WWW.IJRPR.COM

International Journal of Research Publication and Reviews

Journal homepage: www.ijrpr.com ISSN 2582-7421

An Advanced MERN-Based Medicare System for Online Doctor Appointment Management

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A B S T R A C T :

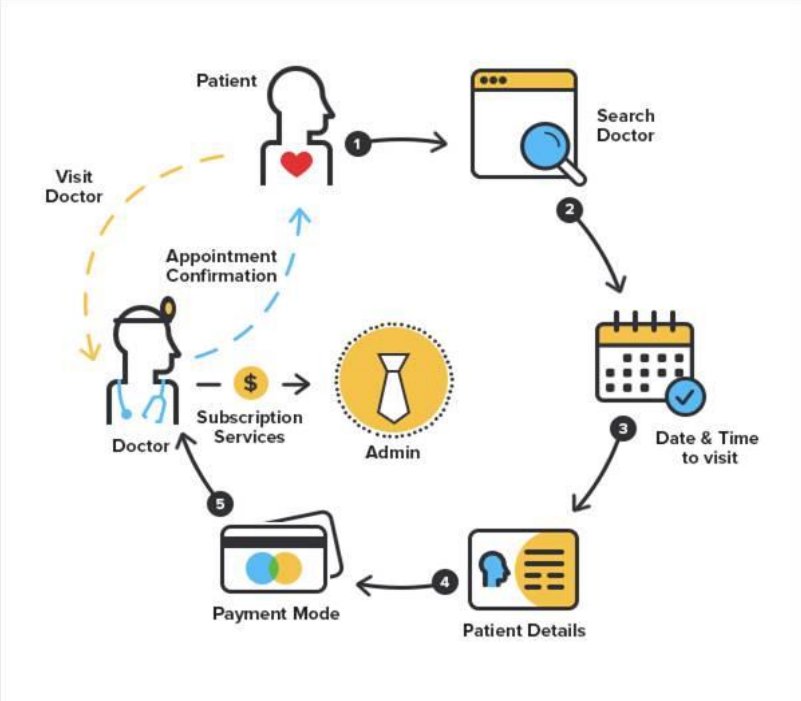
Healthcare institutions often struggle with inefficient manual appointment systems, resulting in long waiting times, scheduling errors, and poor communication between patients and doctors. This research presents *Medicare*, a MERN-stack–based web application that digitalizes doctor appointment booking, patient records, and doctor schedules. The system includes patient registration, doctor verification, secure authentication using JWT, role-based dashboards, and real-time appointment updates. Results indicate that the system significantly reduces manual workload and improves the efficiency of healthcare services. Future enhancements include AI-based doctor suggestions, online consultation, and e-prescription modules.

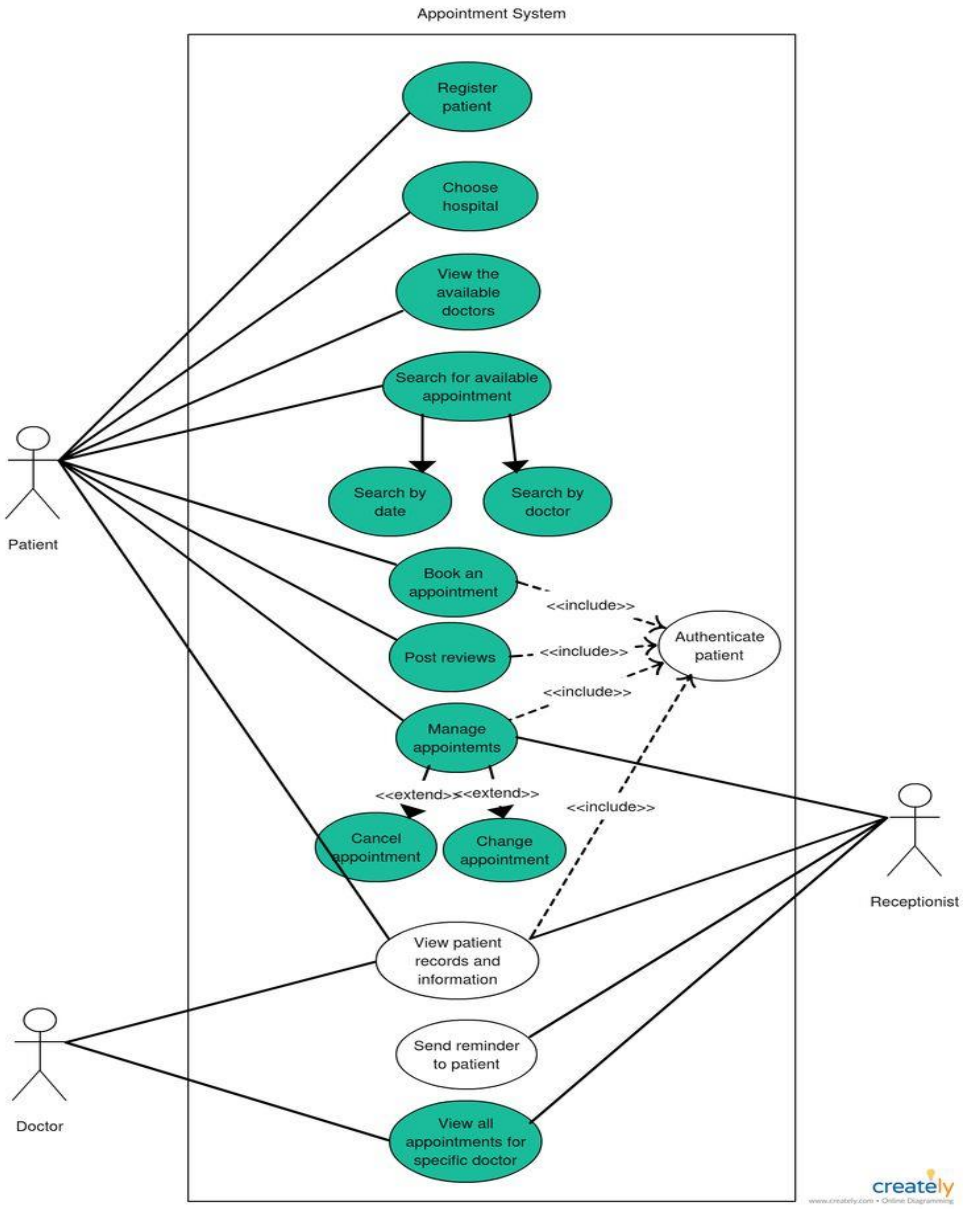
Keywords*:* Doctor Appointment System, MERN Stack, Healthcare Automation, Web Application, Scheduling System, Patient Management.

INTRODUCTION

Traditional hospital appointment systems rely heavily on manual registers, which often lead to long queues, miscommunication, scheduling conflicts, and human errors. In the digital era, healthcare systems must adopt automated solutions to improve speed, accuracy, and convenience.

This research presents *Medicare*, an online doctor appointment management system that supports patient registration, doctor scheduling, appointment booking, and admin monitoring. Built using the MERN stack (MongoDB, ExpressJS, ReactJS, NodeJS), the system aims to provide a modern, scalable, and user-friendly solution for hospitals and clinics.



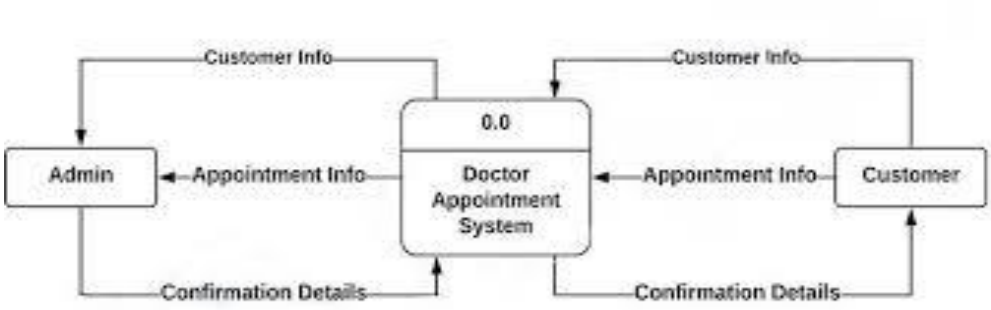


2. LITERATURE REVIEW

Previous studies highlight the limitations of manual appointment booking systems, including long waiting times and lack of transparency. Early web-based systems improved scheduling but lacked advanced features such as authentication, real-time updates, and central data management.

Recent research shows that MERN-based applications provide better scalability, security, and performance for healthcare platforms. Studies also emphasize the importance of secure authentication, encrypted storage, and user-friendly interfaces for medical systems. However, many existing solutions lack complete integration of admin, doctor, and patient modules.

The Medicare system addresses these gaps by combining secure login, doctor verification, appointment management, and automated notifications in a single platform.



3. METHODOLOGY

The methodology involves designing and developing the Medicare system using the MERN architecture.

3.1 System Components

(a) Users (Patient / Doctor / Admin)

- Patients: Register, view doctors, book appointments
- Doctors: Manage schedule, view appointments
- Admin: Verify doctors, manage users and system data

(b) Frontend (ReactJS)

- User dashboards
- Appointment booking interface
- Doctor list and schedules

(c) Backend (NodeJS + ExpressJS)

- API endpoints
- Authentication and authorization
- Logic for managing appointments, users, and doctor data

(d) Database (MongoDB)

- Collections: Users, Doctors, Appointments, Records
- NoSQL flexible schema allows scalable storage

3.2 Security Features

- Password encryption using bcrypt
- JWT-based authentication
- Role-based access control
- Validation of user input

3.3 Workflow

1. User registers or logs in
2. JWT verifies role (patient/doctor/admin)
3. Patients view doctor availability
4. Appointment booking stored in MongoDB
5. Doctors/Admin view and update schedule

4. DISCUSSION

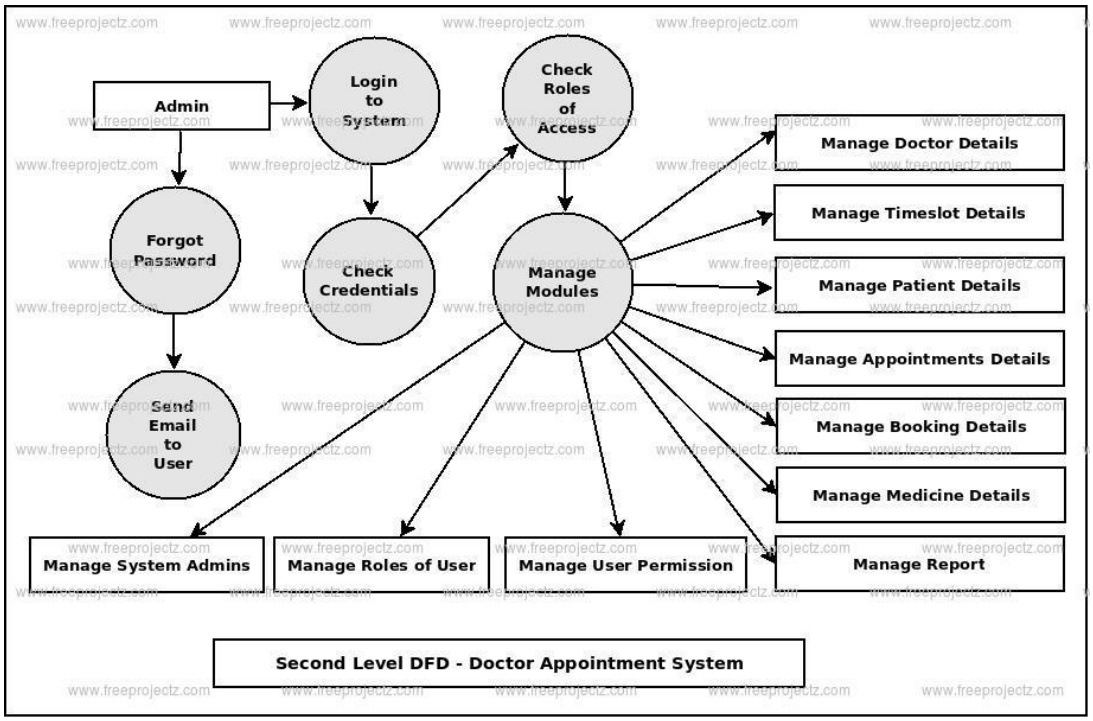
During testing, Medicare significantly improved appointment processes. Clinics previously using manual systems faced:

- 30–60 minute waiting just for booking
- Scheduling conflicts
- No digital record management

Using Medicare:

- Appointment booking time reduced to *2–3 minutes*
- Doctors accessed real-time schedules
- Admin effectively verified doctors and managed system data
- Communication improved
- Zero manual errors

These results demonstrate the system's effectiveness in reducing workload and modernizing healthcare operations.



5 CASE STUDY

A local clinic using manual appointment registers was selected for observation. The problems noted included:

- Long queues for booking
- Patients unsure of doctor availability
- Errors in handwritten registers
- No reminders or notifications

After implementing Medicare:

- Booking became online and instant
- Patients checked availability anytime
- Doctors viewed upcoming schedules easily
- Admin maintained proper records

The case study confirmed that the Medicare system improves efficiency and patient satisfaction.

6 CONCLUSION

The Medicare Doctor Appointment System offers a secure, automated, and efficient solution to modern healthcare challenges. It reduces waiting time, eliminates manual errors, and provides real-time scheduling with role-based dashboards. The MERN stack ensures high performance and scalability. Future extensions include online payments, video consultation, AI-based doctor recommendations, and e-prescriptions.

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