Advance Health Care Management System Using Ethereum Network

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ABSTRACT

As science & technology progressed, medicines became an integral part of the research.Gradually, medical science became an entirely new branch of study & research. As of now, the Health Sector comprises medical institutions i.e., Hospitals, clinics, etc. Thus, the Health sector aims at providing the best medical facilities to the common man. Advance Medical Health Management System provides the benefits of streamlined operations, enhanced system control, patient care, cost control, and improved profitability. AMHMS is easy to use and is designed and developed to deliver real conceivable benefits to hospitals. We also used Blockchain technology in my project, which is a distributed public ledger database that is maintained by a network of verified participants or nodes and stores immutable blocks of data that can be shared securely without third-party intervention. All the required modules and features have been particularly built to fit into the requirements.

Keywords: Blockchain; Healthcare; Data Storage; Clinical Trials; Capabilities; Technology

1. INTRODUCTION

The purpose of the project entitled as **"Advance Health Care Management System Using Ethereum Network"** is to computerise the Front Office Management of Hospital to develop software which is user friendly, simple, fast and cost-effective. It deals with the collection of patient's information, diagnosis details, etc. Traditionally, it was done manually. The main aim of this project is to make Hospital management a paper-free work and provide security to user's data. The main function of the system is to register and store patient details and doctor details and retrieve these details as when required, and also to manipulate these details meaningfully system input contains patient details, diagnosis details; while system output is to get these details onto the screen.

Electronic medical records are considered the main component in the health organisations' system. Recently, the reputation of medical information patients and their privacy is very imperative in the healthcare realm. Therefore, this information is epitomised as proof of social insurance and governance such as the medical conflicts, and medical health insurance. In the last decades, health organisations have faced more problems regarding medical information management to save the privacy of patient information. Privacy is the main issue for achieving the security of the patients' information in smart healthcare applications. Hence, there is a grave necessity to use the blockchain. The blockchain can be used for achieving transparency and security in medical applications. This helps to attain the possibility of making a trustable and secure healthcare system. Likewise, this paper presents a blockchain-based Electronic Medical Records (EMR) management framework in smart healthcare infrastructure in the context of smart cities. The proposed framework utilises blockchain technology for providing security and privacy in healthcare organisations, especially for healthcare information management, and supplies secure storage of electronic records presented in this paper. Therefore, privacy can be preserved through the proposed blockchain approach as illuminated in the proposed system. Moreover, it aims for solving the problem of the scalability that faces the blockchain by using off-chain storage for the records and ensuring the authenticity and integrity of the medical record. In addition, more essential is stressing the ownership of the medical record which is the only property of the patient, not any other entity.

2. LITERATURE SURVEY

	Author	Publishing Year
Blockchain	Ashish Sharma* & Dinesh Bhuriya** *HOD Govt. Women's Polytechnic, Indore. **Lecturer Govt. Women's Polytechnic, Indore.	2019
Electronic Health Record	David N Taylor	2019
● Cyber Threats & Security Measures	Donna S. McDermott , Andrew T. Birk	2019
● Electronic health records in a Blockchain	Rodrigo da Rosa Righi, Cristiano André da Costa	2019

3. PROBLEM DEFINITION

Electronic Health Record (EHR) Management focused on whether to use cloud infrastructures or local centralised systems for storing and sharing EHRs. These centralised systems implied that each hospital and healthcare company would have to keep data on premise in locally managed structures and databases. However, centralised EHRs management systems present some issues as described below:

- No patient control: The patients do not own the data and have no control over it. The patients should own and control their data.
- Scattered records: As patients seek treatments in different structures, the records are replicated. The information becomes scattered.
- Limited system interoperability: Different hospitals and health facilities have different systems. Integration and interoperability issues are the consequences.
- Inconvenient secure sharing: Oftentimes, the process of sharing health records is complex and time-consuming.

4. OBJECTIVES

The combination of Electronic Health Records (EHRs) and Blockchain technology has the potential to revolutionise the healthcare industry by enhancing data security, interoperability, and patient control over their own health information. Here are some of the key objectives of integrating EHRs with Blockchain:

(a) Enhanced Security and Privacy:

- Blockchain provides a decentralised and immutable ledger, making it extremely difficult for unauthorised parties to tamper with or access patient data. Each transaction is securely recorded and linked to previous ones, creating a highly secure chain.

(b) Data Integrity and Trust:

- With Blockchain, data integrity is ensured through cryptographic hashing. Any changes to a record are recorded in subsequent blocks, creating a transparent and tamper-evident history of all transactions. This builds trust among healthcare regarding the accuracy of medical records.

(c) Interoperability and Data Sharing:

- Blockchain can serve as a standardized platform for data exchange among different healthcare providers, systems, and organisations. Smart contracts can facilitate automatic verification and sharing of specific data sets while ensuring compliance with privacy regulations.

(d) Patient-Centric Control:

- Patients gain more control over their health data. They can grant or revoke access to specific healthcare providers or researchers through the use of private keys, ensuring their consent and privacy are prioritised.

(e) Consent Management:

- Blockchain can enable granular consent management, allowing patients to specify which parts of their medical history can be accessed by different parties. This ensures that healthcare providers only access the information they have explicit permission to view.

(f) Reduced Administrative Costs:

- By automating and streamlining processes, such as insurance claims processing and billing, Blockchain can reduce administrative overhead, ultimately leading to cost savings for healthcare providers and payers.

(g) Compliance with Regulations:

- Blockchain can help healthcare organisations comply with various data protection and privacy regulations, such as GDPR in Europe or HIPAA in the United States, by providing a secure framework for managing sensitive health information.

(h) Auditability and Transparency:

- Every transaction on a blockchain is recorded, providing an immutable history of all interactions with the data. This transparency can be crucial for auditing purposes and can help build trust in healthcare systems.

It's important to note that while the integration of EHRs with Blockchain offers significant advantages, it also presents technical challenges and requires careful implementation.
Additionally, regulatory frameworks and industry-wide standards for blockchain in healthcare are still evolving.

5. BLOCK DIAGRAM

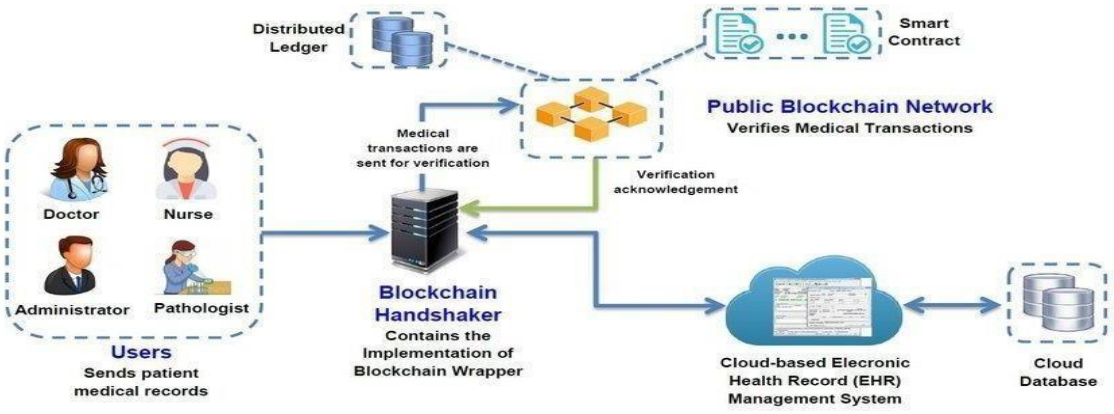

Fig. 1 Flow Diagram of AHCMS

6. SOFTWARE & HARDWARE REQUIREMENTS :

❖ **Hardware Requirement**

- Windows 10 or higher
- i5 processor system or higher
- 4 GB RAM or higher
- 100 GB ROM or higher

❖ **Software Requirement** ● Front end

➔ HTML, CSS, JAVASCRIPT

- Back End
  - ➔ NodeJS, MYSQL ● Security
  - ➔ Blockchain(Ethereum Network)
  - ➔ Solidity
- Visual Studio Code 2019

7. METHODOLOGY

Advance Health Care Management System on Blockchain methodology involves digitizing and decentralizing patient medical information. It encompasses data collection, storage, retrieval, and security protocols to ensure accurate and accessible healthcare records.

AHCMS facilitate real-time information sharing among medical professionals, enhancing patient care coordination and reducing errors. Effective ADHMS implementation requires robust data privacy measures and interoperability standards to support seamless communication between different healthcare systems.

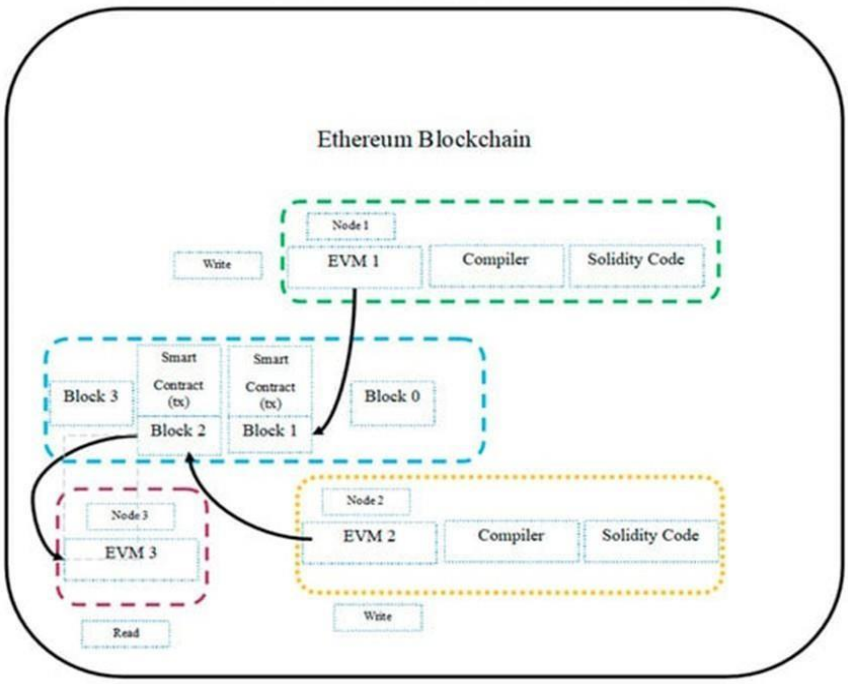

Fig. 2 Data Graph of AHCMS

8. SYSTEM ARCHITECTURE

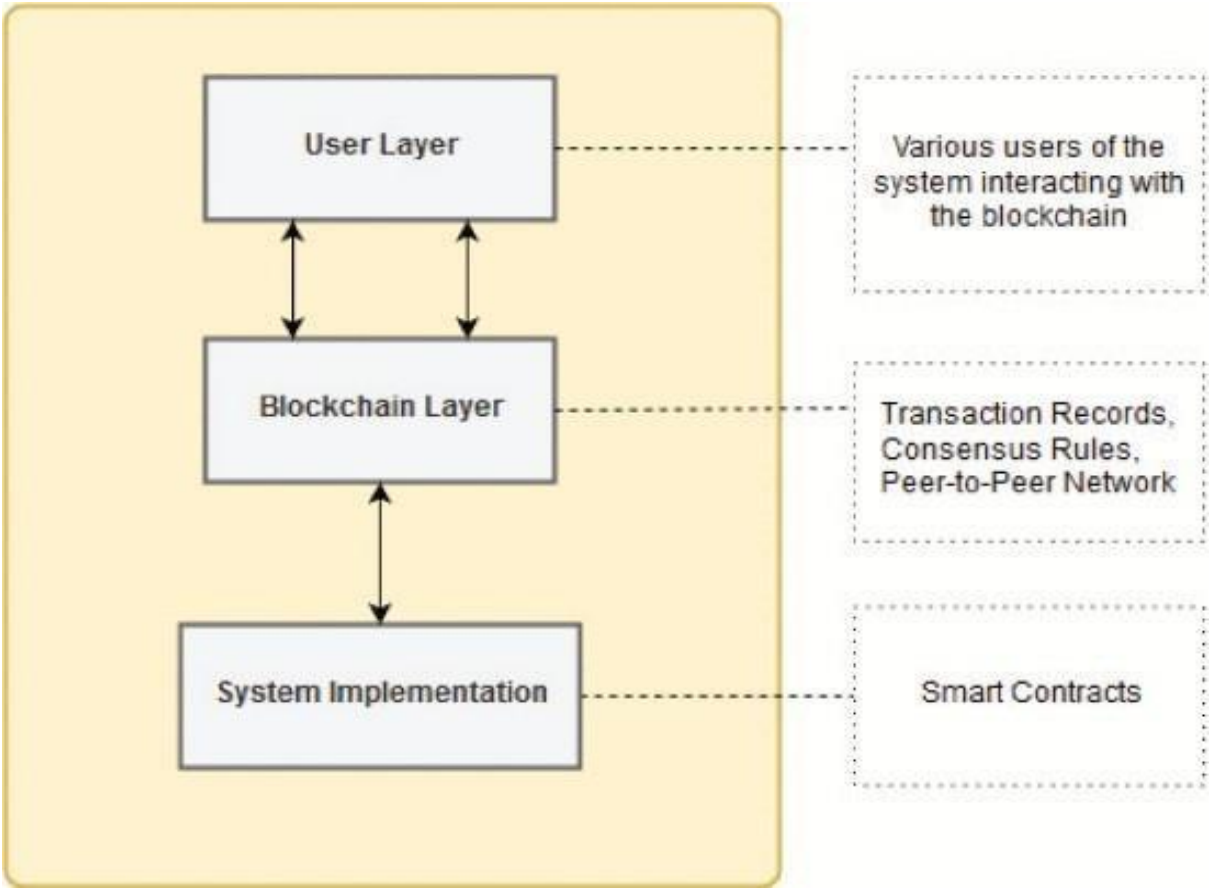

Fig. 3 System Architecture of AHCMS

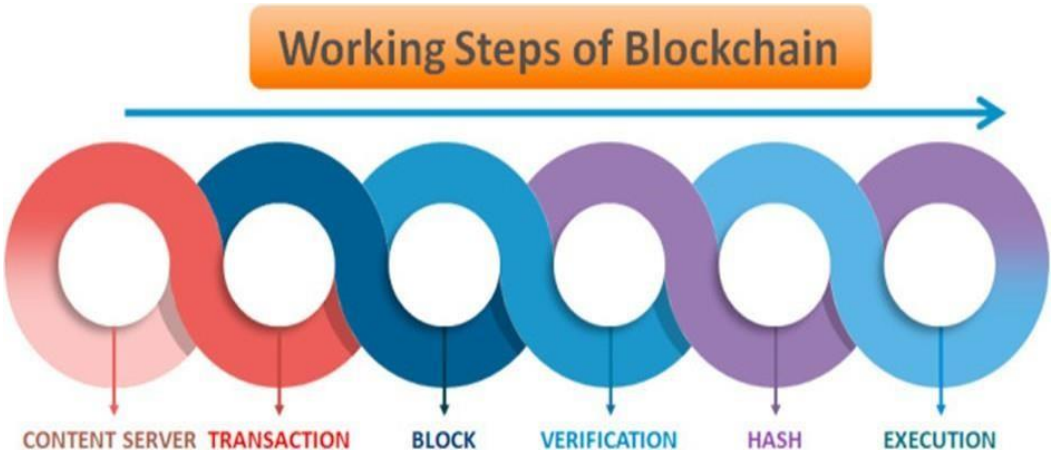

Fig. 4 Working of Blockchain in AHCMS

9. APPLICATIONS

The integration of Electronic Health Records (EHRs) with Blockchain technology has the potential to transform various aspects of healthcare. Here are some specific applications of this combination:

1. Secure Patient Data Management:

- Blockchain ensures secure and immutable storage of patient health records. This prevents unauthorised access, tampering, or data breaches, ensuring the confidentiality and integrity of sensitive information.

2. Consent Management:

- Patients can use blockchain to control who has access to their health data and for what purposes. They can grant specific permissions to healthcare providers, researchers, or other authorized parties, ensuring that their privacy and consent are respected.

3. Interoperability and Data Sharing:

- Blockchain provides a standardised platform for different healthcare providers and systems to securely exchange patient information. This can be particularly valuable in emergency situations where quick access to accurate patient data is critical.

4. Clinical Trials and Research:

- Blockchain allows for secure and transparent sharing of de-identified patient data for research purposes. This can expedite the recruitment process for clinical trials and facilitate collaborative research efforts across institutions.

5. Drug Traceability and Supply Chain Management:

- Blockchain can be used to create a transparent and immutable ledger for tracking the production, distribution, and dispensing of pharmaceuticals. This helps in ensuring the authenticity and safety of medications.

6. Billing and Claims Processing:

- Smart contracts on a blockchain can automate and streamline billing and claims processing. This reduces administrative overhead and minimises the potential for billing errors or fraudulent claims.

7. Identity Verification and Fraud Prevention:

- Blockchain can serve as a trusted platform for identity verification, ensuring that healthcare providers are interacting with legitimate patients. This can help prevent cases of medical identity theft and fraud.

8. Telemedicine and Remote Patient Monitoring:

- Blockchain can enhance the security of remote healthcare interactions. It allows for secure sharing of patient data between remote monitoring devices, healthcare providers, and patients, ensuring the integrity and privacy of the information.

10. Public Health Surveillance:

- Blockchain can be used to create a transparent and tamper-proof ledger for tracking and managing public health data, such as disease outbreaks, vaccinations, and epidemiological information.

10. Credential Verification for Healthcare Professionals:

- Blockchain can be used to securely store and verify the credentials of healthcare professionals, ensuring that they have the necessary qualifications and licences to provide care.

11. Medical Tourism and Cross-Border Healthcare:

- Blockchain can facilitate the secure exchange of patient data across international borders, ensuring that healthcare providers have access to accurate and up-to-date medical records for patients seeking treatment abroad.

12. Personalized Medicine and Genomic Data:

- Blockchain can enable secure storage and sharing of genomic data for personalised medicine applications, ensuring that patients have control over who can access their genetic information.

These applications highlight the potential benefits of integrating EHRs with Blockchain in healthcare. However, it's important to note that the implementation of these technologies requires careful planning, adherence to regulatory requirements, and consideration of technical challenges. Additionally, the field of blockchain in healthcare is still evolving, so it's crucial to stay updated with the latest developments and best practices.

11.CONCLUSION

In conclusion, the integration of Electronic Health Records (EHRs) with Blockchain technology holds great promise for revolutionising the healthcare industry. This combination addresses critical challenges related to data security, interoperability, patient privacy, and trust in the healthcare ecosystem.

By leveraging Blockchain, healthcare organisations can achieve the following key benefits:

1. Enhanced Security and Data Integrity:

- Blockchain's decentralised and immutable ledger ensures that patient data remains secure and tamper-proof. This significantly reduces the risk of data breaches and unauthorised access.

2. Patient-Centric Control and Consent:

- Patients gain greater control over their health information, allowing them to grant and revoke access as needed. This empowers individuals to actively participate in their care and ensures their privacy is respected.

3. Interoperability and Data Exchange:

- Blockchain establishes a standardised platform for seamless data exchange among different healthcare stakeholders. This promotes better collaboration and information sharing, leading to improved patient outcomes.

4. Streamlined Processes and Reduced Costs:

Automation through smart contracts can lead to more efficient administrative processes, reducing overhead costs associated with tasks like billing and claims processing.

5. Research and Innovation Acceleration:

- Secure sharing of de-identified patient data can expedite research efforts and foster medical advancements, ultimately benefiting the broader healthcare community.

6. Compliance and Regulatory Adherence:

- Blockchain provides a robust framework for adhering to privacy regulations like HIPAA and GDPR. This helps healthcare organisations maintain compliance and avoid costly penalties.

7. Trust and Transparency:

- The transparency and auditability of Blockchain instil trust among patients, healthcare providers, and other stakeholders. This transparency helps build confidence in the accuracy and security of medical records.

While the potential benefits are significant, it's important to acknowledge that implementing EHRs with Blockchain is not without challenges. Technical complexities, scalability issues, and regulatory considerations must be carefully addressed. Additionally, achieving widespread adoption and establishing industry-wide standards will be crucial for realising the full potential of this technology.

In summary, the integration of EHRs with Blockchain has the potential to transform healthcare delivery by ensuring secure, interoperable, and patient-centric data management. With continued innovation and thoughtful implementation, this technology has the capacity to revolutionise the healthcare industry for the better.

12.REFERENCES

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