

# Smart Health Camp Management System Using MERN Stack

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## 1. Introduction

Access to reliable healthcare services remains a major challenge in rural and semi-urban regions. Health camps serve as an important mechanism for providing temporary medical assistance to communities with limited access to hospitals and clinics. Traditionally, the management of these camps relies on manual documentation and fragmented communication processes. Such practices often lead to record duplication, information loss, and inefficient coordination among administrators, healthcare professionals, and patients.

The absence of centralized digital infrastructure restricts doctors from accessing patient medical history and delays the dissemination of information regarding upcoming camps. Advances in web technologies and healthcare informatics offer opportunities to modernize these processes through automated digital platforms.

This paper proposes a Smart Health Camp Management System designed to streamline camp organization, improve communication, and maintain secure digital health records. Developed using the MERN stack, the system provides a scalable and user-friendly environment for managing healthcare camp activities.

## 2. LITERATURE REVIEW

Healthcare information systems have been widely studied for their ability to improve administrative efficiency and patient record management. Previous research highlights that digital healthcare platforms enhance data accessibility, reduce operational delays, and support informed medical decision-making.

Web-based patient management systems have demonstrated significant improvements in communication and service delivery. Researchers have

emphasized the importance of centralized databases in maintaining consistent and secure patient records. However, most existing systems focus on hospital environments or remote patient monitoring.

There is limited research addressing the digital management of temporary community healthcare camps. The proposed system contributes to this area by providing a specialized platform for organizing and managing health camps efficiently.

## 3. OBJECTIVE

The objective of this study is to design and develop a Smart Health Camp Management System that improves the efficiency and organization of healthcare camp operations through digital automation. The proposed system provides a secure web-based platform for scheduling health camps, managing patient registration, and maintaining centralized digital medical records. It aims to enhance communication among administrators, doctors, and patients while ensuring data security through role-based access control. Furthermore, the study focuses on reducing manual paperwork, improving the accuracy and accessibility of healthcare information, and evaluating the usability and effectiveness of the system in supporting community healthcare services.

## 4. SYSTEM ARCHITECTURE

The Smart Health Camp Management System follows a three-tier architecture using the MERN stack to ensure scalability and security.

### A. User Interface Layer

The user interface layer is developed using React.js and provides dashboards for Admin, Doctor, and Patient users. It supports registration, login, viewing camp details, notifications, and medical record access.

### B. Application Logic Layer

The application logic layer is implemented using Node.js and Express.js. It handles authentication, role-based access control, API requests, and communication between the frontend and database.

### C. Database Storage Layer

MongoDB is used as the database to store patient records, doctor details, camp schedules, and medical history. It ensures efficient data retrieval and secure storage of sensitive healthcare data.

## 5. DATASET DESCRIPTION

The system uses structured data stored in a MongoDB database. The dataset is generated through interactions by Admin, Doctor, and Patient users.

Patient data includes patient ID, name, age, gender, contact information, location, and login credentials, along with medical records such as health conditions, consultation dates, and doctor remarks. Doctor data includes doctor ID, specialization, and contact details. Health camp data includes camp ID, location, date, and time. These datasets are interconnected to support continuous healthcare monitoring.

Attribute	Description
Data Access	Role-based access for Admin, Doctor, and Patient
Data Validation	Verification of input data before storage
Data Consistency	Centralized database for uniform records
Data Availability	Anytime access through a web application
Backup Support	Secure backup and recovery

## 6. PROPOSED AND EXISTING

### Proposed System:

The proposed Smart Health Camp Management System introduces a digital and automated platform to improve the organization and management of healthcare camps. The system is developed using the MERN stack and provides a secure web-based environment for managing camp scheduling, patient registration, and digital medical records.

The system includes dedicated modules for administrators, doctors, and patients. Administrators

are responsible for scheduling camps and managing system activities. Doctors digitally record patient consultations and medical information during health camps. Patients can register online, receive updates about upcoming camps, and access their medical history through the system.

Secure authentication and role-based access control mechanisms protect sensitive healthcare data and ensure authorized access. The centralized database allows efficient storage and retrieval of information, improving coordination and communication among all users. The proposed system supports efficient healthcare camp management by replacing manual processes with a structured digital solution.

### Existing System:

The existing health camp management system mainly depends on manual and paper-based methods for organizing healthcare activities. In traditional practice, patient registration, camp scheduling, and medical record maintenance are carried out using handwritten documents and separate files. This approach often results in inefficient coordination and difficulty in maintaining accurate records. Paper-based systems make it challenging to store and retrieve patient information quickly, especially when dealing with a large number of participants.

Communication among administrators, doctors, and patients is generally unstructured and time-consuming. The absence of a centralized digital platform limits access to patient medical history and reduces the ability to monitor healthcare activities effectively. As a result, the overall management of health camps becomes less efficient and may affect the quality of healthcare services delivered.

## 7. RESULTS AND EVALUATION



Fig. 1: Admin Dashboard of Smart Health Camp Management System

This figure 1 shows the Admin Dashboard, which provides an overall view of health camps, patients, doctors, and health records. It helps the admin manage

camp, monitor system activities, and control the entire system efficiently.



Figure 2: Upcoming Health Camps Management Page

This figure 2 list of scheduled health camps with key details such as date, location, and patient registration status. It enables users to view and manage camp information through search, filter, and detail options.



Fig 3: Patient Web Page – Health Record View

This figure 3 patient's health details after the camp, including consultation information, checkup timing, diagnosis, vital readings, and doctor's advice. It helps patients and doctors easily track medical history for follow-up care.

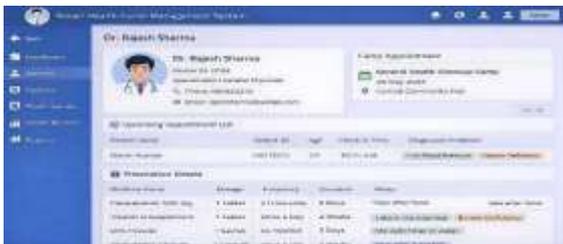


Figure 4: Doctor Web Page – Camp Assignment and Prescription Details. The figure 4 shows the doctor module displaying assigned health camp details, patient list, and digital prescription information. It allows doctors to view patient records and provide accurate electronic prescriptions efficiently.

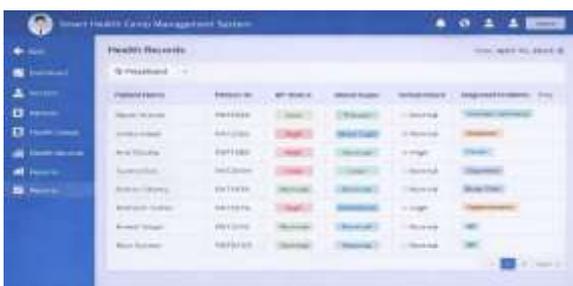


Figure.5: Health Records – Patient Vital Status Page

This figure 5 shows the medical status of patients examined in the health camp. It displays key vital parameters such as blood pressure, blood sugar, and body temperature with their condition categorized as high, normal, or low. The page also lists patient name, diagnosed problem, and assigned doctor for quick reference. This module helps doctors to monitor patient health conditions, identify critical cases, and maintain digital medical records effectively.

## 8. LIMITATIONS

The current version of the system requires a stable internet connection and is accessible only through a web platform. Features such as mobile application support and offline access are not included at this stage. These limitations can be addressed in future developments to improve usability, accessibility, and overall system scalability.

## 9. FUTURE ENHANCEMENTS

Future enhancements include integration of SMS and email notifications for real-time communication. GPS-based location tracking can improve patient-to-camp mapping. Support for uploading medical reports and prescriptions can enhance record management. Integration with hospital management systems and mobile application development can further improve accessibility. AI-based health analysis can be incorporated to predict health risks using historical data.

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