Here are the SQL queries to analyze the scheduling system:

**🔍 1. Peak Appointment Hours**

SELECT HOUR(AppointmentDateTime) AS Hour, COUNT(\*) AS AppointmentCount

FROM appointment

GROUP BY HOUR(AppointmentDateTime)

ORDER BY AppointmentCount DESC;

**🔍 2. Patients with Recurring Cancellations**

SELECT p.PatientID, pt.FullName, COUNT(\*) AS CancellationCount

FROM appointment p

JOIN patients pt ON p.PatientID = pt.PatientID

WHERE p.Status = 'Cancelled'

GROUP BY p.PatientID, pt.FullName

HAVING COUNT(\*) > 2;

**🔍 3. Doctor Availability vs. Actual Appointments**

SELECT d.DoctorID, d.FullName, d.AvailableSlotsPerDay, COUNT(a.AppointmentID) AS ActualAppointments

FROM doctors d

LEFT JOIN appointment a ON d.DoctorID = a.DoctorID

GROUP BY d.DoctorID, d.FullName, d.AvailableSlotsPerDay;

**🔍 4. Average Wait Time per Department**

SELECT Department,

AVG(TIMESTAMPDIFF(MINUTE, BookingDateTime, AppointmentDateTime)) AS AvgWaitTimeMins

FROM appointment

WHERE Status = 'Completed'

GROUP BY Department;

**🔍 5. No-Show Rate by Patient**

SELECT p.PatientID, pt.FullName,

COUNT(\*) AS TotalAppointments,

SUM(CASE WHEN a.Status = 'No Show' THEN 1 ELSE 0 END) AS NoShows,

ROUND(SUM(CASE WHEN a.Status = 'No Show' THEN 1 ELSE 0 END)\*100.0 / COUNT(\*), 2) AS NoShowRate

FROM appointment a

JOIN patients pt ON a.PatientID = pt.PatientID

GROUP BY p.PatientID, pt.FullName;

**🔍 6. Top Departments by Appointment Volume**

SELECT Department, COUNT(\*) AS AppointmentCount

FROM appointment

GROUP BY Department

ORDER BY AppointmentCount DESC;

**🔍 7. Appointment Distribution by Payment Type**

SELECT PaymentType, COUNT(\*) AS Count

FROM appointment

GROUP BY PaymentType;

**🔍 8. First-time vs Repeat Visit Analysis**

SELECT IsFirstVisit, COUNT(\*) AS VisitCount

FROM appointment

GROUP BY IsFirstVisit;

**🔍 9. Gender-wise Appointment Count**

SELECT pt.Gender, COUNT(\*) AS TotalAppointments

FROM appointment a

JOIN patients pt ON a.PatientID = pt.PatientID

GROUP BY pt.Gender;

**🔍 10. Cancellation Reasons Breakdown**

SELECT CancellationReason, COUNT(\*) AS CancellationCount

FROM appointment

WHERE Status = 'Cancelled'

GROUP BY CancellationReason

ORDER BY CancellationCount DESC;