# Online Storage, Retrieval and Authentication of HealthCare Documents using Blockchain

Under the Guidance of Prof. Kumud Wasnik

Presented By:
01 Sai Sleghana Bala
02 Bhavya Prasad
15 Anjali Jadhav

# Introduction

- Healthcare sector is part of one of the most important section of society.
- Many problems faced by healthcare industry.
- Security and retrieval issues.
- Fast scrutiny of healthcare documents not available.
- No immutable records with confidentiality is a setback.
- Tracing drugs beneficial for pharma.
- Insurance allocation to customers.

# Problem Statement

- Health services must balance patient care with information privacy,access and completeness.
- Electronic medical records (EMRs)
- To address these challenges, **a blockchain-based electronic medical records system** is the key solution.
- In this project, we have discussed how blockchain technology can help in better healthcare data management.
- Proposed a blockchain-based records management system

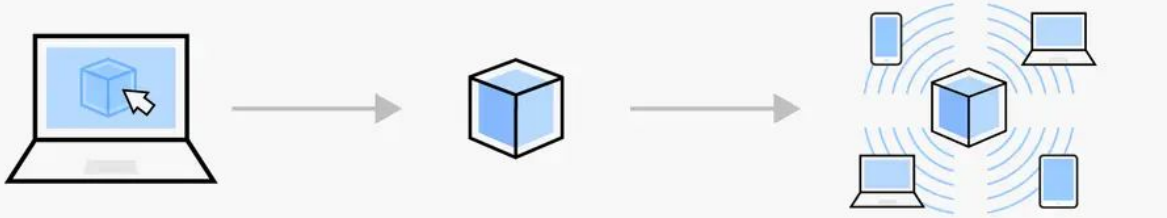
**OBJECTIVE**

- Provide a secure system for storing and sharing medical documents
- To authenticate medical records.
- Authentication can be done.
- Easy, fast and secure retrieval of documents.

# LITERATURE SURVEY

| Pub | Paper | Authors | Description | Advantage | Disadvantage |
|---|---|---|---|---|---|
| 2017 | Block chain Basics | Daniel Drescher | • A shared database that stores data in **"Blocks"** that are then linked together via cryptography.<br>• A chronological order is established among the blocks.<br>• employs a "decentralized" structure; permitting access to not 1; but, multiple users at a given time.<br>• Immutable in nature<br>• All & any changes made in a blockchain are implemented only after validation by all the users. | • Transparency in data<br>• Cryptography & its decentralized nature prevent hacking<br>• Validation prevents discrepancy in data<br>• Allows users to make smart contracts | Lack of a centralized party to govern the database, makes it difficult for users to recover assets if their private key is lost. |
| 2018 | Algorithms & Security Concern in Blockchain Technology: A Brief Review | Kareem Amer & Bin Sulaiman Rejwan & Farooq Muhammad | • Immutability<br>• One way encryption<br>• Salting<br>• Private keys | • Increased security | - |

# How changes get made on a blockchain



Person A wants to make a change to the blockchain.

This change will create a new "block."

This block is broadcast to every computer on the distributed network.

Those computers approve of the change.

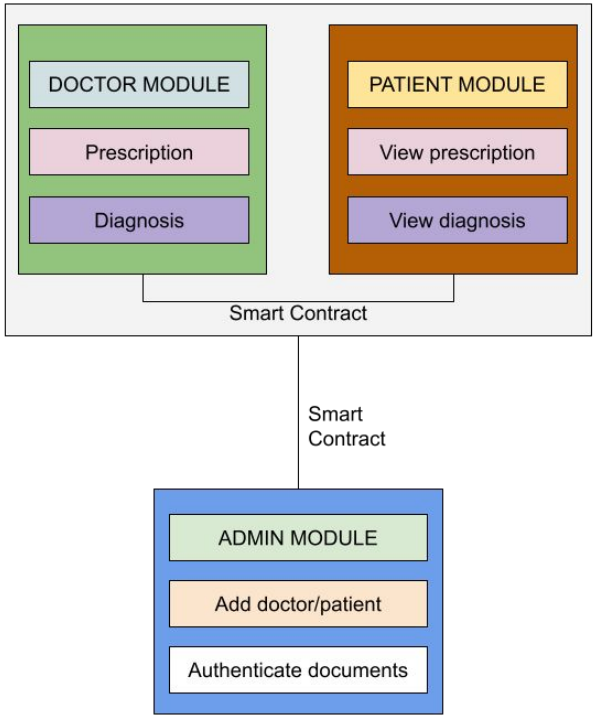
The new block is added to the chain. There is a permanent record of the change and it can't be undone.

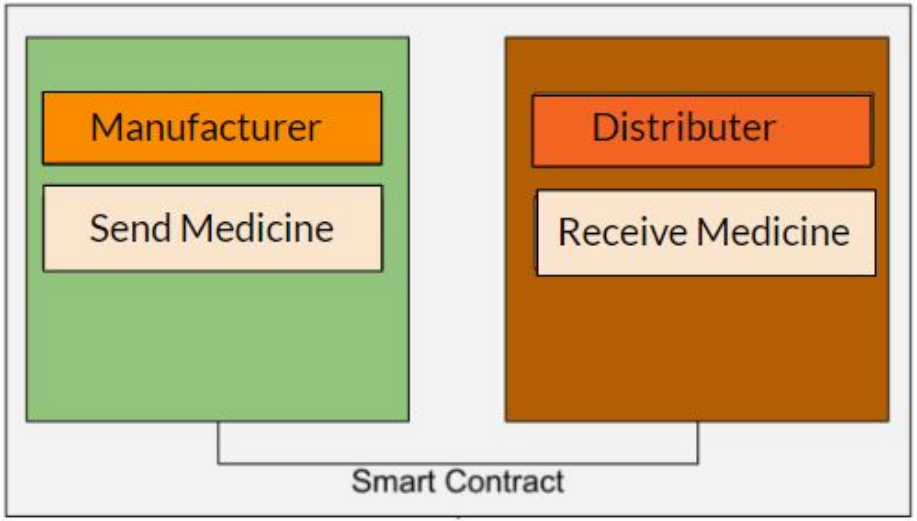
INSIDER

| Pub in | Paper name | Authors | Description | Adv | Disadv |
|---|---|---|---|---|---|
| 2020 | Secure Electronic Medical Records Storage and Sharing Using Blockchain Technology | Muhammad Usman and Usman Qamar | • Storage and sharing of EMR using blockchain<br>• User interface for permissioned blockchain<br>• Membership Management<br>• Nodes for consensus management using smart contracts<br>• Coding language - HTML, CSS, JavaScript. | Security, robustness of blockchain<br><br>Secure algorithms. | No authentication of entities. |

| Pub in | Paper name | Authors | Description | Adv | Disadv |
|---|---|---|---|---|---|
| 2020 | Secured Insurance Framework Using Blockchain and Smart Contract | Abid Hassan , Md. Iftekhar Ali ,Rifat Ahammed ,Mohammad Monirujjaman Khan | • This paper implements the Proof of Authority (PoA) consensus algorithm and uses the Ethereum private network to run the system.<br>• This paper shows a generalized approach for all types of insurance. | Focused on a generalized approach for all types of insurance, Unwanted modification and deletion of client data will be handled by our chosen Proof of Authority (PoA) consensus algorithm. | Problems of Malicious Activities and some potential threats to the framework |
| 2021 | ABlockchain-based approach for drug traceability in Healthcare Supply Chain | AhmadMusamih,Khaled Salah,Raja Jayaraman,Junaid Arshad,Mazin Debe | • Solution for the pharmaceutical supply chain that provides security, traceability, immutability, and access | Conducted security and cost analysis to evaluate the performance of the proposed blockchain-based solution | Problems of Regulatory Consents and lack of transparency |

# Existing System



## Our Contributions:

A user validation feature, which has not been implemented in any pre-existing medical record keeping system.

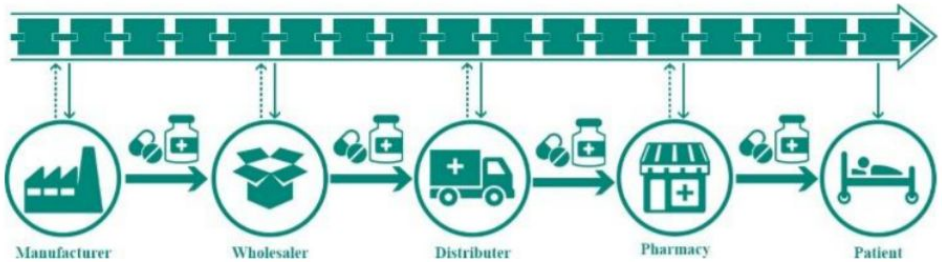
A Drug Traceability Feature, which had some problems in pre-existing system regarding lack of transparency in the supply chain management.

A Secured Insurance Framework, this feature has not been able to overcome the problems of malicious activities and threats in the pre-existing systems.

# Smart Hospital

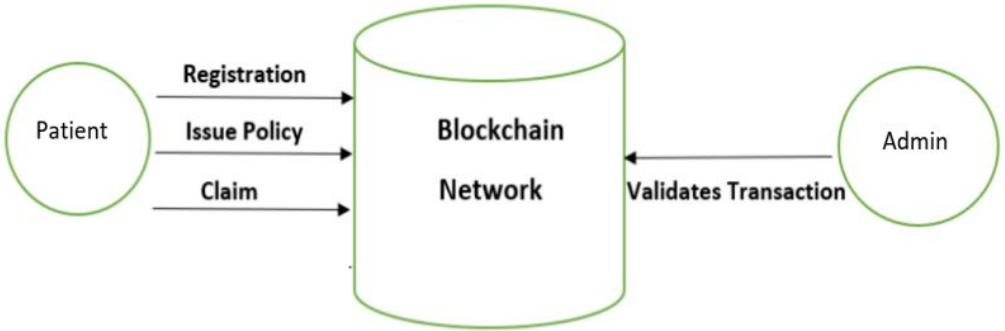
**Drug Traceability**

1. Drugs are considered as the assets with each having a unique key (or hash)
2. Unique ID will be attached to the drug
3. Private Blockchain can be used for participants like->Manufacturer,Distributor. Only these participants will be given access, they can write or access information on the blockchain.
4. A specific Blockchain network to be used to save the transactions record.A private Ethereum Blockchain can be used as a network



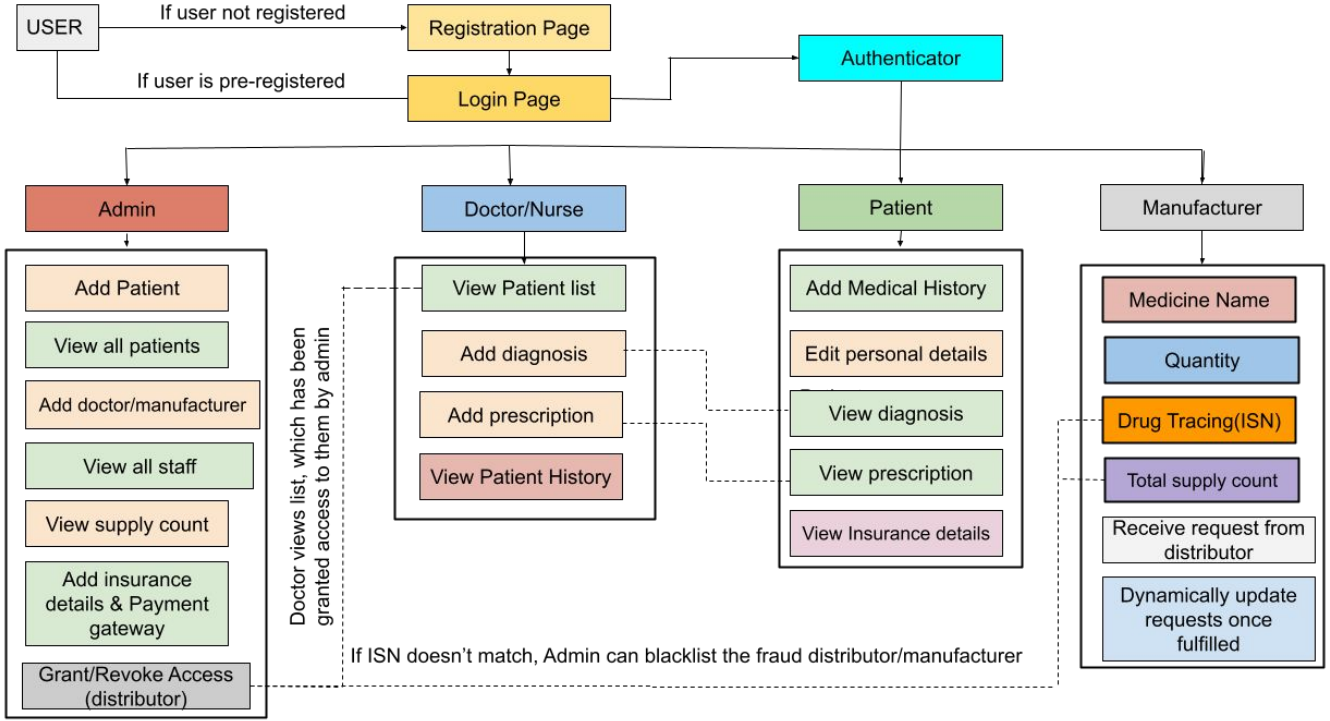
# Secured Insurance Framework

3. **Insurance Data flow diagram**




4.7 Insurance data flow diagram

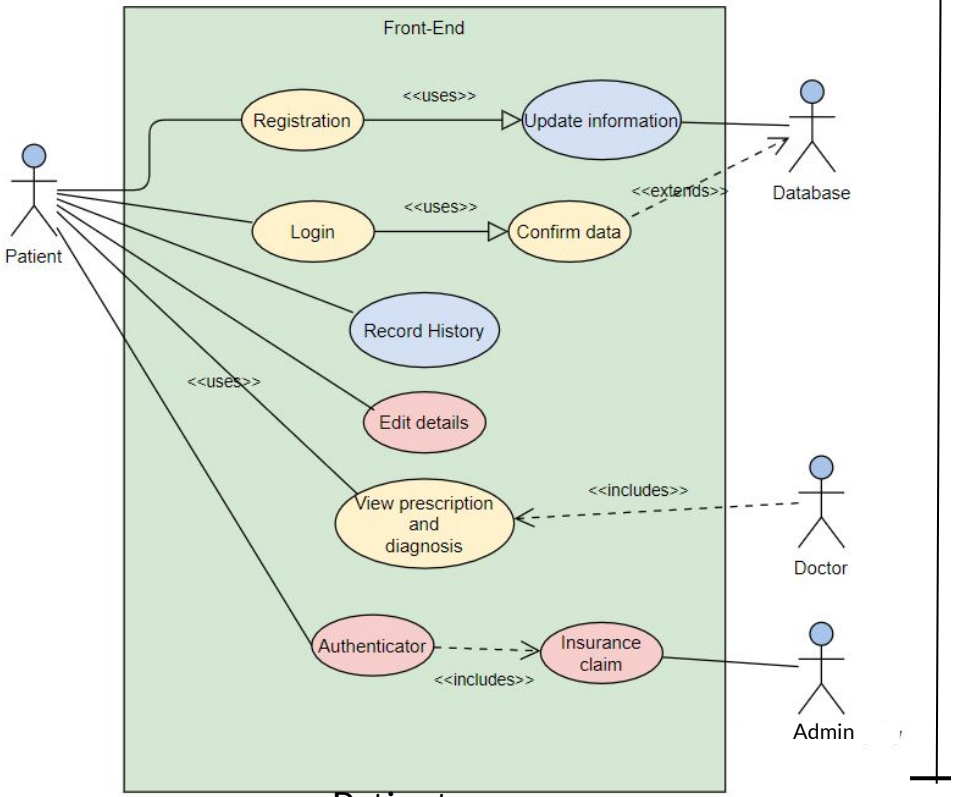
# Proposed System and Website flow



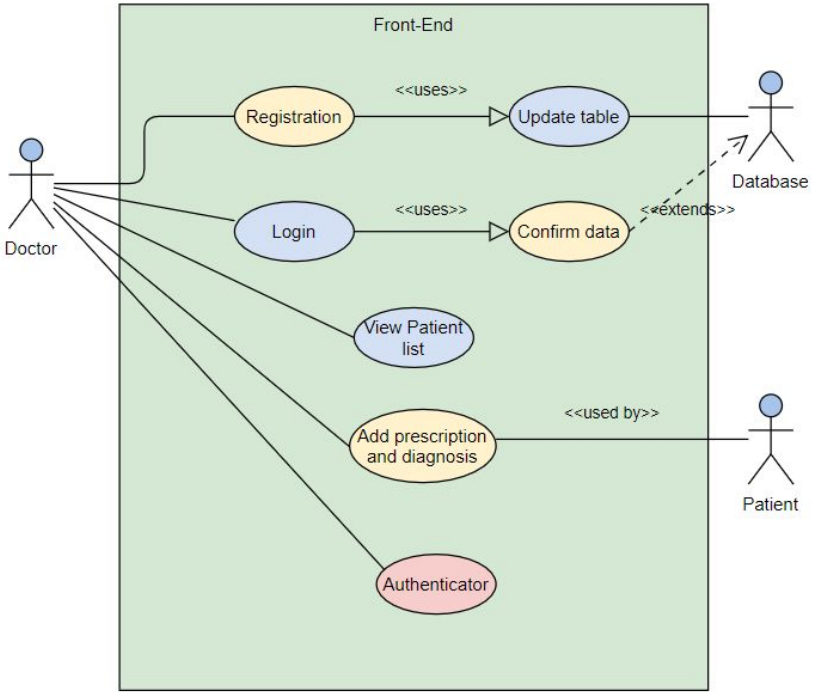
# Methodology

| Understand and install softwares and dependencies | Build smart contracts | Add functionalities | Building front end | Connect to blockchain code |
|---|---|---|---|---|
| • VS Code, Solidity, Remix<br>• Ganache, Remix Deployed blocks<br>• ReactJS, JS, HTML-CSS<br>• MetaMask<br>• NFT Token - ERC721<br>• OS - MS Windows(2 GB) | • Different contracts for doctor, patient, admin, manufacturer and distributor. | • Sharing and approving functionalities added for smart hospital. | • Login Page<br>• Main Page with alternatives respective to designation<br>• Authentication Page | • Integrating the entire project, with smart hospital functionalities too. |

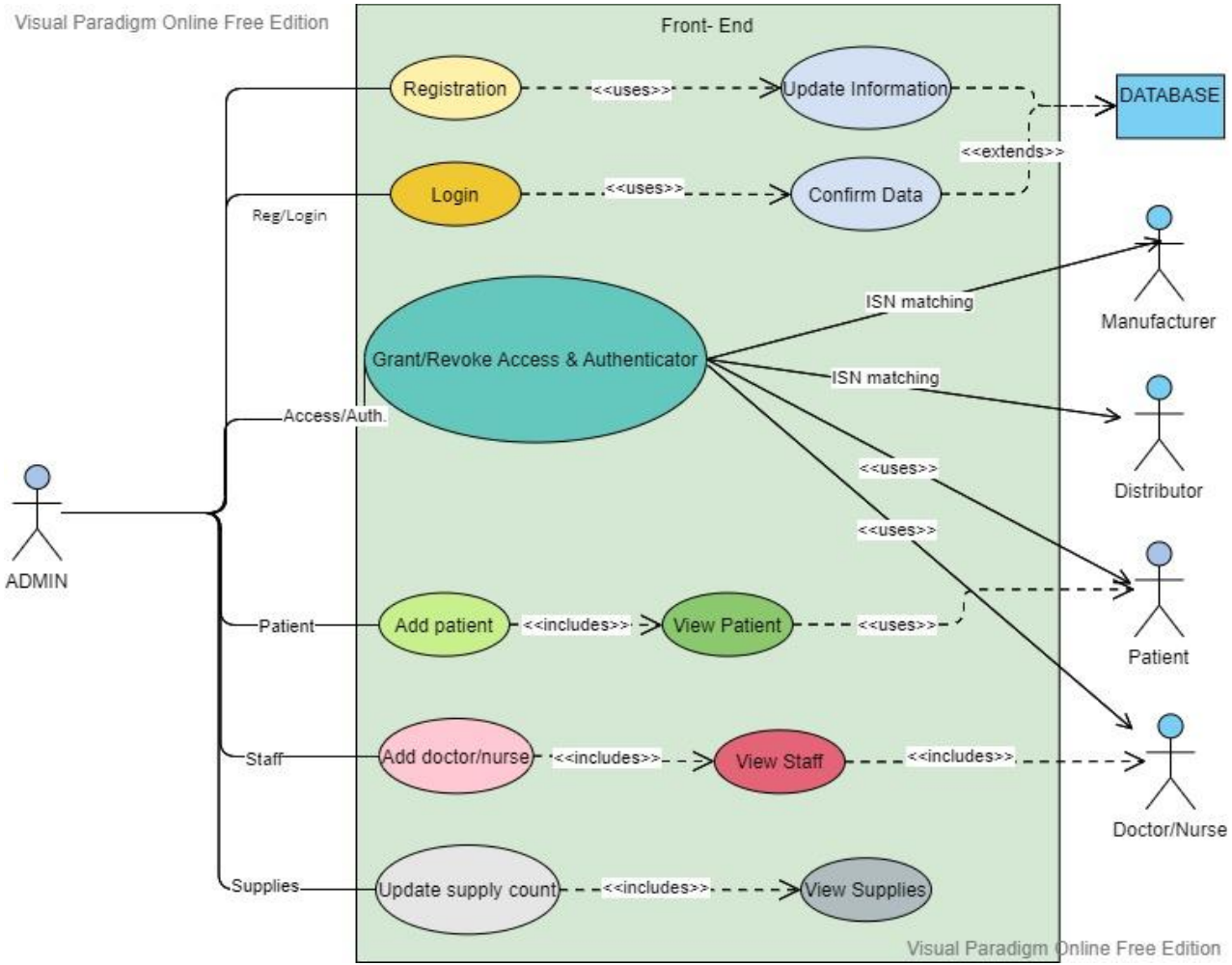
# Use case & data flow diagrams

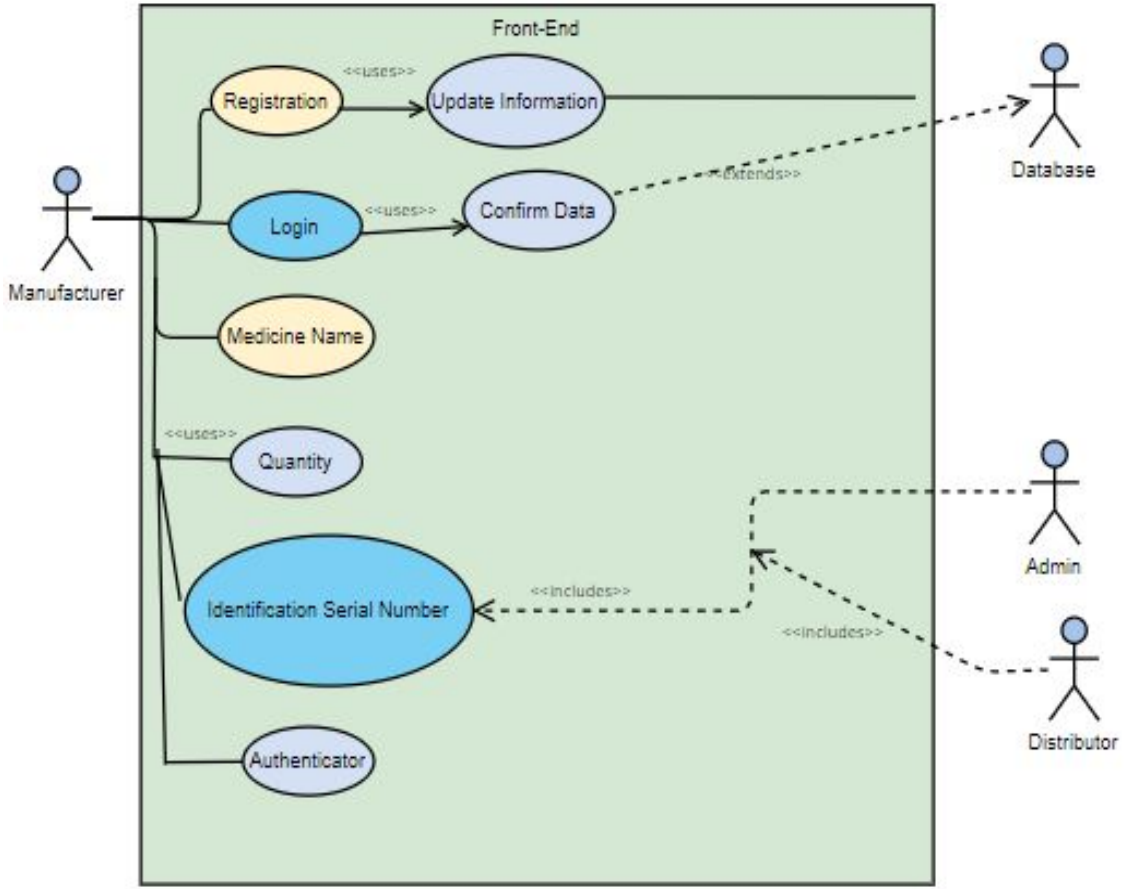


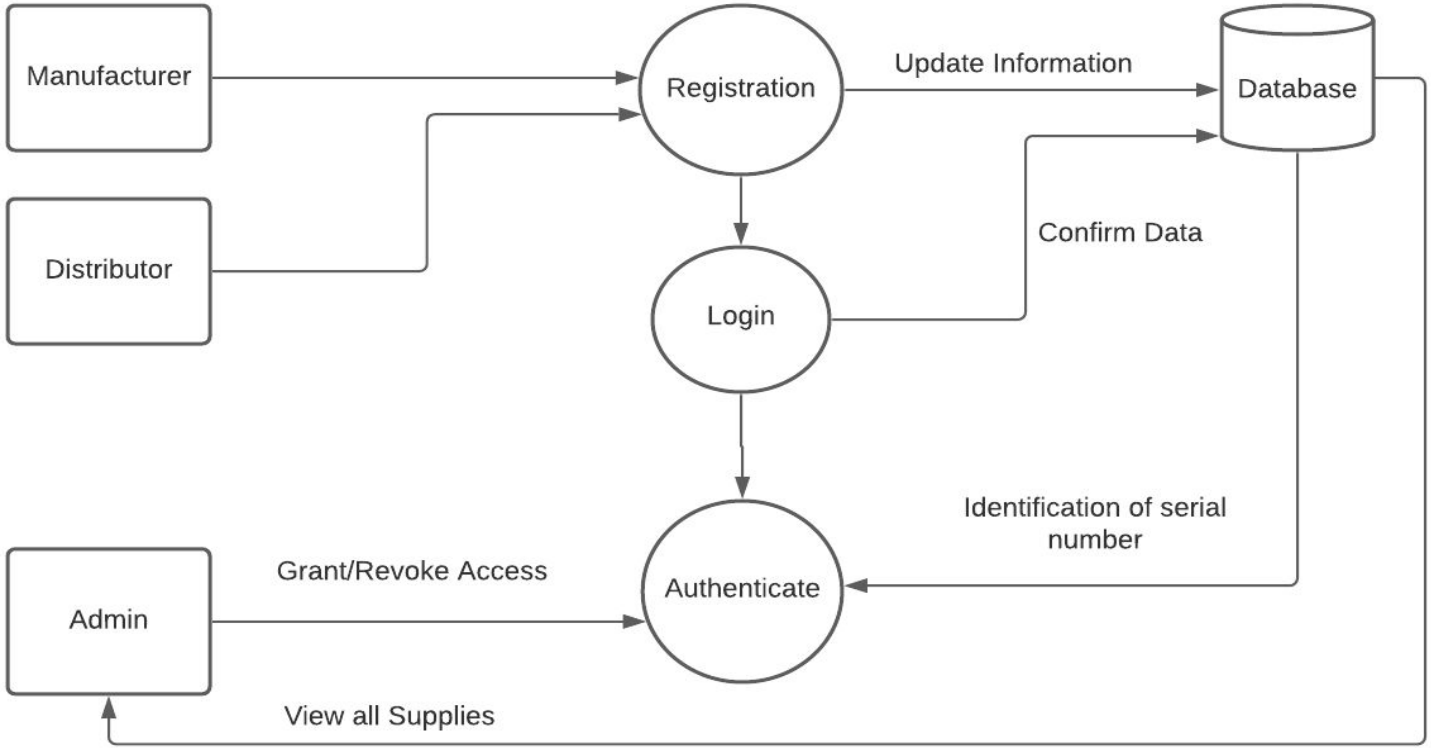

Patient

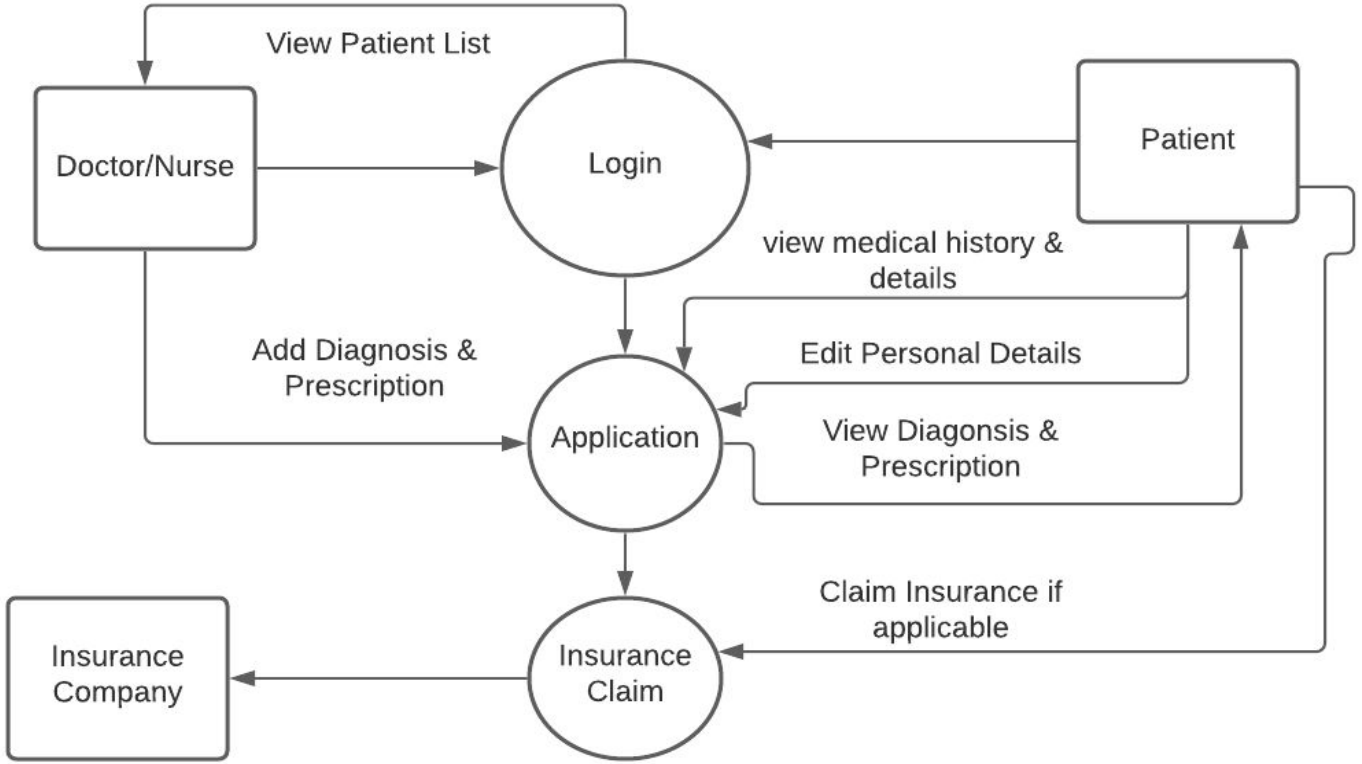



Doctor


Visual Paradigm Online Free Edition
Front- End
Registration
<<uses>>
Update Information
DATABASE
<<extends>>
Login
<<uses>>
Confirm Data
Reg/Login
ISN matching
Manufacturer
Grant/Revoke Access & Authenticator
ISN matching
Distributor
Access/Auth.
<<uses>>
<<uses>>
ADMIN
Patient
Add patient
<<includes>>
View Patient
<<uses>>
Patient
Staff
Add doctor/nurse
<<includes>>
View Staff
<<includes>>
Doctor/Nurse
Supplies
Update supply count
<<includes>>
View Supplies
Visual Paradigm Online Free Edition


Front-End
Registration
<<uses>>
Update Information
Database
<<extends>>
Login
<<uses>>
Confirm Data
Manufacturer
Medicine Name
<<uses>>
Quantity
Admin
Identification Serial Number
<<includes>>
<<includes>>
Distributor
Authenticator


Manufacturer
Distributor
Admin
Registration
Login
Authenticate
Update Information
Database
Confirm Data
Identification of serial number
Grant/Revoke Access
View all Supplies


View Patient List
Doctor/Nurse
Login
Patient
view medical history &
details
Add Diagnosis &
Prescription
Edit Personal Details
Application
View Diagonsis &
Prescription
Claim Insurance if
applicable
Insurance
Company
Insurance
Claim

# Implementation

# Advantages & disadvantages

## Advantages

1. A smart hospital ensures a quick retrieval of documents at any requisite time.
2. Record are stored on a blockchain system, which ensures high security while document storage or retrieval.
3. SQL allows us to exercise parameter constraints on the data being stored easily.
4. Authenticator add to the security of the smart hospital.
5. Drug traceability allows easy tracking and mapping of medicines and prevents any mishandling in the supply-chain sector (manufacturer).

## Disadvantages

1. Hoisting blockchain is a very expensive process as each transaction is chargeable.
2. Patients are liable to losing the non-reassignable login keys given to them during registration.

# Future Scope

1. Reading the text on the document to verify whom it belongs to.
2. Policies according to the healthcare sector will be verified & accessible to all roles.
3. Organ & Blood supply chains will be a part of this system as well.

# References


1. Vinothkumar, J., 2021. Protection of Medical Records Using Blockchain Technology. Research Gate/350809302

2. Maji, D., Lamkoti, R., Shetty, H. and Gondhalekar, B., 2021. Certificate

Verification using Blockchain and Generation of Transcript. [online] Ijert.org. Available at:

3. Ghanghoria, A., Anto Raja, A., Bachche, V. and Rathi, N., 2021. Secure EDocuments Storage using Blockchain. International Research Journal of Engineering and Technology (IRJET), 07(03).

4. Drescher, Daniel. (2017). Blockchain Basics. 10.1007/978-1-4842-2604-9.

5. Kareem, Amer, Bin Sulaiman Rejwan & Farooq Muhammad. (2018). Algorithms and Security Concern in Blockchain Technology: A Brief Review. SSRN Electronic Journal. 10.2139/ssrn.3234933

6. William J.Gordon and Christian Catalini,2018.Blockchain Technology for Healthcare: Facilitating the Transition to Patient-Driven Interoperability.[online]

7. Muhammad Usman and Usman Qamar,2020.Secure Electronic Medical

Records Storage and Sharing Using Blockchain Technology.[online]

8. Ayesha Shahnaz, Usman Qamar and Ayesha Khalid,2019.Using Blockchain for Electronic Health Records.[online] Available-at: <https://ieeexplore.ieee.org/stamp/stamp.jsp?tp=&arnumber=8863359