# Management of Health Records Using Web 3.0

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**Abstract-The adoption of Electronic Health Records (EHR) has brought significant benefits to the healthcare industry, such as improved patient outcomes, better care coordination, and reduced healthcare costs. However, managing EHR data presents significant challenges, including data privacy, security, and interoperability. The proposed system is designed to improve the security, privacy, and accessibility of electronic healthcare reports while enhancing the overall efficiency of healthcare data management. Healthcare reports contain sensitive patient information, and the current management systems are vulnerable to data breaches and tampering. By implementing a decentralized block chain-based system, the security and integrity of healthcare reports can be significantly improved. The project will involve developing a prototype application that allows healthcare providers to securely store, access, and share patient reports on the block chain.**

**Keywords—EHR, Healthcare, Block chain, Private Ethereal, Patient data, Smart contract, Security, Decentralised.**

## I. INTRODUCTION

The digital versions of a patient's medical record are called Electronic Health Records (EHRs). They contain information about a patient's medical history, diagnoses, medications, allergies, immunizations, lab results, and other health-related information. The adoption of EHRs has been driven by advances in technology and the need for more efficient and effective healthcare delivery. EHRs have replaced paper-based medical records, which were often difficult to read, incomplete, and prone to errors. As the healthcare industry continues to evolve, the use of EHRs is expected to become increasingly important. Healthcare providers are investing in EHR systems to improve patient care and reduce costs. The adoption of EHRs also presents opportunities for innovation and collaboration, as healthcare providers work together to improve the quality and efficiency of patient care.

Web3 is the next generation of the internet, built on decentralized technologies that enable secure and transparent transactions without the need for intermediaries. The use of Web3 technologies in EHR management has several benefits. It ensures data privacy and security by eliminating the need for central authorities to store and manage patient data. It also ensures data integrity by providing a tamper-proof platform for storing and sharing patient data. The use of block chain technology in EHR management has several benefits. It provides a secure platform for storing and sharing patient data, reducing the risk of data breaches and unauthorized access. It also ensures data integrity, enabling healthcare providers to trust the accuracy and completeness of patient data. Furthermore, the use of block chain technology facilitates interoperability between different healthcare

providers, enabling them to share patient data seamlessly and securely. The use of Web3 technologies in EHR management also enables patients to control their health data. Patients can manage access to their data using cryptographic keys, giving them greater control over their personal information. Additionally, the use of Web3 technologies facilitates interoperability between different healthcare providers, enabling them to share patient data seamlessly and securely.

## II. LITERATURE REVIEW

[1] Block chain gained popularity as a distributed ledger technology following the Bit coin white paper published in October 2008. As the underlying technology for Bit coin, the main utility of block chain is that it makes possible the exchange of electronic coins among participants in a distributed network without the need for a centralized, trusted third party. Transactions involving the exchange of electronic currencies between persons or companies have traditionally relied on a trusted third party, such as a bank, as a mediator. The reliance on a trusted third party is not desirable for several reasons. A trusted third party may malfunction, fail, or be compromised maliciously to render the financial system unavailable or insecure; thus, undermining a system potentially as a single point of failure. A trusted third party also charges transaction fees and adds some transaction delays.

[2] Cloud computing is a network model of on-demand access for sharing configurable computing resource pools. Compared with conventional service architectures, cloud computing introduces new security challenges in secure service management and control, privacy protection, data integrity protection in distributed databases, data backup, and synchronization.

[3] Block chain-based Internet of Medical Things (IoMT) has started to receive more attention in the healthcare domain as it not only improves the care quality using real-time and continuous monitoring but also minimizes the cost of care. It raises several research questions regarding benchmarking; addressing these questions could help designers determine the existing bottlenecks, leading to a scalable block chain.

[4] The application of block chain technology is being explored to improve the interoperability of patient health information between healthcare organizations while maintaining the privacy and security of data. Block chain is an advanced data structure that comprises a growing list of records called blocks. Many characteristics make block chain technology useful for application in healthcare which include immutability, decentralization, transparency, and traceability.

[5] Healthcare data management has been gaining a lot of attention in recent years because of its high potential to provide more accurate and cost-efficient patient care. The traditional client-server and cloud-based healthcare data management systems suffer from the issues of a single point of failure, data privacy, centralized data stewardship, and system vulnerability. The replication mechanism and privacy and security features of block chain have a promising future in the healthcare domain as they can solve some of the inherent issues of the health management system.

## III. DATASET DESCRIPTION

Electronic Health Records (EHRs) are digital versions of patient health information, which includes medical history, medications, allergies, test results, and demographic information. EHRs are used by healthcare providers to provide better care to patients and to streamline administrative tasks.

| **Data Field** | **Description** |
|---|---|
| Patient ID | A unique identifier for the patient |
| EHR Data | The patient's electronic health record data, including medical history, medications, and test results |
| Private Key | A unique private key that the patient uses to access their EHR data |
| Encryption Algorithm | The encryption algorithm used to encrypt the patient's EHR data to ensure its privacy and security |
| Smart Contracts | Self-executing contracts with terms of the agreement between parties written directly in code |
| Access Control | The mechanisms used to control access to the patient's EHR data, ensuring only authorized parties can access it |

Table 1. Data fields

This table outlines key data fields and their descriptions for EHR management using Web3 block chain, including the patient ID, EHR data, and private key, block chain network, encryption algorithm, smart contracts, access control, auditable record, and compliance.

## IV. EXISTING METHODOLOGIES

Even without the use of Web 3.0 technologies, there are still several methodologies for managing healthcare records that have proven to be effective. These methodologies rely on traditional electronic health record (EHR) systems and other technologies that are widely used in healthcare settings.

One methodology for managing healthcare records is through the use of electronic health record (EHR) systems. EHRs allow healthcare providers to store and manage patient records electronically, providing easy access to patient data and reducing the risk of lost or misplaced records. EHRs also support data exchange between healthcare providers, allowing for efficient and effective communication between care teams.

Another methodology for managing healthcare records is through the use of clinical decision support systems (CDSS). CDSS are computer-based tools that provide healthcare providers with evidence-based recommendations for patient care. CDSS can be used to support clinical decision-making, reduce medical errors, and improve patient outcomes.

Health information exchange (HIE) is another methodology for managing healthcare records. HIE allows for the secure exchange of patient information between healthcare providers, allowing for more coordinated care and better patient outcomes. HIE also allows for the efficient exchange of information between healthcare providers, reducing the need for time-consuming and error-prone manual data entry.

Patient portals are another methodology for managing healthcare records. Patient portals provide patients with online access to their healthcare records, allowing them to view their medical history, request appointments, and communicate with their healthcare providers. Patient portals can also be used to support patient engagement, allowing patients to take a more active role in their healthcare.

Finally, telemedicine is a rapidly growing methodology for managing healthcare records. Telemedicine allows healthcare providers to deliver healthcare services remotely, using technology to connect with patients and provide care. Telemedicine can be used to provide remote consultations, monitor chronic conditions, and deliver behavioral health services, among other uses.

In conclusion, there are several existing methodologies for managing healthcare records that do not rely on Web 3.0 technologies. These methodologies rely on traditional EHR systems, CDSS, HIE, patient portals, and telemedicine, among others. These methodologies have proven to be effective in improving patient outcomes, supporting clinical decision-making, and improving patient engagement. However, there is still room for improvement in healthcare record management, and the adoption of new technologies such as Web 3.0 may provide new opportunities for improving the management of healthcare records in the future.

## V.PROPOSED METHODOLOGIES

### *A. Smart contract*

Smart contracts are self-executing programs that run on block chain networks, such as Ethereum and are designed to automatically enforce the rules and conditions of an agreement or contract. They are essentially computer programs that allow for the automated execution of transactions and can be programmed to trigger specific actions when certain conditions are met. Web3 is the next generation of the web, which is focused on decentralization and the integration of block chain technology. Smart contracts are an essential component of Web3, as they enable the creation of decentralized applications (dApps) that can operate autonomously without the need for intermediaries.

### *B. Web3 technology*

Web3 technology is the next generation of the web, and it is focused on decentralization, peer-to-peer networking, and the integration of block chain technology. It is an umbrella term that encompasses several emerging technologies and concepts, including decentralized applications (dApps), block chain technology,

smart contracts, and decentralized finance (DeFi). Block chain technology is a foundational component of Web3 technology. Block chains are decentralized ledgers that record and verify transactions without the need for a central authority.

One of the key features of Web 3 is the use of block chain technology. Block chain is a distributed ledger that allows for secure and transparent transactions without the need for intermediaries. In Web 3, block chain is used to create decentralized applications (daps) that run on a peer-to-peer network of computers instead of centralized servers. This makes it more difficult for any one entity to control or manipulate the system.

Another important aspect of Web 3 is the emphasis on user privacy and data ownership. With the current web, users often have to give up their personal information to use services like social media or online shopping. In Web 3, users will have more control over their data and be able to decide who has access to it. This could help prevent data breaches and identity theft.

*C. Consensus algorithm*

The consensus algorithm is a key component of block chain technology that ensures that all nodes in a decentralized network agree on the state of the ledger. In other words, it is a mechanism that enables the nodes in a network to reach a common understanding about the validity of transactions, without the need for a central authority. In a block chain network, each node maintains a copy of the ledger, which records all the transactions that have occurred on the network. The consensus algorithm ensures that each node has the same copy of the ledger and that any new transactions are verified and added to the ledger consistently and securely

*D. Encryption of data*

Encryption is a fundamental aspect of block chain technology that is used to ensure the security and privacy of transactions and data on the network. In the block chain, encryption is the process of converting plain text or data into a coded message that can only be accessed by authorized parties. Encryption algorithms are used to perform this process, and they are responsible for converting the data into an unreadable form. Encryption is an essential aspect of block chain technology as it ensures that the transactions and data on the network are secure and private. By encrypting the data, it becomes difficult for unauthorized parties to access or manipulate the information, thereby enhancing the security and trust of the network.

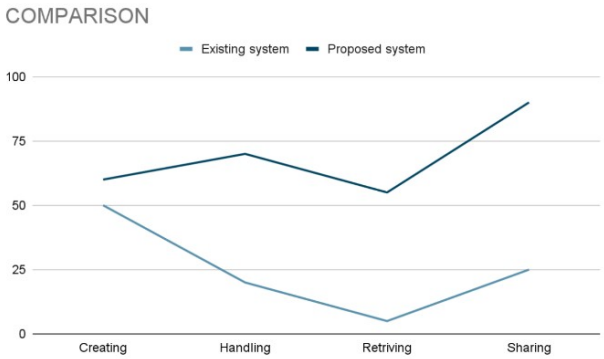
| **Efficiency Factor** | **Traditional EHR Management** | **EHR Management using block chain** |
|---|---|---|
| Interoperability | Limited sharing between different providers/systems | Easy sharing between different providers/systems |
| Data Entry and Verification | Manual data entry and verification | Automated data entry and verification through smart contracts |
| Healthcare Billing and Payment | Slow and complex billing and payment systems | Faster and more secure billing and payment systems |
| Data Security and Privacy | Centralized storage and risk of data breaches | Decentralized storage and enhanced data security and privacy |

| | | |
|---|---|---|
| Maintenance and Cost | Maintenance and upgrades require significant resources and costs | The cost of implementing and maintaining a block chain-based system may be higher |

Table 2. Features of Web3 in Health reports

## VI. RESULT ANALYSIS

EHR management using Web3 block chain offers a range of potential benefits for the healthcare industry. One of the most significant advantages is enhanced data security and privacy. By using a decentralized network, patient health data is distributed across multiple nodes, rather than being stored on a central server that could be vulnerable to hacking and data breaches. Furthermore, the use of encryption and smart contracts ensures that only authorized parties can access patient data, enhancing privacy and control. Another significant




advantage of using Web3 block chain for EHR management is the ability to create a more seamless and efficient sharing of health data between healthcare providers, researchers, and other authorized parties. The use of smart contracts can automate data sharing, ensuring that data is only shared with authorized parties and that patients maintain control over their data. This can lead to better coordination of care, improved patient outcomes, and faster medical discoveries.

There are also challenges and limitations to consider with the use of Web3 block chain in EHR management. One challenge is ensuring interoperability between different block chain networks and healthcare systems. Currently, there is no standard for EHR data.

Different healthcare systems may use different block chains, making it difficult to share data between them. Additionally, the high cost of implementing block chain technology and the need for specialized expertise to manage and maintain the network can be significant barriers to adoption.

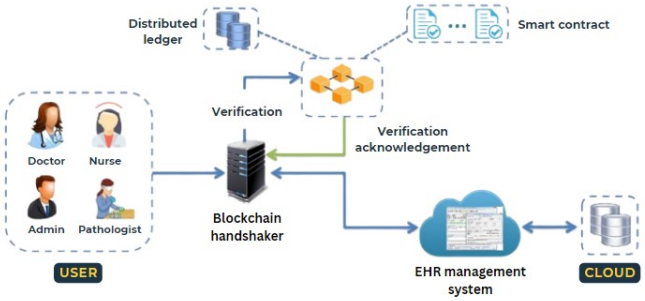



Figure 1. Web3 system

Another limitation is the potential for data loss or corruption in the event of a network failure. While decentralization reduces the risk of a single point of failure, it also means that data may be lost if a significant portion of the nodes goes offline. Similarly, if the network is compromised, patient health data could be at risk. Finally, the use of block chain technology in healthcare raises important ethical and legal questions. For example, there may be concerns about patient consent and control over their data, and there may be legal implications for data ownership and liability.

Fig. 2. Comparison of existing and proposed systems

Overall, EHR management using Web3 block chain offers significant potential benefits for the healthcare industry, particularly in terms of enhanced data security and privacy and more efficient sharing of health data. However, some challenges and limitations need to be addressed before widespread adoption can occur. It will be important to continue to research and develop this technology to ensure that it meets the needs of patients, healthcare providers, and other stakeholders, while also addressing ethical and legal concerns.\

## VII. CONCLUSION

In conclusion, block chain technology has the potential to revolutionize the management of Electronic Health Records (EHR). By providing a secure, decentralized, and transparent platform for storing and sharing patient health information, block chain can improve data integrity, interoperability, and patient privacy. EHR management using block chain has shown promising results in improving the security, privacy, and interoperability of patient health information. The use of block chain technology provides a decentralized and transparent platform for storing and sharing health information, which can improve data integrity and reduce the risk of fraud and data breaches. EHR management using block chain has shown promising results in terms of data security, privacy, and interoperability. The use of smart contracts and cryptographic techniques ensure that only authorized personnel can access patient data, reducing the risk of data breaches and fraud. Moreover, block chain technology enables the seamless sharing of health information between healthcare providers and patients, leading to better coordination and continuity of care.

## VIII. FUTURE WORKS

Future work for the project of EHR management using block chain could focus on the following areas: As the number of patients and healthcare providers using the block chain-based EHR system grows, it is important to ensure that the system can handle large volumes of data transactions. To be widely adopted, the block chain-based EHR system needs to be integrated with existing healthcare IT systems. Future work could focus on developing standards and protocols to enable interoperability between the block chain-based EHR system and existing systems. Overall, future work for the project of EHR management using block chain should focus on addressing these challenges to improve the scalability, interoperability, regulatory compliance, user experience, and privacy and security of the system. By doing so, the block chain-based EHR system has the potential to transform the healthcare industry by improving data integrity, interoperability, and patient outcomes.

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