

# Medical Health Record using Block Chain

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**Abstract:** *The future of healthcare systems is being shaped by incorporating emerged technological innovations to drive new models for patient care. By acquiring, integrating, analyzing, and exchanging medical data at different system levels, new practices can be introduced, offering a radical improvement to healthcare services. We present a novel smart and secure Medical health record system which, leverages blockchain technologies, permits patient centric medical records transactions .Office of the National Coordinator (ONC) for Health Information Technology is seeking patient-centric MHR designs that shift data ownership from providers to patients. There are multiple barriers to patient-centric MHR in the current system, such as security and privacy concerns, data inconsistency, timely access to the right records across multiple healthcare facilities. After investigating the current workflow of MHR, our system provides a feasible solution to these challenges by utilizing the unique features of blockchain. In particular, we develop a blockchain-based architecture and enable a flexible configuration thereof, which optimize medical data sharing between different health entities and fulfill the diverse levels of Quality of Service (QoS) that MHR may require. Finally, we highlight the benefits of the proposed MHR system and possible directions for future research.*

**Keywords:** Medical Health report, Patient centric, blockchain technology, Data ownership, Secure

## I. INTRODUCTION

Blockchain has been an interesting research area for a long time and the benefits it provides have been used by a number of various industries. Similarly, the healthcare sector stands to benefit immensely from blockchain technology due to security, privacy, confidentiality and decentralization. Nevertheless, the Electronic Health Record (EHR) systems face problems regarding data security, integrity and management. In this paper, we discuss how blockchain technology can be used to transform the MHR systems and could be a solution to these issues. We present a framework that could be used for the implementation of blockchain technology in healthcare sector for MHR. The aim of our proposed framework is firstly to implement blockchain technology for MHR and secondly to provide secure storage of electronic records by defining granular access rules for the users of the proposed framework. Moreover, this framework also discusses the scalability problem faced by the blockchain technology in general via use of off-chain storage of the records. This framework provides the MHR system with the benefits of having a scalable, secure and integral blockchain-based solution. The MHR systems have been implemented in a number of hospitals around the world due to the benefits it provides, mainly the improvement in security and its cost-effectiveness. They are considered a vital part of the healthcare sector as it provides much functionality to healthcare. These functionalities are electronic storage of medical records, patients' appointment management, billing and accounts, and lab tests. They are available in many of the MHR system being used in the healthcare sector. The basic focus is to provide secure, temper-proof, and shareable medical records across different platforms. Despite the fact that the notion behind usage of MHR systems in the hospitals or healthcare was to improve the quality of healthcare, these systems faced certain problems.

## II. LITERATURE REVIEW

### 2.1 Blockchain-Enabled Healthcare Systems

Published by: Alaa Awad Abdellatif, Abeer Z. Al-Marridi, Amr Mohamed, Aiman Erbad, Carla Fabiana Chiasserini, and Ahmed Refaey.

Published on: May 04 ,2020.The future of healthcare systems is being shaped by the incorporation of emerging technological innovations, driving the development of new models for patient care. By leveraging advancements in edge computing and blockchain technologies, a novel smart and secure Healthcare system (ssHealth) is proposed in this article. ssHealth enables various capabilities, including epidemics discovery, remote monitoring, and fast emergency response. The system also facilitates secure medical data exchange among local healthcare entities, allowing for the integration of multiple national and international entities and correlation of critical medical events, such as emerging epidemics management and control. Notably, the proposed system utilizes a blockchain-based architecture with flexible configuration to optimize medical data sharing among health entities, while ensuring diverse levels of Quality of Service (QoS) requirements are met.

## 2.2 Blockchain for Electronic Health Records.

Published by: Ayesha Shahnaz, Usman Qamar & Ayesha Khalid.

Published on: October 9, 2019.

Blockchain technology has garnered significant attention as a research area, with various industries recognizing its benefits. The healthcare sector, in particular, stands to gain immensely from the implementation of blockchain technology, as it offers enhanced security, privacy, confidentiality, and decentralization. However, Electronic Health Record (EHR) systems often encounter challenges related to data security, integrity, and management. In this paper, we explore how blockchain technology can transform EHR systems and serve as a potential solution to these issues. We propose a framework for the implementation of blockchain technology in the healthcare sector for EHR, with two main objectives: firstly, to enable the use of blockchain technology for EHR; and secondly, to provide secure storage of electronic records by defining granular access rules for users within the proposed framework. Additionally, our framework addresses the scalability challenge often faced by blockchain technology through the use of off-chain storage for records. Overall, our proposed framework offers the EHR system the benefits of a scalable, secure, and integral blockchain-based solution.

## 2.3 Patient-Centric Health Information Exchange Framework Using Blockchain Technology

Published by: Yan Zhuang , Student Member, IEEE, Lincoln R. Sheets , Yin-Wu Chen , Zon-Yin Shae.

Published on: 8, August 2020.

Health Information Exchange (HIE) has shown significant benefits for patient care, including improving healthcare quality and expediting coordinated care. The Office of the National Coordinator (ONC) for Health Information Technology is advocating for patient-centric HIE designs that prioritize data ownership by patients rather than providers. However, the current system faces several barriers to achieving patient-centric HIE, including concerns related to security, privacy, data inconsistency, and timely access to records across multiple healthcare facilities. In this paper, we propose a feasible solution to these challenges by leveraging the unique features of blockchain, a distributed ledger technology known for its robust security. Using the smart contract feature, which is a programmable self-executing protocol on a blockchain, we have developed a blockchain model that protects data security, ensures data provenance, and empowers patients with full control over their health records while maintaining their privacy. Our design achieves patient-centric HIE by personalizing data segmentation and implementing an "allowed list" for clinicians to access patient data. We have conducted a large-scale simulation to evaluate the feasibility, stability, security, and robustness of our patient-centric HIE model.

## 2.4 A Secure Remote Healthcare System for Hospital Using Blockchain SmartContract

Published by: Hoai Luan Pham, Thi Hong Tran, Yasuhiko Nakashima.

The combination of Internet of Things (IoT) technology with remote healthcare systems has gained significant attention due to its efficiency and convenience in improving human life. However, with the exponential increase in the number of IoT devices in the healthcare system, concerns related to privacy and security of patient information have emerged. To address this issue, we propose the use of blockchain-based smart contracts for managing patients' information and medical devices. Specifically, we utilize the Ethereum blockchain protocol to create a remote healthcare system that

includes healthcare providers (such as hospitals), healthcare professionals (doctors), and patients. Sensor-based health condition data of patients is automatically written into the blockchain. Additionally, we introduce a processing mechanism to store medical device information efficiently and selectively based on the health situation of the patient. This involves filtering sensor data before deciding whether to write it into the blockchain, which helps reduce the size of the blockchain and optimize transaction costs. However, in case of abnormal data from sensors, it is immediately written to the blockchain to trigger an emergency contact to the doctor and hospital for timely treatment. We have verified the proposed smart contract on the Ethereum test environment called TESTRPC and implemented the system in an experimental environment using real devices, demonstrating its effectiveness at a small scale

**III. SYSTEM DESIGN**

**3.1 Existing System**

According to our survey, 83 percent of the systems proposed since 2016 are patient based, while 17 percent are entity based. For healthcare applications, the blockchain architectures that have been proposed so far can be broadly classified into two categories: patient based and entity-based. In patient-based architectures, patients participate in the blockchain and transactions are driven by the patient directly. However, such architectures have a limitation in terms of the system’s scalability. In entity-based architectures, instead, health organizations, hospitals, research institutes, and alike are the main actors, while patients only interact with the health organizations to acquire the service they need.

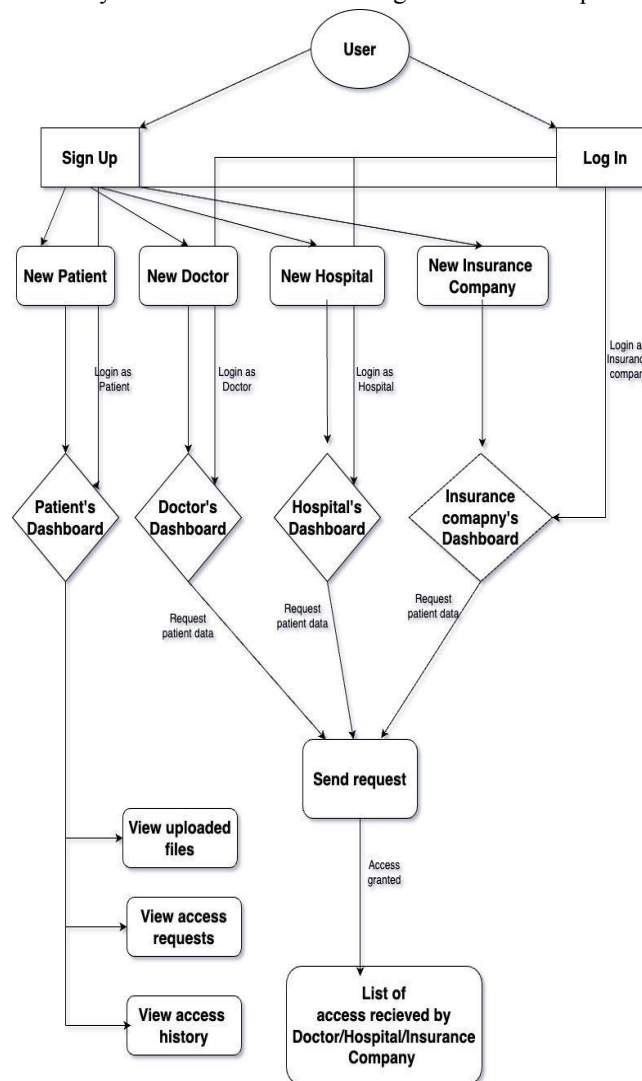


Figure 1.Flow Diagram

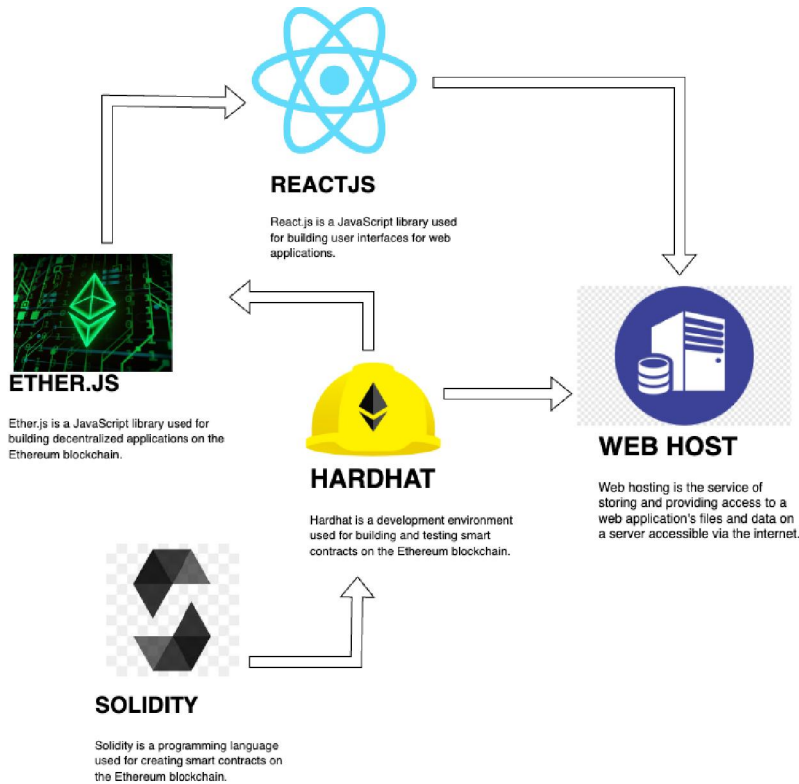


Figure 2. Overview Of structure

### 3.2 Platform Overview

In this section, we describe how to develop the MHR System based on Smart Contract to protect private information . Fig. 2 shows the overall structure of the proposed system

Entities of the system

1) The healthcare provider: We call the hospital A is the healthcare provider. The process of using smart contract for the hospital A in order to manage patients and doctors are presented as follows. One important aspect for e-health systems is integrating healthcare providers, patients, and payers into one “digitized community,” in order to improve the quality of services and drive costs down. Indeed, to realize a sustainable healthcare-business model, healthcare providers will have to own health plans powered by insurance companies.

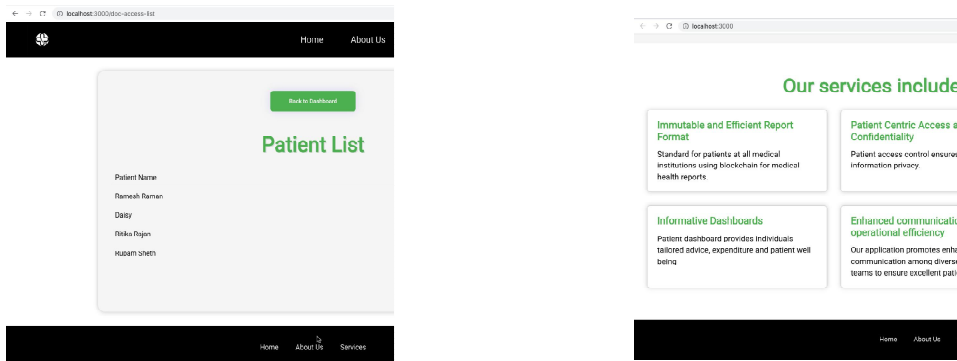


Figure 3

2) Healthcare professionals: Healthcare professionals (doctors), play a very important role in the system as a direct supervisor for patients to timely treatment, doctors can access body parameters to check the patient’s health situation

3) Patients: Patients, as indicated Fig. 3, play a core role in the system by using the services the system caters as the system revolves around patient.

Each entity requires to register to the network with aadhar card number and the minimal fee for registration through the signup module each entity requires a metamask wallet and a web browser to use the system. In our web application represented in figure 4 patient centric decentralized system, Hospital and Medical insurance need access permission from their profile while patients would be required to grant access to avail services of medical institutions.

Our blockchain model keeps all the log files so that patients can always review who has accessed their data. All clinicians can check the source of EHR data, which ensures data provenance. Clinicians are able to check only the data input by trusted healthcare facilities

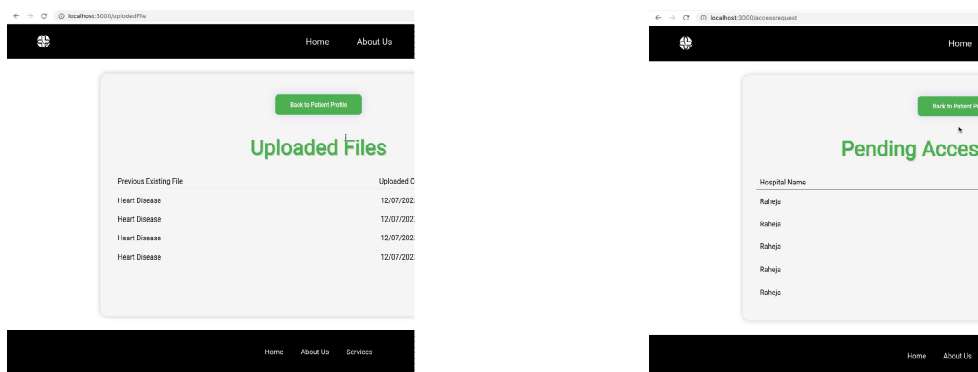


Figure 4

IV. FUTURE SCOPE

For the future, we plan to implement the payment module in the existing framework. For this we need to have certain considerations as we need to decide how much a patient would pay for consultation by the doctor on this decentralized system functioning on the blockchain. We would also need to define certain policies and rules that comply with the principles of the healthcare sector. Implementing health records increases interoperability between staffs, patient and healthcare centres, Standard format for medical report adopted universally reduces Information asymmetry. Secure hashing in the future would decrease data breaches by a great margin. Data access and Transparency can be maintained by Patient rather than medical institutions. Potential Disease Outbreak can be pulverized.

V. CONCLUSION

In this paper we discussed how blockchain technology can be useful for the healthcare sector and how it can be used for electronic health records. Despite the advancement in the healthcare sector and technological innovation in MHR systems they still faced some issues that were addressed by this novel technology, i.e., blockchain. Our proposed framework is a combination of secure record storage along with the granular access rules for those records. It creates such a system that is easier for the users to use and understand. The role-based access also benefits the system as the medical records are only available to the trusted and related individuals. This also solves the problem of information asymmetry of the MHR system.

ACKNOWLEDGMENT

This work was supported by Head of Department, Er. Sanam Kazi. Research and project supervisor Dr.Ashfaq Shaikh gave timely help and guidance in completing this project successfully and all teaching and non-teaching staff of Information Technology faculty facilitated us in completion of our project. Deep regards and gratitude to our in-charge Principal Dr. Ganesh Kame for his support and facilities provided to us for the same.

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