Title:

Health Record Management System.

1.Problem statement

The medical records are very crucial and important for any person and organization. Strong data protection measures are crucial for safeguarding the privacy of individuals. In the era of digital world, the privacy and security of the medical records are very crucial. There is high chance of data breaching in centralized systems.

It needs a decentralized system that can provide privacy and protection. Blockchain has that potential which can make a big impact in the area of privacy and security of the data. Decentralized and immutability of the blockchain technology can provide a robust and secure architecture for the medical industry. This technology can prevent the hacker or attackers to misuse the medical records of any individual or organization.

2.Proposed model

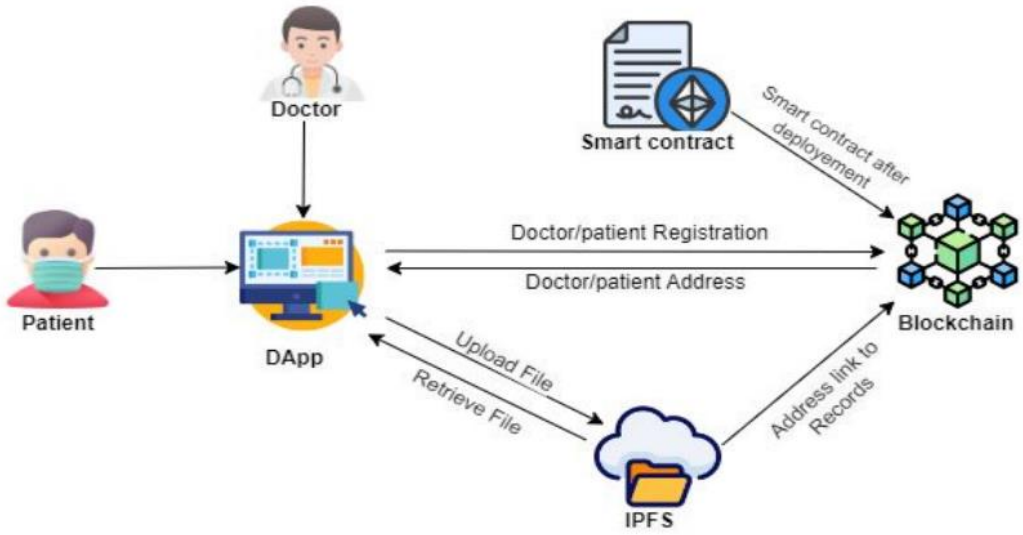
The proposal model is designed and developed to provide medical consultant services to the users. It provides the secure communication channel for the communication between the users and store the user's data on the blockchain and IPFS.

The Ethereum blockchain is used in the proposed model. The proposed model works in the decentralized manner and provide the more security and privacy to the digital records as compare to centralized systems. Medical records can not change or modify after uploading on the blockchain. Because of the immutable feature of the blockchain.

The proposed model has the different portals and functionality for the different users.

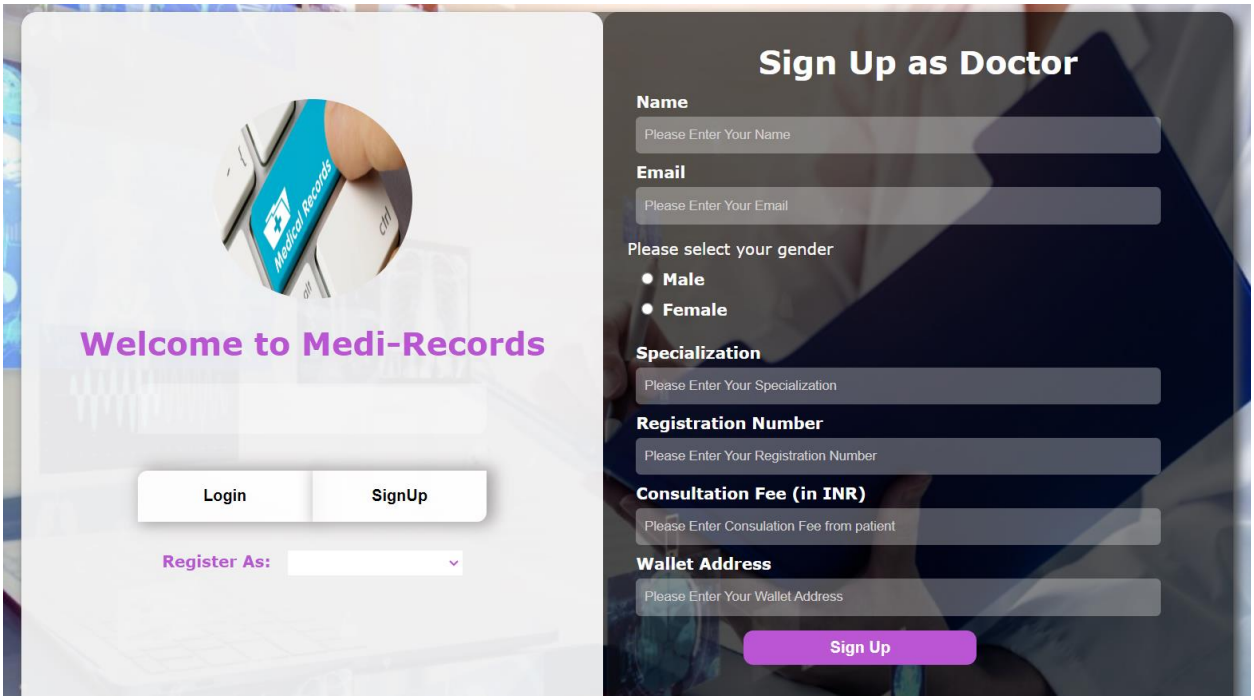
3. Architecture and workflow of model

Architecture:

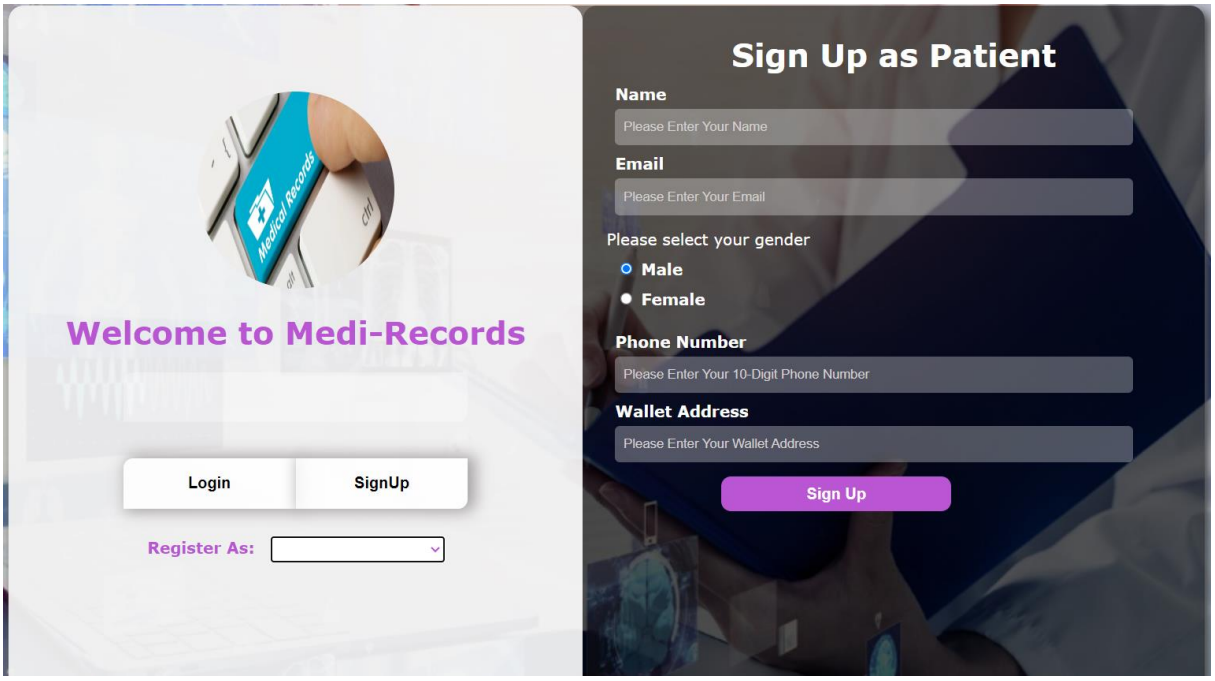


The decentralized application is designed and developed to make easy and fast user experience. The proposed model has the 2 portals one is for the patient and another for the user as a doctor.

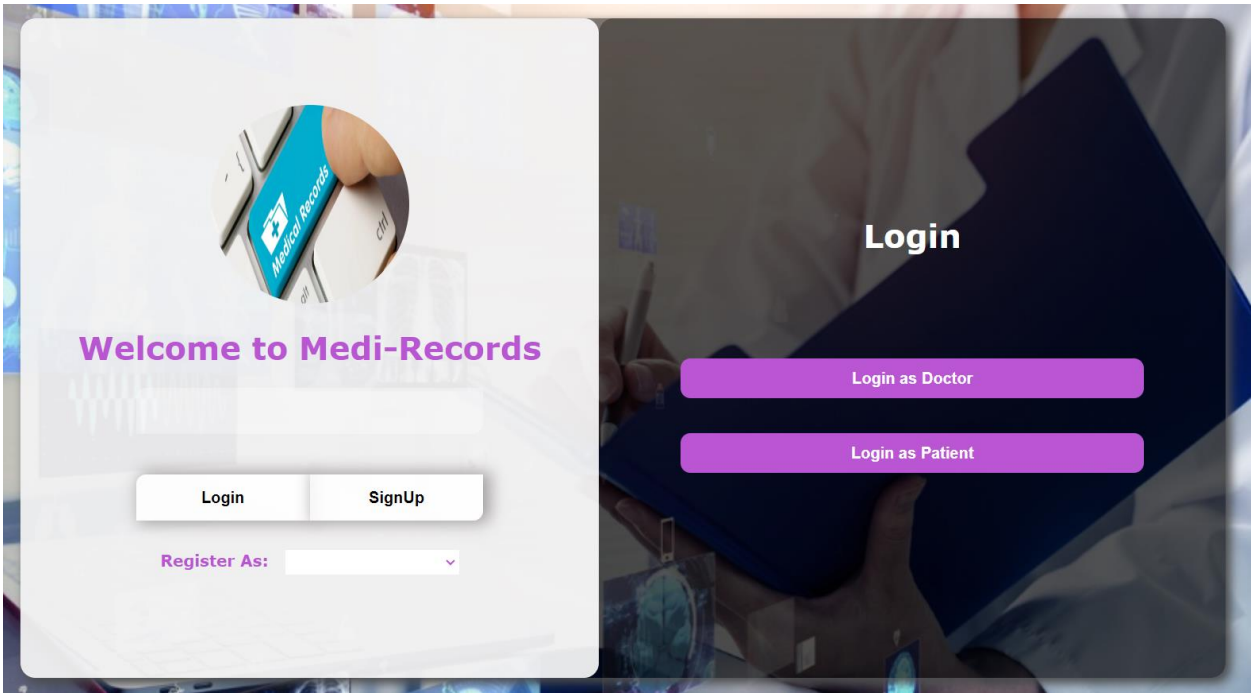
Sign-up for Doctor:



Sign-up for Patient:



Log-in page:

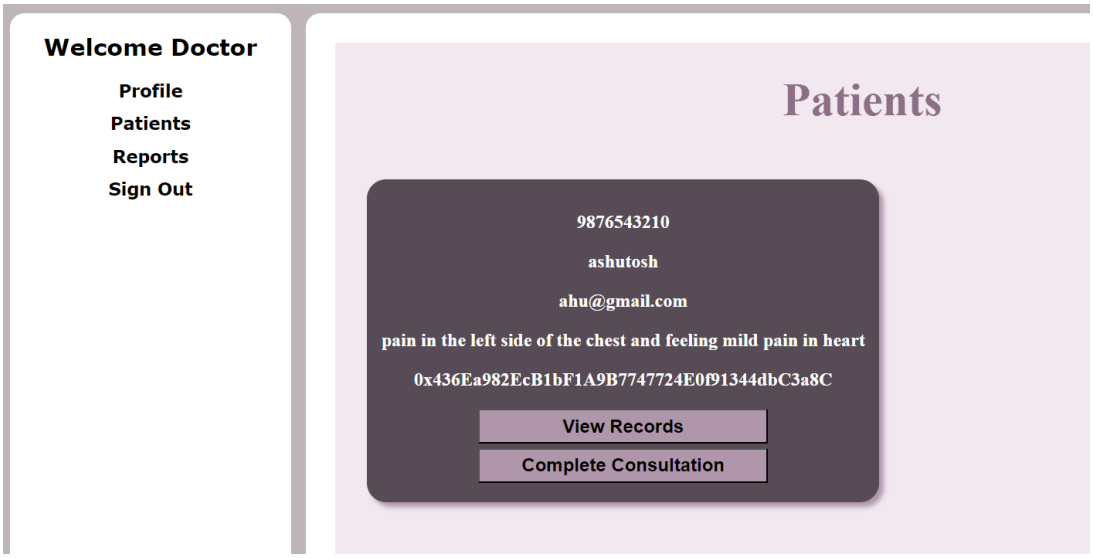


1. Doctor portal

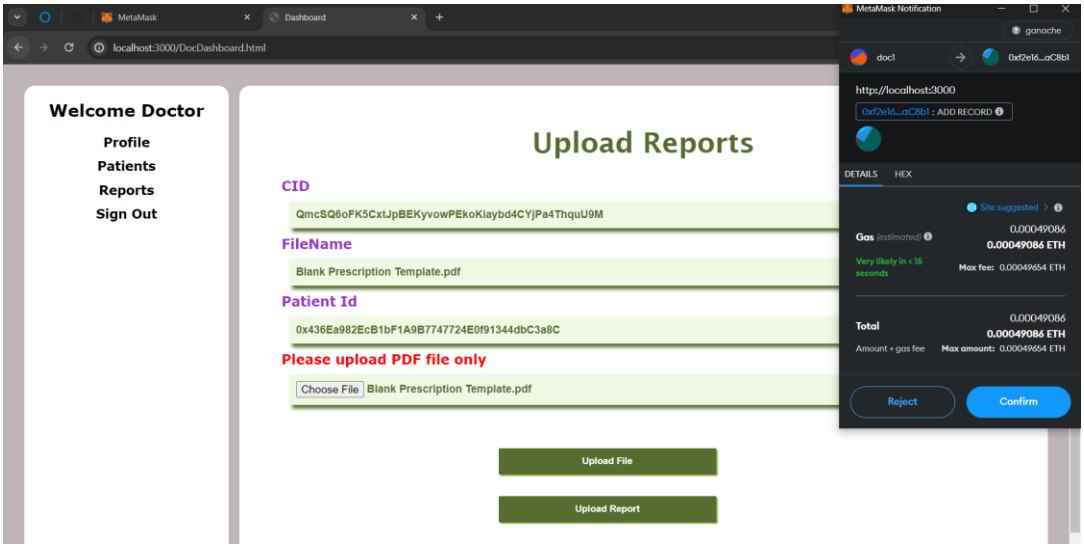
The doctor can register using the MetaMask address and other require details. After successful sign-up doctor re-direct to portal where user can see his profile and can see the patient's appointment in the appointment portion. Doctor can talk to the patient on the phone number given in the patient details and prescribe the medicine based on the discussion. After the successful appointment doctor can upload the prescription and test reports to the blockchain and documents will store on the IPFS.

Profile of Doctor:

Patient Details on Doctor's Portal:



Prescription Details on Doctor portal:



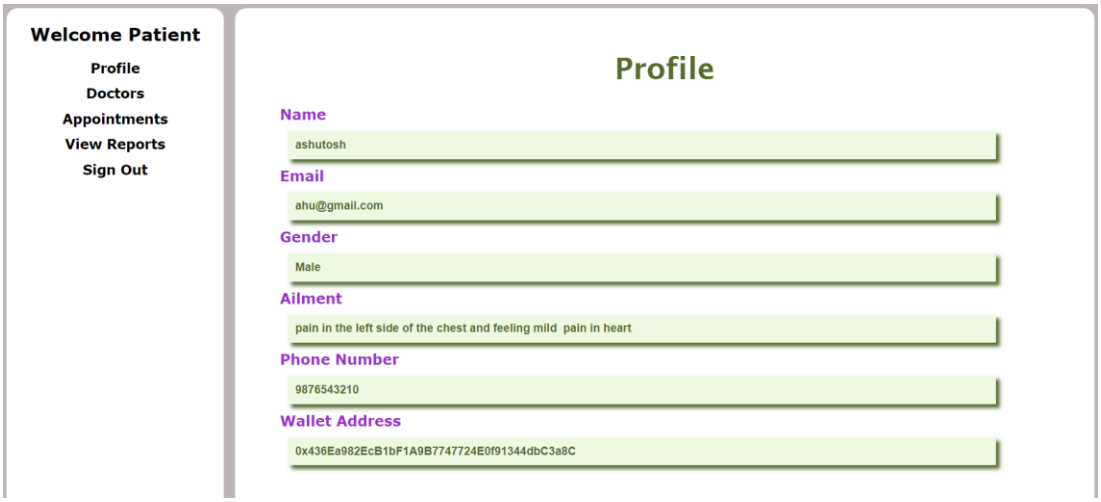
2. Patient portal

The patient needs to sign up in the portal using the MetaMask address and other require details. After successful registration the patient can see the list of doctor and specifications. Patient can select the based on the his/her requirement and doctor's specialization.

Patient can take the appointment through the portal and provide the necessary details of decease. The selected doctor will get the notification of appointment of patients on his/her Portal and can consult the patient.

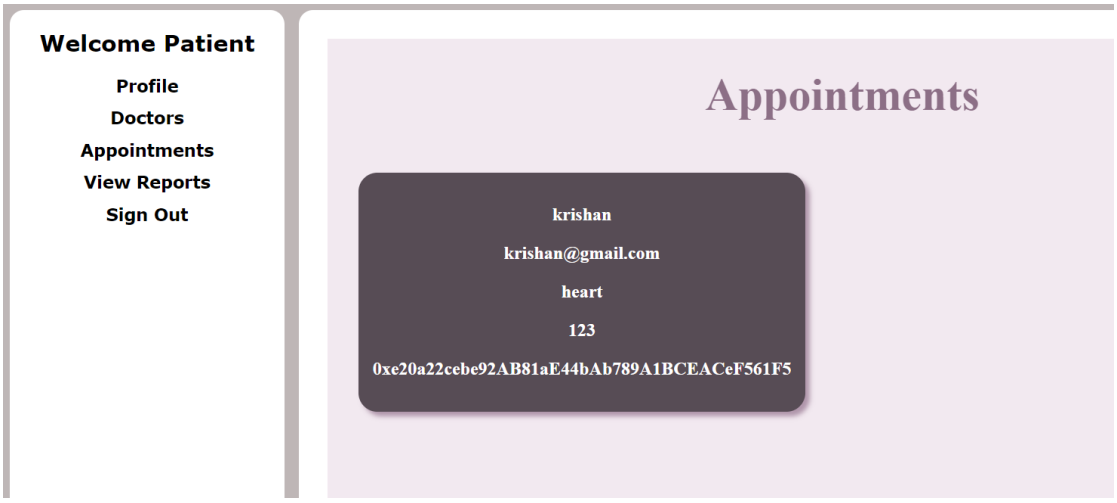
After the successful consultation the patient will get the prescription on his Portal and patient can download the prescription.

Profile of Patient:

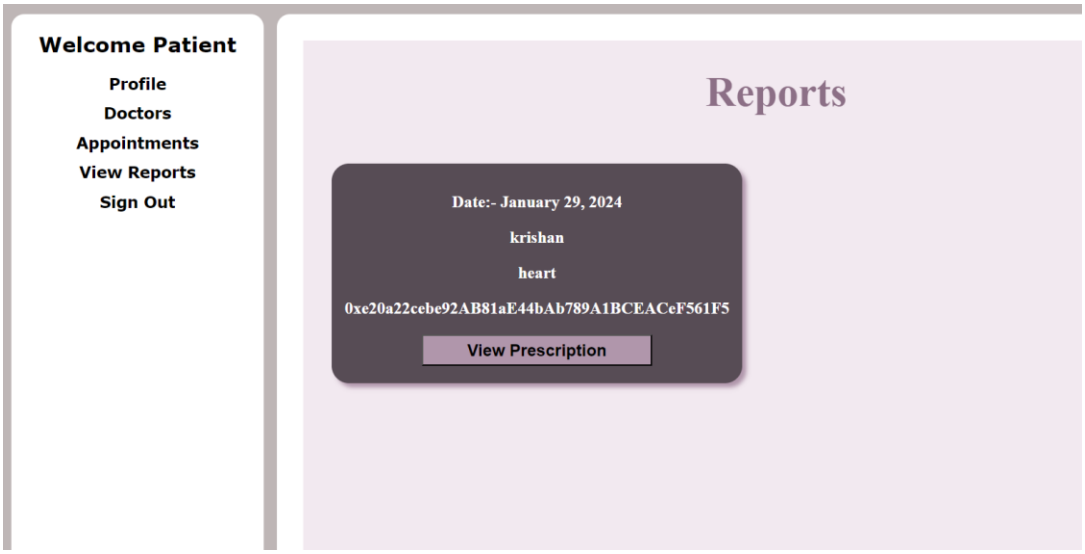


Doctor List on Patient's Portal:

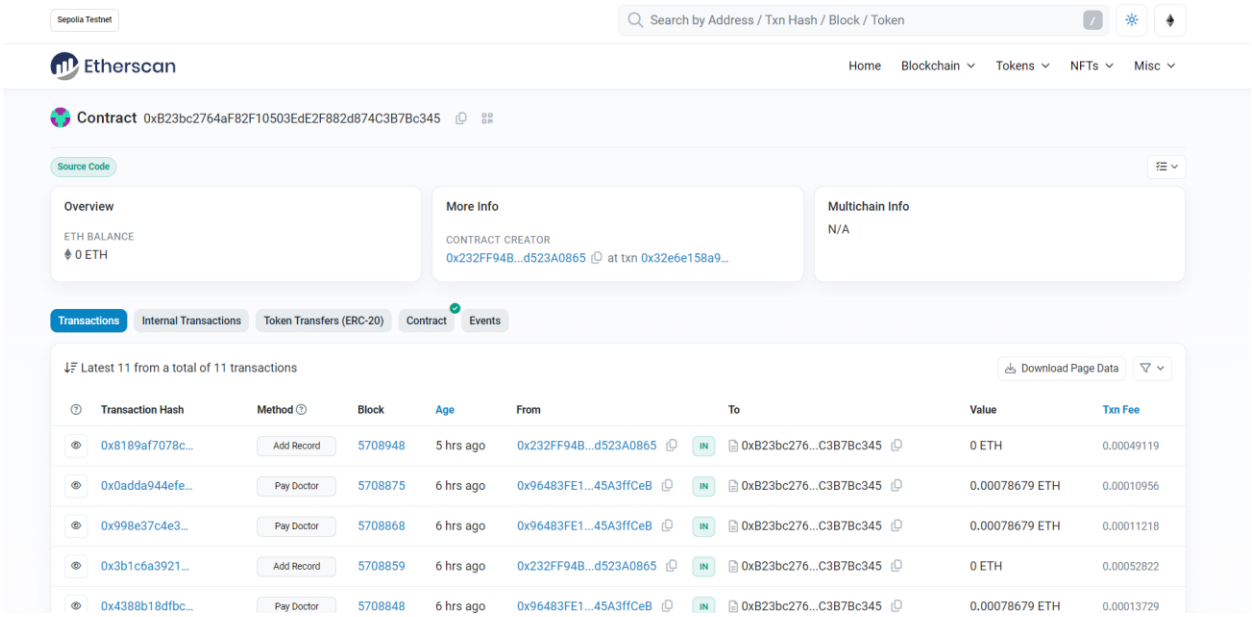
Appointment List on Patient's Portal:



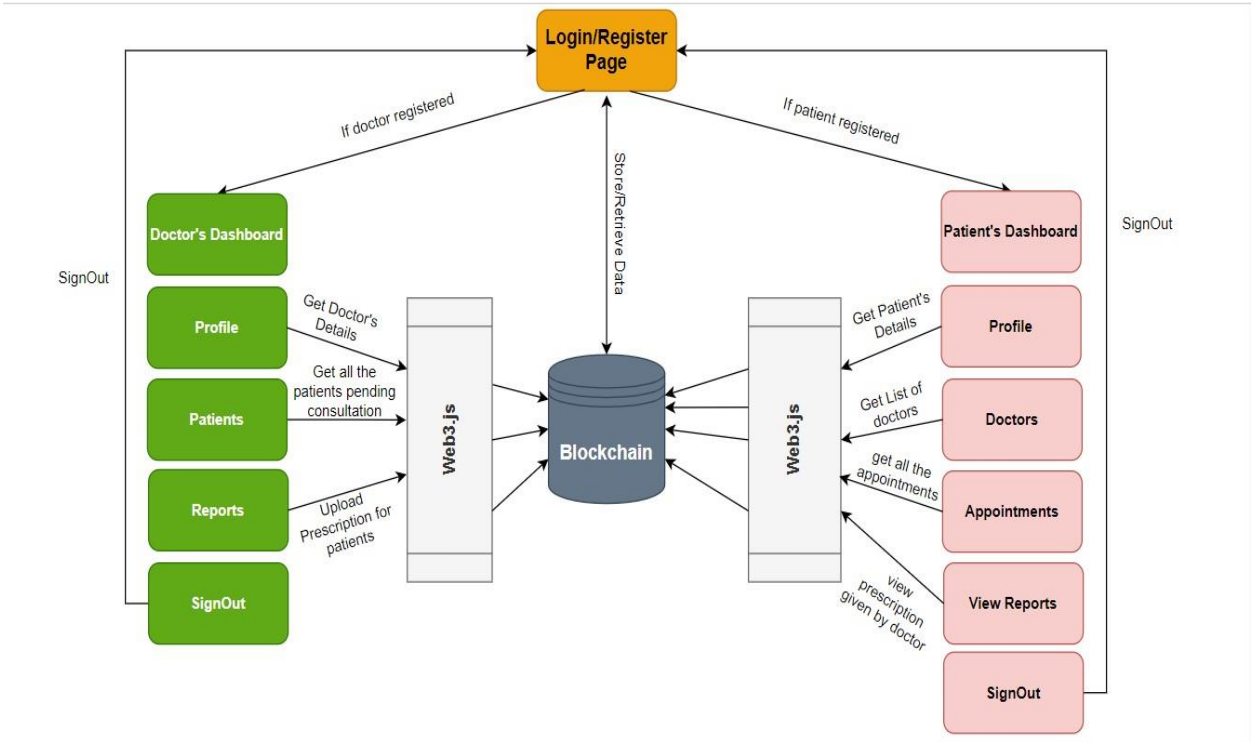
Prescription after doctor appointment:



Transaction Details on Sepolia Test Network:



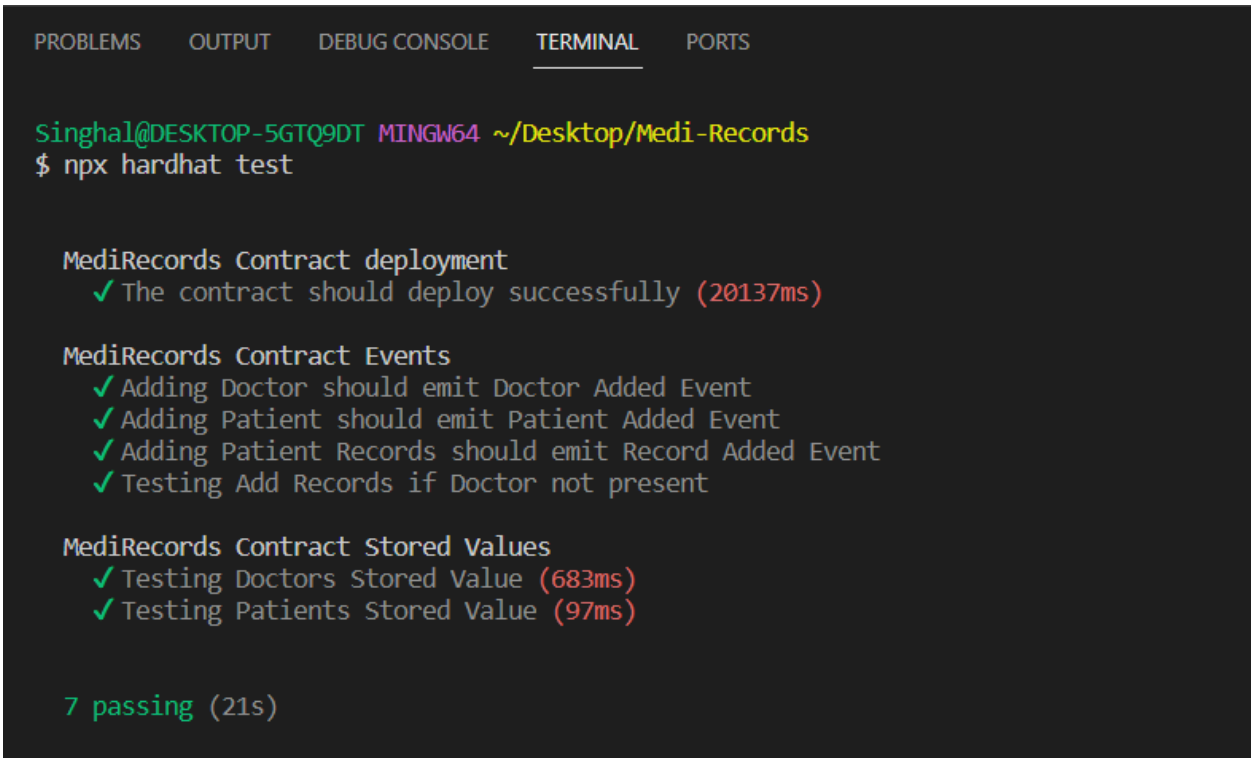
The flow of the application is depicted in the flowchart below:



5. Testing results

The smart contract testing is carried out using the hardhat framework which includes mocha and chai. The following are the test cases the dapp is tested for

1. We have tested if the contract is deployed successfully by checking if the owner of the deployed contract is the one who deployed the contract.
2. We have tested for the events emitted by the addDoctor, addPatient and addRecords functions of the smart contract. We have checked if the events emitted are with the same name and arguments as declared in the contract.
3. We have tested for the correctness of the data stored in the blockchain. This is done by checking individual input data with the data stored in the blockchain.
4. In total there are test cases written to verify correctness of data and all of them have passed. Below is the screenshot for the same executed and its result



6. Future scops & enhancement:

- The present proposal model does not have the inbuilt calling feature which can be added in future.
- In the future enhancement the feature of video calling can be added which will make the consultation process easier and fast.
- The transaction cost of the model is little high which can reduce in future.
- Two factor authentication can make the proposed model more secure and robust which can enhance in future.
- The banking network system is not available in the prototype model which can be added in future.