International Journal of Recent Engineering Research and Development (IJRERD)
ISSN: 2455-8761
www.ijrerd.com || Volume 09 – Issue 03 || May - Jun 2024 || PP. 166-170

Secure patient and Medical data sharing using Blockchain Technology

Sivashanmugam A, Prakash P, Vengadesan M,
UG Scholar, Department of CSE, A.R.J College of Engineering and Technology,
Mannargudi, Thiruvarur, Tamilnadu-614 001, India

Sheela M,
Assistant Professor, Department of CSE, A.R.J College of Engineering and Technology,
Mannargudi, Thiruvarur, Tamilnadu-614 001, India

Abstract: Background Diagnosis requires that clinicians communicate and share patient information in an efficient manner. Advances in electronic health records (EHRs) and health information technologies have created both challenges and opportunities for such communication. Methods We conducted a multi-method, focused ethnographic study of physicians on general medicine inpatient units in two teaching hospitals. Physician teams were observed during and after morning rounds to understand workflow, data sharing and communication during diagnosis. To validate findings, interviews and focus groups were conducted with physicians. Field notes and interview/focus group transcripts were reviewed and themes identified using content analysis. Results Existing communication technologies and EHR- based data sharing processes were perceived as barriers to diagnosis. In particular, reliance on paging systems and lack of face-to-face communication among clinicians created obstacles to sustained thinking and discussion of diagnostic decision-making. Further, the EHR created data overload and data fragmentation, making integration for diagnosis difficult. To improve diagnosis, physicians recommended replacing pagers with two-way communication devices, restructuring the EHR to facilitate access to key information and improving training on EHR systems. Conclusions As advances in health information technology evolve, challenges in the way clinicians share information during the diagnostic process will rise. To improve diagnosis, changes to both the technology and the way in which we use it may be necessary.

Keyword: EHRS, Hit, Communication, Fragmentation, Blockchain.

1. Introduction

As medical technology advances, there is an increasing need for healthcare providers all over the world to securely share a growing volume of data. Blockchain is a powerful technology that allows multiple parties to securely access and share data. Given the enormous challenge that healthcare systems face in digitizing and sharing health records, it is not unexpected that many are attempting to improve healthcare processes by utilizing blockchain technology. By systematically, this review addresses the existing gap by methodically discussing the state, research trends, and challenges of blockchain in medical data exchange. The number of articles on this issue has increased, reflecting the growing importance and interest in blockchain research for medical data exchange. Recent blockchain-based medical data sharing advances include safe healthcare management systems, health data architectures, smart contract frameworks, and encryption approaches. The evaluation examines medical data encryption, blockchain networks, and how to improves hospital workflows. The findings show that blockchain can improve patient care and healthcare services by securely sharing data.

2. Literature Survey

Stanfill M.H, et.all;(2018), Health information management Implications of artificial intelligence is described as Artificial intelligence (AI) and related technologies are increasingly prevalent in business and society, and are beginning to be applied to healthcare. These technologies have the potential to transform many aspects of patient care, as well as administrative processes within provider, payer and pharmaceutical organizations. There are already a number of research studies suggesting that AI can perform as well as or better than humans at key healthcare tasks, such as diagnosing disease. Today, algorithms are already outperforming radiologists at spotting malignant tumours, and guiding researchers in how to construct cohorts for costly clinical trials. However, for a variety of reasons, we believe that it will be many years before AI replaces humans for broad medical process domains. In this article, we describe both the potential that AI offers to automate aspects of care and some of the barriers to rapid implementation of AI in healthcare.

J. Adamu, et.al,(2019), Security issues and framework of electronic medical record is described as The study collects data through a systematic review of past studies that have addressed the topic of EHRs and security issues, and other relevant publications on EHR systems, and procedures that help safeguard health records databases. A total of 30 sources are analyzed for all pertinent information regarding security concerns of health records databases. These sources were obtained through an internet search on credible databases, including Google Scholar, PubMed, and CINAHL databases. The results of the current study reveal the perceived vulnerability of EHRs to security concerns, common security issues, the nature of these common security concerns, Health Insurance Portability and Accountability Act rules, provider responsibilities, and recommendations for reducing EHR security risks. This paper also reveals effective strategies such as privacy-protection awareness and staff training to enhance the security of health records databases.

S. Ghafur, et.al,(2021), Public perceptions on data sharing is described as some publicly available datasets, but these are usually only shared after study (and publication) completion, which means a severe delay of months or even years before others can analyse the data. One solution is to incentivize the hospitals to share their data with (other) academic institutes and the industry. Here, we show an analysis of the current literature around data sharing, and we discuss five aspects of data sharing in the medical domain: publisher requirements, data ownership, growing support for data sharing, data sharing initiatives and how the use of federated data might be a solution. We also discuss some potential future developments around data sharing, such as medical crowd sourcing and data generalists.

3. Proposed System

As medical technology advances, there is an increasing need for healthcare providers all over the world to securely share a growing volume of data. Blockchain is a powerful technology that allows multiple parties to securely access and share data. Given the enormous challenge that healthcare systems face in digitizing and sharing health records, it is not unexpected that many are attempting to improve healthcare processes by utilizing blockchain technology. By systematically, this review addresses the existing gap by methodically discussing the state, research trends, and challenges of blockchain in medical data exchange. The number of articles on this issue has increased, reflecting the growing importance and interest in blockchain research for medical data exchange. Recent blockchain-based medical data sharing advances include safe healthcare management systems, health data architectures, smart contract frameworks, and encryption approaches. The evaluation examines medical data encryption, blockchain networks, and how to improves hospital workflows. The findings show that blockchain can improve.

4. System Architecture

The input module captures input data, including images of patients faces and scanned tickets and face detection system uses algorithms to detect and extract faces from the captured images.

User Interface Layer:

Users: Individuals interacting with the system to access and manage medical data.
Optional: Optional features or functionalities available to users for enhanced interaction.

Middleware Layer:

Query: Manages and processes queries initiated by users.
Individual: Handles individual data queries.
Query & Xml: Supports structured query language (SQL) and XML data formats.
Matching: Matches queries to relevant data sources.
Decom-Distributor: Decomposes queries and distributes them across appropriate nodes.
Result: Collects and presents query results to users.
Query Index: Indexes queries for efficient retrieval.
Patient ID: Manages patient identification information securely.
Local Driver: Interfaces with local databases securely and efficiently.
DB List position & Wirehouse: Manages database positions and data warehousing.
Generator, Collector, Display: Generates, collects, and displays data as required.
Specific ID Checker: Validates specific identification details securely.
Selected Specific/All Data Sources List: Manages lists of selected or all available data sources.
Defined DB List: Lists databases with defined access controls and permissions.
Schema Dictionary: Defines data schemas and structures for consistency.
Adaptors: Interfaces and integrates various data sources and formats.
Knowledge Repository: Stores and manages metadata and knowledge related to data sources.

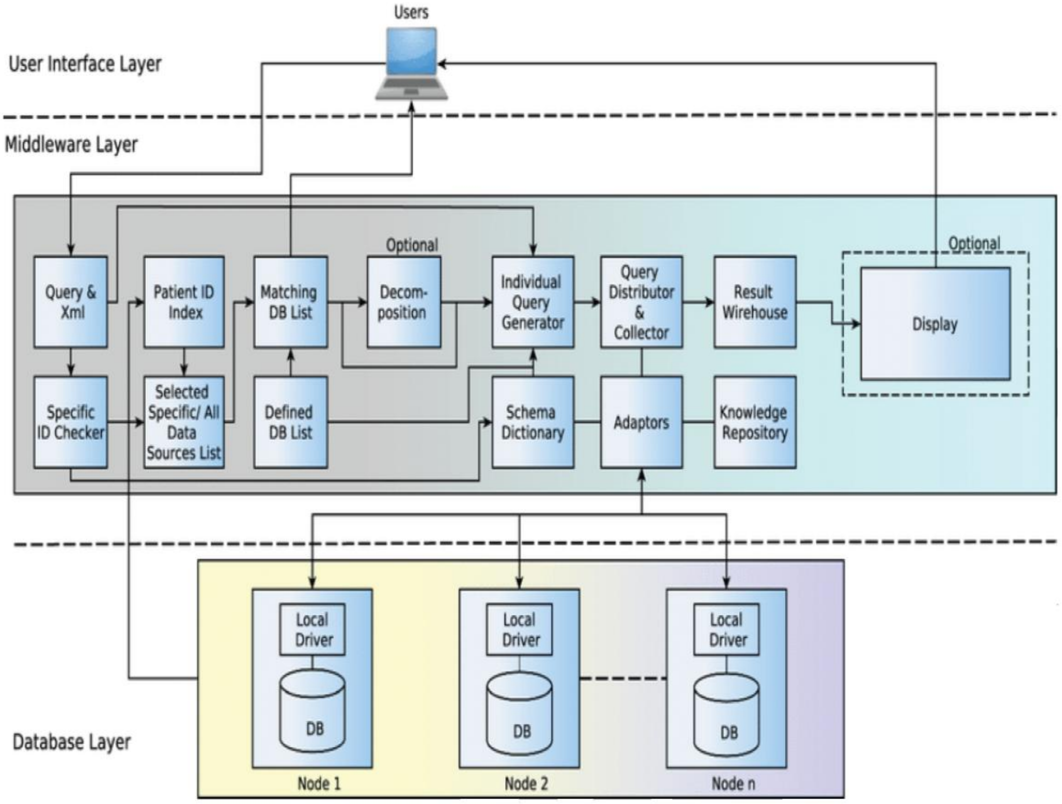


Figure 1: System Architecture

Database Layer:

DB: Centralized or distributed databases storing patient and medical data securely.

Node 1, Node 2, Node n: Represents different nodes within a blockchain network or distributed database system.

Integration with Blockchain Technology:

Blockchain Technology: Utilizes blockchain for secure, transparent, and immutable data sharing and transactions.

Security: Ensures data privacy, integrity, and access control through blockchain's cryptographic principles.

Transaction Management: Facilitates secure transactions and audit trails for data access and sharing.

Consensus Mechanism: Ensures agreement among network participants on the validity of transactions and data updates

5. Implementation

Implementing a secure patient and medical data sharing project using blockchain technology involves several key steps and considerations. Below is a structured approach to implement such a project:

1. Project Planning and Requirements Gathering

The Objectives is clearly outline the goals of the project, such as improving data security, enabling efficient data sharing among healthcare providers, enhancing patient privacy, etc. And Identify Stakeholders are Involve stakeholders including healthcare providers, patients, IT specialists, legal advisors, and regulatory experts.

2. Designing the Architecture

Blockchain Selection are hoose a suitable blockchain platform based on factors like consensus mechanism, scalability, smart contract capabilities, and community support. And Smart Contracts is define and deploy smart contracts for managing access control, data sharing agreements, and executing transactions securely.

3. Development and Implementation

The Backend Development implements backend services for data processing, encryption, decryption, and integration with blockchain nodes. Smart Contract Development is write and deploy smart contracts that enforce access control policies, manage data permissions, and facilitate secure transactions. Integrate various data sources (e.g., electronic health records systems, medical imaging systems) through adapters with the middleware layer.

4. Data Security and Privacy Measures

Implement end-to-end encryption for data transmission and storage to protect patient confidentiality and Use blockchain-based identity management systems to manage access rights and permissions securely. Enable auditing and logging mechanisms to track data access and modifications for accountability and compliance.

5. Testing and Quality Assurance

Functional Testing the functionality of the entire system including data sharing, query handling, and smart contract execution. Security Testing is conduct penetration testing and vulnerability assessments to identify and mitigate potential security risks. Performance Testing is Evaluate system performance under different loads to ensure scalability and responsiveness.

6. Deployment and Maintenance

Deploy the system in stages or phases, starting with a pilot project to validate functionality and gather user feedback. Implement monitoring tools to oversee system health, performance metrics, and blockchain network status and plan for regular updates, patches, and upgrades to keep the system secure and compliant with evolving regulations.

7. User Training and Support

Provide training sessions for healthcare providers and users on using the system securely and effectively and offer ongoing support channels to address user queries, issues, and feedback.

8. Evaluation and Optimization

Monitor system performance, user feedback, and compliance metrics to identify areas for improvement. Continuously optimize the system based on feedback, technological advancements, and changing healthcare needs.

6. Results

Implementing a secure patient and medical data sharing project using blockchain technology yields significant benefits across healthcare systems. It ensures enhanced security and privacy through robust encryption and immutable audit trails, fostering trust among stakeholders.

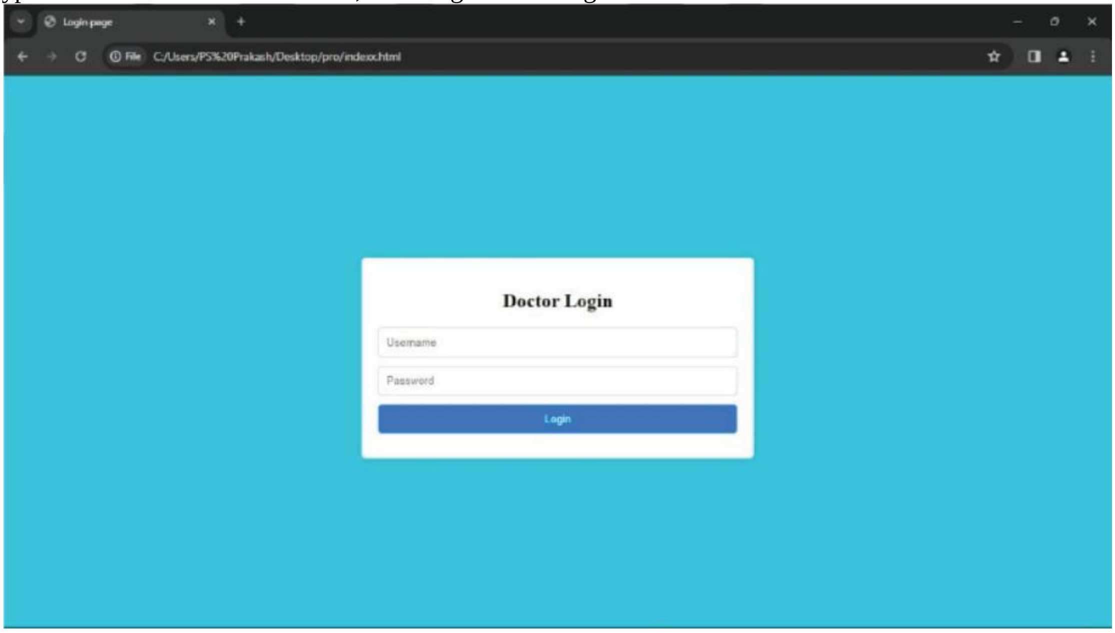
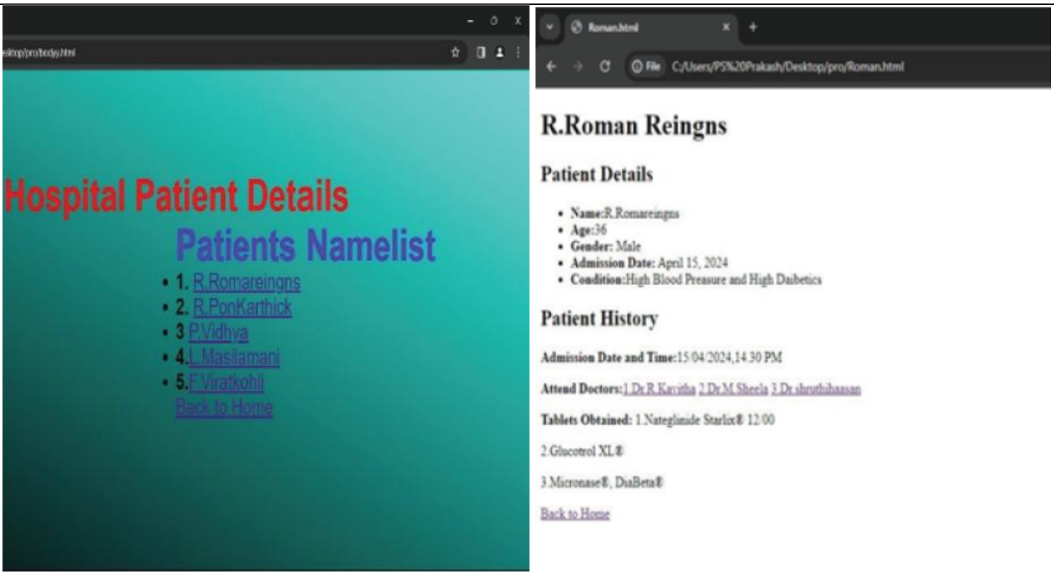


Figure 2: Login



Hospital Patient Details

Patients Namelist

- 1. R.Romareingns
- 2. R.PonKarthick
- 3 P.Vidhya
- 4.L.Masilamani
- 5.F.Viratkohli

Back to Home

R.Roman Reingns

Patient Details

- **Name:**R.Romareingns
- **Age:**36
- **Gender:** Male
- **Admission Date:** April 15, 2024
- **Condition:**High Blood Preasure and High Daibetics

Patient History

Admission Date and Time:15/04/2024,14.30 PM

Attend Doctors:1.Dr.R.Kavitha 2.Dr.M.Sheela 3.Dr.shruthihaasan

Tablets Obtained: 1.Nateglinide Starlix® 12:00

2.Glucotrol XL®

3.Micronase®, DiaBeta®

Back to Home

Figure 3: Output Image

Efficient data sharing and interoperability are achieved via streamlined processes and smart contracts, reducing administrative burdens and improving operational efficiency. Compliance with regulatory standards such as HIPAA and GDPR is strengthened, empowering patients with greater control over their data. This approach not only drives cost efficiencies by automating data management but also catalyzes research and development through data-driven insights and transparent management of clinical trials. Overall, blockchain integration promotes transparency, enhances decision-making, and improves healthcare outcomes by facilitating secure and seamless data exchange.

7. Conclusion

Implementing a secure patient and medical data sharing project using blockchain technology brings substantial benefits to healthcare organizations, patients, and stakeholders. It enhances security, privacy, efficiency, and compliance while fostering innovation and improving patient care outcomes. By leveraging blockchain's unique capabilities, healthcare systems can overcome existing challenges in data management and create a more interconnected and patient-centric ecosystem.

8. References

[1]. Stanfill, M.H.; Marc, D.T. Health information management: Implications of artificial intelligence on healthcare data and information management. Yearb. Med. Inform. 2018

[2]. Adamu, J.; Hamzah, R.; Rosli, M.M. Security issues and framework of electronic medical record: A review. Bull. Electr. Eng. Inform. 2019

[3]. Enaizan, O.; Zaidan, A.A.; Alwi, N.; Zaidan, B.B.; Alsalem, M.A.; Albahri, O.; Albahri, A. Electronic medical record systems: Decision support examination framework for individual, security and privacy concerns using multi-perspective analysis. Health Technol. 2019

[4]. Hulsen, T. Sharing is caring—Data sharing initiatives in healthcare. Int.

[5]. J. Environ. Res. Public Health 2020Ghafur, S.; Van Dael, J.; Leis, M.; Darzi, A.; Sheikh, A. Public perceptions on data sharing: Key insights from the UK and the USA. Lancet Digit. Health 2021

[6]. chwalbe, N.; Wahl, B.; Song, J.; Lehtimaki, S. Data sharing and global public health: Defining what we mean by data. Front. Digit. Health 2022

[7]. Singh, C.; Chauhan, D. IoT–Blockchain Integration-Based Applications Challenges and Opportunities. Mob. Radio Commun. 5g Netw. Proc. MRCN 2023

[8]. Lin, B.; Huang, Y.; Zhang, J.; Hu, J.; Chen, X.; Li, J. Cost-driven off- loading for DNN-based applications over cloud, edge, and end devices. IEEE Trans. Ind. Inform. 2023.

[9]. Saha, A.; Amin, R.; Kunal, S.; Vollala, S.; Dwivedi, S.K. Review on "Blockchain technology based medical healthcare system with privacy issues". Secur. Priv. 2020

[10]. Aste, T.; Tasca, P.; Di Matteo, T. Blockchain technologies: The foreseeable impact on society and industry. Computer 2017.