

## **Blockchain in Healthcare: A Comprehensive Overview**

Term Paper – Blockchain and Cryptocurrency Technologies

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## **Research Paper references:**

### **1. Blockchain Technology in Healthcare: A Systematic Review**

**Authors:** S. Agbo, Q. H. Mahmoud, J. Eklund

**Published:** 2019

**Journal:** Healthcare (MDPI)

**Summary:** This paper looks at how blockchain can be used in healthcare by reviewing studies from 2016 to 2018. It talks about how blockchain can help in areas like electronic health records (EHRs), supply chain management, and clinical trials. The paper also explains the benefits of using blockchain in these areas, as well as some of the challenges that come with it.

**Link:** [MDPI](#)

### **2. A Survey on Blockchain for Healthcare: Challenges, Benefits, and Future Directions**

**Authors:** M. Arbabi, M. H. Yaghmaee, M. A. Rajabzadeh, M. Hosseinzadeh

**Published:** 2022

**Source:** TU Delft Research Repository

**Summary:** This paper talks about how blockchain can be used in healthcare today. It covers the benefits, like better data security and giving patients more control, as well as challenges, like problems with scaling and meeting regulations. The paper also suggests areas for future research to solve these issues.

**Link:** [TU Delft Research Portal](#)

### **3. MedRec: A Case Study for Blockchain in Healthcare**

**Authors:** Ariel Ekblaw, Asaph Azaria, John D. Halamka, Andrew Lippman

**Published:** 2016

**Source:** MIT Media Lab

**Summary:** This case study looks at how MedRec, a blockchain system for managing electronic health records, works in practice. It explains the system's design, the benefits it offers for data security and sharing information, and the challenges faced when it was put into use.

**Link:** [MIT Digital Currency Initiative](#)

## **Blockchain in Healthcare: The Complete Picture**

Digital technology adoption has transformed the way the healthcare industry operates in terms of the following advances: Electronic Health Records (EHRs), telemedicine, and emerging data-sharing platforms, which enable service providers to deliver services much more effectively than they could before. Collectively these changes promise better patient care, simpler administrative processes, and greater efficiency. However, they also herald significant challenges, the most important of which include privacy, security, and interoperability of data systems. The application of blockchain technology into healthcare systems is hailed as the solution to all these problems, offering possibly secure, clear, and decentralized solutions for managing healthcare data.

Initially, blockchain was developed for cryptocurrency applications, specifically Bitcoin. It has also been described as a distributed ledger technology (DLT) storing data in blocks chained to each other. Each block contains such information as a timestamp, a reference to the previous block, and transaction details. To be more secure than the other record-keeping systems, blockchain ensures that ownership and nature of the data never fall into a single party but get diverse while very tight encryption and immutability make stored records highly secure. These unique features have made the blockchain robust against the common challenges faced in healthcare that include privacy of data, security breaches, and lack of good data sharing among systems.

This paper will therefore provide a synopsis for an in-depth study of how blockchain is applied to healthcare, with a detailed examination of specific benefits, challenges, and future possibilities.

### **The Importance of Blockchain in Healthcare**

#### **1. Increased Data Security and Privacy**

Two main concerns in the healthcare industry are the security and privacy of the patient data. Healthcare data are sensitive and include medical histories, test results and prescriptions, and this information is valuable. Conventional data storage or management methods rely on centralized systems, which are prone to attacks, unauthorized access, or simple human error. For example, healthcare providers have had to report data breaches that put patients' information at risk of identity theft and worse consequences.

Blockchains present a way out of this bind, providing decentralized tamper-proof systems for storing healthcare records. Once data is stored in a blockchain, no one can alter it without the network's consensus. Therefore, hackers or unauthorized users will find it almost impossible to manipulate the records. Thus, the integrity and security of patient information are assured, and every amendment of the records is duly logged with a time stamp for accountability.

Another great thing about the blockchain is that it allows patients to have better control over their data. With blockchain, the patient can control who has access to their medical records by private key. This translates to the fact that the patient can always grant or revoke access to any data, thereby affording the patient a level of control not available with traditional systems. This is of special importance since patients can also rest assured that their sensitive information is shared only with professionals authorized for that purpose.

#### **2. Enhanced Interoperability**

Interoperability in healthcare means that disparate systems can communicate with one another and share data. One of the big problems with many healthcare systems is that different organizations—hospitals, doctors, insurance companies, pharmacies—also tend to use different systems, often incompatible systems, to exchange information seamlessly. Thus, patients may be caught in the middle of fragmented care, with different healthcare providers unaware of critical details from other parts of their treatment.

Blockchain technology manages this challenge, with all authorized participants of the healthcare ecosystem able to access a shared ledger. Rather than each healthcare provider storing their isolated set of records, blockchain provides a single, shared source of truth. This means the moment a healthcare provider makes an update about a patient's record, any other party allowed access into the blockchain will be able to view the updated information in real-time. This eliminates data silos and reduces errors caused by missing or incomplete information, ultimately improving the quality of care for patients.

Apart from this, smart contracts will allow automation of sharing records in healthcare, filing insurance claims, and prescription refills. Smart contracts are self-executing contracts wherein the terms are directly written into lines of code. This could greatly reduce administrative overload.

## **Future Directions and Conclusion**

Last but not least, despite the aforementioned challenges, this enabler holds great promise for revolutionizing the healthcare industry. As the technology matures, here are some other additions that could serve to its advancement in the sector:

**Smart Contracts:** Smart contracts could automate processes such as insurance claims, billing, and payments. By doing so, they could go a long way toward helping cut down on administrative overhead costs and reduce errors.

**AI Integration:** The synergy of blockchain and AI would enhance decision-making and predictive analytics in healthcare with a view to better patient outcomes at lower costs.

**Federated Learning:** This refers to the technique whereby machine learning models are able to learn over non-centralized data, allowing the healthcare entities to collaborate securely in their research while keeping patients' data totally private.

With these points discussed, it can be concluded that blockchain is a tool used to secure, ensure transparency, and run an efficient operation regarding healthcare data. Although obstacles such as scalability, regulation, and adoption cost are prominent, the advantages these present far outweigh these disadvantages. If innovation and collaboration persist, blockchain would be set to delineate healthcare, enhance patient care, lessen administrative burdens, and sustain secure and efficient handling of healthcare data. The ongoing evolution of this technology demonstrates that blockchain will certainly become a crucial player in the future of healthcare.