

## **A BLOCK CHAIN BASED SOLUTION FOR DIGITAL TWIN FOR MEDICAL USE**

**First Author<sup>1</sup>, Second Author<sup>2</sup>**

<sup>1</sup> *Abhilasha, Master of Computer Application BKIT-Bhalki*

<sup>2</sup> *Prof. Poojarani.N, Master of Computer Application BKIT-Bhalki*

**Abstract** - The health problems of this world's population are universal. Nowadays, protecting one's personal medical information is a priority for everyone. No one likes to let people in on their vulnerabilities. Electronic health records (EHR) were developed as a solution to this issue. However, a number of experts have pointed out that there are drawbacks to EHR that patients should be aware of. In this study, we will explore how blockchain technology may replace EHR and other healthcare record keeping methods. A blockchain is a distributed ledger in which each transaction is represented by a hash value and each block contains a reference to the block before it. As use of blockchain technology in the healthcare industry grows. Blockchain ensures the confidentiality, availability, auditability, and manageability of health records. People's health data in particular lacks trustworthiness, centralization, and transparency, which raises questions about the distinction between "external" health data and "internal" health data. This is a significant stumbling block in the expansion of healthcare in many countries. However, they all suffer from what we term a lack of data care and refurbishment. Health care data should be as open and decentralised as feasible. Moreover, the same data must be used as the ready-to-use source of information for governments to take immediate action if there is a possibility of an outbreak, lack of medication and equipment, vaccination and clinic drives, and many other probable problems faced by certain locality encompassing the health institutes. A solid middle ground linking individuals, communities, and national healthcare systems was what was really lacking. To do this, we implement this system.

**Key Words:** Blockchain, Digital-E-Health, EHR.

### **INTRODUCTION**

Modern technologies like Machine Learning and Blockchain are incorporated into a fully effective healthcare data management system. The patient's authorised hospital staff may upload the patient's medical records to the platform, and the patient can then view those documents from any internet-connected device, at any time. Through this method, hospitals and patients may have a one-way conversation. Using this system, analytics may be performed on patient data in aggregate without compromising individual privacy. Government agencies may use this information to zero in on the negative consequences of illnesses, distribute resources effectively, trace the source of epidemics, anticipate occurrences, prepare for them, raise awareness, and more.

Data analytics for data care, redirected medicine purchase, and an individual medical report analyzer are just a few of the complex features included. In addition to having these characteristics, its unique selling point is that its underlying infrastructure is based entirely on Blockchain technology. The privacy and security standards built into the app are a major aspect for any individual or business. As computing power increases, formerly time-consuming and difficult programmes may be run and cracked in much less time. Increased protection against data tampering is one of the many benefits of using Blockchain in the healthcare industry. Patients and businesses alike may benefit from the system's in-depth analysis of health conditions and situations, as well as its cutting-edge functionalities and rigorous safety measures. To this day, nobody knows for sure who invented blockchain technology under the alias Satoshi Nakamoto.

Bitcoin was the first digital money, and blockchain was developed to prevent duplicate spending without relying on a central server or database. Medical facilities and government health agencies used paper records to keep track of patient information and other sensitive data before the advent of modern technology. Since the texts were created by people, there is a loss of credibility and many errors. This compelled the healthcare industry and other sectors to adopt EHR systems. Which were safer and less expensive than paper documents.

Electronic health records (EHR) were the panacea for the healthcare industry. Which were used to centrally store patient information, process billing, do laboratory tests, and share patient information with other medical facilities and clinicians.

### **Problem statement:**

In recent decades, healthcare has risen to prominence as a national and international priority. The expansion of medical infrastructure has triumphed, and the percentage of the population with access to necessary medical care has been rising at an encouraging 2% yearly rate. Because the relevant data is only accessible after the epidemic is visible, even big nations are too late to prevent an outbreak. It takes a long time to see the effects of vaccines and new medicines. However, this time frame may be shortened with continuous data collection and analysis using data from a large geographical area.

### **Literature Survey:**

Just like in other sectors, healthcare is seeing an increase in the pace, volume, and value of its data as it becomes more digitised. Better medical outcomes cannot be achieved without proper data management tools for extracting useful information and drawing useful conclusions.

EMR abstracts, claims data, and information on enrollment and medical programmes are all collected by the majority of healthcare organisations, according to a study. Only the most advanced businesses incorporate data from EMR feeds and illness management programmes into their routine operations. Whatever the case may be, these management systems cannot be regarded useful outside the context of the specific hospital administration. This is because each company's management system is tailored to react to, and preserve information unique to, that company. One country, one system, which would centralise and standardise access to medical records across all institutions, is not something it can deliver.

PaaS deployments that have attempted to create a system usable by anybody have been quite rare. IBM has created a digital health pass app to store user medical data. The software stores its users' data in reverse chronological order.

The purpose of Digital Health Pass is to make it easy for companies to check the medical credentials of visitors meeting their own specific requirements, such as workers, customers, fans, and tourists. This software is based on the principles of decentralisation (to reduce the need to gather personal information), blockchain technology (to store information securely and efficiently), and cryptography (to prevent unauthorised access to stored information).

Some potential medical use cases where blockchain technology may play a big part in streamlining the process have been outlined by (Khazer et al), outlining the current state of research on healthcare utilising distributed ledger technology.

The group deliberated on the many ways in which blockchain technology may improve the healthcare administration system. The IoMT delivery method based on networking protocols was also suggested.

Blockchain for Healthcare Data Security and Privacy (Litchfield et al. Healthcare data security and privacy were significantly enhanced by using blockchain technology. In addition to doing a healthcare needs assessment, they highlighted concerns about the confidentiality of patient information and proposed using blockchain technology as a solution.

## **SYSTEM ANALYSIS:**

### **Existing System:**

The set of technologies and norms that facilitate the transfer of data electronically across institutions. Depending on the system and health care settings, mobile devices like tablets and smartphones with handwriting capabilities may also be used to access and update patient records in an electronic medical record (EMR). Individual notes from an electronic medical record (EMR) might be immediately viewable and accessible through a private health record (PHR).

#### Disadvantages:

1. There are significant differences in how each care environment operates. This makes it difficult to create a universal EHR system.
2. The potential for electronic health records to be utilised in advanced ways and linked across locations of treatment further complicates concerns about their long-term preservation.
3. Multiple independent entities may generate, employ, modify, and examine records.
4. Doctors, hospitals, insurance companies, and patients are all part of the healthcare ecosystem. A user's data may have been compromised.

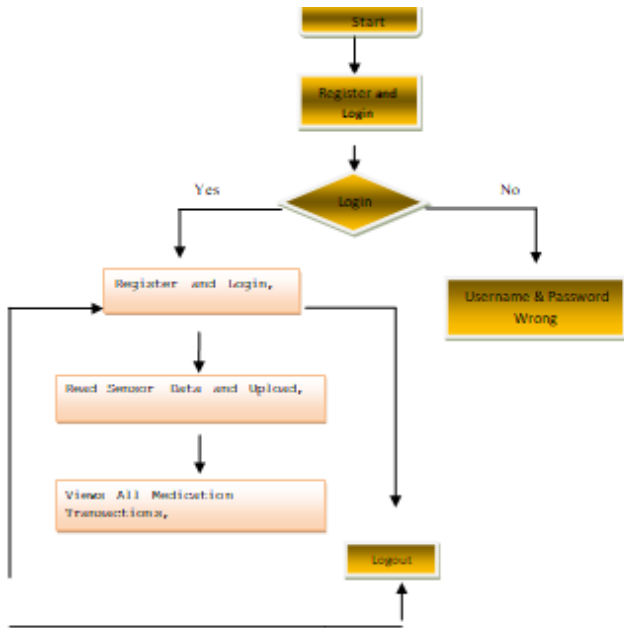
### **Proposed System**

There are two user accounts in the system. Users, or "Patients," may join up for the service. The user's whole medical history is stored in this profile, organised chronologically for easy retrieval at any time. The doctor's profile is customised such that authentication is dependent on a unique identifier; the platform issues this identifier only once the doctor transmits the information from his or her government-issued medical licence. Each medical professional employed by a hospital must be registered. The physician's profile extends beyond the patient's. In other words, the doctor may play the role of a patient and have all of his or her medical information filed under the same profile. User-specific settings, password resets, and email verification are all available via the system.

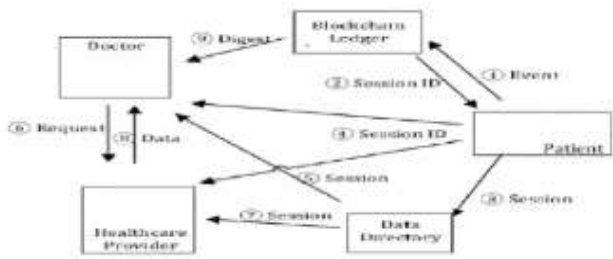
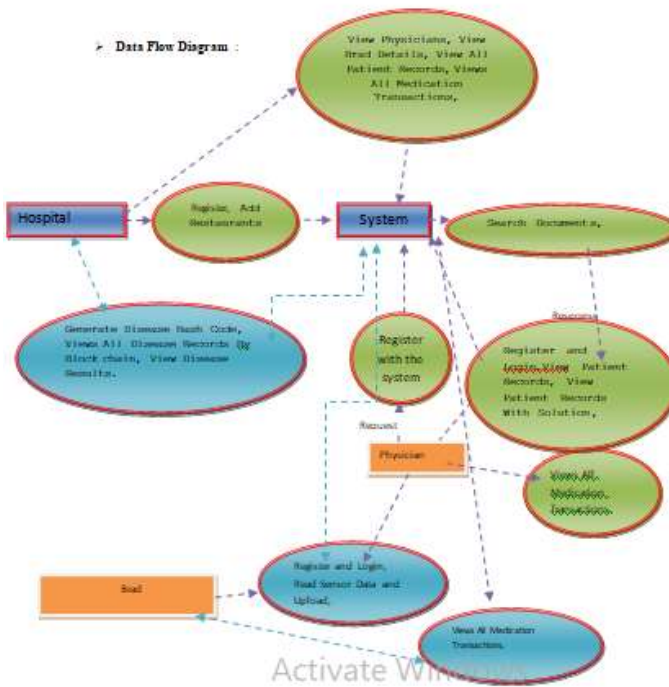
In what follows, we'll assume a patient is seeing their family doctor, someone they've already seen several times. The doctor may look up the patient's medical history after learning about the problem(s). The patient authenticates their access using an OTP (One-Time Password). Doctors might get more understanding from their previous encounters with patients by perusing their data in reverse chronological order. The doctor may go on to the prescription page after they have collected the necessary information from the patient.

The system's prescription page follows a document-based design, displaying the patient's information with a straightforward form. The patient's health and medication needs throughout the course of a day and night may be reported using this form. This prescription is subsequently transformed into a legal document, converted into a PDF for printing, and a digital copy is attached to the patient's medical file. After the appointment is completed, the patient may revoke the doctor's access to their medical records.

## **ARCHITECTURE**



Data Flow Diagram :



## Results and Analysis:



## Working:

The primary goal of the system is to facilitate clear, transparent communication between hospitals and patients, therefore allowing third parties such as the government to make use of patients' medical records without jeopardising individuals' right to privacy and security. This is accomplished superbly by making smart and effective use of technologies like Blockchain, in conjunction with a versatile data management system. All socioeconomic groups would have equal access to the platform because of its user-friendly and powerful interface and user experience. Adding an additional layer of security provided by Blockchain architecture in the backend.

Traditional hospital data management systems often have limited functionality and can only be accessible inside the hospital's physical walls. The system's unique capabilities in comparison to other hospital data management systems allow it to solve these problems.

In addition to reducing the need for paper copies of medical records, the system's data may be accessible from any location at any time, saving substantial time and decreasing the likelihood of essential medical papers being misplaced.

Organisational authorities may monitor the health state of a whole area with the use of Advanced Data Analytics, which allows them to precisely spot any irregularities in health domains. Machine learning allows for the development of suggestive models that can detect anomalies and provide appropriate remedies. As the model is constantly updated with fresh information, it is able to detect previously unseen patterns.

With the use of NLP, doctors may identify chronic conditions in their patients without having to rely on their medical history.

Everything is at your fingertips in today's online-centric society. The patient may easily order any medication thanks to the automatic rerouting to the pharmacy.

Constraints such as implementation obstacles resulting from the early stage of technology, a shortage of developers, and many more mean that no product is guaranteed to be flawless upon its first release. There is a

great deal of room for development in the system as a hospital data management platform. The need for these characteristics is dependent on developments in technology and society. Adding new features shouldn't slow down the system or violate any of the rules set out by the current model, and it shouldn't stray too far from the original concept either.

### **Conclusion:**

As a result of the epidemic, every country is devoting greater resources to the health care system. Technologies progress as a means to address specific issues and enhance existing conditions. The pandemic emphasised the need of having comprehensive health monitoring systems in place. The system adds a novel dimension to conventional healthcare infrastructures. Data Analytics, Natural Language Processing, and Protection Against Data Tampering are just a few of the powerful characteristics that allow it to serve as a universal solution. A patient's right to access their own medical records is expanded by the usage of the system. Using NLP, clinicians may quickly learn about a patient's history of chronic disease without consulting his or her medical records, which can be a big time saver. Governments depend on information provided by hospitals throughout the country, but are often not provided with accurate information owing to misunderstandings or a lack of resources to call each hospital individually. Due to the use of outdated medical technology, hospitals cannot provide real-time data. The technology solves these issues and gives timely information to authorities and citizens. As a result, this method greatly improves the accuracy of monitoring epidemics like Covid. Additionally, the system facilitates the government's ability to distribute healthcare funding more effectively. The potential for this system to grow is enormous. It has the potential to be made even more adaptable and sturdy with the addition of several additional functions. Like Social Security numbers, governments may issue health ID cards. You may use this card anywhere in the country, and getting your insurance to cover the costs is simple. This system has enormous potential use and features that can be added to it in the near and far future.

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