BLOCKCHAIN: A PANACEA FOR MEDICAL DATA ACCESS AND MANAGEMENT

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***Abstract*— Healthcare is a data-intensive domain where a very large amount of data is created, disseminated, and accessed every day. For example, data is created when a patient is admitted in a hospital. The main objective is to make sure that this data related to the patients are available across every hospital. This ensures that the doctors have a better knowledge of the patient's history of ailments and provide better treatment to the patients. Typically, healthcare providers are interconnected by means of the Health Information Systems (HIS) allowing them to exchange medical data. However, the size of current HIS is limited to a set of hospitals or a given region, and therefore the common practice is that patient-related medical data are not available for exchange. This causes a major setback in providing patients with efficient treatment. This is because the history of treatment the patient has undergone is unavailable to the doctor who is treating the patient for the day. This is a major problem persisting in this country. However, it is possible to overcome the problem. A comprehensive solution is provided to this problem by maintaining a common database. Blockchain is used to make sure that the data stored in the database is not tampered. As a result, hospitals can share data related to the patients with ease and provide better treatment to them.**

Keywords—HEALTH INFORMATION SYSTEM, BLOCKCHAIN, AES ALGORITHM, HASH, CLOUD.

I. INTRODUCTION

Medical data refers to information that is associated with regular patient care or as part of a clinical trial program. There are several categories of such data, as this can be quite a broad definition. So, data exist for each and every patient. The data of each and every patient should be captured. Data captured in paper format cannot be shared among hospitals. Computerizing paper records also is not feasible because it is costly and there are lots of possibilities for making mistakes during data entry. So, the best solution for this problem is to maintain a computerized record for each and every patient that can be uniquely identified so that it is possible to keep track of the patient's history of ailments. This data can be put to good use by sharing among hospitals. The main problem imposed by patient mobility is that the availability of medical data associated with the patient at a secondary care hospital for clinical analysis, specialist referrals or surgeries. Nowadays not all hospitals have the means for providing the required treatment for each disease. Only certain private hospitals are capable of providing the required treatment. This causes patients admitted even in government hospitals to shift to private hospitals. This causes a need to share medical data among hospitals. In the existing system, the patient data is not available for exchange. The healthcare providers are connected by means of Health Information System. The size of the current Health Information System is limited only to a few hospitals. This does not allow the medical data such as treatment provided to a patient previously admitted in a different hospital to be shared with the hospital in which the patient is currently admitted. This is the primary disadvantage of the system that is in existence.

II. LITERATURE SURVEY

Few works with varied functionalities were proposed and some of the primary papers were referred. The following lines of development were considered important for our system.

M. Steward [1], suggested the change from paper records to computer-based storage and processing of medical data along with the increase in data in the field of health care.

R. Hauxe [2], proposed that there is need for a global or regional health information system which proves to be more useful than maintaining an institution-based system.

K. Häyrinena [3], suggested to include the patients and health consumers as users of the health information system, besides the health care professionals and administrators.

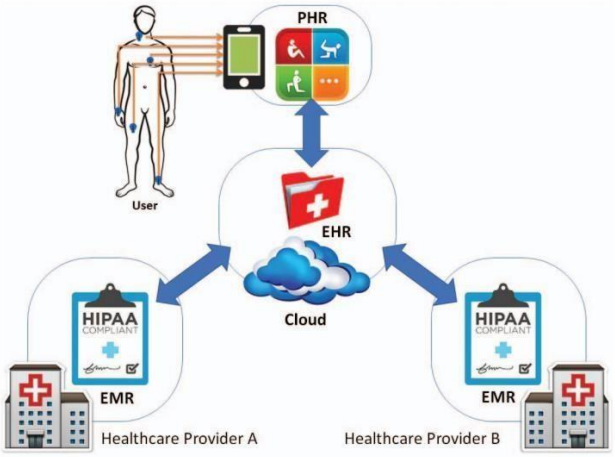
M. Ciampi [4], In his work suggested that the use of health information system should not only be towards the benefit of patients and better administration, but also for clinical and epidemiological research.

M. Moharra [5], proposed the shift from mainly focusing on technical health information system problems to strategic information management.

S.H. Han [6], suggested the shift from mainly alphanumeric data in health information system to images and also include data on the molecular level.

III. MATERIALS AND METHODS

In the proposed system we maintain a common database. Blockchain is used to ensure the integrity of the data in the database. This makes sure that no one can alter or modify the data in the database once it has been uploaded.

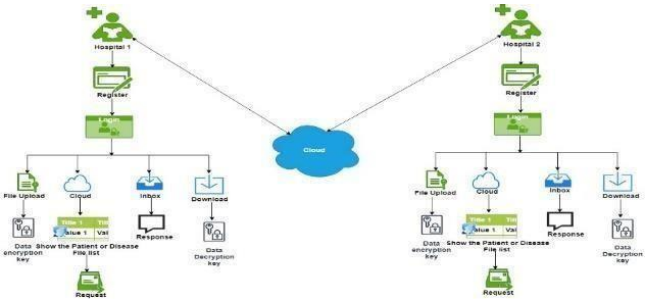


The hospitals should register their details in a web application after which they can login using their credentials. The hospitals can upload the patient's detail along with the treatment provided to them in the form of a report. When a new medical data is created for a patient after consultation or a procedure, a new block is created and instantiated. This block is distributed all over the hospital network. These blocks are stored among multiple nodes of an infrastructure and not centrally stored. Each block contains a timestamp of its production, the hash of the previous block and the transaction data which in our context is the patient's medical data. Once the data is uploaded, it cannot be modified without doing so for all the subsequent blocks. This means that any modification will be easily detected. As the block data is publicly visible it is necessary to secure the data before it is uploaded. For this purpose, AES algorithm is being used so that the record is secure in the database.

The data of the patient can be browsed using the patients Aadhar number. This allows us to differentiate people who have the same name. A hospital that wishes to view the patient's data uploaded by another hospital has to first request the hospital for the data. If the request is not accepted then the corresponding data cannot be viewed. On the other hand, if the request is accepted, then a response is sent along with the file key to the requesting hospital and then the data can beviewed.

IV. DATA SECURITY AND PRIVACY

A patient's health record consists of several personal and sensitive information that attracts cybercriminals. They may even try to benefit financially from the patient by threatening to expose them. Therefore, ensuring the security of the health record is crucial yet challenging due to the interplay and complexity involved in the system.

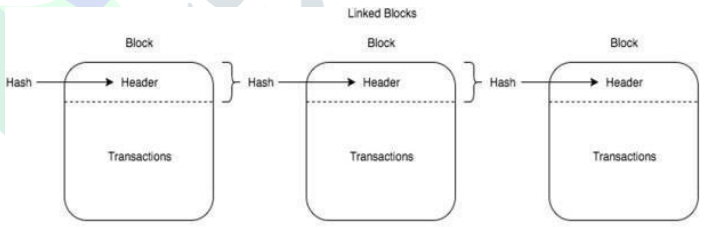


A comprehensive system for maintaining health records

The privacy and integrity of the data should not only be protected from external attackers but also from unauthorized attempts to access by anyone inside the network. Any leakage or modification of data can be intentional or unintentional and the healthcare provider should be held criminally liable for such unfortunate incidents. To avoid such incidents the data must be encrypted before uploading it into the cloud. But this increases the time and cost consumed to retrieve the data. Access control models should be used to regulate and limit the access to data. This proves effective against external attackers but is useless against internal attackers who are authorized to view the data.

V. THE BENEFITS OF BLOCKCHAIN

Conceptually, blockchain is secure and it provides the capability to achieve decentralized consensus and consistency, and resilience to intentional and unintentional attacks.



The blockchain technology

The key benefits of deploying a blockchain in our approach are as follows:

1. Avoiding a performance bottleneck or single point failure;
2. Data is consistent, timely, accurate and easily distributed;
3. Unauthorized modifications can be trivially detected.

VI. CHALLENGES

A number of challenges are associated with electronic health records. For example, can the data uploaded by the healthcare provider be trusted? Who should be held legally liable in case of a misdiagnosis? Another challenge is to determine how fit is blockchain to store health related data. Blockchain was

originally designed to record transaction data which is relatively small.

In order to deal with these challenges many have suggested to store the data outside of a blockchain in a distributed or conventional database and store their hashes in the blockchain. This idea however is not without a probable challenge. With the tightening of data protection laws around the world it may not be very long before the hashes of personal data are regarded as personal data. Then the whole idea of using blockchain to store medical data should bereconsidered.

VII. CONCLUSION

Despite having several challenges and thorny legal issues the exchange of medical data will benefit all users ranging from patients, hospitals, insurance companies and even the government.

VIII. REFERENCE

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