

HEALTHCARE ANALYTICS SQL PROJECT

WHOLE-PERSON HEALTHCARE REQUIRES WHOLE-SYSTEM ANALYTICS



Project Overview

- The Healthcare Analytics System is designed to manage and analyze data within a healthcare facility.
- Providing a comprehensive view of patient care, doctor performance, billing, and staff management.
- This system integrates various aspects of healthcare data to facilitate better decision-making, streamline operations, and improve patient outcomes.

Tables and Their Functionalities

- **Patients Table**
Stores information about patients including their personal details, contact information, and status.
- **Doctors Table**
Contains details about doctors, their specialties, and contact information.
- **Appointments Table**
Tracks appointments between patients and doctors, including appointment dates and statuses.
- **Medical Records Table**
Records medical information about patients, including diagnoses, treatments, and the date of the record.
- **Prescriptions Table**
Maintains details about prescriptions issued to patients, including medication details and dosage.
- **Billing Table**
Manages billing information for patients, tracking amounts, billing dates, and payment statuses.
- **Departments Table**
Organizes information about different departments in the healthcare facility and their head doctors.

Continued...

- **Hospital Staff Table**
Contains details about the hospital staff, their positions, and the departments they belong to.
- **Functionality Overview**
Patient Management
Track and manage patient details including personal information, contact details, and status.
- **Doctor Management**
Maintain records of doctors, their specialties, and contact information.
- **Appointments Scheduling and Tracking**
Schedule, track, and update appointment details.

Continued...

- **Medical Records Maintenance**
Document diagnoses, treatments, and other medical records for patients.
- **Prescription Management**
Manage and track prescriptions issued to patients, including medication details and dosage instructions.
- **Billing and Payment Tracking**
Handle billing processes, track payment statuses, and manage financial records.
- **Department and Staff Management**
Organize and manage information about various departments and their head doctors. Track hospital staff details, their positions, and departmental associations.

Data Cleansing of all the Tables

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```
--Cleaning the Appointments Table Data
select *, datepart(year, appointmentdate) Appointment_Year,
datepart(month, appointmentdate) Appointment_Month,
datepart(day, appointmentdate) Appointment_Day,
CONVERT(date, appointmentdate) Appointment_time
from Appointments

--Cleaning the Billing Table Data
select *, datepart(year, billingdate) Billing_year,
datepart(month, billingdate) Billing_Month,
datepart(weekday, billingdate) Billing_Day
from Billing

--Cleaning the Doctors Table Data
select *,
concat(firstname, ' ', lastname) Doctors_FullName
```

100 %

Results Messages

| | AppointmentID | PatientID | DoctorID | AppointmentDate | Status | Appointment_Year | Appointment_Month | Appointment_Day | Appointment_time |
|----|---------------|-----------|----------|-------------------------|-----------|------------------|-------------------|-----------------|------------------|
| 1 | 1 | 1 | 1 | 2024-07-01 10:00:00.000 | Completed | 2024 | July | 1 | 2024-07-01 |
| 2 | 2 | 2 | 2 | 2024-07-05 11:00:00.000 | Completed | 2024 | July | 5 | 2024-07-05 |
| 3 | 3 | 3 | 3 | 2024-07-10 12:00:00.000 | Completed | 2024 | July | 10 | 2024-07-10 |
| 4 | 4 | 4 | 4 | 2024-07-15 09:00:00.000 | Completed | 2024 | July | 15 | 2024-07-15 |
| 5 | 5 | 5 | 5 | 2024-07-20 14:00:00.000 | Completed | 2024 | July | 20 | 2024-07-20 |
| 6 | 6 | 6 | 1 | 2024-08-01 10:30:00.000 | Completed | 2024 | August | 1 | 2024-08-01 |
| 7 | 7 | 7 | 1 | 2024-08-06 11:30:00.000 | Completed | 2024 | August | 6 | 2024-08-06 |
| 8 | 8 | 8 | 2 | 2024-08-11 12:30:00.000 | Pending | 2024 | August | 11 | 2024-08-11 |
| 9 | 9 | 9 | 3 | 2024-08-16 09:30:00.000 | Pending | 2024 | August | 16 | 2024-08-16 |
| 10 | 10 | 10 | 3 | 2024-08-21 14:30:00.000 | Pending | 2024 | August | 21 | 2024-08-21 |

Exploratory Data Analysis

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```
---Exploratory Data Analysis
--Retrieve data from one or more tables.
---Select All Columns from a Table
SELECT * FROM Patients;

---Select Specific Columns from a Table
SELECT FirstName, LastName FROM Doctors;

--Sorts the result set in ascending or descending order.
SELECT * FROM Patients ORDER BY LastName ASC;

--Groups rows that have the same values in specified columns into summary rows.
--Question: Count the number of patients by gender.
SELECT Gender, COUNT(*) AS NumberOfPatients
FROM Patients
GROUP BY Gender;

--Getting total, average, maximum and minimum of bills
SELECT SUM(Amount) AS TotalBilling FROM Billing;
SELECT Avg(Amount) AS AvgBilling FROM Billing;
SELECT Max(Amount) AS HighestBilling FROM Billing;
SELECT Min(Amount) AS LowestBilling FROM Billing;
```

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Results Messages

| | PatientID | FirstName | LastName | DOB | Gender | ContactNumber | Address | Status |
|---|-----------|-----------|----------|------------|--------|---------------|----------------------|----------|
| 3 | 3 | Rohan | Singh | 1982-01-30 | Male | 9876543212 | Bangalore, Kamataka | Active |
| 4 | 4 | Priya | Mehta | 1995-09-15 | Female | 9876543213 | Chennai, Tamil Nadu | InActive |
| 5 | 5 | Amit | Kumar | 1987-05-20 | Male | 9876543214 | Pune, Maharashtra | Active |
| 6 | 6 | Sneha | Patel | 1991-12-11 | Female | 9876543215 | Ahmedabad, Gujarat | Active |
| 7 | 7 | Vikram | Joshi | 1984-08-25 | Male | 9876543216 | Kolkata, West Bengal | Active |
| 8 | 8 | Deepa | Das | 1992-11-20 | Female | 9876543217 | Hyderabad, Telangana | Active |

Data Analysis questions

```
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```

```
--Performing Data Analysis questions

--1.Question: Retrieve patients who have never had an appointment. names for all appointments.
SELECT P.FirstName, P.LastName
FROM Patients P
Left JOIN Appointments A ON P.PatientID = A.PatientID
WHERE A.AppointmentDate IS NULL;

--2.Question: Retrieve patients' names along with their doctors' names for all appointments.
SELECT P.FirstName AS PatientFirstName, P.LastName AS PatientLastName, D.FirstName AS DoctorFirstName, D.LastName AS DoctorLastName
FROM Appointments A
INNER JOIN Patients P ON A.PatientID = P.PatientID
INNER JOIN Doctors D ON A.DoctorID = D.DoctorID;

--3.Question: Retrieve names from both the Doctors and Patients tables.
SELECT FirstName, LastName, concat(FirstName, ' ', LastName)FullName FROM Doctors
UNION
SELECT FirstName, LastName, concat(FirstName, ' ', LastName)FullName FROM Patients;

--4.Question: Retrieve doctors and the number of patients they have seen.
WITH PatientCounts AS (
```

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Results Messages

| | FirstName | LastName | FullName |
|---|-----------|----------|----------------|
| 1 | Amit | Kumar | Amit Kumar |
| 2 | Anita | Desai | Anita Desai |
| 3 | Arjun | Verma | Arjun Verma |
| 4 | Dr. Anil | Joshi | Dr. Anil Joshi |
| 5 | Dr. Meera | Rao | Dr. Meera Rao |
| 6 | Dr. Ravi | Patel | Dr. Ravi Patel |

Data Analysis questions continued...

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```
--4.Question: Retrieve doctors and the number of patients they have seen.  
WITH PatientCounts AS (  
    SELECT DoctorID, COUNT(*) AS NumberOfPatients  
    FROM Appointments  
    GROUP BY DoctorID  
)  
SELECT Concat(D.FirstName, ' ', D.LastName) as DoctorName, P.NumberOfPatients  
FROM Doctors D  
JOIN PatientCounts P ON D.DoctorID = P.DoctorID;  
  
--5.Question: Retrieve doctors who have more than 10 appointments.  
SELECT DoctorID, COUNT(*) AS AppointmentCount  
FROM Appointments  
GROUP BY DoctorID  
HAVING COUNT(*) > 10;  
  
--6.Question: Assign row numbers to billing records ordered by amount.  
SELECT Amount,  
    ROW_NUMBER() OVER (ORDER BY Amount DESC) AS RowNum,  
    Rank() OVER (ORDER BY Amount DESC) AS Rank,  
    Dense_Rank () OVER (ORDER BY Amount DESC) AS DenseRank  
FROM Billing;
```

100 %

Results Messages

| | DoctorName | NumberOfPatients |
|---|-------------------|------------------|
| 1 | Dr. Ravi Patel | 3 |
| 2 | Dr. Sunita Desai | 2 |
| 3 | Dr. Anil Joshi | 3 |
| 4 | Dr. Meera Rao | 1 |
| 5 | Dr. Vikram Kapoor | 1 |

Data Analysis questions continued...

```
HealthCare_Analytic...L\Sunil K Pal (52))* -> X
--7.Retrieve patients with pending appointments.
SELECT P.FirstName, P.LastName, concat(P.FirstName, ' ', P.LastName)Patients_FullName
FROM Patients P
WHERE EXISTS (SELECT 1 FROM Appointments A WHERE A.PatientID = P.PatientID AND A.Status = 'Pending');

--8.Question: List all patients' names and their contact numbers.
SELECT FirstName, LastName,concat(FirstName, ' ', LastName)Patients_fullName, ContactNumber
FROM Patients;

--9.Question: Retrieve the details of Active patients who had appointments scheduled in the last 7 days.
SELECT P.PatientID, P.FirstName, P.LastName, P.DOB, P.Gender, P.ContactNumber, P.Address
FROM Patients P
INNER JOIN Appointments A ON P.PatientID = A.PatientID
WHERE P.Status = 'Active' and AppointmentDate >= DATEADD(DAY, -7, GETDATE());

--10.Question: List all doctors along with their specialties.
SELECT FirstName, LastName, Specialty
FROM Doctors;

--11.Question: Retrieve the details of doctors who have more than 1 appointments in the current month.
SELECT D.FirstName, D.LastName, COUNT(A.AppointmentID) AS AppointmentCount
FROM Doctors D
JOIN Appointments A ON D.DoctorID = A.DoctorID
WHERE MONTH(A.AppointmentDate) = MONTH(GETDATE())
AND YEAR(A.AppointmentDate) = YEAR(GETDATE())
GROUP BY D.FirstName, D.LastName
HAVING COUNT(A.AppointmentID) > 1;
```

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Results Messages

| | FirstName | LastName | Patients_FullName |
|---|-----------|----------|-------------------|
| 1 | Pooja | Rao | Pooja Rao |
| 2 | Rahul | Nair | Rahul Nair |

Data Analysis questions continued...

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```
--12.Question: List the appointments that are still pending (status 'Pending').  
SELECT *  
FROM Appointments  
WHERE Status = 'Pending';  
  
--13.Question: Find the most common diagnosis given by doctors.  
SELECT Diagnosis, COUNT(*) AS Frequency  
FROM MedicalRecords  
GROUP BY Diagnosis  
ORDER BY Frequency DESC  
  
--14.Question: Find the total billing amount for the current month.  
SELECT SUM(Amount) AS TotalBilling  
FROM Billing  
WHERE MONTH(BillingDate) = MONTH(GETDATE())  
AND YEAR(BillingDate) = YEAR(GETDATE());  
  
--15.Question: Find the number of staff members in each department.  
SELECT Dept.DepartmentName, COUNT(*) AS StaffCount  
FROM HospitalStaff HS  
JOIN Departments Dept ON HS.DepartmentID = Dept.DepartmentID  
GROUP BY Dept.DepartmentName;
```

100 %

Results Messages

| | AppointmentID | PatientID | DoctorID | AppointmentDate | Status |
|---|---------------|-----------|----------|-------------------------|---------|
| 1 | 8 | 8 | 2 | 2024-08-11 12:30:00.000 | Pending |
| 2 | 9 | 9 | 3 | 2024-08-16 09:30:00.000 | Pending |
| 3 | 10 | 10 | 3 | 2024-08-21 14:30:00.000 | Pending |

| | Diagnosis | Frequency |
|---|-----------|-----------|
| 1 | Diabetes | 1 |
| 2 | Epilepsy | 1 |

Data Analysis questions continued...

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```
--16.Question: Find the number of male and female Active patients.
SELECT Gender, COUNT(*) AS NumberOfPatients
FROM Patients
Where Status = 'Active'
GROUP BY Gender;

--17.Question: Retrieve the details of ACTIVE patients who have appointments scheduled in the next 7 days.
SELECT P.FirstName, P.LastName, A.AppointmentDate
FROM Patients P
JOIN Appointments A ON P.PatientID = A.PatientID
WHERE P.Status = 'Active' AND A.AppointmentDate BETWEEN GETDATE() AND DATEADD(DAY, 7, GETDATE());

--18.Question: Find the number of doctors in each specialty.
SELECT Specialty, COUNT(*) AS NumberOfDoctors
FROM Doctors
GROUP BY Specialty;

--19.Question: Find the total number of appointments scheduled in the current year.
SELECT COUNT(*) AS TotalAppointments
FROM Appointments
WHERE YEAR(AppointmentDate) = YEAR(GETDATE());
```

100 %

Results Messages

| | Gender | NumberOfPatients |
|---|--------|------------------|
| 1 | Female | 4 |
| 2 | Male | 5 |

| | FirstName | LastName | AppointmentDate |
|---|-----------|----------|-------------------------|
| 1 | Rahul | Nair | 2024-08-16 09:30:00.000 |

| | Specialty | NumberOfDoctors |
|---|------------|-----------------|
| 1 | Cardiology | 1 |

Data Analysis questions continued...

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```
--20.Question: Retrieve the details of appointments along with patient and doctor names.  
SELECT A.AppointmentID, P.FirstName AS PatientFirstName, P.LastName AS PatientLastName,  
       D.FirstName AS DoctorFirstName, D.LastName AS DoctorLastName, A.AppointmentDate  
FROM Appointments A  
JOIN Patients P ON A.PatientID = P.PatientID  
JOIN Doctors D ON A.DoctorID = D.DoctorID;  
  
--21.Question: Find the medications that have been prescribed the most.  
SELECT Medication, COUNT(*) AS PrescriptionCount  
FROM Prescriptions  
GROUP BY Medication  
ORDER BY PrescriptionCount DESC;  
  
--22.Question: Retrieve the details of unpaid bills.  
SELECT *  
FROM Billing  
WHERE PaymentStatus = 'Pending';
```

100 %

Results Messages

| | AppointmentID | PatientFirstName | PatientLastName | DoctorFirstName | DoctorLastName | AppointmentDate |
|---|---------------|------------------|-----------------|-----------------|----------------|-------------------------|
| 1 | 1 | Arjun | Verma | Dr. Ravi | Patel | 2024-07-01 10:00:00.000 |
| 2 | 2 | Neha | Sharma | Dr. Sunita | Desai | 2024-07-05 11:00:00.000 |
| 3 | 3 | Rohan | Singh | Dr. Anil | Joshi | 2024-07-10 12:00:00.000 |
| 4 | 4 | Priya | Mehta | Dr. Meera | Rao | 2024-07-15 09:00:00.000 |
| 5 | 5 | Amit | Kumar | Dr. Vikram | Kapoor | 2024-07-20 14:00:00.000 |
| 6 | 6 | Sneha | Patel | Dr. Ravi | Patel | 2024-08-01 10:30:00.000 |
| 7 | 7 | Vikram | Joshi | Dr. Ravi | Patel | 2024-08-06 11:30:00.000 |
| 8 | 8 | Pooja | Rao | Dr. Sunita | Desai | 2024-08-11 12:30:00.000 |

| | Medication | PrescriptionCount |
|---|------------|-------------------|
| 1 | Amlodine | 1 |

Data Analysis questions continued...

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```
--23.Question: List the top 3 doctors with the highest number of appointments.  
WITH DoctorAppointments AS (  
    SELECT DoctorID, COUNT(*) AS NumberOfAppointments  
    FROM Appointments  
    GROUP BY DoctorID  
)  
  
SELECT TOP 3 DA.DoctorID, Concat(FirstName, ' ', LastName) AS DoctorName, DA.NumberOfAppointments  
FROM DoctorAppointments DA  
INNER JOIN Doctors D ON DA.DoctorID = D.DoctorID  
ORDER BY DA.NumberOfAppointments DESC
```

100 %

Results Messages

| | DoctorID | DoctorName | NumberOfAppointments |
|---|----------|------------------|----------------------|
| 1 | 1 | Dr. Ravi Patel | 3 |
| 2 | 3 | Dr. Anil Joshi | 3 |
| 3 | 2 | Dr. Sunita Desai | 2 |

Conclusion

- The Healthcare Analytics System provides a robust framework for managing various aspects of healthcare data, enabling healthcare providers to deliver better patient care and streamline their operations.
- By integrating patient management, doctor performance tracking, appointment scheduling, medical record maintenance, prescription management, billing, and staff organization, this offers a comprehensive solution for healthcare analytics.