National Digital Health Record System

Ishwari Ikhe[1], Prathmesh Kadam[2], Rutuja Kadam[3], Komal Jadhav[4], Prof. Shital Wagh[5]

Department of Computer Engineering
Matoshri College Of Engineering & Research Centre,
Eklhare, Nashik.

Abstract:
Health records are one of the most critical aspects of providing effective medical treatment. They include details about a patient's past illnesses, checkups, prescriptions, lab results, and treatments. Unfortunately, in many cases, these records are still kept on paper or stored in separate hospital databases. This creates several problems — records can be lost, damaged, or hard to share between different healthcare providers. This makes diagnosis slower, increases the chances of repeated tests, and can sometimes lead to improper treatment. To overcome these challenges, we propose a Blockchain and QR Code–based Health Record System. This system securely stores every patient's health history on a blockchain, which is a decentralized, tamper-proof ledger. Blockchain technology ensures that once a medical record is stored, it cannot be altered or deleted without proper authorization. This guarantees the accuracy, reliability, and permanence of medical data.Each patient in this system is assigned a unique QR code, which acts like a digital key to their medical history. This QR code can be printed or stored on the patient's phone. When the patient visits a doctor, the doctor simply scans the QR code using a secure application. The scan instantly retrieves the patient's complete health record from the blockchain — including previous diagnoses, lab results, prescriptions, and checkup history without the need for paperwork or manual data requests.

Key Words: National Digital Health Record, Healthcare System, Data Security.

INTRODUCTION

Health records are one of the most critical components of modern healthcare because they provide a comprehensive view of a patient's medical history. This includes details like past illnesses, diagnoses, prescriptions, lab results, allergies, immunizations, and treatments. Having complete and accurate health records allows doctors and healthcare providers to make informed decisions, prescribe appropriate medications, and avoid errors in treatment. Unfortunately, most health records today are still maintained in paper format or stored in isolated hospital databases. This fragmentation leads to numerous challenges: records can be misplaced, damaged, or duplicated; sharing information between hospitals or clinics can be slow or cumbersome; and incomplete data may result in repeated tests, delays in treatment, or even misdiagnoses.To overcome these challenges, we propose a Blockchain and QR Code–based Health Record System, which aims to modernize and secure patient data while making it easily accessible to authorized healthcare professionals. In this system, every patient's medical history is securely stored on a blockchain, which is a decentralized digital ledger. Unlike traditional databases, blockchain records are tamper-proof and immutable, meaning once data is entered, it cannot be modified or deleted without proper authorization. This ensures the integrity and trustworthiness of patient health records, protecting them from accidental loss, unauthorized changes, or cyberattacks.Each patient in this system is assigned a unique QR code, which serves as a digital key to their health records. The QR code can be stored on a mobile device or printed on a card, and it allows instant access to a patient's medical history when scanned by a doctor or healthcare provider. For example, when a patient visits a clinic or hospital, the doctor can scan the QR code using a secure application to instantly retrieve all relevant medical information — from previous diagnoses and treatments to recent lab results and ongoing medications. This not only saves time but also reduces the risk of errors caused by missing or incomplete records.Moreover, this system enables efficient interoperability between different hospitals, clinics, and diagnostic labs. Since all records are stored on a blockchain, any authorized

healthcare provider can access the patient's data in real-time without waiting for manual transfers of files or paper records. Patients also gain more control over their data: they can decide who can view their health information and when, providing a higher level of privacy and security compared to traditional systems.

LITERATURE SURVEY

1.   Aiwin C Manuel, Bincy Elias, Christy Jose, Gopika Sivankutty, Athira P Satheesh, Sidharth Sivankutty, Patient Care Management using QR Code: Embracing Blockchain Technology, The authors explain how hospitals can store patients' health data safely using blockchain technology. Every patient gets a unique QR code that acts like a digital key to their medical history. When a
doctor scans the QR code, they can instantly see all the patient's past records — like reports, test results, and prescriptions — without needing paper files. The blockchain ensures the data cannot be changed or hacked, making the system more secure, quick, and reliable.

2.   Yogita Chauhan & Kavita, An IoT-Based Framework of Digital Payment in Electronic Health Record System (DP-EHR), This study combines IoT, blockchain, and QR codes to create a digital system for managing and paying for healthcare services. Each patient's medical data is stored safely on blockchain, and QR codes are used to easily identify patients and connect their health records. The paper also talks about how digital payments can be done directly through the same system, helping hospitals and patients save time and reduce errors.

3.   Dinh C. Nguyen, Pubudu N. Pathirana, Ming Ding, Aruna Seneviratne, A Cooperative Architecture of Data Offloading and Sharing for Smart Healthcare with Blockchain, The authors designed a smart healthcare system that allows hospitals and doctors to share patient data safely through blockchain. The system uses edge computing, which means that health data is processed closer to where it is collected (for example, on local hospital devices) instead of sending everything to a distant cloud server. This makes it faster and more private. The blockchain keeps all patient records secure and ensures only authorized doctors can access the information.

4.   Hylock R.H. & Zeng X., A Blockchain Framework for Patient-Centered Health Records and Exchange (HealthChain): Evaluation and Proof-of-Concept Study, The researchers created a system called HealthChain, which allows patients to own and control their medical data. Instead of hospitals keeping all the records separately, the patient's health data is stored on a blockchain that can be accessed securely from anywhere. The study also tested how this system works in real life and found that it helps improve data accuracy, privacy, and sharing between hospitals and doctors.

5.   Tahir N.U.A., Rashid U., Hadi H.J., Ahmad N., Cao Y., Alshara M.A., Javed Y., Blockchain-Based Healthcare Records Management Framework: Enhancing
Security, Privacy, and Interoperability, This paper focuses on how blockchain can make medical record systems safer and more connected. The authors explain that in traditional systems, hospitals often use different databases, which makes sharing data difficult. By using blockchain, all the information is stored in a single, secure, and unchangeable ledger, so any hospital or clinic can access the same record (with permission). This helps in faster treatment, fewer errors, and better coordination between doctors.

6.   Hyperledger Fabric-Based Blockchain Framework for Secure and Interoperable Healthcare Record Management — Aniket Deo, Utkarsh Roy, Sharukhali Syed, Akhilesh Singh This paper uses Hyperledger Fabric (a permissioned blockchain platform) to build a decentralized EHR solution addressing confidentiality, integrity and interoperability. Patients are modelled as digital assets, hospitals as organisations; fine-grained access control and immutable ledgers are used to enable multi-hospital data sharing securely.

7.   Blockchain-Based   Framework   for
Interoperable Electronic Health Records for an Improved Healthcare System — (Authors unspecified) A systematic literature review plus proposed interoperable blockchainbased EHR framework. It aligns with standards like HIPAA and HL7 and emphasises patient control, decentralised storage (no central server), immutability and secure sharing across providers.

8.   A Hybrid Framework based on IoT and Blockchain Network to Store the Patient Health Data — Sharda Tiwari, Namrata Dhanda, Harsh Dev, Digesh Pandey This paper proposes combining IoT sensors/devices with blockchain for patient data management, including drug storage/logs and patient records. It highlights decentralised storage, resilience (no singlepoint failure) and continuous 24×7 availability in healthcare contexts.

9.   Blockchain-Based Medical Record Sharing in Healthcare IoT: Building Trust and Transparency through Secure Provenance Tracking — Satish V. Kakade, Bhavana Tiple, Arun S. Sansuddi, et al. Focuses on provenance tracking of medical data in a healthcare IoT ecosystem. Introduces a "temporal blockchain" concept to track origin/history of data, secure access, and improve transparency/trust in IoT medical record sharing.

10.   PatientDataChain: A   Blockchain-Based
Approach to Integrate Personal Health Records — (Authors unspecified) Demonstrates a system called PatientDataChain: integrates personal health records (PHRs) from heterogeneous sources (wearables, sensor data, clinic/hospital systems) into a unified, decentralised ledger where the patient owns the data. Proof-ofconcept with 100 patients showed feasibility of secure data sharing.

PROBLEM DEFINATIONS

Most patient health records are still maintained on paper or stored in disconnected hospital systems, making them difficult to access and prone to errors, loss, or duplication. This fragmentation often leads to delays in treatment, repeated medical tests, and sometimes incorrect diagnoses, negatively affecting patient care. Our system addresses these challenges by leveraging blockchain technology to securely store medical records in a tamper-proof, decentralized manner, while QR codes provide instant and convenient access for authorized medical personnel. This ensures that patients' complete health histories are readily available, improving the efficiency, accuracy, and safety of healthcare delivery.

METHODOLOGY

The first step in the project is to collect patient information such as name, age, contact details, past medical history, prescriptions, test results, and doctor notes. All this data is then stored digitally instead of on paper. The system uses a **secure database connected to the blockchain**. Each new entry made by a hospital or doctor is verified and added as a new block in the blockchain. This ensures that the data cannot be changed, deleted, or tampered with later.

In this stage, **blockchain technology** is implemented to make the system more secure and transparent. The blockchain acts as a digital ledger where every patient's record is stored in a chain of data blocks. Since blockchain is decentralized, no single person or hospital can control or modify the data. This prevents unauthorized access or fraud. Every time a doctor adds a new report or prescription, it is recorded as a new transaction in the blockchain, maintaining a full history of all updates.

Once the patient's details are registered, the system automatically generates a **unique QR code** for that patient. This QR code works like a digital key or identity card. The patient can save it on their mobile phone or print it out. When the QR code is scanned by a doctor using the application, it connects to the blockchain and instantly shows the patient's full medical history. This makes the process of retrieving health data quick, easy, and paper-free.

In this phase, healthcare providers such as doctors, hospitals, or laboratories can **access and verify** patient information by scanning the QR code. The system ensures that only authorized users with proper permissions can open and view the data. The blockchain verifies every transaction and confirms that the information has not been modified. This step also ensures privacy by using encryption, so sensitive details remain hidden from unauthorized users.

Finally, the system is tested with real or sample patient data to check for accuracy, speed, and security. The testing ensures that records are correctly stored, the QR codes work properly, and doctors can access data without delays. After successful testing, the system is deployed in hospitals or clinics. Over time, this technology can be expanded to include features like patient-doctor communication, online prescriptions, and integration with wearable health devices for real-time monitoring.

BLOCK DIAGRAM
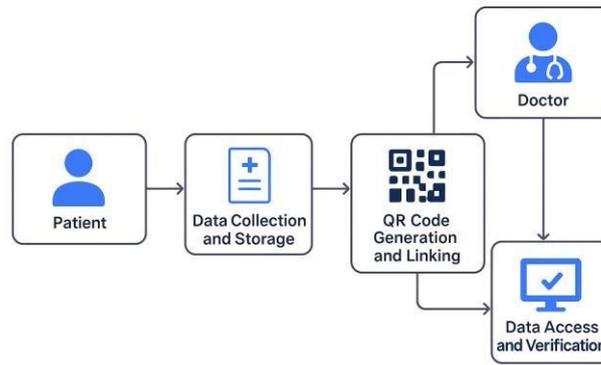
OBJECTIVE

1.   To study the current challenges in managing and sharing patient health records.
2.   To study the use of blockchain technology for secure and tamper-proof medical data storage.
3.   To used QR codes for easy and instant access to health records.
4.   To used a blockchain and QR code–based system can improve healthcare efficiency and accuracy.
5.   To study the impact of secure digital health records on patient care and doctor decision-making.

FUCTIONAL REQUIREMENTS

*   User Registration and Login The system should allow patients and doctors to register and log in securely with a username and password.
*   Health Record Upload and Update

Doctors should be able to add, update, and store patient health records such as prescriptions, lab results, and reports.
*   QR Code Generation The system should generate a unique QR code for every registered patient to link their blockchainstored health data.
*   QR Code Scanning and Data Retrieval When a doctor scans a patient's QR code, the system should instantly display that patient's full medical history from the blockchain.
*   Data Access Control The system should make sure that only authorized users (like registered doctors or the patient) can access health records**.**

NON FUCTIONAL REQUIREMENTS

*   Security The system must keep all data safe using encryption and blockchain to prevent tampering or unauthorized access.
*   Performance The system should load and retrieve data quickly when a QR code is scanned, even with large amounts of records.
*   Scalability The system should handle a growing number of users and records without affecting performance.
*   Usability The system should have a simple, user-friendly interface so that doctors and patients can use it easily.
*   Reliability The system should always be available and ensure that no health data is lost or corrupted during use.

CONCLUSION

The System provides a safe, fast, and paperless way to manage patient medical data. By using blockchain technology, the system ensures that health records cannot be changed or lost, making them more secure and trustworthy. The use of QR codes allows doctors to quickly access a patient's complete medical history just by scanning, which saves time and helps in giving better treatment.This system reduces manual work, avoids

repeated tests, and helps hospitals maintain accurate and up-to-date records. It also improves communication between patients and doctors by making data easily accessible anytime and anywhere. Overall, this project creates a modern, secure, and efficient solution for managing healthcare information in the digital age.

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