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Blockchain Based Health Care Record Sharing System

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ABSTRACT:

Blockchain technology was developed to make it easier for people to exchange money, do away with the requirement for a reliable third party to notarize and verify transactions, and safeguard data confidentiality and privacy. In order to facilitate data sharing and enhance interoperability among patients, hospitals, clinics, and other medical stakeholders, this project uses block-chain technology to manage and distribute electronic health and medical records. The entities taking part in the built-in chain network determine which blockchain's architecture is employed. Although the usage of blockchains may eliminate duplication and give carers consistent patient information, it still has several drawbacks that could undermine the entire stakeholder network or violate patient privacy.

Keywords: Blockchain Technology, Cloud Network, Security, Healthcare Sector, Prototype App

1. INTRODUCTION

Better health is important to human happiness and the welfare of society. It plays a vital role in the economic progress of the nation. Ill health, casualty, emergencies occur every day and the diseases are expected to be diagnosed and treated. A health record is a collection of clinical data related to the patient's mental and physical health, gathered from different sources. Health record consists of a patient's medical history, examination, diagnosis, treatment, results of lab investigation, scanning reports, alerts like allergic to etc. These health records can be managed both manually and digitally.

The traditional method which is followed in most of the hospitals for maintaining records is the manual method which includes papers and books. This method has serious limitations such as a need for large storage areas and retrieval of records is difficult. In the present era computerization of clinical records has become popular asthe storage and retrieval of the records is easy. However, the chances of manipulationwithout identification has become a serious concern [1].

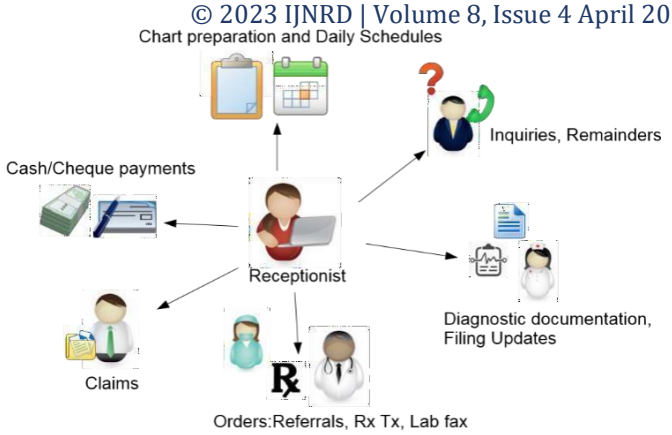


Fig 1.1 Hospital Activity diagram

There are intense queries about the storage of patient's data, providing authorization to access the data, security & immutability of the data. These problems can be solved by developing a decentralized digital health infrastructure that is by integrating Blockchain technology into the healthcare system [5].

Blockchain technology has the capability to rebuild the modern economy by maintaining and updating record. Being voluminous, health care records are best stored in the cloud to enable easy access and sharing of information among the different stakeholders [3]. One possible technology to enhance integrity, authenticity, and consistency of stored and exchanged medical records is Blockchains. Blockchains can guarantee security of sensitive data by tracking access to confidential medical records and ensuring authorized access. Blockchains as a technology relies on public key cryptography and hashing mechanisms as a mean to keep track of historical transactions pertained to distributed patients' records while preserving confidentiality, integrity and availability [4]. This will ensure that records are not lost or being wrongly modified, falsified or accessed by unauthorized users. In Blockchains, patients' records can only be appended to the database, but not removed. New information can be securely linked to a previous record using cryptographic hashing [7].

Records are added to the blockchain based on a consensus among the majority of miners in the blockchain. Miners are a set of specialnodes working together to validate new transactions added to a blockchain. To be able to add a record to a blockchain, miners have to compete to solve a difficult mathematical problem known as Proof of Work (POW) which takes 10 minutes on average [6]. Blockchain is verified and linked to the preceding 'block,' forming a long chain. After all, Blockchain is the name of the record. As any transaction is registered and checked publicly, Blockchain provides a good deal of accountability. When entered, no one can modify all the information written in the Blockchain. It serves to demonstrate that the data is actual and unchanged. In Blockchain, data are maintained on networks instead of a central database. Blockchain offers a fantastic forum to develop and compete with traditional companies for modern and creative business models [2]. The EHR systems have been implemented in a number of hospitals around the world due the benefits it provides, mainly the improvement in security and its cost effectiveness. These functionalities are electronic storage of medical records, patients" appointment management, billing and accounts, and lab tests.

The EHR system also faces some other problems which are as follows:

1.Interoperability: It is the way for different information systems to exchange information between them.

2.Information Asymmetry: Today the greatest problem in healthcare sector defined by the critics is information asymmetry which refers to one party having better access to information than the other party.

3.Data Breaches: Data breaches in healthcare sector also calls for the need of a better platform. A study was done for analyzing the data breaches in EHR systems and it depicted that 173 million data entries have been compromised in

these systems since October 2009.

2. OBJECTIVE:

- To produce confidentiality for patient medical recordsvictimization using "Blockchain Technology".
- To provide Patient information secrecy or confidentiality which is necessary pillars of drugs.
- To Protect the personal details of a patient to bond trust between the doctor and also the patient.

3. PROPOSED SYSTEM:

To understand the blockchain architecture let us use the following figure 3.1 that explains the whole process of a transaction being send from a user on the blockchain network.

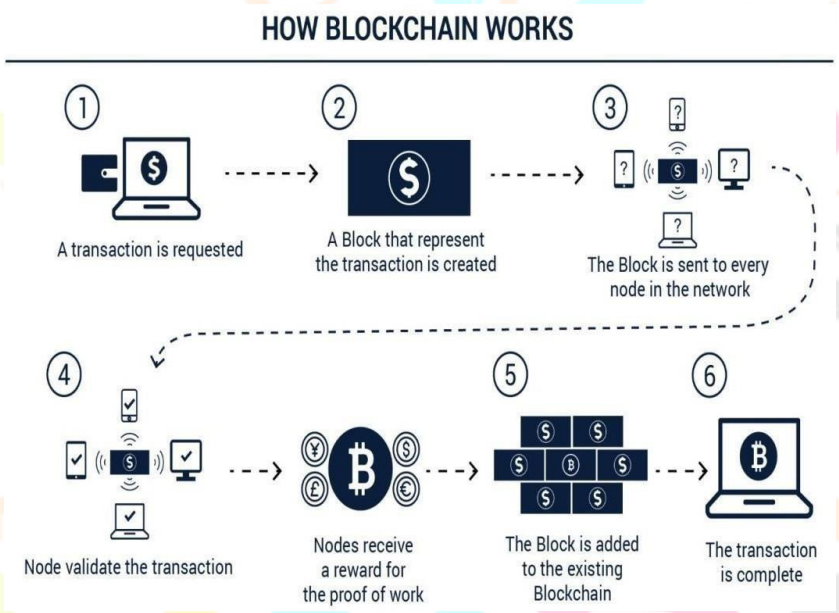


Fig 3.1 An Overview of Blockchain Architecture

1.A new transaction being sent by a user on the blockchain network suggests that a new block is created. A block in the blockchain is used for keeping transactions in them and these blocks are distributed to all of the connected nodes in the network. That transaction placed inside a block is broadcasted to all of the nodes in the network. All the nodes in the network have a copy of the complete blockchain that helps them in verification process. When a block ontaining the user, transaction is broadcasted to all of the connected nodes, they verify that the block is not tampered by any means. If this verification results in success then the nodes add that block in their own copy of blockchain

2.This whole process of the block being added on the blockchain is done by the nodes reaching upon a consensus where they decide which blocks are valid to be added on the blockchain and which are not. This validation is performed by the connected nodes using some known algorithms to verify the transaction and to ensure that sender is an authenticated part of the network. When a node succeeds in performing the validation that node is rewarded with crypto- currency. This process of validatingthe transaction is known as mining and the node performing this validation is known as miner. After validation is done, that block is added to the blockchain.

3.After the whole process of validation is performed the transaction is completed. As we can see above, the Blockchain structure is highly complex but ensures that there is security built into the core system. All nodes in the network make the structure increasingly safe to interact in. This has enabled greater control using Blockchain, as more data can be transmitted using the technology. Additionally, from a purely functional standpoint, there are more significant advantages to using Blockchain over traditional formats. There are poorer control and fewer compliance measures present in usual standards. Additionally, the investment required to make a conventional datastorage network security is immense. Blockchain comes in and ensures that data are saving and cost saving benefits to storing data over the distributed ledger.

4. Data Flow Diagram:

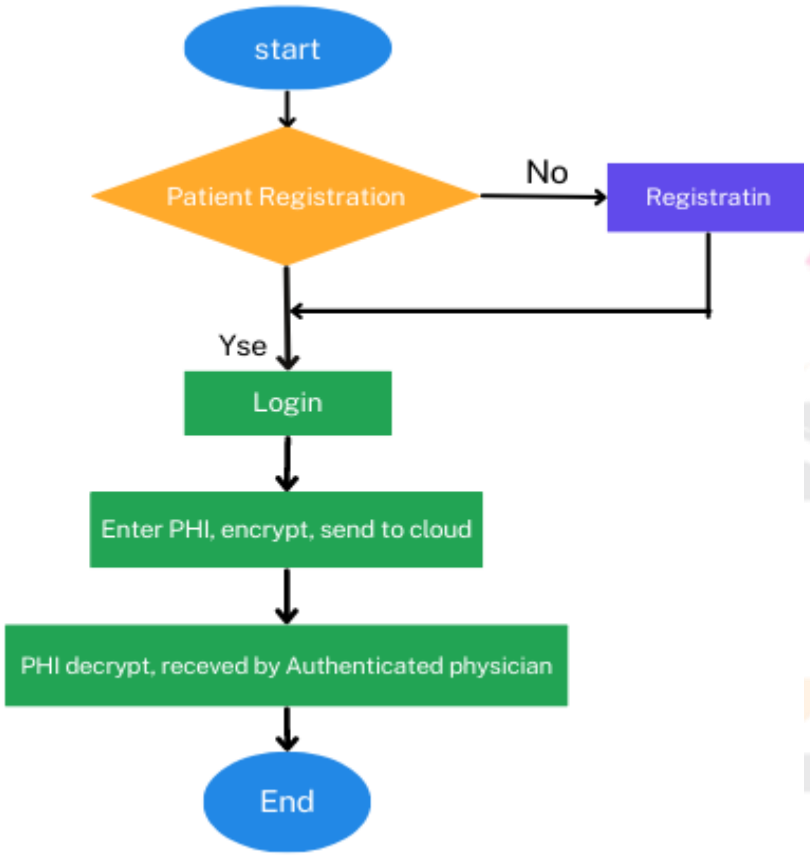


Fig 4.1 Data Flow Diagram

E- Healthcare system aims at gathering and storing patient's details and sharing health related information. First of all, our existing system needs to register the new patients. Once registration is done then patients' needs to do his/ her Authentication. Then our existing system collect the real time personal information (PHI) and health problems from patients and transmit them to the healthcare provider for the authorized physicians to decide on the corresponding treatment. They send the PHI in terms of text and image to the cloud, and also the other personal queries related to their medical history. In cloud computing, collected PHI should match the physicians experience to judge the state of the patient and unfortunately, delegating both storage and computation to the untrusted entity would bring a series of security. This is where deduplication comes into play. It is a technique for eliminating duplicate copies of data, and has been widely used in cloud storage to reduce storage space and upload bandwidth. Attribute-based encryption (ABE) has been a preferred encryption technology to solve the challenging problem of security during data sharing in cloud computing.

5. Use case Diagram:

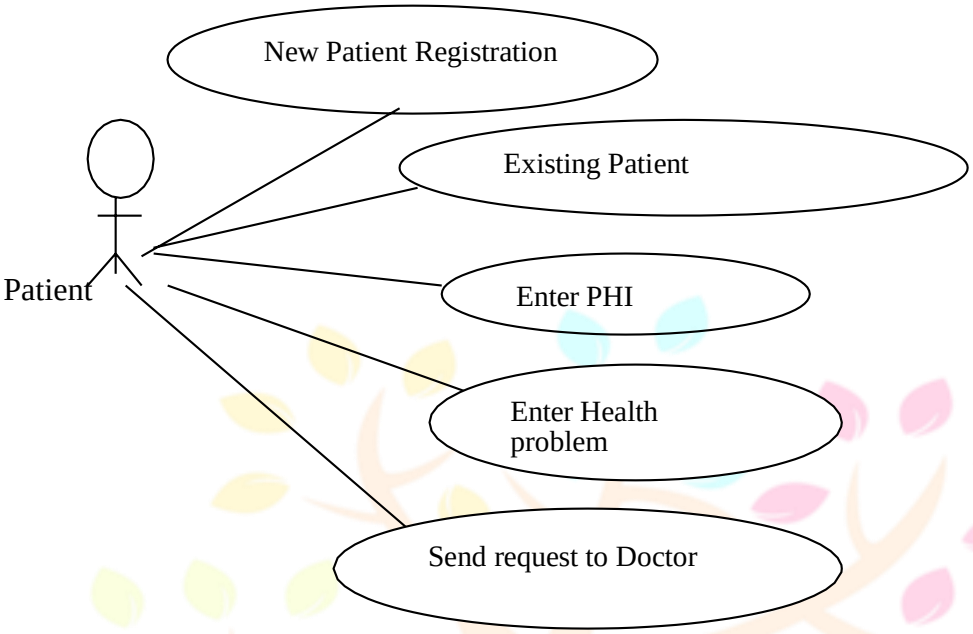


Fig 5.1 Use case Diagram of Patients

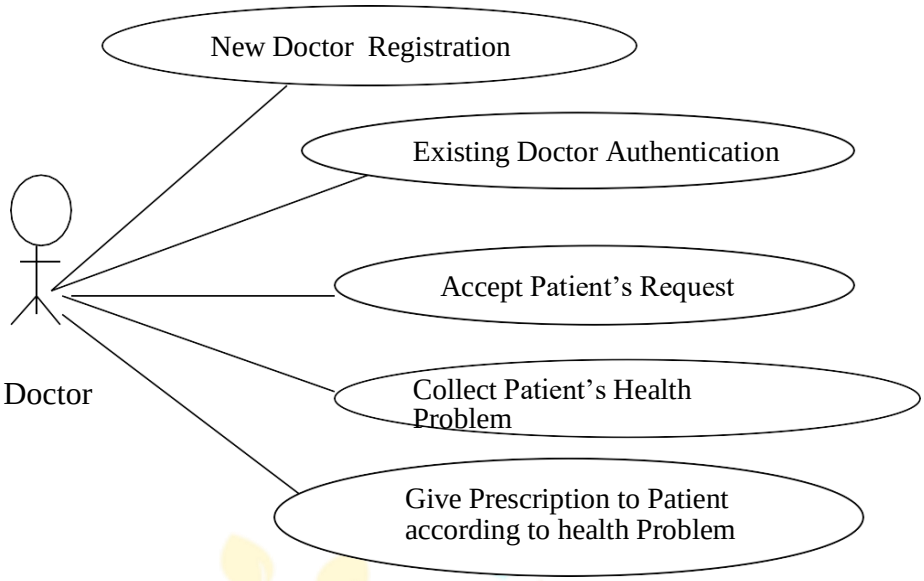


Fig 5.2 Use case Diagram of Doctors

6. SYSTEM IMPLEMENTATION:

6.1 User Interface

6.1.1 Home page

Screenshot 6.1.1 Home Page

This is the "Home Page" that will appear first when our website is opened, In this page, there are Six tabs that are visible which are "User Login"," User Registration"," Hospital Login"," Hospital Registration"," Admin"," Miners". When Clicked on "User Login tab" and "User Registration tab" User Login details and User Registration details appear. Same as for "Hospital Login" and "Hospital Registration".

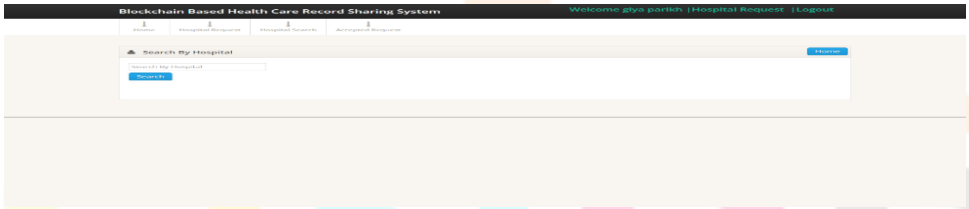
When Clicked on "Admin tab" Total Users Record and Hospital Record appear. And When clicked on last tab that is "Miners" tab, a Result of Verification Record appear.

6.1.2 Patient Registration

Screenshot 6.1.2 Patient Registration

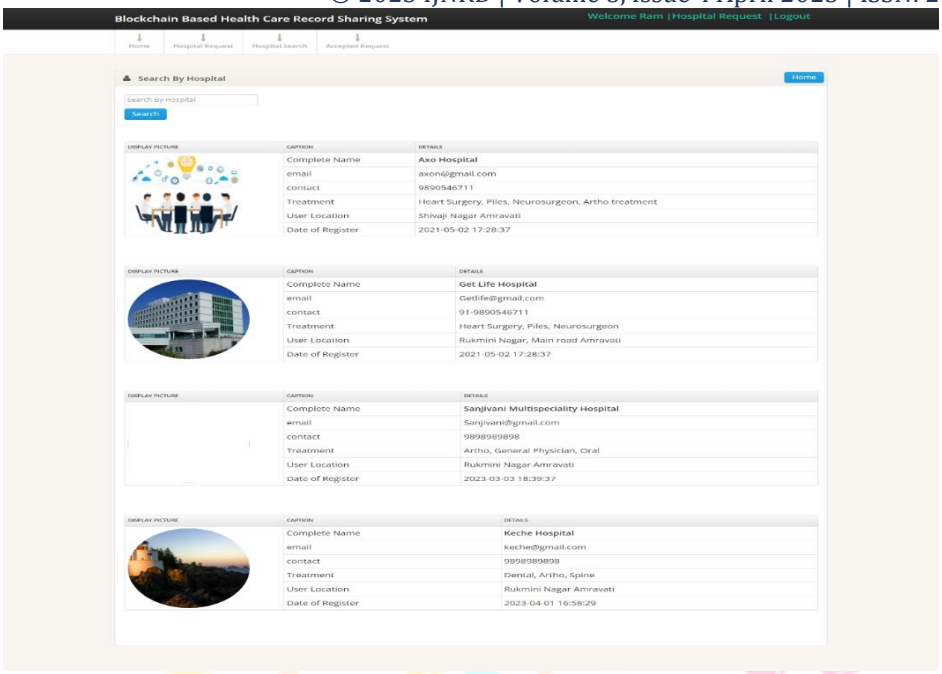
This is the Patient Registration page that will appear when clicked on Patient Registration tab ,an application for the User to fill their data for Hospital registration. In this application, there are various filled like Email Address, Password, Full Name, Age, Height, Gender, Blood Group, Contact Number, Address, Profile pic.

6.1.2.1 Description of Patient Panel



Screenshot 6.1.2.1 Hospital Search in Patient Panel

After Login to “Users Login” tab this page appears. Search by Hospital name tab appear here, application of these tab is Patients can easily find out the Hospital. This page also contains additional four tabs which are Home, Hospital Request, Hospital Search, Accepted Request.



Screenshot 6.1.2.2 Hospital Search in Patient Panel

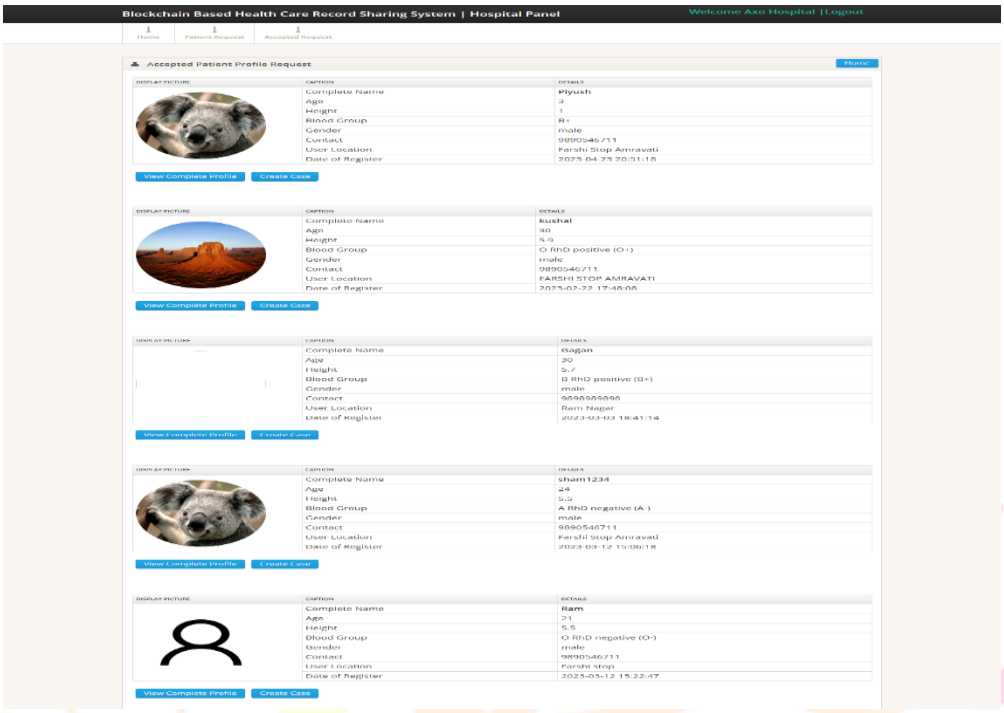
This is "search by hospital name page" that will appear when clicking on Hospital search tab. Application of these tab is it contain the information of Hospital, Hospital profile photo.

6.1.3 Hospital Registration

Screenshot 6.1.3 Hospital Registration

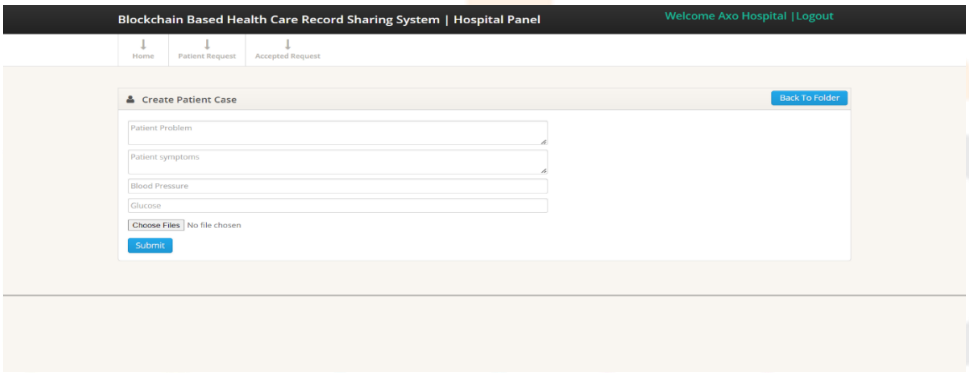
This is the "Hospital Registration page" that will appear when clicked on "Hospital Registration tab", an application for the User to fill hospital data for Hospital registration. In this application, there are various filled like Email Address, Password, Hospital Name, Contact Number, Address, Treatment provided by Hospital, Hospital pic.

6.1.3.1 Description of Hospital Panel



Screenshot 6.1.3.1 Patient search in Hospital Panel

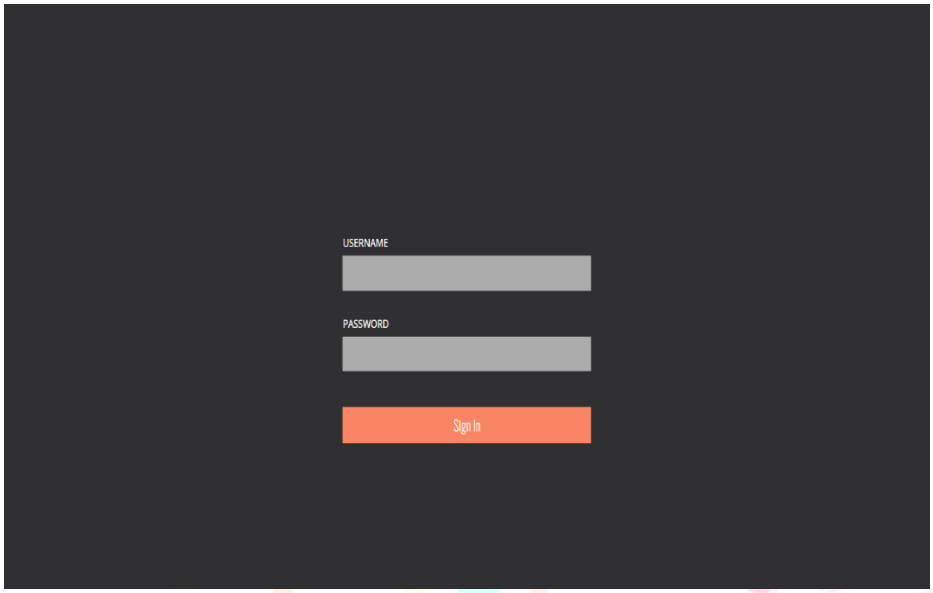
This is "Accepted profile Request page" that will appear when clicking on accepted request tab. Application of these tab is it contain the information of Patients, Patient profile photo. Patient create case tab and view complete profile tab appear here .



Screenshot 6.1.3.2 Patient Create Case in Hospital Panel

This is How the Patient Create Case Page appear. after clicking on create case tab.

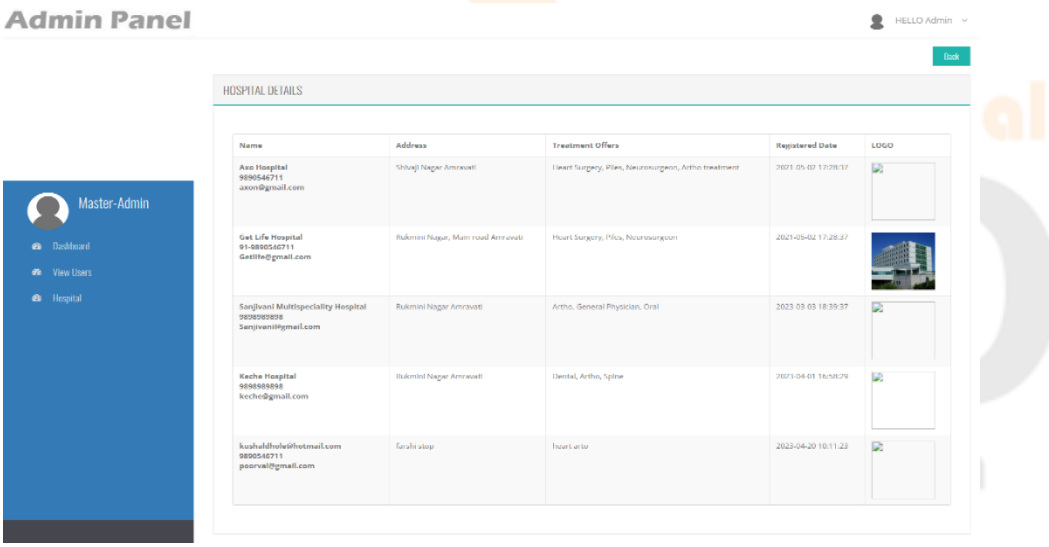
6.1.4 Login Screen for Admin and Miners



Screenshot 6.1.4 Login Screen for Admin and Miners

This is the “Sign In” page for Admin and Miners panel. when clicked on Admin and Miners tab these pages will appear first, which contain specific Username and Password for all Users.

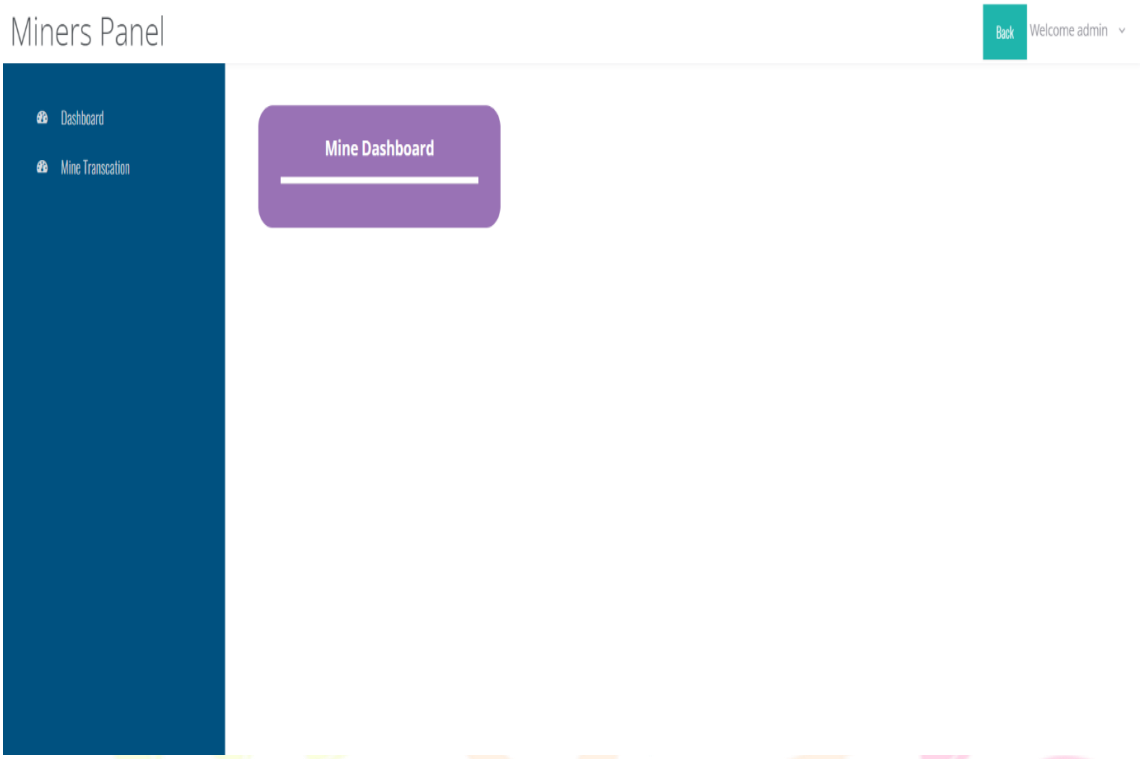
6.1.4.1 Description of Admin Panel:



Screenshot 6.1.4.1 Admin Hospital list

This is Hospital Record page, after clicking on Hospital tab this page appears. This page contains Name of Hospital, Address, Treatment Provided by Hospital, Registration date and Logo of Hospital.

6.1.4.2 Miner Dashboard:



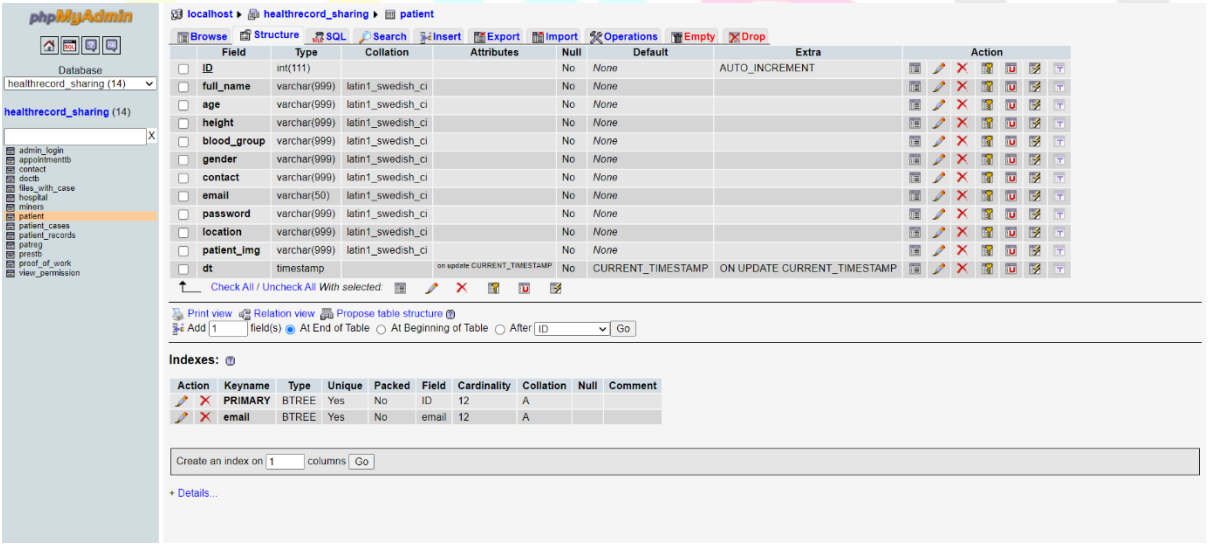
Screenshot 6.1.4.2 Miner Dashboard

This is the Miner Dashboard page after sign in Miner dashboard will appear first.
It contains Two tabs that are visible which are Dashboard and Mine Transaction .

6.2 Algorithm Implementation:

It is very important to create tables in order to store the information in a systematic manner. In this step, we will build tables for the created database. In the created Database (Login page in this case), click on the 'Structure' tab. Towards the end of the tables list, the user will see a 'Create Table' option. Fill the input fields titled "Name" and "Number of Columns" and hit the 'Go' button.

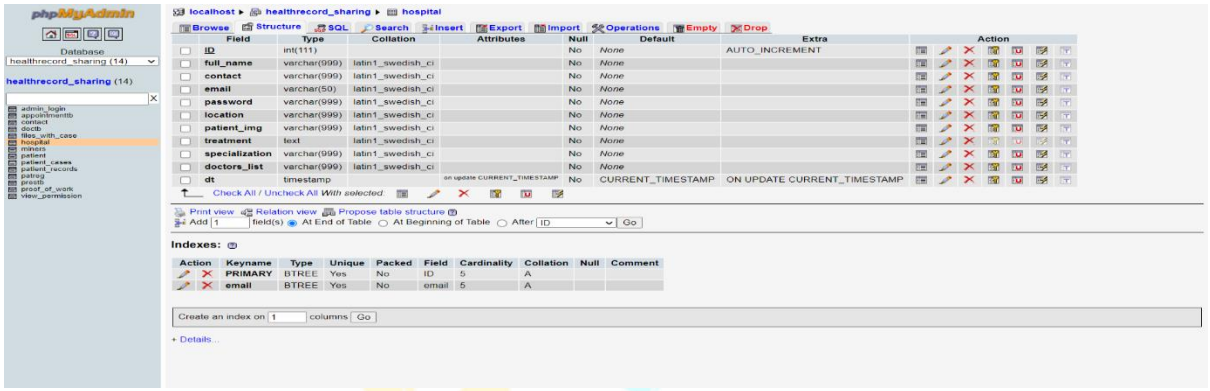
6.2.1 Patient Table:



Screenshot 6.2.1 Patient Table

These Screenshot shows the Table for Patient Database. Application of these Table is patient can register and login to their Account and, also shows the implementation of sha-1 algorithm when the data of patients Manipulated.

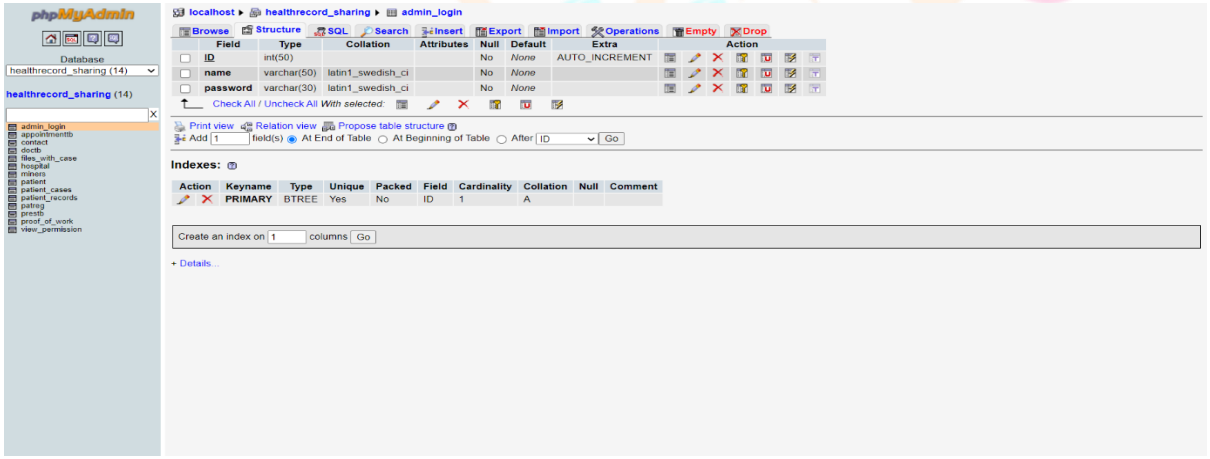
6.2.2 Hospital Table:



Screenshot 6.2.2 Hospital Table

These Screenshot shows the Table for Hospital Database. Application of these Table is Hospital can register and login to their Account and ,also shows the implementation of sha-1 algorithm when the data of Hospital Manipulated.

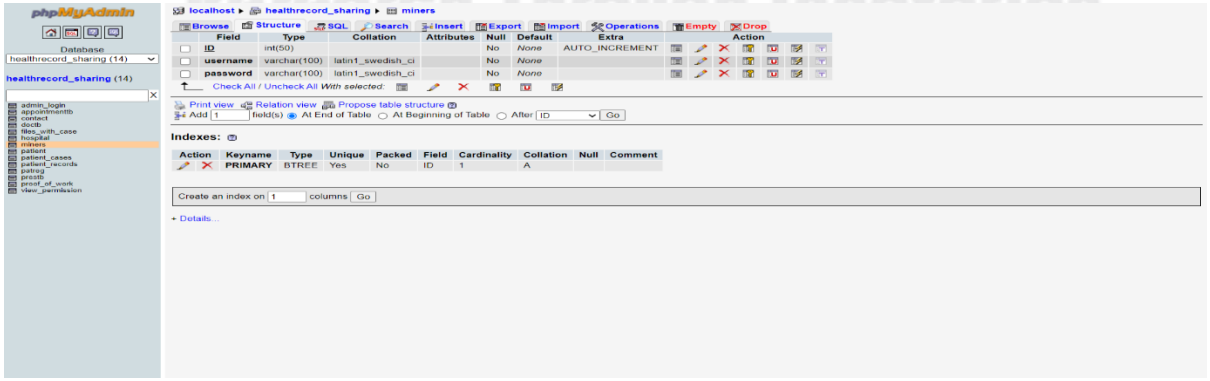
6.2.3 Admin Table:



Screenshot 6.2.3 Admin Table

These Screenshot shows the Table for Admin Database. Application of these Table is Admin can register and login to their Account and, also shows the implementation of sha-1 algorithm when the data of Admin Manipulated.

6.2.4 Miners Table:

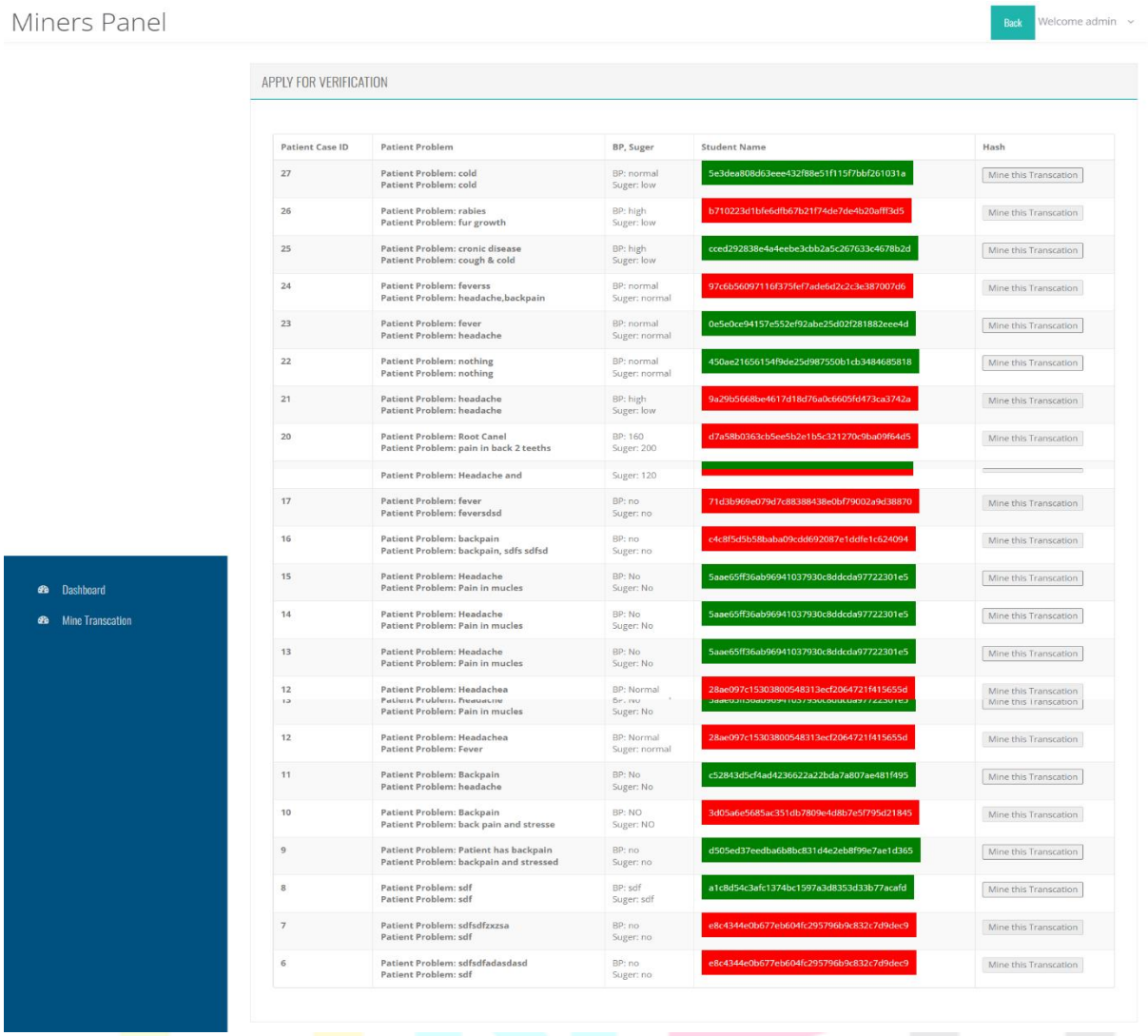


Screenshot 6.2.4 Miners Table

These Screenshot shows the Table for Miners Database . Application of these Table is Miners can register and login to their Account, also shows the implementation of sha-1 algorithm when the data of Miners Manipulated.

7. RESULT ANALYSIS

7.1 Mined Transaction:



Screenshot 7.1 Mined Transaction Result

This is the Mine Transaction page that will appear when clicked on the mine Transaction tab.in this application we can see the Patient Records Verification .The Records which get manipulated are seen as Red in colour and which are unmanipulated are seen as Green in colour.This application contains patient case Id, Patient Problem, Bp sugar ,Specific key.

8. CONCLUSION

Hosting of Blockchain in healthcare sector is very much useful in everyone's day to day life and it is mainly important in healthcare sector There are innovative applications of Blockchain in healthcare due to inherent encryption and decentralization Blockchain technology was found to be useful in real health care environments, including sharing of healthcare and medical data. In addition, data sharing and collaboration via blockchain could help hospitals get a prior understanding of patient's medical history before the consultation. It enhances the security of patients' electronic medical records, promotes the monetization of health information, improves interoperability among healthcare organizations, and helps counterfeit combat medicines.

No matter where you are treated in the globe, your health record will be available and accessible on your phone and validated through a distributed ledger such as blockchain.

Overall, this technology would significantly enhance and eventually revolution is how patients

9. Future Scope:

- In future, we will enhance the working on security of sharing the Medical record in Blockchain based Health record sharing system .
- The future implementation will be online help for patients and chatting with doctors and web administrator.
- In Blockchain based Health record sharing system we can add facility for user detail.
- In Blockchain based Health record sharing system ,we can add facility to find doctor near your location.

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