



## **Advanced Web Development**

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## **Medical Appointment Web System**

### **Problem**

A modern clinic needs an integrated web system that allows patients to schedule, manage, and track their medical appointments efficiently. The current process relies on phone calls and manual record-keeping, leading to appointment overlaps, loss of information, and delays in patient service.

This situation affects both patient satisfaction and the clinic's operational efficiency, highlighting the need for a digital, centralized solution.

### **Overview**

In the healthcare environment, patient care heavily depends on the coordination of multiple professionals, the management of resources (consulting rooms, medical equipment), and the timely handling of appointments. A single missed or duplicated appointment can cascade into longer waiting times, reduced doctor efficiency, and dissatisfaction among patients.

A web-based appointment scheduling system centralizes this process. Patients can log in to view available slots, book or modify appointments, and receive reminders. Doctors can manage their calendars, approve reschedules, and access patient information securely. Administrators can monitor clinic performance, balance workloads, and generate reports.

Unlike traditional paper or spreadsheet systems, the web application ensures data consistency, real-time synchronization, and automated communication between patients and staff. This reduces administrative workload and increases patient satisfaction through transparency and efficiency.

## Background

In a clinical context, appointments are the most important part of operations. Each appointment links a patient, a doctor, a specialty, a consultation room, and a specific time slot. Managing this efficiently requires understanding several entities and relationships:

- A Doctor has a defined schedule (working days, hours, and exceptions).
- A Patient may have one or multiple appointments, each associated with a specific service (such as general consultation, lab test, follow-up).
- A Consultation Room can only be assigned to one appointment at a time.
- Each Appointment progresses through statuses such as *Scheduled*, *Confirmed*, *In Progress*, *Completed*, or *Cancelled*.

To ensure accurate scheduling, the system must dynamically compute available slots based on real-time data. For example, if Dr. Pérez works from 08:00 to 16:00 with a lunch break from 12:00 to 13:00, and already has three appointments booked, the algorithm should calculate and display only the remaining available intervals (08:00–09:00, 10:00–11:00, etc.) for new bookings.

The system also integrates with Electronic Health Records (EHR) to provide context to each consultation. When a doctor opens an appointment, the system retrieves the patient's medical history, allergies, and previous diagnoses. After the consultation, any new prescriptions or diagnostic notes are automatically appended to the patient's record.

From a business perspective, billing is dynamically generated based on factors such as consultation duration, insurance plan, and doctor specialty. The system ensures traceability of all transactions through an audit module that records user actions with timestamps, enabling accountability and compliance with healthcare regulations.

## **Analyst Comparison**

To evaluate the performance and efficiency of the medical appointment system, as well as the professionals who use it, various indicators can be compared among doctors, specialties, or administrative staff. Each doctor operates within the same digital environment, but their performance may vary depending on the number of patients attended, appointment punctuality, and patient satisfaction.

The system records detailed data from every appointment, including scheduled time, check-in time, consultation duration, cancellations, and follow-ups. Using these records, several performance metrics can be computed:

- Total Consultations (TC): total number of appointments completed by a doctor or specialty.
- Attendance Rate (AR): ratio of completed appointments to scheduled appointments.
- Average Consultation Time (ACT): average duration of a consultation.
- Cancellation Ratio (CR): percentage of appointments cancelled or rescheduled by patients or staff.
- Patient Satisfaction Index (PSI): rating derived from patient feedback surveys after each visit.

By analyzing these metrics, the clinic can identify patterns such as which doctors maintain the highest patient satisfaction, which specialties experience more cancellations, or which time slots cause delays. This data-driven comparison supports administrative decisions like workload balancing, incentive programs, and scheduling adjustments.

Another measure of overall clinic performance is the Operational Efficiency Index (OEI), calculated as the ratio between the total number of effective consultations and the total available time of medical staff. A higher OEI indicates that the system and its users are utilizing resources optimally.

In summary, this comparison framework allows the clinic to continuously improve its service quality, identify inefficiencies, and enhance the patient experience through evidence-based management.