

# **Vaccination Management System**

## **Team Members**

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# **Problem Statement**

The current vaccination management process is inefficient, prone to errors, and leads to missed appointments, poor inventory control, and limited access to records. Facilities struggle with staff coordination, inventory tracking, and patient scheduling. Patients face challenges in accessing services, making appointments, and maintaining vaccination records. These issues cause delays, vaccine wastage, and incomplete coverage, threatening public health. A centralized, automated solution is urgently needed to address these problems.

# **User Requirement Specification**

## **Purpose of the Project**

The purpose of this project is to develop a centralized, automated Vaccination Management System to streamline and enhance the efficiency of vaccination-related operations. This system aims to address the inefficiencies and challenges in the current vaccination process, such as errors in record-keeping, missed appointments, poor inventory management, and limited access to vaccination data. By integrating functionalities for patient scheduling, inventory control, and role-specific operations, the system will ensure better service delivery, reduce vaccine wastage, and improve public health outcomes.

# Scope of the Project

The Vaccination Management System will serve as a comprehensive platform for managing vaccination processes in healthcare facilities. It will cater to multiple user roles, including patients, health workers, facility managers, and administrators, offering tailored functionalities for each. The system will facilitate patient registration, scheduling, and vaccination records; support staff in logging vaccinations and managing appointments; enable facility managers to oversee inventory, staff, and operations; and empower administrators to manage users, facilities, and vaccine manufacturers. The project's scope includes the development of a web-based application integrated with a robust database to ensure seamless data management and operational efficiency.

## Detailed Description

The Vaccination Management System is designed as a web-based application with a database backend to manage all vaccination-related activities. It will feature the following functionalities for its primary actors:

- **Patient:**  
Patients can register on the platform, log in, schedule vaccination appointments, view their vaccination history, and check upcoming appointments.
- **Health Worker:**  
Health workers can log in, update vaccination details for patients, view their assigned appointments, and monitor inventory levels relevant to their role.
- **Facility Manager:**  
Facility managers will oversee the management of health workers, handle inventory (add, view, edit, delete stock), manage facility details, and monitor all appointments. The

dashboard will provide alerts for low stock levels and vaccine expiry.

- **Administrator:**

The admin will have full control of the system, including the management of all users (patients, health workers, facility managers), facilities, vaccine manufacturers, and vaccines.

The system will incorporate features like automated alerts, inventory tracking to reduce wastage, and secure access controls to ensure data privacy.

## Functional Requirements

### 1. Patient Management

- Patients can register and log in to their accounts.
- Patients can schedule vaccination appointments.
- Patients can view vaccination records and upcoming appointments.

### 2. Vaccination Logging by Health Workers

- Health workers can log vaccinations for patients.
- Health workers can view their appointment schedules.

### 3. Inventory Management

- Facility managers can add, edit, and delete inventory items.
- Automatic deletion of expired or depleted inventory items.
- Low stock and expiry alerts are displayed on the manager's dashboard.

### 4. Appointment Management

- Patients can book and reschedule appointments.
- Health workers and facility managers can view and manage all appointments.

## 5. Facility Management

- Facility managers can add and edit facility details.
- Facility managers can manage health workers associated with the facility.

## 6. Admin Panel

- The admin can manage all users (patients, health workers, and facility managers).
- The admin can manage facilities, vaccine manufacturers, and vaccine details.

## 7. Database Integration

- A centralized database will store all information securely.
- Automatic updates for stock levels, vaccination records, and user activities.

## 8. Dashboard Alerts

- Facility managers receive low stock and expiry alerts on their dashboards.
- Summary statistics for administrators, including user and vaccine data.

# **List of Tools Used**

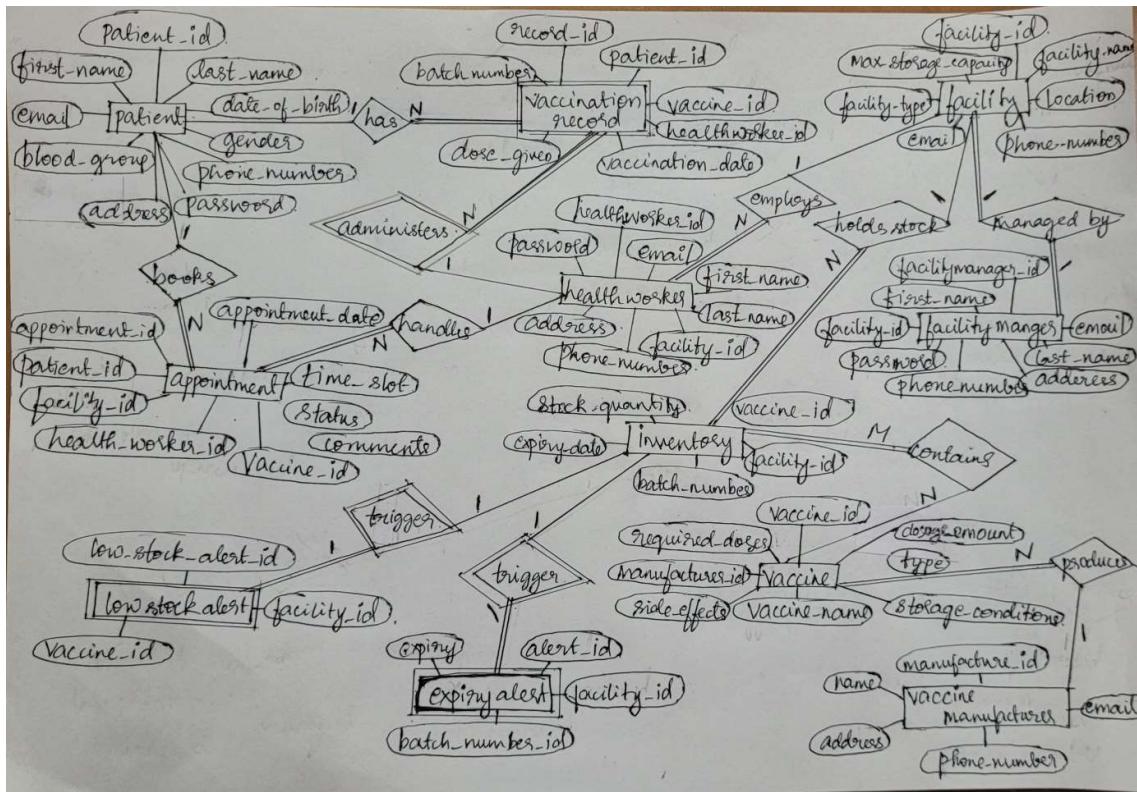
## **1. Frontend Development**

- HTML: For structuring the web pages and content.
- CSS: For styling and layout design.
- JavaScript: For interactivity and dynamic functionalities on the frontend.
- Bootstrap: For responsive design and pre-built UI components.

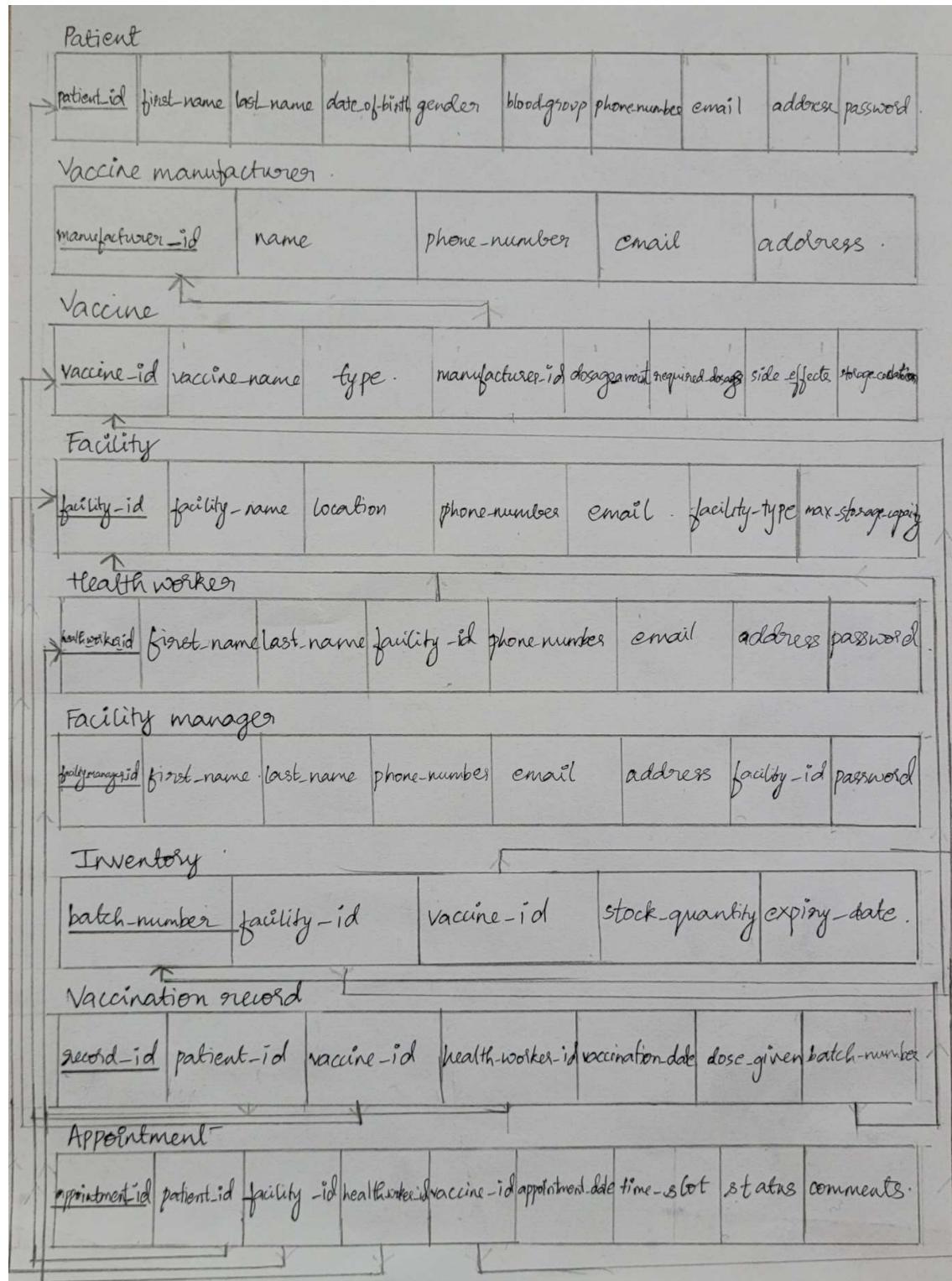
## **2. Backend Development**

- MySQL: For database management.
- Workbench (MySQL Workbench): For designing, querying, and managing the database.

# ER Diagram



# Relational Schema



# DDL Commands

```
-- Table: patient
CREATE TABLE Patient (
    patient_id INT PRIMARY KEY AUTO_INCREMENT,
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    date_of_birth DATE, -- Date of birth cannot be in the future
    gender ENUM('Male', 'Female', 'Other') NOT NULL, -- Gender should be restricted to valid options
    blood_group VARCHAR(3) CHECK (blood_group IN ('A+', 'A-', 'B+', 'B-', 'O+', 'O-', 'AB+', 'AB-')), -- Valid blood groups
    phone_number VARCHAR(15) CHECK (phone_number REGEXP '^[0-9]+$', -- Ensure phone number contains only digits
    email VARCHAR(100) UNIQUE, -- Ensure email is unique per patient
    address VARCHAR(255),
    password VARCHAR(255) NOT NULL -- Adjust the length based on your hashing strategy
);

-- Table: Vaccine Manufacturer
CREATE TABLE Vaccine_Manufacturer (
    manufacturer_id INT PRIMARY KEY AUTO_INCREMENT,
    name VARCHAR(100) UNIQUE NOT NULL,
    phone_number VARCHAR(15) CHECK (phone_number REGEXP '^[0-9]+$', -- Only digits allowed in phone number
    email VARCHAR(100) UNIQUE, -- Ensure manufacturer's email is unique
    address VARCHAR(255)
);

-- Table: Vaccine
CREATE TABLE Vaccine (
    vaccine_id INT PRIMARY KEY AUTO_INCREMENT,
    vaccine_name VARCHAR(100) UNIQUE NOT NULL,
    type VARCHAR(50) NOT NULL CHECK (type IN ('Inactivated', 'Live', 'Subunit', 'mRNA', 'Vector')), -- Limited to specific types
    manufacturer_id INT,
    dosage_amount DECIMAL(5,2) NOT NULL CHECK (dosage_amount > 0), -- Dosage must be positive
    required_doses INT NOT NULL CHECK (required_doses >= 1), -- Must require at least one dose
    side_effects VARCHAR(255),
    storage_conditions VARCHAR(255),
    FOREIGN KEY (manufacturer_id) REFERENCES Vaccine_Manufacturer(manufacturer_id)
);

-- Table: Facility
CREATE TABLE Facility (
    facility_id INT PRIMARY KEY AUTO_INCREMENT,
    facility_name VARCHAR(100) NOT NULL,
    location VARCHAR(255),
    phone_number VARCHAR(15) CHECK (phone_number REGEXP '^[0-9]+$', -- Make phone number unique
    email VARCHAR(100) UNIQUE, -- Make email unique
    facility_type VARCHAR(50) CHECK (facility_type IN ('Hospital', 'Clinic', 'Vaccination Center')), -- Restrict to certain types
    max_storage_capacity INT NOT NULL CHECK (max_storage_capacity > 0) -- Capacity must be a positive number
);
```

```

-- Table: Health Worker
CREATE TABLE Health_Worker (
    health_worker_id VARCHAR(10) PRIMARY KEY, -- Use VARCHAR to allow IDs like "HW123"
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    facility_id INT,
    phone_number VARCHAR(15) CHECK (phone_number REGEXP '^[0-9]+$'),
    email VARCHAR(100) UNIQUE, -- Make email unique
    address VARCHAR(255),
    password VARCHAR(255) NOT NULL, -- Adjust the length based on your hashing strategy
    FOREIGN KEY (facility_id) REFERENCES Facility(facility_id) -- Reference to Facility
);

-- Table: Facility Manager
CREATE TABLE Facility_Manager (
    facility_manager_id VARCHAR(10) PRIMARY KEY, -- Use VARCHAR to allow IDs like "FM123"
    first_name VARCHAR(100) NOT NULL,
    last_name VARCHAR(100) NOT NULL,
    phone_number VARCHAR(15) CHECK (phone_number REGEXP '^[0-9]+$'), -- Ensure phone number contains only digits
    email VARCHAR(100) UNIQUE, -- Ensure email is unique per patient
    address VARCHAR(255),
    facility_id INT,
    password VARCHAR(255) NOT NULL, -- Adjust the length based on your hashing strategy
    FOREIGN KEY (facility_id) REFERENCES Facility(facility_id) -- Reference to Facility
);

-- Table: Inventory (now tracking batches of vaccines)
CREATE TABLE Inventory (
    batch_number VARCHAR(50) PRIMARY KEY,
    facility_id INT, -- which facility stores this batch
    vaccine_id INT, -- which vaccine type (conceptual)
    stock_quantity INT NOT NULL CHECK (stock_quantity >= 0), -- Stock cannot be negative
    expiry_date DATE NOT NULL, -- Expiry date cannot be in the past
    FOREIGN KEY (facility_id) REFERENCES Facility(facility_id),
    FOREIGN KEY (vaccine_id) REFERENCES Vaccine(vaccine_id)
);

```

```

-- Table: Appointment
CREATE TABLE Appointment (
    appointment_id INT PRIMARY KEY AUTO_INCREMENT,
    patient_id INT NOT NULL, -- Reference to the patient scheduling the appointment
    facility_id INT NOT NULL, -- Reference to the facility where the appointment is scheduled
    health_worker_id VARCHAR(10), -- Reference to the health worker attending the appointment
    vaccine_id INT NOT NULL, -- Reference to the vaccine
    appointment_date DATE NOT NULL, -- Date of the appointment
    time_slot ENUM('Morning', 'Afternoon', 'Evening') NOT NULL, -- Time slot
    status ENUM('Scheduled', 'Completed', 'Canceled') DEFAULT 'Scheduled', -- Status of the appointment
    comments VARCHAR(255), -- Optional comments for the appointment
    FOREIGN KEY (patient_id) REFERENCES Patient(patient_id),
    FOREIGN KEY (facility_id) REFERENCES Facility(facility_id),
    FOREIGN KEY (health_worker_id) REFERENCES Health_Worker(health_worker_id),
    FOREIGN KEY (vaccine_id) REFERENCES Vaccine(vaccine_id)
);

-- Table: Vaccination Record
CREATE TABLE Vaccination_Record (
    record_id INT PRIMARY KEY AUTO_INCREMENT,
    patient_id INT,
    vaccine_id INT,
    health_worker_id VARCHAR(10),
    vaccination_date DATE NOT NULL, -- Vaccination date cannot be in the future
    dose_given INT NOT NULL CHECK (dose_given > 0), -- Dose must be a positive amount
    batch_number VARCHAR(50), -- Track the batch the dose comes from
    FOREIGN KEY (patient_id) REFERENCES Patient(patient_id),
    FOREIGN KEY (vaccine_id) REFERENCES Vaccine(vaccine_id),
    FOREIGN KEY (health_worker_id) REFERENCES Health_Worker(health_worker_id),
    FOREIGN KEY (batch_number) REFERENCES Inventory(batch_number)
);

```

# CRUD Operation Screenshots

## Patient Registration

First Name

Last Name

Date of Birth

 CALENDAR

Gender

 DROPDOWN

Blood Group

 DROPDOWN

Phone Number

Email

Address

Password

**Register**

## Schedule Vaccination

Select Vaccine

Select Facility

Select Health Worker

Select Date

 □

Preferred Time Slot

Additional Comments (optional)

**Book Appointment**

## Your Scheduled Appointments

Appointment ID	Date	Facility	Health Worker	Vaccine	Time Slot	Status	Comments
1	11/05/2024	Springfield General Hospital	John	COVID-19 Vaccine	Morning	Scheduled	Initial consultation for patient 1
8	11/22/2024	Springfield General Hospital	John	COVID-19 Vaccine	Morning	Scheduled	
7	11/30/2024	Springfield General Hospital	John	COVID-19 Vaccine	Morning	Scheduled	

Schedule Vaccination

See Vaccination History

Scheduled Appointments

**Your Vaccinations**

Record ID	Date	Dose Given	Batch Number

**Edit Profile**

First Name: Lucas

Last Name: Johnson

Date of Birth: 14-05-1990 □

Gender: Male

Phone Number: 1234567890

Email: a@a.com

Address: 123 Maple Street, Springfield, IL

Password:

Close Save Changes

## Your Vaccinations

Record ID	Date	Health Worker	Vaccine Name	Dose Given	Batch Number
1	23-11-2024	John Doe	COVID-19 Vaccine	1	BATCH001COVID19

## Log Vaccination Event

Patient ID

Vaccine

 Choose a Vaccine

Dose Given

Batch Number

**Log Vaccination Event**

## Welcome, John Doe

Manage your appointments, patient records, and inventory efficiently.

### Today's Appointments

Patient Name	Vaccine	Time	Remarks
No appointments today			

## Welcome, Alice

Manage health workers, inventory, and appointments efficiently.

Low Stock Alerts
No low stock alerts

Expiry Alerts
Batch Number: BATCH001INFLUENZA, Expiry Date: 11/30/2024

### Today's Appointments

Appointment ID	Patient Name	Health Worker Name	Vaccine Name	Time Slot	Status
No appointments for today.					

## Manage Health Workers

**Add Health Worker**

Health Worker ID	Health Worker Name	Actions
HW001	John Doe	
HW002	Jane Smith	
HW003	Alice Johnson	

## Manage Inventory

[Add Inventory](#)

Batch ID	Vaccine Name	Quantity	Expiry Date	Actions
BATCH001COVID19	COVID-19 Vaccine	4	2025-12-31	
BATCH001INFLUENZA	Influenza Vaccine	150	2024-11-30	
BATCH002COVID19	COVID-19 Vaccine	200	2026-12-31	

## Manage Users

[Patients](#)   [Health Workers](#)   [Facility Managers](#)[Add Patient](#)

Patient ID	Patient Name	Actions
1	Lucas Johnson	
2	Emily Walker	
3	Liam Davis	
4	Sophia Brown	
5	Mason Scott	

## Manage Facilities

[Add Facility](#)

Facility ID	Facility Name	Actions
1	Springfield General Hospital	
2	Greenwood Medical Center	

## Manage Vaccine Manufacturers

[Add Manufacturer](#)

Manufacturer ID	Manufacturer Name	Actions
1	Pfizer Inc.	
2	Moderna Therapeutics	
3	Sanofi Pasteur	
4	AstraZeneca	
5	Johnson & Johnson	

## Manage Vaccines

[Add Vaccine](#)

Vaccine ID	Vaccine Name	Actions
1	COVID-19 Vaccine	
2	Influenza Vaccine	
3	Hepatitis B Vaccine	
4	MMR Vaccine	
5	Tetanus Vaccine	

# List of Functionalities

## 1. User Role Management

- Four user roles: Patient, Health Worker, Facility Manager, and Administrator, each with role-specific features and access.

## 2. Patient Features

- Registration and Login: Patients can create accounts and log in securely.
- Appointment Scheduling: Patients can book, view, and manage vaccination appointments.
- Vaccination Records: Access personal vaccination history and upcoming schedules.

The screenshot shows a user interface for scheduling a vaccination appointment. On the left, there is a sidebar with three options: "Schedule Vaccination", "See Vaccination History", and "Scheduled Appointments". On the right, the main area is titled "Schedule Vaccination" and contains the following fields:

- Select Vaccine: A dropdown menu with "Choose..." option.
- Select Facility: A dropdown menu with "Choose..." option.
- Select Health Worker: A dropdown menu with "No Preference" option.
- Select Date: A date input field with the placeholder "dd-mm-yyyy" and a calendar icon.
- Preferred Time Slot: A dropdown menu with "Choose..." option.
- Additional Comments (optional): A text area for entering comments.

At the bottom of the form is a blue "Book Appointment" button.

Schedule Vaccination

See Vaccination History

Scheduled Appointments



### Your Vaccinations

Record ID	Date	Health Worker	Vaccine Name	Dose Given	Batch Number
1	23-11-2024	John Doe	COVID-19 Vaccine	1	BATCH001COVID19

Schedule Vaccination

See Vaccination History

Scheduled Appointments



### Your Scheduled Appointments

Appointment ID	Date	Facility	Health Worker	Vaccine	Time Slot	Status	Comments
1	11/05/2024	Springfield General Hospital	John	COVID-19 Vaccine	Morning	Scheduled	Initial consultation for patient 1
8	11/22/2024	Springfield General Hospital	John	COVID-19 Vaccine	Morning	Scheduled	
7	11/30/2024	Springfield General Hospital	John	COVID-19 Vaccine	Morning	Scheduled	

### 3. Health Worker Features

- **Appointment Viewing:** Health workers can see their assigned appointments.
- **Vaccination Logging:** Record vaccination details for patients.
- **Inventory Access:** View vaccine inventory relevant to their tasks.

The screenshot shows a mobile application interface. On the left, there is a sidebar with the following menu items: "Home", "See All Appointments", "Log Vaccination", and "View Inventory". On the right, the main content area has a header "All Appointments" and a table with the following data:

Patient Name	Vaccine	Date	Time	Remarks
Lucas	COVID-19 Vaccine	5/11/2024	Morning	Initial consultation for patient 1
Sophia	MMR Vaccine	8/11/2024	Morning	X-ray appointment for patient 4
Mason	Tetanus Vaccine	20/11/2024	Evening	Pre-surgery consultation for patient 5
Lucas	COVID-19 Vaccine	22/11/2024	Morning	
Lucas	COVID-19 Vaccine	30/11/2024	Morning	

Home

See All Appointments

Log Vaccination

View Inventory

### Log Vaccination Event

Patient ID

Vaccine

Choose a Vaccine

Dose Given

Batch Number

**Log Vaccination Event**

Home

See All Appointments

Log Vaccination

View Inventory

### Inventory

Vaccine Name	Available Doses	Batch Number	Expiration Date
COVID-19 Vaccine	4	BATCH001COVID19	2025-12-31
Influenza Vaccine	150	BATCH001INFLUENZA	2024-11-30
COVID-19 Vaccine	200	BATCH002COVID19	2026-12-31

#### 4. Facility Manager Features

- Health Worker Management: Add, edit, and delete health worker details.
- Inventory Management: Add, edit, delete, and monitor vaccine inventory, including:
  - Low stock alerts.
  - Expiry alerts.
  - Automatic deletion of expired or depleted stock.
- Facility Management: Manage facility details and operations.
- Appointment Oversight: View and manage all appointments within the facility.
- Dashboard Alerts: Summary alerts for low stock and approaching vaccine expiry dates.

Home

Manage Health Workers

Manage Inventory

Facility Info

View All Appointments

## Welcome, Alice

Manage health workers, inventory, and appointments efficiently.

Low Stock Alerts

No low stock alerts

Expiry Alerts

Batch Number: BATCH001INFLUENZA, Expiry Date: 11/30/2024

### Today's Appointments

Appointment ID	Patient Name	Health Worker Name	Vaccine Name	Time Slot	Status
No appointments for today.					

Home

Manage Health Workers

Manage Inventory

Facility Info

View All Appointments

## Manage Health Workers

Add Health Worker

Health Worker ID	Health Worker Name	Actions
HW001	John Doe	
HW002	Jane Smith	
HW003	Alice Johnson	

Home

Manage Health Workers

Manage Inventory

Facility Info

View All Appointments

## Manage Inventory

Add Inventory

Batch ID	Vaccine Name	Quantity	Expiry Date	Actions
BATCH001COVID19	COVID-19 Vaccine	4	2025-12-31	
BATCH001INFLUENZA	Influenza Vaccine	150	2024-11-30	
BATCH002COVID19	COVID-19 Vaccine	200	2026-12-31	

Home

Manage Health Workers

Manage Inventory

Facility Info

View All Appointments

## Facility Info

**Facility Name:** Springfield General Hospital

**Location:** 123 Elm Street, Springfield, IL

**Phone Number:** 1234567890

**Email:** contact@springfieldhospital.com

**Facility Type:** Hospital

**Max Storage Capacity:** 5000

Edit Facility Info

Home

Manage Health Workers

Manage Inventory

Facility Info

View All Appointments

### All Appointments

Appointment ID	Patient Name	Health Worker ID	Vaccine Name	Appointment Date	Time Slot	Status	Comments
1	Lucas Johnson	HW001	COVID-19 Vaccine	2024-11-05	Morning	Scheduled	Initial consultation for patient 1
3	Sophia Brown	HW001	MMR Vaccine	2024-11-08	Morning	Canceled	X-ray appointment for patient 4
5	Mason Scott	HW001	Tetanus Vaccine	2024-11-20	Evening	Scheduled	Pre-surgery consultation for patient 5
7	Lucas Johnson	HW001	COVID-19 Vaccine	2024-11-30	Morning	Scheduled	
8	Lucas Johnson	HW001	COVID-19 Vaccine	2024-11-22	Morning	Scheduled	
4	Mason Scott	HW002	Tetanus Vaccine	2024-11-09	Afternoon	Scheduled	Physical therapy session for patient 5
6	Mason Scott	HW002	Tetanus Vaccine	2024-11-20	Evening	Scheduled	Pre-surgery consultation for patient 5
2	Liam Davis	HW003	Hepatitis B Vaccine	2024-11-07	Evening	Scheduled	Blood work follow-up for patient 3

## 5. Administrator Features

- **User Management:** Manage all users (patients, health workers, and facility managers).
- **Facility Management:** Add, edit, and delete facilities.
- **Vaccine Management:** Manage vaccine details and manufacturers.

The screenshots illustrate the administrator interface for managing various entities:

- Manage Vaccines:** Shows a list of vaccines with columns for Vaccine ID, Vaccine Name, and Actions. The data is as follows:

Vaccine ID	Vaccine Name	Actions
1	COVID-19 Vaccine	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
2	Influenza Vaccine	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
3	Hepatitis B Vaccine	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
4	MMR Vaccine	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
5	Tetanus Vaccine	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>

- Manage Facilities:** Shows a list of facilities with columns for Facility ID, Facility Name, and Actions. The data is as follows:

Facility ID	Facility Name	Actions
1	Springfield General Hospital	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
2	Greenwood Medical Center	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>

- Manage Vaccine Manufacturers:** Shows a list of manufacturers with columns for Manufacturer ID, Manufacturer Name, and Actions. The data is as follows:

Manufacturer ID	Manufacturer Name	Actions
1	Pfizer Inc.	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
2	Moderna Therapeutics	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
3	Sanofi Pasteur	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
4	AstraZeneca	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
5	Johnson & Johnson	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>

- Manage Users:** Shows a list of users categorized by role: Patients, Health Workers, and Facility Managers. The Patient tab is selected, showing a list of patients with columns for Patient ID, Patient Name, and Actions. The data is as follows:

Patient ID	Patient Name	Actions
1	Lucas Johnson	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
2	Emily Walker	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
3	Liam Davis	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
4	Sophia Brown	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>
5	Mason Scott	<input type="radio"/> <input checked="" type="checkbox"/> <input type="button"/>

# Triggers, Procedures and Event Schedulers

## Procedure to assign the least-busy health worker when patient chooses no preference

```
CREATE PROCEDURE GetHealthWorkerWithLeastAppointments(IN facilityId INT)
BEGIN
    SELECT
        hw.health_worker_id
    FROM
        Health_Worker hw
    LEFT JOIN
        Appointment a ON hw.health_worker_id = a.health_worker_id
    WHERE
        hw.facility_id = facilityId
    GROUP BY
        hw.health_worker_id
    ORDER BY
        COUNT(a.appointment_id) ASC
    LIMIT 1;
END $$
```

```
document.getElementById('healthWorkerSelect').addEventListener('change', function () {
    const selectedOption = this.value;
    const facilityId = document.getElementById('facilitySelect').value;

    if (selectedOption === '') { // No Preference selected
        fetch(`http://localhost:3000/health-worker/least-appointments?facilityId=${facilityId}`)
            .then(response => response.json())
            .then(data => {
                if (data.healthWorkerId) {
                    // Automatically assign the least busy health worker
                    this.value = data.healthWorkerId;
                    console.log(`Assigned Health Worker ID: ${data.healthWorkerId}`);
                } else {
                    console.error('No health workers available.');
                }
            })
            .catch(error => console.error('Error fetching least busy health worker:', error));
    }
})
```

```

app.get('/health-worker/least-appointments/:facilityId', (req, res) => {
  const { facilityId } = req.params;
  console.log("Facility ID:", facilityId);

  const parsedFacilityId = parseInt(facilityId, 10);
  if (isNaN(parsedFacilityId)) {
    return res.status(400).json({ error: 'Invalid Facility ID' });
  }

  // Use a callback-based approach for mysql library
  db.query('CALL GetHealthWorkerWithLeastAppointments(?)', [parsedFacilityId], (error, results, fields) => {
    if (error) {
      console.error('Database error:', error);
      return res.status(500).json({
        error: 'Internal server error',
        details: error.message
      });
    }

    // For stored procedures with mysql, results is typically a 2D array
    // First element contains the rows
    if (results && results[0] && results[0].length > 0) {
      res.status(200).json({ healthWorkerId: results[0][0].health_worker_id });
    } else {
      res.status(404).json({ error: 'No health workers available for the selected facility.' });
    }
  });
});

```

## HW003 Alice is the least busy worker

### All Appointments

Appointment ID	Patient Name	Health Worker ID	Vaccine Name	Appointment Date	Time Slot	Status	Comments
1	Lucas Johnson	HW001	COVID-19 Vaccine	2024-11-05	Morning	Scheduled	Initial consultation for patient 1
3	Sophia Brown	HW001	MMR Vaccine	2024-11-08	Morning	Canceled	X-ray appointment for patient 4
5	Mason Scott	HW001	Tetanus Vaccine	2024-11-20	Evening	Scheduled	Pre-surgery consultation for patient 5
7	Lucas Johnson	HW001	COVID-19 Vaccine	2024-11-30	Morning	Scheduled	
8	Lucas Johnson	HW001	COVID-19 Vaccine	2024-11-22	Morning	Scheduled	
4	Mason Scott	HW002	Tetanus Vaccine	2024-11-09	Afternoon	Scheduled	Physical therapy session for patient 5
6	Mason Scott	HW002	Tetanus Vaccine	2024-11-20	Evening	Scheduled	Pre-surgery consultation for patient 5
2	Liam Davis	HW003	Hepatitis B Vaccine	2024-11-07	Evening	Scheduled	Blood work follow-up for patient 3

## Patient books with no preference

## Schedule Vaccination

Select Vaccine

Select Facility

Select Health Worker

Select Date

 □

Preferred Time Slot

Additional Comments (optional)

Book Appointment

Alice gets assigned to the patient

9	11/23/2024	Springfield General Hospital	Alice	COVID-19 Vaccine	Morning	Scheduled	Least busy test
---	------------	------------------------------	-------	------------------	---------	-----------	-----------------

**Trigger to decrease inventory when vaccination is logged**

DELIMITER \$\$

```
CREATE TRIGGER update_inventory_after_vaccination
AFTER INSERT ON Vaccination_Record
FOR EACH ROW
BEGIN
    -- Decrease the stock quantity for the specific batch
    UPDATE Inventory
    SET stock_quantity = stock_quantity - NEW.dose_given
    WHERE batch_number = NEW.batch_number;

    -- Check if the stock quantity has reached zero and delete the row if it has
    DELETE FROM Inventory
    WHERE batch_number = NEW.batch_number AND stock_quantity <= 0;
END$$

DELIMITER ;
```

Current inventory of Influenza is 150

#### Inventory

Vaccine Name	Available Doses	Batch Number	Expiration Date
COVID-19 Vaccine	4	BATCH001COVID19	2025-12-31
Influenza Vaccine	150	BATCH001INFLUENZA	2024-11-30
COVID-19 Vaccine	200	BATCH002COVID19	2026-12-31

Health Worker gives 1 dose of Influenza

#### Log Vaccination Event

Patient ID

Vaccine



Dose Given

Batch Number



**Log Vaccination Event**

Inventory decreases by 1

#### Inventory

Vaccine Name	Available Doses	Batch Number	Expiration Date
COVID-19 Vaccine	4	BATCH001COVID19	2025-12-31
Influenza Vaccine	149	BATCH001INFLUENZA	2024-11-30
COVID-19 Vaccine	200	BATCH002COVID19	2026-12-31

## Event scheduler to remove expired batches

```
DELIMITER $$

CREATE EVENT remove_expired_batches
ON SCHEDULE EVERY 1 DAY
DO
BEGIN
    -- Delete expired inventory batches
    DELETE FROM Inventory
    WHERE expiry_date < CURDATE();
END$$
```

```
DELIMITER ;
```

## Trigger and Procedure for Low Stock Alert

```
-- Procedure for Low Stock Alert Refresh
DELIMITER //
CREATE PROCEDURE RefreshLowStockAlerts()
BEGIN
    -- Clear existing low stock alerts
    DELETE FROM Low_Stock_Alert;

    -- Insert new low stock alerts
    INSERT INTO Low_Stock_Alert (vaccine_id, facility_id)
    SELECT vaccine_id, facility_id
    FROM (
        SELECT
            vaccine_id,
            facility_id,
            SUM(stock_quantity) AS total_stock
        FROM Inventory
        GROUP BY vaccine_id, facility_id
    ) AS vaccine_stock
    WHERE total_stock < 10;
END //
DELIMITER ;
```

```

-- Trigger to Refresh Low Stock Alerts on Inventory Update
DELIMITER //
CREATE TRIGGER refresh_low_stock_alerts
AFTER UPDATE ON Inventory
FOR EACH ROW
BEGIN
    CALL RefreshLowStockAlerts();
END //
DELIMITER ;

DELIMITER //
CREATE TRIGGER refresh_low_stock_alerts_after_insert
AFTER INSERT ON Inventory
FOR EACH ROW
BEGIN
    CALL RefreshLowStockAlerts();
END //
DELIMITER ;

DELIMITER //
CREATE TRIGGER refresh_low_stock_alerts_after_delete
AFTER DELETE ON Inventory
FOR EACH ROW
BEGIN
    CALL RefreshLowStockAlerts();
END //
DELIMITER ;

```

Current COVID-19 stock is 204

### Manage Inventory

[Add Inventory](#)

Batch ID	Vaccine Name	Quantity	Expiry Date	Actions
BATCH001COVID19	COVID-19 Vaccine	4	2025-12-31	
BATCH001INFLUENZA	Influenza Vaccine	150	2024-11-30	
BATCH002COVID19	COVID-19 Vaccine	200	2026-12-31	

Editing stock of BATCH002COVID19 to 4

**Manage Inventory**

**Add Inventory**

Batch ID	Vaccine Name	Expiry Date
BATCH001COVID19	COVID-19 Vaccine	2025-12-31
BATCH001INFLUENZA	Influenza Vaccine	2024-11-30
BATCH002COVID19	COVID-19 Vaccine	2026-12-31

**Edit Inventory**

Batch ID: BATCH002COVID19

Vaccine Name: COVID-19 Vaccine

Quantity: 4

Expiry Date: 31-12-2026

**Update**

Total COVID19 stock is now 8

### Manage Inventory

**Add Inventory**

Batch ID	Vaccine Name	Quantity	Expiry Date	Actions
BATCH001COVID19	COVID-19 Vaccine	4	2025-12-31	
BATCH001INFLUENZA	Influenza Vaccine	149	2024-11-30	
BATCH002COVID19	COVID-19 Vaccine	4	2026-12-31	

It is displayed in the Low Stock Alerts section

### Welcome, Alice

Manage health workers, inventory, and appointments efficiently.

Low Stock Alerts
<b>COVID-19 Vaccine:</b> 8 units

Expiry Alerts
<b>Batch Number:</b> BATCH001INFLUENZA, <b>Expiry Date:</b> 11/30/2024

### Today's Appointments

Appointment ID	Patient Name	Health Worker Name	Vaccine Name	Time Slot	Status
No appointments for today.					

## Event Scheduler and Trigger for Expiry Alerts

```
-- Event Scheduler for Expiry Alerts
DELIMITER //
CREATE EVENT check_vaccine_expiry
ON SCHEDULE EVERY 1 DAY
DO
    BEGIN
        -- Clear existing expiry alerts
        DELETE FROM Expiry_Alert;

        -- Insert new expiry alerts
        INSERT INTO Expiry_Alert (batch_number, facility_id)
        SELECT batch_number, facility_id
        FROM Inventory
        WHERE expiry_date <= CURDATE() + INTERVAL 10 DAY;
    END //
DELIMITER ;

DELIMITER //
CREATE TRIGGER update_expiry_alerts
AFTER UPDATE ON Inventory
FOR EACH ROW
BEGIN
    -- Remove existing alerts for this batch
    DELETE FROM Expiry_Alert
    WHERE batch_number = NEW.batch_number;

    -- Insert new alert if batch expires within 10 days
    IF NEW.expiry_date <= CURDATE() + INTERVAL 10 DAY THEN
        INSERT INTO Expiry_Alert (batch_number, facility_id)
        VALUES (NEW.batch_number, NEW.facility_id);
    END IF;
END //
DELIMITER ;
```

Influenza expires within 10 days

## Manage Inventory

Add Inventory

Batch ID	Vaccine Name	Quantity	Expiry Date	Actions
BATCH001COVID19	COVID-19 Vaccine	4	2025-12-31	
BATCH001INFLUENZA	Influenza Vaccine	149	2024-11-30	
BATCH002COVID19	COVID-19 Vaccine	4	2026-12-31	

It is displayed in the Expiry Alerts section

### Welcome, Alice

Manage health workers, inventory, and appointments efficiently.

Low Stock Alerts

**COVID-19 Vaccine:** 8 units

Expiry Alerts

**Batch Number:** BATCH001INFLUENZA, **Expiry Date:** 11/30/2024

### Today's Appointments

Appointment ID	Patient Name	Health Worker Name	Vaccine Name	Time Slot	Status
No appointments for today.					

Editing BATCH001COVID19 to expire within 10 days

Manage Invent

Add Inventory

Batch ID	Vaccine Name	Expiry Date
BATCH001COVID19	COVID-19 Vaccine	2025-12-31
BATCH001INFLUENZA		2024-11-30
BATCH002COVID19		2026-12-31

### Edit Inventory

Batch ID: BATCH001COVID19

Vaccine Name: COVID-19 Vaccine

Quantity: 4

Expiry Date: 29-11-2024

**Update**

It is displayed in the Expiry Alerts section

## Welcome, Alice

Manage health workers, inventory, and appointments efficiently.

### Low Stock Alerts

**COVID-19 Vaccine:** 8 units

### Expiry Alerts

**Batch Number:** BATCH001INFLUENZA, **Expiry Date:** 11/30/2024

**Batch Number:** BATCH001COVID19, **Expiry Date:** 11/29/2024

### Today's Appointments

Appointment ID	Patient Name	Health Worker Name	Vaccine Name	Time Slot	Status
No appointments for today.					

Low stock alerts are on the basis of vaccines whereas expiry alerts are on the basis of batches

## Nested query to get vaccine batches of a specific health worker

```
// Endpoint to get vaccine batches for a specific health worker
app.get('/batches/:healthWorkerId', (req, res) => {
  const healthWorkerId = req.params.healthWorkerId;
  const vaccineId = req.query.vaccineId; // Get the vaccine ID from query parameters

  // Query to get vaccine batches related to the health worker's facility and the selected vaccine
  const query = `
    SELECT i.batch_number, i.expiry_date, v.vaccine_name
    FROM Inventory i
    JOIN Vaccine v ON i.vaccine_id = v.vaccine_id
    WHERE i.facility_id =
      (
        SELECT facility_id
        FROM Health_Worker
        WHERE health_worker_id = ?
      ) AND i.vaccine_id = ?`; // Filter by vaccine_id

  db.query(query, [healthWorkerId, vaccineId], (error, results) => {
    if (error) {
      console.error('Error fetching batch numbers:', error);
      return res.status(500).json({ error: 'Database error' });
    }
    res.json(results); // Send JSON response with batch data
  });
});
```

```

async function populateBatchDropdown(vaccineId) {
  try {
    const response = await fetch(`http://localhost:3000/batches/${healthWorkerId}?vaccineId=${vaccineId}`);
    const batches = await response.json();
    const batchSelect = document.getElementById('batchNumber');

    // Clear existing options
    batchSelect.innerHTML = '';

    batches.forEach(batch => {
      const option = document.createElement('option');
      option.value = batch.batch_number; // Assuming batch_number is the unique identifier
      option.textContent = batch.batch_number; // Display batch number
      batchSelect.appendChild(option);
    });
  } catch (error) {
    console.error('Error fetching batches:', error);
  }
}

```

Only those batches of the chosen vaccine that are present at the facility where the health worker works is displayed

### Log Vaccination Event

Patient ID

1

Vaccine

COVID-19 Vaccine

Dose Given

1

Batch Number

BATCH001COVID19  
BATCH001COVID19  
BATCH002COVID19  
Log vaccination event

## Aggregate query SUM is used to find the total of all the batches of a particular vaccine in the Low Stock Alert section

```
-- Procedure for Low Stock Alert Refresh
DELIMITER //
CREATE PROCEDURE RefreshLowStockAlerts()
BEGIN
    -- Clear existing low stock alerts
    DELETE FROM Low_Stock_Alert;

    -- Insert new low stock alerts
    INSERT INTO Low_Stock_Alert (vaccine_id, facility_id)
    SELECT vaccine_id, facility_id
    FROM (
        SELECT
            vaccine_id,
            facility_id,
            SUM(stock_quantity) AS total_stock
        FROM Inventory
        GROUP BY vaccine_id, facility_id
    ) AS vaccine_stock
    WHERE total_stock < 10;
END //
DELIMITER ;
```

8 is the sum of the stock quantity of all the COVID-19 batches

Low Stock Alerts

COVID-19 Vaccine: 8 units

## Github Repository Link

<https://github.com/madanPES/vaccinationManagementSystemDBMS>