor                       |  | Baka Hospital   |                  |                        |                      |
|------------------------------|--|-----------------|------------------|------------------------|----------------------|
| D100001                      |  | Department List |                  |                        |                      |
|                              |  | Department ID   | Department Name  | Head Doctor            | Period               |
| Dashboard                    |  | 01              | Cardiology       | Alice Marie Johnson    | 2015-06-01 - Present |
| Doctor Information           |  | 02              | Neurology        | Bob Andrew Smith       | 2017-09-15 - Present |
| Medical Record and Treatment |  | 03              | Orthopedics      | Clara Louise Brown     | 2016-01-20 - Present |
| Doctor                       |  | 04              | Pediatrics       | David Michael Taylor   | 2018-04-10 - Present |
| Patient                      |  | 05              | Oncology         | Ella Grace Davis       | 2019-11-05 - Present |
| Nurse                        |  | 06              | Dermatology      | Frank John Miller      | 2014-07-23 - Present |
| Department                   |  | 07              | Radiology        | Grace Emily Wilson     | 2020-03-18 - Present |
| Room                         |  | 08              | Surgery          | Henry Arthur Moore     | 2021-12-01 - Present |
| Appointment                  |  | 09              | Psychiatry       | Isabella Sophia Harris | 2022-05-15 - Present |
|                              |  | 10              | Gastroenterology | Jack Thomas Martinez   | 2023-02-10 - Present |

| Doctor                       |  | Baka Hospital |          |                   |                            |                                   |
|------------------------------|--|---------------|----------|-------------------|----------------------------|-----------------------------------|
| D100001                      |  | Room List     |          |                   |                            |                                   |
|                              |  | Room ID       | Capacity | Room Type         | Current Number of Patients | List of Patients                  |
| Dashboard                    |  | 101           | 2        | General Ward      | 0                          | <button>List of Patients</button> |
| Doctor Information           |  | 102           | 1        | ICU               | 1                          | <button>List of Patients</button> |
| Medical Record and Treatment |  | 103           | 3        | General Ward      | 0                          | <button>List of Patients</button> |
| Doctor                       |  | 104           | 1        | ICU               | 0                          | <button>List of Patients</button> |
| Patient                      |  | 105           | 2        | Private Room      | 1                          | <button>List of Patients</button> |
| Nurse                        |  | 106           | 4        | General Ward      | 3                          | <button>List of Patients</button> |
| Department                   |  | 107           | 1        | ICU               | 0                          | <button>List of Patients</button> |
| Room                         |  | 108           | 3        | Semi-Private Room | 0                          | <button>List of Patients</button> |
| Appointment                  |  | 109           | 2        | Private Room      | 0                          | <button>List of Patients</button> |
|                              |  | 110           | 4        | General Ward      | 0                          | <button>List of Patients</button> |



Baka Hospital

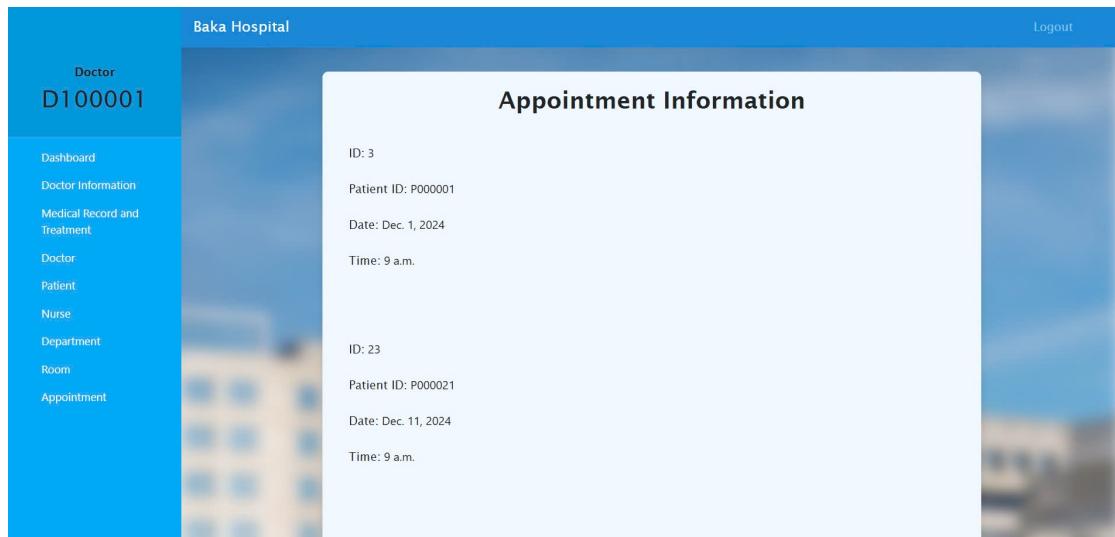
Logout

Doctor  
D100001

Appointment Information

ID: 3  
Patient ID: P000001  
Date: Dec. 1, 2024  
Time: 9 a.m.

ID: 23  
Patient ID: P000021  
Date: Dec. 11, 2024  
Time: 9 a.m.



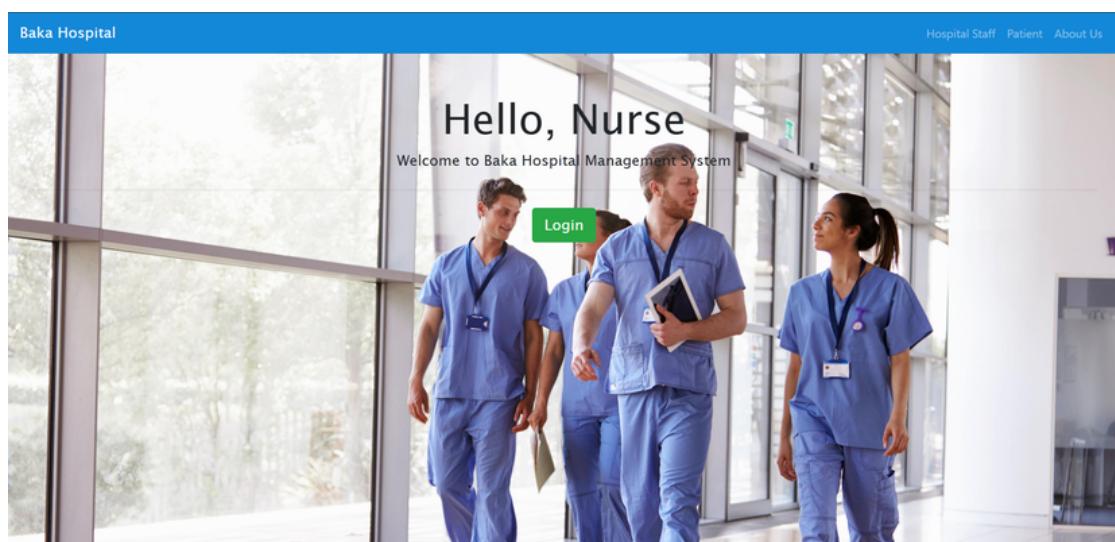
### 9.3 Nurse

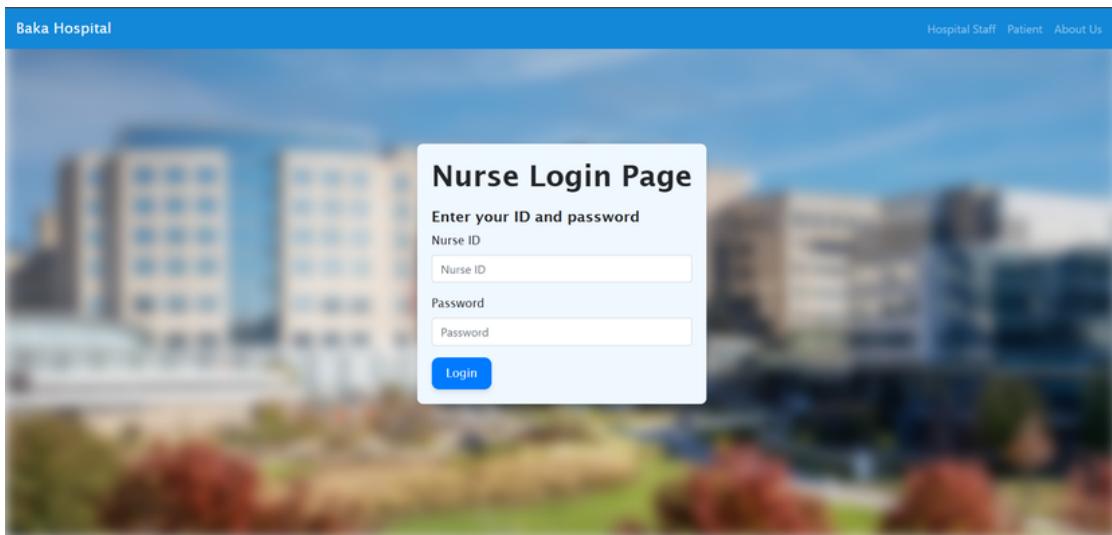
Baka Hospital

Hospital Staff Patient About Us

Hello, Nurse  
Welcome to Baka Hospital Management System

Login





Nurse Information

ID: N100001

SSN: 1212121212

First Name: Karen

Middle Name: Anne

Last Name: Anderson

Date of Birth: April 10, 1985

Gender: F

Phone Number: 1112223334

Salary: 50000

Department: Cardiology



| Medical Records              |           |            |                        |              |              |                         |                                 |                |  | Logout                |                         |
|------------------------------|-----------|------------|------------------------|--------------|--------------|-------------------------|---------------------------------|----------------|--|-----------------------|-------------------------|
| Nurse                        |           |            |                        |              |              |                         |                                 |                |  |                       |                         |
| N100001                      | Record ID | Patient ID | Patient Name           | Record Date  | Treatment ID | Diagnosis               | Result                          | Treatment Date | Treatment Procedure                        | Edit Record           | Delete Record           |
| Dashboard                    | 1         | P000001    | John Michael Doe       | Nov. 2, 2024 | 1            | Normal chest X-ray      | No abnormalities detected       | Nov. 1, 2024   | X-ray for chest examination                | <button>Edit</button> | <button>Delete</button> |
| Information                  | 2         | P000002    | Alice Marie Smith      | Nov. 3, 2024 | 2            | Pre-diabetes            | Blood sugar levels elevated     | Nov. 2, 2024   | Blood test for diabetes screening          | <button>Edit</button> | <button>Delete</button> |
| Medical Record and Treatment | 3         | P000003    | Robert Lee Johnson     | Nov. 4, 2024 | 3            | Torn meniscus           | MRI confirmed damage            | Nov. 3, 2024   | MRI for knee injury                        | <button>Edit</button> | <button>Delete</button> |
| Patient List                 | 4         | P000004    | Linda Ann Brown        | Nov. 5, 2024 | 4            | Normal ECG              | No irregular heartbeats         | Nov. 4, 2024   | ECG for heart health check-up              | <button>Edit</button> | <button>Delete</button> |
| Doctor List                  | 5         | P000005    | Michael James Williams | Nov. 6, 2024 | 5            | No significant findings | Ultrasound showed no issues     | Nov. 5, 2024   | Ultrasound for abdominal pain              | <button>Edit</button> | <button>Delete</button> |
| Nurse List                   | 6         | P000006    | Sophia Grace Taylor    | Nov. 7, 2024 | 6            | Gastritis               | Endoscopy revealed inflammation | Nov. 6, 2024   | Endoscopy for gastrointestinal examination | <button>Edit</button> | <button>Delete</button> |
| Department List              | 7         | P000007    | David                  | Nov. 8,      | 7            | Fractured               | X-ray confirmed                 | Nov. 7, 2024   | X-ray for fractured arm                    | <button>Edit</button> | <button>Delete</button> |
| Room                         |           |            |                        |              |              |                         |                                 |                |  |                       |                         |

| Nurse                        | Baka Hospital  |                                 | Logout                          |
|------------------------------|----------------|---------------------------------|---------------------------------|
| N100001                      | Add New Record |                                 |                                 |
| Dashboard                    | Record ID:     | <input type="text"/>            |                                 |
| Information                  | Patient ID:    | <input type="text"/>            |                                 |
| Medical Record and Treatment | Recorddate:    | <input type="text"/> dd/mm/yyyy | <input type="button" value=""/> |
| Patient List                 | Diagnosis:     | <input type="text"/>            |                                 |
| Doctor List                  | Test Results:  | <input type="text"/>            |                                 |
| Nurse List                   |                |                                 |                                 |
| Department List              |                |                                 |                                 |
| Room                         |                |                                 |                                 |



Baka Hospital

Nurse  
N100001

Logout

## Edit Record

### Medical Record

Record ID:

Patient ID:

Recorddate:

Diagnosis:

Test Results:

Baka Hospital

Nurse  
N100001

Logout

## Confirm Deletion

Are you sure you want to delete the following Record?

**Record ID:** 1

**Treatment ID:**

**Diagnosis:** Normal chest X-ray

**Result:** No abnormalities detected

**Procedure:** X-ray for chest examination

**Delete Record** **Cancel**



| Nurse<br>N100001 |                        | Baka Hospital  |        |              |                          |       | Logout |
|------------------|------------------------|----------------|--------|--------------|--------------------------|-------|--------|
|                  |                        | Patient List   |        |              |                          |       |        |
| ID               | Full Name              | Date of Birth  | Gender | Phone Number | Address                  |       |        |
| P000001          | John Michael Doe       | Jan. 15, 1990  | M      | 1234567890   | 123 Oak St Downtown      | CityA |        |
| P000002          | Alice Marie Smith      | July 23, 1985  | F      | 2345678901   | 456 Maple Ave Uptown     | CityB |        |
| P000003          | Robert Lee Johnson     | Dec. 2, 1978   | M      | 3456789012   | 789 Pine Rd Suburb       | CityC |        |
| P000004          | Linda Ann Brown        | Sept. 17, 1992 | F      | 4567890123   | 321 Birch Ln Westside    | CityA |        |
| P000005          | Michael James Williams | May 10, 1980   | M      | 5678901234   | 654 Cedar Dr Eastside    | CityB |        |
| P000006          | Sophia Grace Taylor    | April 20, 2000 | F      | 6789012345   | 123 Elm St Northside     | CityC |        |
| P000007          | David Charles Miller   | Nov. 5, 1995   | M      | 7890123456   | 987 Oak St Southside     | CityA |        |
| P000008          | Emma Rose Davis        | March 13, 1989 | F      | 8901234567   | 654 Willow Ave Riverside | CityB |        |
| P000009          | William Henry Moore    | Feb. 25, 2002  | M      | 9012345678   | 321 Pine Rd Lakeside     | CityC |        |
| P000010          | Olivia Lynn Garcia     | June 30, 1994  | F      | 0123456789   | 987 Birch Ln Valley      | CityA |        |
| P000011          | James Edward Anderson  | Aug. 18, 1988  | M      | 223445566    | 789 Walnut St Hillside   | CityD |        |

| Nurse<br>N100001 |                        | Baka Hospital  |        |              |                  |             | Logout |
|------------------|------------------------|----------------|--------|--------------|------------------|-------------|--------|
|                  |                        | Doctor List    |        |              |                  |             |        |
| ID               | Full Name              | Date of Birth  | Gender | Phone Number | Department       | License     |        |
| D100001          | Alice Marie Johnson    | May 15, 1980   | F      | 9998887776   | Cardiology       | LIC00000001 |        |
| D100002          | Bob Andrew Smith       | Sept. 23, 1975 | M      | 8887776665   | Neurology        | LIC00000002 |        |
| D100003          | Clara Louise Brown     | Nov. 10, 1990  | F      | 7776665554   | Orthopedics      | LIC00000003 |        |
| D100004          | David Michael Taylor   | Jan. 22, 1982  | M      | 6665554443   | Pediatrics       | LIC00000004 |        |
| D100005          | Ella Grace Davis       | April 30, 1995 | F      | 5554443332   | Oncology         | LIC00000005 |        |
| D100006          | Frank John Miller      | June 18, 1978  | M      | 4443332221   | Dermatology      | LIC00000006 |        |
| D100007          | Grace Emily Wilson     | Aug. 5, 1987   | F      | 3332221110   | Radiology        | LIC00000007 |        |
| D100008          | Henry Arthur Moore     | March 12, 1985 | M      | 2221110009   | Surgery          | LIC00000008 |        |
| D100009          | Isabella Sophia Harris | Dec. 20, 1992  | F      | 1110009998   | Psychiatry       | LIC00000009 |        |
| D100010          | Jack Thomas Martinez   | July 1, 1989   | M      | 0009998887   | Gastroenterology | LIC00000010 |        |
| D100011          | Emily Charlotte Adams  | Feb. 17, 1983  | F      | 9876543210   | Cardiology       | LIC00000011 |        |



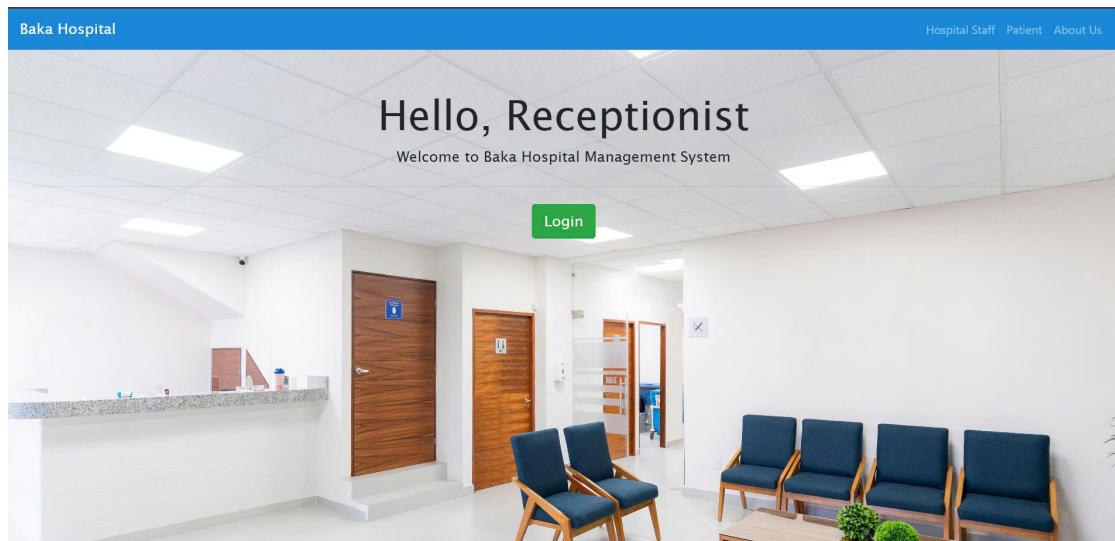
| Baka Hospital |                              |           |                      |                |              |            | Logout           |    |
|---------------|------------------------------|-----------|----------------------|----------------|--------------|------------|------------------|----|
| Nurse List    |                              |           |                      |                |              |            | Logout           |    |
| Nurse         | ID                           | Full Name | Date of Birth        | Gender         | Phone Number | Department | Year Experience  |    |
| N100001       | Dashboard                    | N100001   | Karen Anne Anderson  | April 10, 1985 | F            | 1112223334 | Cardiology       | 5  |
|               | Information                  | N100002   | Louis Edward Brooks  | June 15, 1990  | M            | 2223334445 | Neurology        | 3  |
|               | Medical Record and Treatment | N100003   | Mia Sophia Clark     | Sept. 20, 1992 | F            | 3334445556 | Orthopedics      | 8  |
|               | Patient List                 | N100004   | Noah James Evans     | March 8, 1988  | M            | 4445556667 | Pediatrics       | 2  |
|               | Doctor List                  | N100005   | Olivia Grace Green   | Dec. 1, 1995   | F            | 5556667778 | Oncology         | 6  |
|               | Nurse List                   | N100006   | Peter George Hill    | July 18, 1991  | M            | 6667778889 | Dermatology      | 4  |
|               | Department List              | N100007   | Quinn Diana Jones    | Nov. 25, 1983  | F            | 7778889990 | Radiology        | 7  |
|               | Room                         | N100008   | Ryan William King    | Aug. 30, 1987  | M            | 8889990001 | Surgery          | 10 |
|               |                              | N100009   | Sophia Charlotte Lee | May 12, 1990   | F            | 9990001112 | Psychiatry       | 1  |
|               |                              | N100010   | Thomas Henry Moore   | Oct. 3, 1985   | M            | 0001112223 | Gastroenterology | 9  |
|               |                              | N100011   | Ava Emily Nelson     | March 14, 1994 | F            | 1112223335 | Cardiology       | 9  |

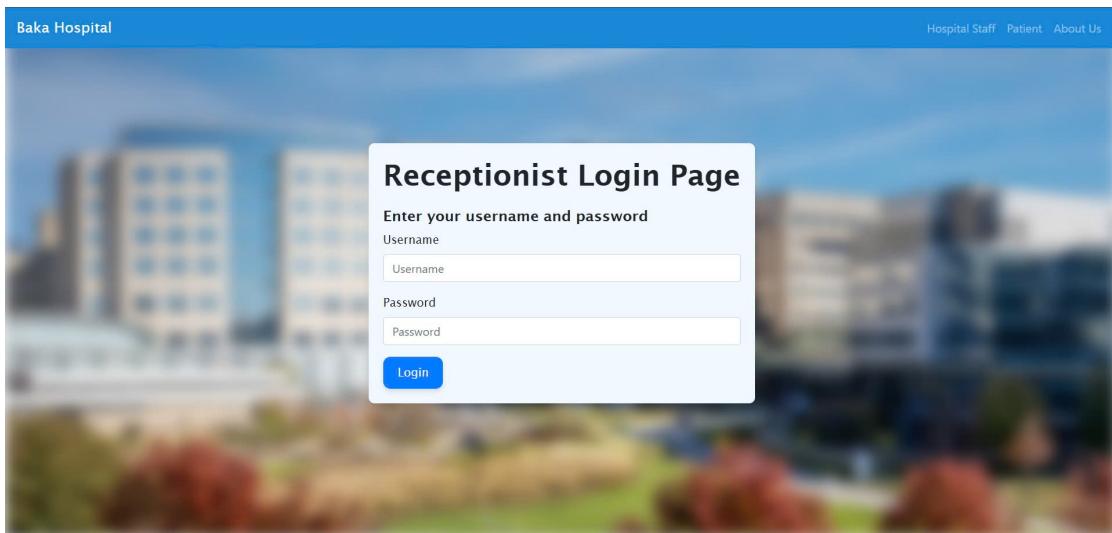
| Baka Hospital   |                 |                  |                        |                      |
|-----------------|-----------------|------------------|------------------------|----------------------|
| Department List |                 |                  |                        |                      |
| Department ID   | Department Name | Head Doctor      | Period                 | Logout               |
| N100001         | 01              | Cardiology       | Alice Marie Johnson    | 2015-06-01 - Present |
|                 | 02              | Neurology        | Bob Andrew Smith       | 2017-09-15 - Present |
|                 | 03              | Orthopedics      | Clara Louise Brown     | 2016-01-20 - Present |
|                 | 04              | Pediatrics       | David Michael Taylor   | 2018-04-10 - Present |
|                 | 05              | Oncology         | Ella Grace Davis       | 2019-11-05 - Present |
|                 | 06              | Dermatology      | Frank John Miller      | 2014-07-23 - Present |
|                 | 07              | Radiology        | Grace Emily Wilson     | 2020-03-18 - Present |
|                 | 08              | Surgery          | Henry Arthur Moore     | 2021-12-01 - Present |
|                 | 09              | Psychiatry       | Isabella Sophia Harris | 2022-05-15 - Present |
|                 | 10              | Gastroenterology | Jack Thomas Martinez   | 2023-02-10 - Present |



| Baka Hospital |           |          |                   |                            |                                   |
|---------------|-----------|----------|-------------------|----------------------------|-----------------------------------|
| Nurse         | Room List |          |                   |                            | Logout                            |
| N100001       | Room ID   | Capacity | Room Type         | Current Number of Patients | List of Patients                  |
| Dashboard     | 101       | 2        | General Ward      | 0                          | <button>List of Patients</button> |
|               | 102       | 1        | ICU               | 1                          | <button>List of Patients</button> |
|               | 103       | 3        | General Ward      | 0                          | <button>List of Patients</button> |
|               | 104       | 1        | ICU               | 0                          | <button>List of Patients</button> |
|               | 105       | 2        | Private Room      | 1                          | <button>List of Patients</button> |
|               | 106       | 4        | General Ward      | 3                          | <button>List of Patients</button> |
|               | 107       | 1        | ICU               | 0                          | <button>List of Patients</button> |
|               | 108       | 3        | Semi-Private Room | 0                          | <button>List of Patients</button> |
|               | 109       | 2        | Private Room      | 0                          | <button>List of Patients</button> |
|               | 110       | 4        | General Ward      | 0                          | <button>List of Patients</button> |

## 9.4 Receptionist





| Baka Hospital      |           | Appointment List |               |            |                       |                         | Logout |
|--------------------|-----------|------------------|---------------|------------|-----------------------|-------------------------|--------|
| Receptionist Khanh |           |                  |               |            |                       |                         |        |
| Appointment ID     | Doctor ID | Patient ID       | Date          | Time       | Edit Appointment      | Delete Appointment      |        |
| 1                  | D100003   | P000003          | Dec. 1, 2024  | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |        |
| 2                  | D100002   | P000002          | Dec. 1, 2024  | 9:30 a.m.  | <button>Edit</button> | <button>Delete</button> |        |
| 3                  | D100001   | P000001          | Dec. 1, 2024  | 9 a.m.     | <button>Edit</button> | <button>Delete</button> |        |
| 4                  | D100002   | P000007          | Dec. 10, 2024 | 11:30 a.m. | <button>Edit</button> | <button>Delete</button> |        |
| 5                  | D100003   | P000004          | Dec. 9, 2024  | 10 a.m.    | <button>Edit</button> | <button>Delete</button> |        |
| 6                  | D100004   | P000004          | Dec. 2, 2024  | 10:30 a.m. | <button>Edit</button> | <button>Delete</button> |        |
| 7                  | D100005   | P000005          | Dec. 2, 2024  | 11 a.m.    | <button>Edit</button> | <button>Delete</button> |        |
| 8                  | D100006   | P000006          | Dec. 3, 2024  | 11:30 a.m. | <button>Edit</button> | <button>Delete</button> |        |
| 9                  | D100007   | P000007          | Dec. 3, 2024  | noon       | <button>Edit</button> | <button>Delete</button> |        |
| 10                 | D100008   | P000008          | Dec. 4, 2024  | 12:30 p.m. | <button>Edit</button> | <button>Delete</button> |        |
| 11                 | D100009   | P000009          | Dec. 4, 2024  | 1 p.m.     | <button>Edit</button> | <button>Delete</button> |        |



Baka Hospital

Logout

Receptionist  
Khanh

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

Add New Appointment

ID

Patient ID

Doctor ID

Date

Time

**Close** **Add Appointment**

Baka Hospital

Logout

Receptionist  
Khanh

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

Edit Appointment Information

ID

Patient ID

Doctor ID

Date

Time

**Close** **Save Changes**



Baka Hospital Logout

Receptionist  
**Khanh**

[Dashboard](#)  
[Appointment](#)  
[Patient](#)  
[Room](#)  
[Doctor List](#)  
[Nurse List](#)  
[Department List](#)

**Confirm Deletion**

Are you sure you want to delete the following appointment?

ID: 1  
Doctor ID: D100003  
Patient ID: P000003  
Date: Dec. 1, 2024  
Time: 10 a.m.

[Delete Appointment](#) [Cancel](#)

Baka Hospital Logout

Receptionist  
**Khanh**

[Dashboard](#)  
[Appointment](#)  
[Patient](#)  
[Room](#)  
[Doctor List](#)  
[Nurse List](#)  
[Department List](#)

**Patient List**

| ID      | SSN        | Full Name              | Date of Birth  | Gender | Phone Number | Address                     | Edit Information     | Delete Patient         |
|---------|------------|------------------------|----------------|--------|--------------|-----------------------------|----------------------|------------------------|
| P000001 | 1234567890 | John Michael Doe       | Jan. 15, 1990  | M      | 1234567890   | 123 Oak St Downtown CityA   | <a href="#">Edit</a> | <a href="#">Delete</a> |
| P000002 | 9876543210 | Alice Marie Smith      | July 23, 1985  | F      | 2345678901   | 456 Maple Ave Uptown CityB  | <a href="#">Edit</a> | <a href="#">Delete</a> |
| P000003 | 5647382910 | Robert Lee Johnson     | Dec. 2, 1978   | M      | 3456789012   | 789 Pine Rd Suburb CityC    | <a href="#">Edit</a> | <a href="#">Delete</a> |
| P000004 | 1928374650 | Linda Ann Brown        | Sept. 17, 1992 | F      | 4567890123   | 321 Birch Ln Westside CityA | <a href="#">Edit</a> | <a href="#">Delete</a> |
| P000005 | 5738291046 | Michael James Williams | May 10, 1980   | M      | 5678901234   | 654 Cedar Dr Eastside CityB | <a href="#">Edit</a> | <a href="#">Delete</a> |
| P000006 | 2847361820 | Sophia Grace Taylor    | April 20, 2000 | F      | 6789012345   | 123 Elm St Northside CityC  | <a href="#">Edit</a> | <a href="#">Delete</a> |
| P000007 | 3746281930 | David Charles Miller   | Nov. 5, 1995   | M      | 7890123456   | 987 Oak St Southside CityA  | <a href="#">Edit</a> | <a href="#">Delete</a> |
| ...     | ...        | ...                    | March 13,      | F      | ...          | 654 Willow Ave              | <a href="#">Edit</a> | <a href="#">Delete</a> |



Baka Hospital

Logout

Receptionist  
Khanh

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

Add New Patient

ID

SSN

First Name

Middle Name

Last Name

Date of Birth  
 dd/mm/yyyy

Gender

Baka Hospital

Logout

Receptionist  
Khanh

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

Edit Patient Information

ID  
 P000001

SSN  
 1234567890

First Name  
 John

Middle Name  
 Michael

Last Name  
 Doe

Date of Birth  
 15/01/1990

Gender



Baka Hospital Logout

Receptionist  
**Khanh**

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

**Confirm Deletion**

Are you sure you want to delete the following patient?

Name: John Michael Doe  
SSN: 1234567890

**Delete Patient** **Cancel**

Baka Hospital Logout

Receptionist  
**Khanh**

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

**Room List**

| Room ID | Capacity | Room Type         | Current Number of Patients | Add Patient        | List of Patients        |
|---------|----------|-------------------|----------------------------|--------------------|-------------------------|
| 101     | 2        | General Ward      | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 102     | 1        | ICU               | 1                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 103     | 3        | General Ward      | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 104     | 1        | ICU               | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 105     | 2        | Private Room      | 1                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 106     | 4        | General Ward      | 3                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 107     | 1        | ICU               | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 108     | 3        | Semi-Private Room | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 109     | 2        | Private Room      | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |
| 110     | 4        | General Ward      | 0                          | <b>Add Patient</b> | <b>List of Patients</b> |



Baka Hospital

Logout

Receptionist  
Khanh

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

Add New Patient into Room 101

Patient ID:  
-----

Nurse ID:  
-----

Admitted Date:  
dd/mm/yyyy

Discharged Date:  
dd/mm/yyyy

[Close](#) [Add New Room Information](#)

Baka Hospital

Logout

Receptionist  
Khanh

Dashboard  
Appointment  
Patient  
Room  
Doctor List  
Nurse List  
Department List

Patient List in Room 106

| ID      | Full Name           | SSN        | Date of Birth  | Phone Number | Gender | Admitted Date | Discharged Date |
|---------|---------------------|------------|----------------|--------------|--------|---------------|-----------------|
| P000004 | Linda Ann Brown     | 1928374650 | Sept. 17, 1992 | 4567890123   | F      | Dec. 1, 2024  | Dec. 10, 2024   |
| P000006 | Sophia Grace Taylor | 2847361820 | April 20, 2000 | 6789012345   | F      | Dec. 5, 2024  | Dec. 12, 2024   |
| P000029 | Oliver Nathan Adams | 0011223345 | Dec. 30, 1987  | 0011223344   | M      | Dec. 9, 2024  | Dec. 15, 2024   |

[Back To Room List](#)



| Baka Hospital   |         | Doctor List            |                |        |              |                  | Logout      |
|---|---------|------------------------|----------------|--------|--------------|------------------|-------------|
| Receptionist<br>Khanh   | ID      | Full Name              | Date of Birth  | Gender | Phone Number | Department       | License     |
| Dashboard<br>Appointment<br>Patient<br>Room<br>Doctor List<br>Nurse List<br>Department List | D100001 | Alice Marie Johnson    | May 15, 1980   | F      | 9998887776   | Cardiology       | LIC00000001 |
|   | D100002 | Bob Andrew Smith       | Sept. 23, 1975 | M      | 8887776665   | Neurology        | LIC00000002 |
|   | D100003 | Clara Louise Brown     | Nov. 10, 1990  | F      | 7776665554   | Orthopedics      | LIC00000003 |
|   | D100004 | David Michael Taylor   | Jan. 22, 1982  | M      | 6665554443   | Pediatrics       | LIC00000004 |
|   | D100005 | Ella Grace Davis       | April 30, 1995 | F      | 5554443332   | Oncology         | LIC00000005 |
|   | D100006 | Frank John Miller      | June 18, 1978  | M      | 4443332221   | Dermatology      | LIC00000006 |
|   | D100007 | Grace Emily Wilson     | Aug. 5, 1987   | F      | 3332221110   | Radiology        | LIC00000007 |
|   | D100008 | Henry Arthur Moore     | March 12, 1985 | M      | 2221110009   | Surgery          | LIC00000008 |
|   | D100009 | Isabella Sophia Harris | Dec. 20, 1992  | F      | 1110009998   | Psychiatry       | LIC00000009 |
|   | D100010 | Jack Thomas Martinez   | July 1, 1989   | M      | 0009998887   | Gastroenterology | LIC00000010 |
|   | D100011 | Emily Charlotte Adams  | Feb. 17, 1983  | F      | 9876543210   | Cardiology       | LIC00000011 |

| Baka Hospital   |         | Nurse List           |                |        |              |                  | Logout          |
|---|---------|----------------------|----------------|--------|--------------|------------------|-----------------|
| Receptionist<br>Khanh   | ID      | Full Name            | Date of Birth  | Gender | Phone Number | Department       | Year Experience |
| Dashboard<br>Appointment<br>Patient<br>Room<br>Doctor List<br>Nurse List<br>Department List | N100001 | Karen Anne Anderson  | April 10, 1985 | F      | 1112223334   | Cardiology       | 5               |
|   | N100002 | Louis Edward Brooks  | June 15, 1990  | M      | 2223334445   | Neurology        | 3               |
|   | N100003 | Mia Sophia Clark     | Sept. 20, 1992 | F      | 3334445556   | Orthopedics      | 8               |
|   | N100004 | Noah James Evans     | March 8, 1988  | M      | 4445556667   | Pediatrics       | 2               |
|   | N100005 | Olivia Grace Green   | Dec. 1, 1995   | F      | 5556667778   | Oncology         | 6               |
|   | N100006 | Peter George Hill    | July 18, 1991  | M      | 6667778889   | Dermatology      | 4               |
|   | N100007 | Quinn Diana Jones    | Nov. 25, 1983  | F      | 7778889990   | Radiology        | 7               |
|   | N100008 | Ryan William King    | Aug. 30, 1987  | M      | 8889990001   | Surgery          | 10              |
|   | N100009 | Sophia Charlotte Lee | May 12, 1990   | F      | 9990001112   | Psychiatry       | 1               |
|   | N100010 | Thomas Henry Moore   | Oct. 3, 1985   | M      | 0001112223   | Gastroenterology | 9               |
|   | N100011 | Ava Emily Nelson     | March 14, 1994 | F      | 1112223335   | Cardiology       | 9               |



| Baka Hospital         |                 | Logout           |                        |                      |
|-----------------------|-----------------|------------------|------------------------|----------------------|
| Receptionist<br>Khanh | Department List |                  |                        |                      |
|                       | Department ID   | Department Name  | Head Doctor            | Period               |
|                       | 01              | Cardiology       | Alice Marie Johnson    | 2015-06-01 - Present |
|                       | 02              | Neurology        | Bob Andrew Smith       | 2017-09-15 - Present |
|                       | 03              | Orthopedics      | Clara Louise Brown     | 2016-01-20 - Present |
|                       | 04              | Pediatrics       | David Michael Taylor   | 2018-04-10 - Present |
|                       | 05              | Oncology         | Ella Grace Davis       | 2019-11-05 - Present |
|                       | 06              | Dermatology      | Frank John Miller      | 2014-07-23 - Present |
|                       | 07              | Radiology        | Grace Emily Wilson     | 2020-03-18 - Present |
| Dashboard             | 08              | Surgery          | Henry Arthur Moore     | 2021-12-01 - Present |
| Appointment           | 09              | Psychiatry       | Isabella Sophia Harris | 2022-05-15 - Present |
| Patient               | 10              | Gastroenterology | Jack Thomas Martinez   | 2023-02-10 - Present |
| Room                  |                 |                  |                        |                      |
| Doctor List           |                 |                  |                        |                      |
| Nurse List            |                 |                  |                        |                      |
| Department List       |                 |                  |                        |                      |

## 9.5 Patient

Baka Hospital

Hospital Staff · Patient · About Us

# Hello, Patient

Welcome to Baka Hospital Management System

Register Your Account   Login



Baka Hospital

Hospital Staff Patient About Us

### Patient Sign Up

Enter your patient ID and create your own password

Patient ID

Password

Already have an account? [Login here](#)

Baka Hospital

Hospital Staff Patient About Us

### Patient Login Page

Enter your ID and password

Patient ID

Password

Do not have account? [Signup here](#)



Baka Hospital

Logout

Patient

- Dashboard
- Information
- Health Information
- Appointment
- Room
- Doctor List
- Nurse List
- Department List

### Patient Information

ID: P000001  
SSN: 1234567890  
First Name: John  
Middle Name: Michael  
Last Name: Doe  
Date of Birth: Jan. 15, 1990  
Gender: M  
Phone Number: 1234567890  
Street: 123 Oak St  
District: Downtown  
City: CityA

Baka Hospital

Logout

Patient

- Dashboard
- Information
- Health Information
- Appointment
- Room
- Doctor List
- Nurse List
- Department List

### Patient Health Information

#### Medical Record

ID: 1  
Date: Nov. 2, 2024  
Diagnosis: Normal chest X-ray  
Test Result: No abnormalities detected

#### Treatment

ID: 1  
Date: Nov. 1, 2024  
Procedure: X-ray for chest examination



Baka Hospital

Logout

Patient

- Dashboard
- Information
- Health Information
- Appointment
- Room
- Doctor List
- Nurse List
- Department List

### Appointment Information

ID: 3  
Doctor ID: D100001  
Date: Dec. 1, 2024  
Time: 9 a.m.

ID: 33  
Doctor ID: D100011  
Date: Dec. 16, 2024  
Time: 8 a.m.

Baka Hospital

Logout

Patient

- Dashboard
- Information
- Health Information
- Appointment
- Room
- Doctor List
- Nurse List
- Department List

### Room Information

Room ID: 101  
Admitted Date: Dec. 1, 2024  
Discharged Date: Dec. 7, 2024



Baka Hospital

Logout

Patient

- Dashboard
- Information
- Health Information
- Appointment
- Room
- Doctor List
- Nurse List
- Department List

**Room Information**

Room ID: 101

Admitted Date: Dec. 1, 2024

Discharged Date: Dec. 7, 2024

Baka Hospital

Logout

Patient

- Dashboard
- Information
- Health Information
- Appointment
- Room
- Doctor List
- Nurse List
- Department List

**Doctor List**

| ID      | Full Name              | Date of Birth  | Gender | Phone Number | Department       | License     |
|---------|------------------------|----------------|--------|--------------|------------------|-------------|
| D100001 | Alice Marie Johnson    | May 15, 1980   | F      | 9998887776   | Cardiology       | LIC00000001 |
| D100002 | Bob Andrew Smith       | Sept. 23, 1975 | M      | 8887776665   | Neurology        | LIC00000002 |
| D100003 | Clara Louise Brown     | Nov. 10, 1990  | F      | 7776665554   | Orthopedics      | LIC00000003 |
| D100004 | David Michael Taylor   | Jan. 22, 1982  | M      | 6665554443   | Pediatrics       | LIC00000004 |
| D100005 | Ella Grace Davis       | April 30, 1995 | F      | 5554443332   | Oncology         | LIC00000005 |
| D100006 | Frank John Miller      | June 18, 1978  | M      | 4443332221   | Dermatology      | LIC00000006 |
| D100007 | Grace Emily Wilson     | Aug. 5, 1987   | F      | 3332221110   | Radiology        | LIC00000007 |
| D100008 | Henry Arthur Moore     | March 12, 1985 | M      | 2221110009   | Surgery          | LIC00000008 |
| D100009 | Isabella Sophia Harris | Dec. 20, 1992  | F      | 1110009998   | Psychiatry       | LIC00000009 |
| D100010 | Jack Thomas Martinez   | July 1, 1989   | M      | 0009998887   | Gastroenterology | LIC00000010 |
| D100011 | Emily Charlotte Adams  | Feb. 17, 1983  | F      | 9876543210   | Cardiology       | LIC00000011 |



| Patient            |         | Baka Hospital        |                |        |              |                  |                 |
|--------------------|---------|----------------------|----------------|--------|--------------|------------------|-----------------|
|                    |         | Nurse List           |                |        |              |                  |                 |
|                    | ID      | Full Name            | Date of Birth  | Gender | Phone Number | Department       | Year Experience |
| Dashboard          | N100001 | Karen Anne Anderson  | April 10, 1985 | F      | 1112223334   | Cardiology       | 5               |
| Information        | N100002 | Louis Edward Brooks  | June 15, 1990  | M      | 2223334445   | Neurology        | 3               |
| Health Information | N100003 | Mia Sophia Clark     | Sept. 20, 1992 | F      | 3334445556   | Orthopedics      | 8               |
| Appointment        | N100004 | Noah James Evans     | March 8, 1988  | M      | 4445556667   | Pediatrics       | 2               |
| Room               | N100005 | Olivia Grace Green   | Dec. 1, 1995   | F      | 5556667778   | Oncology         | 6               |
| Doctor List        | N100006 | Peter George Hill    | July 18, 1991  | M      | 6667778889   | Dermatology      | 4               |
| Nurse List         | N100007 | Quinn Diana Jones    | Nov. 25, 1983  | F      | 7778889990   | Radiology        | 7               |
| Department List    | N100008 | Ryan William King    | Aug. 30, 1987  | M      | 8889990001   | Surgery          | 10              |
|                    | N100009 | Sophia Charlotte Lee | May 12, 1990   | F      | 9990001112   | Psychiatry       | 1               |
|                    | N100010 | Thomas Henry Moore   | Oct. 3, 1985   | M      | 0001112223   | Gastroenterology | 9               |
|                    | N100011 | Ava Emily Nelson     | March 14, 1994 | F      | 1112223335   | Cardiology       | 9               |

| Patient            |               | Baka Hospital    |                        |                      |
|--------------------|---------------|------------------|------------------------|----------------------|
|                    |               | Department List  |                        |                      |
|                    | Department ID | Department Name  | Head Doctor            | Period               |
| Dashboard          | 01            | Cardiology       | Alice Marie Johnson    | 2015-06-01 - Present |
| Information        | 02            | Neurology        | Bob Andrew Smith       | 2017-09-15 - Present |
| Health Information | 03            | Orthopedics      | Clara Louise Brown     | 2016-01-20 - Present |
| Appointment        | 04            | Pediatrics       | David Michael Taylor   | 2018-04-10 - Present |
| Room               | 05            | Oncology         | Ella Grace Davis       | 2019-11-05 - Present |
| Doctor List        | 06            | Dermatology      | Frank John Miller      | 2014-07-23 - Present |
| Nurse List         | 07            | Radiology        | Grace Emily Wilson     | 2020-03-18 - Present |
| Department List    | 08            | Surgery          | Henry Arthur Moore     | 2021-12-01 - Present |
|                    | 09            | Psychiatry       | Isabella Sophia Harris | 2022-05-15 - Present |
|                    | 10            | Gastroenterology | Jack Thomas Martinez   | 2023-02-10 - Present |