# EPICARE: An AI-Powered System for Emergency Patient Identification and Personalized Care

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***Abstract*—Delays in gaining access to patient records in emergency medical settings can have potentially fatal consequences. EPICARE, an AI-powered system for quick and safe patient identification and intelligent care support, is presented in this study. Instant access to encrypted health records from a secure cloud database is made possible by the ability to uniquely identify patients through fingerprint verification, QR code scanning, or facial recognition. Prescription uploads, timely medication alarms, AI-based health risk prediction, preventing harmful drug interactions, a chatbot for health-related questions, and personal logging tools for vital signs, nutrition, and exercise are all integrated into the system. EPICARE improves patient safety, emergency response, and healthcare efficiency by providing distinct dashboards for administrators and users.**

***Keywords—Emergency healthcare, patient identification, face recognition, QR code, fingerprint authentication, medical records, drug interaction prevention, health risk prediction, smart health assistant.***

## I. INTRODUCTION

Access to correct medical information and prompt patient identification are essential components of emergency healthcare management. Serious medical consequences or even death may result from treatment delays brought on by incomplete patient histories, allergies, current drugs, or previous conditions. Effective health data retrieval is particularly important in emergency situations, including accidents or unconsciousness. In this study, we examine a range of intelligent systems and technologies for accessing medical data and identifying patients in real time. This overview highlights the significance of prompt identification, describes the dangers of postponing treatment, and introduces our AI-powered strategy for resolving these issues.

This article emphasizes that the value of medical laboratory testing should be assessed not only by cost but also by its clinical impact. Laboratory tests play a crucial role in clinical decision-making, influencing outcomes by guiding diagnosis and treatment. The paper highlights the importance of selecting appropriate tests and effectively reporting results to inform clinical actions. It also discusses how clinical decision support systems can enhance the utility of laboratory testing by aligning test selection and interpretation with evidence-based practices. Overall, the article advocates for a value-based approach to laboratory medicine that prioritizes patient outcomes[1]. An article underscores the pivotal role of clinical laboratory testing in modern healthcare, highlighting its significance in diagnosing diseases, monitoring patient health, and guiding treatment decisions. It examines the impact of laboratory diagnostics on chronic disease management, infectious disease control, and treatment efficacy[2].In a study involving 15,160 patients undergoing emergency noncardiac surgery, 18.6% experienced surgical delays. These delays were associated with higher in-hospital mortality (4.9% vs. 3.2%), longer hospital stays, and increased healthcare costs. The study suggests that systemic issues contribute to surgical delays, emphasizing the need for improved operating room access to enhance emergency surgery outcomes[3].Another article reviews the advancements in medical image diagnosis and retrieval systems, focusing on the integration of artificial intelligence to improve diagnostic accuracy[4]. A study by The Ohio State University Comprehensive Cancer Center looked into how patients with head and neck squamous cell carcinoma were affected by surgical delays. According to the study, survival chances were considerably lowered by delays of 67 days or more following diagnosis, with the probability of dying rising by 4.6% for every 30-day delay. According to the study, prompt surgical intervention is crucial for improving these patients' chances of survival[5].

## II. LITERATURE REVIEW

The literature review for EPICARE covers breakthroughs in AI-powered healthcare systems, focusing on biometric identification, predictive analytics, and patient data integration. Recent studies emphasise the increased application of facial recognition and QR code scanning for secure patient identification, improving response times in emergencies. Studies on machine learning models highlight how they can improve early intervention efforts by predicting health concerns based on past patient data. Prior systems have exhibited limits in real-time decision-making, privacy, and interoperability, which EPICARE solves through a unified platform incorporating authentication, risk prediction, and interactive dashboards. This assessment underscores the requirement of sophisticated, integrated healthcare systems that ensure both accuracy and efficiency.

In order to improve patient data storage and retrieval in healthcare systems, T. Sandamal et al. presents a deep learning architecture. The system's use of cutting-edge

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neural networks guarantees quicker access to patient records, enhancing clinical judgment. The method offers healthcare practitioners a scalable option by addressing issues with data volume and retrieval speed [6].

A thorough patient data management system designed for medical services is presented in the study by Aljahdali et al. The system's main objectives are the safekeeping, effective retrieval, and smooth exchange of patient data amongst medical professionals. It improves the accuracy of medical records by including strong security measures and user-friendly interfaces[7]. I. Karthika et al. presents the difficulties of sending confidential and secure medical data. Sensitive patient data is protected during transmission by the suggested solution, which uses secure communication protocols and encryption techniques[8].

MedRec by Sonish Sivarajkumar et al. uses blockchain technology to manage health information in a way that guarantees patient autonomy, security, and openness. The technology makes it easy for authorized parties to share records, which improves cooperation and trust in healthcare services[9]. The function of information retrieval systems in healthcare is examined in this chapter, with a focus on how crucial they are to the management of enormous volumes of medical data[10].

Vinay Vishnani et al. proposed using Google Street View images to detect manholes and create location maps. The process includes image preprocessing, image scaling, and pixel-by-pixel iteration to improve results. Additionally, a regression model was developed to relate the distance between the manhole and the image area, making it possible to perform GPS control inference. This approach can help plan for and avoid emergencies and bad situations[9]. Rahul V. M. et al. investigates wire electric discharge machining's impact on Ni–Ti-Hf-based alloys' surface morphology, crucial for their shape recovery properties. Increasing discharge energy causes material remelting, forming lumps and globules. Srijit Panja et al. states that the function of information retrieval systems in healthcare is examined in this chapter, with a focus on how crucial they are to the management of enormous volumes of medical data. [10].

The goal of the study Siryeol Lee B.S et al. is to improve hospital equipment management by utilizing a customized database and QR codes[11]. K Vivekrabinson et al. examined several machine learning and deep learning methods for face recognition, tracking, identification, and person detection. It talks about how these techniques are used in security, surveillance, and medical fields[12].

Abdulhadi Altherwi et al. reviews the use of facial recognition technologies in medical settings. It investigates the applications of facial recognition in surveillance, access control, and patient identification[13]. Hayes WC et al. proposes a hospital patient identification system based on QR codes. The technology seeks to expedite administrative procedures and decrease patient identification errors[14].

Joshi, P et al. examines the application of QR code technology to improve patient safety in medical settings. QR codes are used to identify patients, administer medications, and retrieve medical records[15]. Arwa Mashat et al. examines the utility of blockchain technology for safe patient data sharing is examined in this study. Blockchain offers a decentralized, impenetrable platform for health record management[16].

Chong Song et al. investigates the use of facial recognition technologies in hospital access control. The technology limits access to authorized personnel in an effort to improve security[17]. Quetzalli Hidalgo et al. describes the incorporation of QR codes into electronic health records (EHRs) . Physical documents and medical equipment can be connected to digital records via QR codes[18].

Joshi, P et al. studies looks into how to secure electronic health records using biometric authentication. Biometric techniques like facial and fingerprint recognition are assessed for efficacy[19]. The privacy-preserving methods for facial recognition in medical applications. It solves issues with regulatory compliance and data privacy[20].

S. Srinivasan et al. introduces a hospital drug administration system based on QR codes. The system seeks to protect patients and lower pharmaceutical errors. To confirm a patient's identify and medication information, QR codes are utilized[21]. Beibut Amirgaliyev et al. examines the advantages and disadvantages of the various methods thorough review of current advancements in facial recognition, tracking, identification, and person detection technology[22].

Q. Zhan et al. studies the creation of a deep learning-based automated facial recognition system for evaluating pain in adults with cerebral palsy is investigated. Because this population has communication difficulties, established methods of assessing pain are frequently insufficient[23].

Sabater-Gárriz Á et al. examines the COVID-19 pandemic's effects on facial recognition technology (FRT), with particular attention paid to issues like algorithmic bias and mask wear[24]. S. Ali et al. studies explores how facial recognition technology may be integrated into eHealth systems and how blockchain technology might help secure associated data[25].

To sum up, the literature study emphasises how crucial it is to include AI technology into healthcare in order to enhance patient identification, risk assessment, and data accessibility. Existing systems have set the groundwork, but they frequently lack comprehensive integration and real-time adaptation. By overcoming existing constraints and putting forward a more intelligent, secure, and responsive healthcare system, EPICARE expands on these insights.

## III. PROPOSED METHODOLOGY

The EPICARE's methodology is divided into several interconnected parts that work together to enable smart health monitoring, real-time patient identification, and enhanced care delivery through the use of AI and IoT technology. The architecture comprises two primary interfaces: a User Dashboard where individuals may engage with their health data and receive intelligent warnings, and an Admin Dashboard where healthcare practitioners can manage patient information.

**1. Patient Registration and Data Management**:
Patients' basic information, medical history, current ailments, and prescriptions are entered by administrators using the dashboard for patient registration and data management. Every patient has a unique QR code that connects to their cloud-based database record. The system offers numerous techniques for safe and quick patient identification, including fingerprint scanning and OpenCV-based face recognition for additional dependability in emergency situations.

**2. Multi-Modal AI-Assisted Recognition:**
Healthcare professionals can use fingerprint matching, face recognition, or QR code scanning to identify patients in an emergency. In order to provide prompt and knowledgeable therapy, the system quickly extracts the patient's medical history from the database.

**3. AI-Powered Health Risk Assessment:**
The system assesses symptoms, comorbidities, and lifestyle factors to produce early health risk alerts using AI models based on past patient data. This aids in anticipating

prospective issues and directing therapeutic choices.

**4. Preventing Drug Interactions:**
An AI-powered medication interaction checker is part of the platform. Based on current prescriptions and known interactions, the system automatically highlights any potentially dangerous drug combinations when new medications are added to a patient's profile.

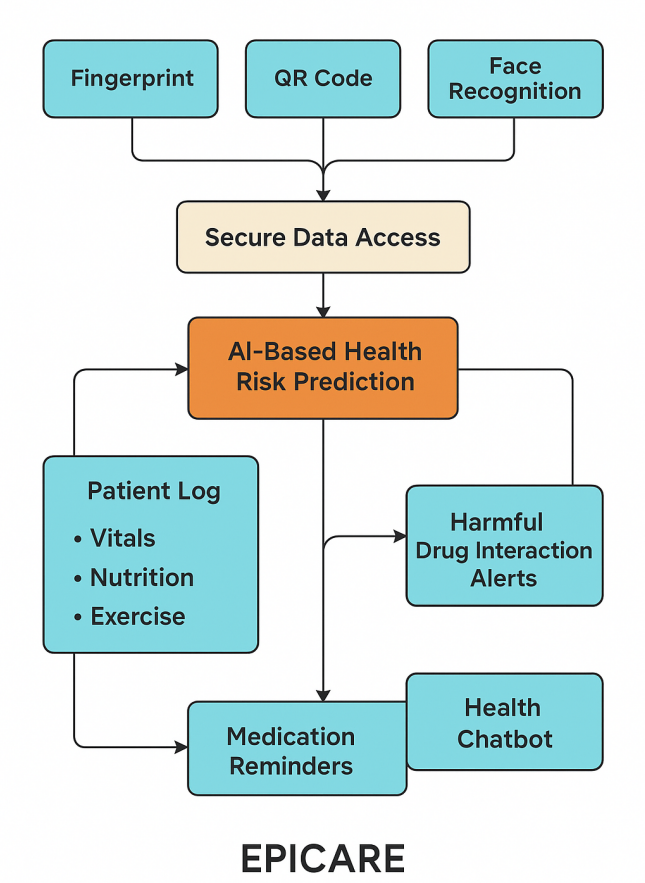
**5. Health-Related Chatbot:**
The user interface incorporates an intelligent AI chatbot that can respond to commonly asked enquiries, offer basic medical advice, clarify test findings, and help users navigate the system's capabilities.

**6. Upload of User Prescriptions & Alerts:**
Prescriptions can be uploaded by patients via the user dashboard. To guarantee adherence, the system uses optical character recognition (OCR) to process these and schedules timely medication and follow-up warnings.

**7. Fitness & Diet Tracking:**
Users can record their weight, water intake, food, and exercise each day. The technology helps users stay on track with their rehabilitation programs and health objectives by analysing trends over time and providing tailored feedback.

**8. Ongoing Education and Observation:**
The system continuously improves AI models for better prediction accuracy and tailored care recommendations using feedback and data from patient interactions.

The EPICARE project uses a variety of cutting-edge technologies to provide intelligent, safe healthcare services. For quick and accurate patient identification, it uses facial recognition using OpenCV and Streamlit, and QR code scanning to provide instant access to medical records. FastAPI and MongoDB power the backend, facilitating effective data management and retrieval. Health risk prediction is supported by machine learning models developed with scikit-learn, and a responsive user interface is provided by the frontend using HTML, CSS, and JavaScript. Together, these technologies guarantee great system accuracy, user-friendly engagement, and real-time processing.




1. Flowchart of EPICARE

The functional architecture of an AI-powered healthcare system intended to offer safe and intelligent patient support is depicted in the EPICARE flowchart. Either face recognition, QR code scanning, or fingerprint scanning is used to authenticate the patient at the start of the procedure. Following authentication, the system permits safe access to the patient's medical records, guaranteeing confidentiality and security. Then, using the patient's medical history and real-time data inputs, an AI-based health risk prediction module analyses this data and plays a key role in identifying possible health hazards.

Multiple integrated components support the system. Users can enter and track their vitals, diet, and exercise through the patient log module, which helps the AI model make more accurate predictions. This investigation suggests that when a patient is taking more than one prescription, the system can alert them to potentially dangerous drug interactions, protecting their safety. EPICARE also offers patient-specific medication reminders, encouraging compliance with recommended therapies. Additionally, a health chatbot is integrated to provide interactive assistance, respond to health-related enquiries, and assist users in managing their health. All things considered, EPICARE offers a thorough, safe, and astute method of delivering contemporary healthcare.

## IV. RESULTS AND DISCUSSIONS

EPICARE is a cutting-edge AI-powered system that uses safe techniques including fingerprint, QR code, and facial recognition to improve patient identification and healthcare support. The outputs of the facial recognition and QR code scanning modules are shown in the figures below, which show how the system can efficiently and rapidly obtain patient data for effective healthcare delivery.

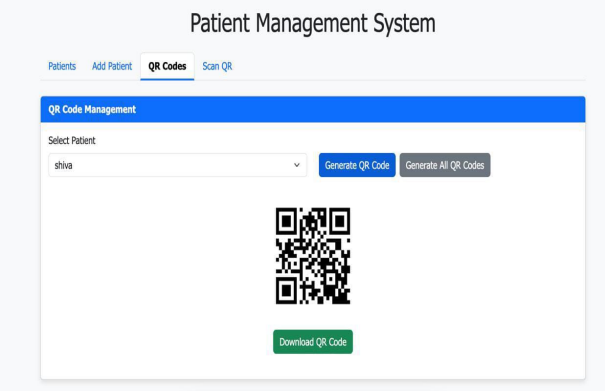



Fig 2: EPICARE QR Code Generation

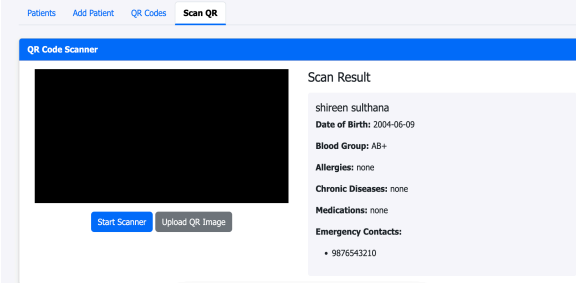



Fig 3: EPICARE QR SCAN AND DATA RETRIEVAL

The creation and scanning of QR codes for easy data retrieval in the EPICARE system are demonstrated in the two images above. Every QR code, which contains encrypted patient data, is created specifically for each individual. Secure and effective access to patient records is ensured by the system's rapid retrieval and display of the relevant data upon scanning the QR code. By streamlining healthcare procedures and giving medical professionals rapid access to vital patient data, this procedure enhances reaction times and the standard of care provided.

Fig 4 illustrates the face recognition procedure, which involves taking a picture of a person and analysing it to extract distinguishable facial traits. After that, the biometric information is safely saved in the system, linking the picture to the user's profile for quick and easy retrieval in the future. The system uses this stored data to promptly and precisely identify the person when necessary, guaranteeing a quick and dependable access to their details.

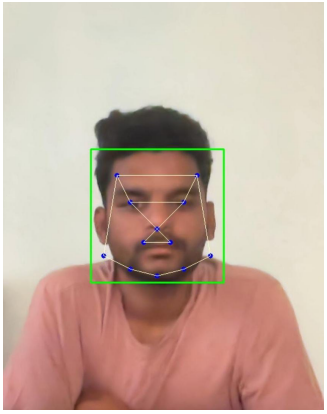


Fig 4: EPICARE Face Recognition

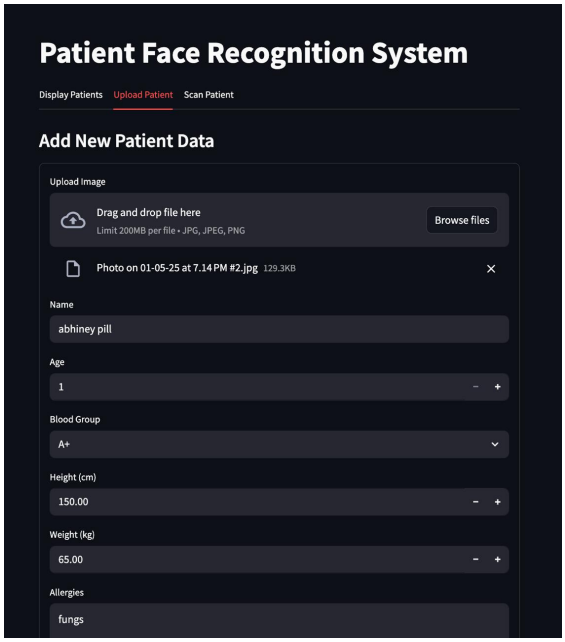



Fig 5: EPICARE Add New Patient Data

The procedure for adding a new patient to the EPICARE system is depicted in the above figure. The patient's name, age, gender, contact information, and medical history are all recorded in this phase, along with a picture of their face. Because this data is safely stored in the database, it can be quickly and accurately retrieved via facial recognition or QR code scanning in the future.

## V. CONCLUSION

In this study, we introduced EPICARE, a smart and safe healthcare support system that uses cutting-edge technologies like facial recognition and QR code scanning to expedite patient identification and provide quick access to medical records. EPICARE improves the effectiveness of healthcare services by combining encrypted data retrieval and biometric authentication, especially in emergency situations where prompt access to patient data is essential. The system's modular design, which includes medication warnings, AI-based risk prediction, and health monitoring capabilities, demonstrates how it may help consumers and

healthcare professionals by providing a single digital platform.

The outcomes of our system's testing and deployment validate EPICARE's ability to provide individualised care support and accurate identification. The technology enhances the speed and precision of patient data access and aids in better clinical decision-making by utilising machine learning and secure data handling. Future research will concentrate on growing the dataset, improving forecast accuracy, and incorporating wearable technology and real-time hospital networks into the algorithm. All things considered, EPICARE is a big stride in the direction of safer, more intelligent, and responsive healthcare delivery.

Future research will concentrate on improving EPICARE's scalability and integration with real-time hospital administration systems, even if it has shown encouraging results in terms of safe patient identification and effective data retrieval. The creation of a centralised cloud-based architecture that permits smooth data synchronisation across several healthcare facilities is one important topic. This would further enhance continuity of care by enabling authorised medical staff to remotely access and update patient records. In order to make the system flexible in a variety of healthcare settings, efforts will also be made to provide multilingual interfaces and region-specific compliance with healthcare data requirements like HIPAA.

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