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# BLOCKCHAIN BASED HEALTHCARE SYSTEM - QUICKDOC

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## ABSTRACT

Prescription and Maintenance of Health Records impact the efficiency of health- care. In medical services, Data Confidentiality and Privacy are critical concerns. For the vast majority of people, Data Security and Secure Storage of Medical Data are always top priorities. A technology platform is necessary for a secure, smooth communication system in a Healthcare System. Blockchain has been evolving technology for a few years now. The main characteristics of Blockchain that draw in the majority of developers are its Distributed Ledger, Decentralization and Immutability. Therefore, Blockchain Technology can be used to safely store personal medical data. Its usage in healthcare systems will have a significant influence. In recent years, there has been a paradigm shift in Health Record storage in Mobile Cloud Environments, with mobile devices integrated with Cloud Computing to facilitate sharing of medical data between Patients and Providers. This Healthcare system enables healthcare services with low operating costs, high flexibility, and high medical data history availability. The proposed system includes Medical History sharing framework that combines Blockchain on a Desktop Ap- plication. In particular, we have designed a trusted access control mechanism to securely share health records among various patients and healthcare providers. We present a prototype implementation that predicts the disease and treatment to be prescribed to the patient based on the symptoms using Machine Learning Techniques. In this system the model helps doctors to examine the symptoms of patients in real-time and make decisions quickly. Thus, a machine learning model uses patient data to make informed predictions which helps in the prescription part. This system includes a hardware USB RFID Card Reader which reads information from RFID cards and communicate with a computer or other devices via a USB interface. Advantage of using this is to get complete information by scanning the card with unique ID of patients and doctors. The proposed system includes a healthcare system that interacts with Doctors, Patients and Pharmacies or Medical Stores while securely managing Patient Medical Data.

## 1. INTRODUCTION

In this busy world we don't have time to wait in infamously medical lines. The issue is that the administrative staff at the hospital frequently manages the queue manually. The patient then takes a token, waits for their turn, and asks for the doctor. The most frustrating part is that after travelling a long distance to get there, they learn that the doctor is either on vacation or cannot get an appointment. Second, the confidentiality of medical records is essential to the delivery of quality healthcare since it involves safeguarding the private and sensitive health information of patients. In order to prevent unauthorized access during transmission and storage, medical records should be encrypted. This system will help us to overcome all these problems because now patients can make appointments at home, they can check whether the doctor they want to see is available or not. Doctors can also confirm or decline the appointments, which helps both the patient and the doctor because if the doctor declines' appointment, then patient will know this in advance and patient will visit hospital only when the doctor confirms' the appointment this will save time and money of the patient. Patients can also pay the doctor's consultant fee online to save their time.

## 2. LITERATURE REVIEW

The integration of blockchain technology into healthcare systems has gained traction due to its potential to address various challenges such as data security, interoperability, and patient privacy. Blockchain, initially developed as the underlying technology for cryptocurrencies, has evolved into a versatile tool for securely storing and sharing sensitive information in a decentralized manner. One of the key benefits of blockchain in healthcare is its ability to enhance data security by employing cryptographic techniques such as hash functions and digital signatures. SHA-256, a widely used cryptographic hash function, plays a pivotal role in ensuring the integrity and authenticity of data stored on the blockchain. By generating unique hash values for each data input, SHA-256 makes it computationally infeasible to tamper with or alter the original data, thereby providing a tamper-proof audit trail for healthcare transactions. Moreover, blockchain facilitates interoperability among disparate healthcare systems by establishing a common framework for data exchange and sharing. Interoperability is crucial for enabling seamless communication and collaboration among healthcare stakeholders, including patients, providers, and payers. Through blockchain-based networks, healthcare organizations can securely share patient data while maintaining granular control over access

permissions and data privacy. In addition to data security and interoperability, blockchain offers transparency and auditability, which are essential for ensuring trust and accountability in healthcare transactions. Every transaction recorded on the blockchain is transparently visible to all network participants, eliminating the need for intermediaries and reducing the risk of fraud or data manipulation. Furthermore, blockchain's immutable ledger ensures that once a transaction is recorded, it cannot be altered or deleted, providing a verifiable audit trail for regulatory compliance and accountability. On the other hand, disease prediction has emerged as a critical area of research in healthcare, aiming to leverage advanced data analytics and machine learning techniques to identify patterns and trends associated with various medical conditions. Traditional approaches to disease prediction often rely on statistical models and clinical expertise, which may have limitations in capturing complex interactions and hidden patterns within large-scale healthcare datasets. Aspect mining, a subset of data mining, focuses on extracting meaningful insights from complex datasets by identifying relevant aspects or features. In the context of disease prediction, aspect mining enables the discovery of hidden correlations and predictive factors that may not be apparent through traditional statistical analysis alone. This paper addresses the crucial issues of Medical data privacy and data protection. This paper has designed a HealthCare system that securely manages personal medical data and creates interaction between Doctors, Patients, Insurance

Companies and Pharmacy shops. They have used the concept of private blockchain which is an efficient way to revolutionize data storage in a healthcare system. This private blockchain will have all the details of doctors, insurance companies with whom the patients have interacted. The transaction and insurance details will be stored with the help of smart contracts. This paper discusses four modules in which the first module describes the system for patients for storing medical history and booking appointments online. The second module elaborates the solution for doctors in which doctors can access patient's medical data and treat them accordingly. After treatment, the doctors can then upload prescriptions or suggest lab test accordingly. Third module is for insurance companies which allow insurance companies for document verification and further processes. This reduces unwanted fraud by patients. The last module is for medical store facility. As per the prescription by doctors, patients can buy medicines from the store and this information will be stored in the system. The implementation is done using ganache a personal blockchain for Ethereum and corda distributed application development. They have also used Truffle Suite and Meta Mask and an IPFS system for storing all large files. Few of the limitations identified are patient must have mobile phones and an internet connection to interact with the system. "Advanced Healthcare System Using Artificial Intelligence", Santosh San- jeev, Gowtham Sai Ponniekanti, G. Pradeep Reddy, International Conference on Cloud Computing, Data Science Engineering (Confluence 2021)[3] Health is one of the major factors which determines and improves the comfort of humans. Advanced technologies can be used to change the current scenario. This paper proposed a web interface which enables access of medical records to the patients and a neural network model which predicts medication for ailments. The author proposes use of speech to text model and applies Natural Language Processing (NLP) on the text to provide patient with a prescription. The author also describes development of a neural network which helps in predicting the medication for a patient based on the symptoms.The proposed system is explained in three parts in which the first part focuses on the frontend of the proposed system which describes the user interface for patients as well as doctors. The second part describes the back-end process of the web application. The third part explains the creation of an AI bot that predicts medication using neural networks. The authors have used HTML, CSS for front end and Django for backend. It has a Word Error Rate of 21.5 percent for the custom trained speech to text model. The AI bot achieved an accuracy of 88 percent. "Design of a Secure Medical Data Sharing Scheme Based on Blockchain", Xu Cheng, Fulong Chen, Dong Xie, Hui Sun, Cheng Huang, Journal of Med- ical Systems, Springer [4] The decentralization feature of blockchain is helpful to solve the problem that the secure authentication process is highly dependent on the trusted third party and imple- ment data security transmission. This paper discusses the use of blockchain technology to describe the security requirements in authentication process and a network model of MCPs based on blockchain is proposed. In the system model, the hash of the medical data of each hospital and the lo- cation index of the summary and medical data in the cloud storage are stored in the medical consortium chain in cipher text. The author describes BAN logic which helps to prove authentication and key establishment thus proving the validity of the protocol. The paper combines cloud storage with cryptography to analyse the feasibility of blockchain security authentication in MCPs. "Towards Using Blockchain Technology for eHealth Data Access Manage- ment", Nabil Rifi, Elie Rachkidi, Nazim Agoulmine, Nada Chendeb Taher, International Conference on Advances in Biomedical Engineering (ICABME 2017) [5]

This paper mainly focuses on specific problems and highlights the benefits of the blockchain technology for the deployment of a secure and a scalable solution for medical data exchange in order to have the best performance

possible. The author mentions it is infeasible and provokes very poor performance to store all the data on the blockchain, so they have used blockchain only to transfer only part of the data and an Off-Chain database is used for storage. The implementation mentions the use of sensors for generating data which triggers a smart contract which sends a notification to the doctors. This approach is a transparent and efficient way to access and share patient's data in a private secure way with the patient completely in control of his own data. This approach is completely user-centric. The integration of blockchain technology into healthcare systems has sparked considerable interest and innovation in recent years, driven by the urgent need for secure, interoperable, and patient-centric healthcare solutions. Blockchain, originally developed as the underlying technology for cryptocurrencies like Bitcoin, has evolved into a transformative tool for healthcare, offering unparalleled potential to revolutionize data management, interoperability, and patient empowerment. One of the key advantages of blockchain in healthcare lies in its ability to ensure data integrity and security through decentralized, immutable ledgers. By distributing healthcare data across a network of nodes and cryptographically securing each transaction, blockchain mitigates the risk of data breaches, tampering, and unauthorized access. This enhanced data security is particularly critical in healthcare, where sensitive patient information must be safeguarded against cyber threats and privacy breaches. Moreover, blockchain fosters interoperability by establishing a common, standardized framework for data exchange and sharing among disparate healthcare stakeholders. Traditional healthcare systems are often siloed, with fragmented data stored in proprietary formats that hinder seamless communication and collaboration. Blockchain's distributed ledger architecture enables secure, real-time data sharing across organizational boundaries, facilitating care coordination, interoperability, and continuity of patient information. Furthermore, blockchain empowers patients by granting them greater control and ownership over their health data. With blockchain-based patient portals and personal health records, individuals can securely access, manage, and share their medical information with healthcare providers, enabling more informed decision-making and active participation in their healthcare journey. Additionally, blockchain-enabled smart contracts facilitate patient consent management, allowing individuals to specify how their data should be accessed and used by third parties. In addition to data security and interoperability, blockchain holds immense promise for enhancing clinical research and drug development processes. By leveraging blockchain's transparency, traceability, and tamper-proof nature, researchers can securely share and validate clinical trial data, streamline regulatory compliance, and accelerate the pace of medical innovation. Blockchain-based platforms also enable novel approaches to patient recruitment, consent management, and data monetization in clinical research. Moreover, the convergence of blockchain with other emerging technologies such as artificial intelligence (AI), Internet of Things (IoT), and decentralized finance (DeFi) is poised to unlock new opportunities for healthcare innovation. Blockchain-based AI algorithms can analyze large- scale healthcare datasets to derive actionable insights for disease prediction, treatment optimization, and personalized medicine. Similarly, blockchain- enabled IoT devices can securely collect, transmit, and store patient- generated health data, empowering remote patient monitoring, telemedicine, and preventive healthcare initiatives. Despite its transformative potential, blockchain in healthcare faces several challenges and barriers to adoption, including regulatory uncertainty, scalability limitations, interoperability issues, and concerns around data privacy and governance.

## 3. AIM & OBJECTIVES

This study aims to present the outcomes of developing and implementing a blockchain-based healthcare system with integrated disease prediction capabilities. The primary objective is to establish a robust infrastructure leveraging blockchain technology, SHA-256 encryption, and aspect mining algorithms to enhance data security, interoperability, and predictive analytics in healthcare. Specifically, the objectives include designing and implementing modules for patient management, doctor interface, and pharmacy integration within the blockchain ecosystem. Additionally, the study aims to ensure data security through the implementation of SHA-256 encryption and to employ aspect mining algorithms to analyze patient data for disease prediction. Furthermore, the development of machine learning models based on historical patient data for predictive analytics is a key objective. The performance of the system will be rigorously evaluated in terms of data security, predictive accuracy, usability, and scalability. User feedback from healthcare providers and patients will be gathered to assess the system's effectiveness in real-world scenarios. Finally, comprehensive documentation and reports will be prepared to detail the system architecture, implementation process, evaluation results, and future recommendations for further enhancements. Through these objectives, the study seeks to demonstrate the feasibility and efficacy of blockchain technology in revolutionizing healthcare delivery and disease prediction, ultimately leading to improved patient outcomes and healthcare management. This research endeavor contributes to the growing body of literature on blockchain applications in healthcare and lays the foundation for future advancements in this field, fostering innovation and progress in healthcare technology.

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## 4. SYSTEM ARCHITECTURE

We have designed a trusted access control mechanism to securely share health records among various patients and healthcare providers. We present a prototype implementation that predicts the disease and treatment to be prescribed to the patient based on the symptoms using machine learning technique as well as using blockchain in a desktop application running on firebase cloud. This system illustrates the specific problems and highlights the benefits of the blockchain technology to deployment a secure and scalable solution for medical data exchange in order to have the best performance possible. The proposed system includes a healthcare system that interacts with doctors, patients and pharmacies or medical stores while securely managing patient medical data. This study aims to present the outcomes of developing and implementing a blockchain-based healthcare system with integrated disease prediction capabilities. The primary objective is to establish a robust infrastructure leveraging blockchain technology, SHA-256 encryption, and aspect mining algorithms to enhance data security, interoperability, and predictive analytics in healthcare. Specifically, the objectives include designing and implementing modules for patient management, doctor interface, and pharmacy integration within the blockchain ecosystem. Additionally, the study aims to ensure data security through the implementation of SHA-256 encryption and to employ aspect mining algorithms to analyze patient data for disease prediction. Furthermore, the development of machine learning models based on historical patient data for predictive analytics is a key objective. The performance of the system will be rigorously evaluated in terms of data security, predictive accuracy, usability, and scalability. User feedback from healthcare providers and patients will be gathered to assess the system's effectiveness in real-world scenarios. Finally, comprehensive documentation and reports will be prepared to detail the system architecture, implementation process, evaluation results, and future recommendations for further enhancements. innovation and progress in healthcare technology.

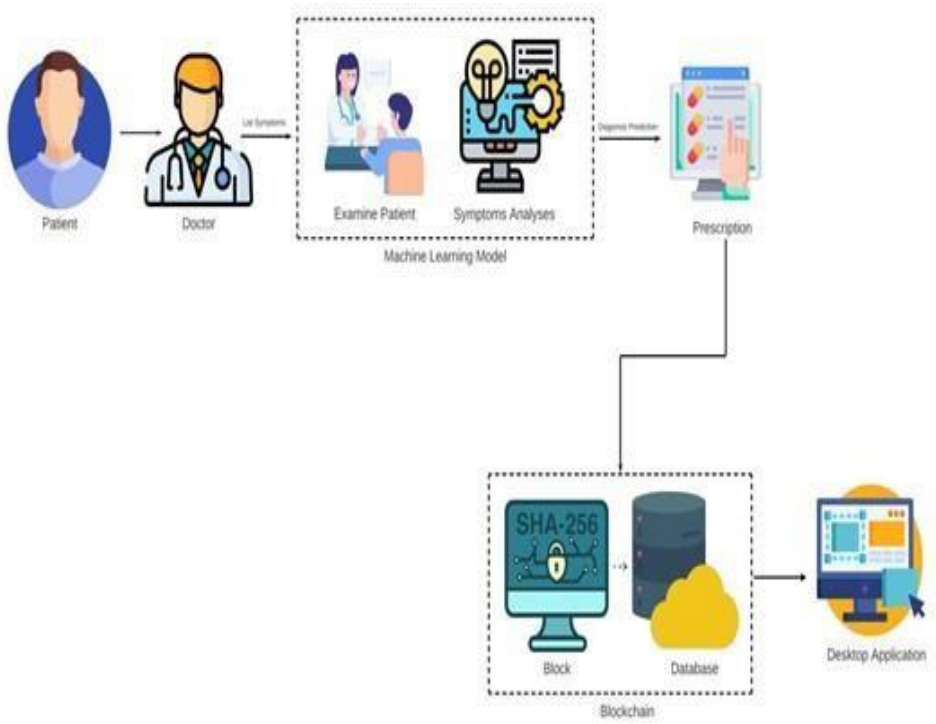


**Fig: 1** QuickDoc System Architecture

## 5. LIBRARIES AND SERVICES USED

1. **Firebase:** A Google platform for building web and mobile apps, offering services like authentication, real-time databases, cloud storage, and more. It provides scalable backend infrastructure and client-side SDKs for streamlined development, popular for its ease of use and real- time capabilities.
2. **C#.Net:** This is a powerful programming language developed by Microsoft for building a wide range of applications. With its rich features and seamless integration with other Microsoft technologies, it provides developers with a robust ecosystem for software development.
3. **API:** Act as bridges between different software applications, facilitating communication and interaction. They define rules for how software components should interact, enabling developers to access specific features or services provided by a software platform or service. APIs play a crucial role in building modular and scalable software architectures.

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## 6. RESULTS

**Register Page**

**1. QuickDoc Logo**


**Fig: 2** QuickDoc Logo




**Fig: 3** Register Page

The "QuickDoc Logo" features a simple text that can be perceived as stylized letters or an emblem, imparting a sense of modernity and sophistication. Its color scheme, a gradient of teal, adds a touch of freshness and contemporary appeal. The logo's design emphasizes simplicity and innovation, aligning well with the brand's identity as a technology-oriented platform. the logo should be distinct enough to differentiate QuickDoc from its competitors while resonating with its industry and targetaudience.

**2. Sign in Page**

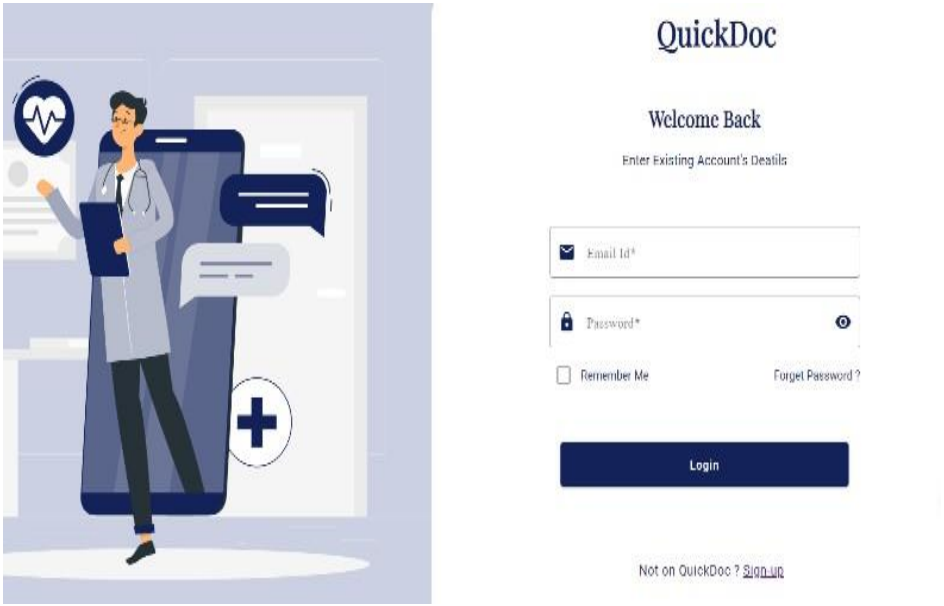


**Fig: 4** Sign in Page

The sign-in page serves as the gateway for users to access the blockchain- based healthcare system, providing a secure authentication mechanism to verify user identities and grant access to the platform's functionalities. Upon accessing the sign-in page, users are prompted to enter their credentials, typically consisting of a username and password. The page may also incorporate additional authentication methods, such as two- factor authentication or biometric verification, to enhance security measures. Once authenticated, users are granted access to their respective accounts, where they can view personalized information, manage appointments, access medical records, and interact with healthcare providers. The sign-in page plays a crucial role in ensuring data security and privacy, as only authorized users with valid credentials can gain access to sensitive healthcare information stored within the blockchain network. Additionally, the design of the sign-in page focuses on user experience, with intuitive layout and clear instructions to facilitate seamless navigation and enhance usability for both healthcare providers and patients. Overall, the sign-in page serves as the first point of entry into the blockchain-based healthcare system, laying the foundation for secure and efficient user interactions within the platform.

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The The register page serves as the initial step for users to create their accounts within the blockchain-based healthcare system, enabling them to securely register their information and gain access to the platform's features and services. Upon accessing the register page, users are prompted to provide their personal details, including their first name, last name, and select their role from a predefined list such as patient, doctor, or pharmacy. This role selection ensures that users are appropriately categorized within the system, allowing for tailored access permissions and functionalities based on their roles.

**4. Patient Page**

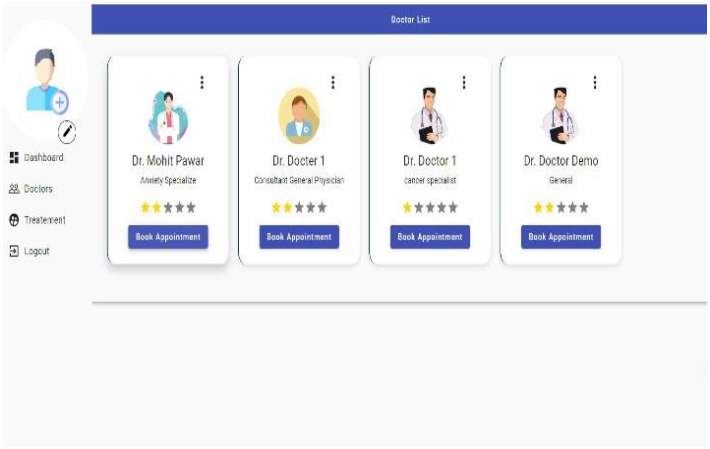


**Fig: 5** Patient Page

The The patient page serves as a central hub within the blockchain-based healthcare system, offering a range of functionalities tailored to meet the needs of patients and facilitate their healthcare journey. Upon accessing the patient page, users are presented with a user-friendly interface featuring various tabs and options to manage their healthcare activities. The disease prediction tab enables patients to access predictive analytics tools that analyze their medical history and provide insights into potential health risks or conditions. This feature empowers patients to take proactive measures for preventive healthcare and early intervention. Additionally, the book appointment feature allows patients to schedule consultations with healthcare providers conveniently through the platform. Patients can browse through the list of available doctors, view their profiles and specialties, and select the preferred appointment slot based on their convenience.

**5. Doctor Page**

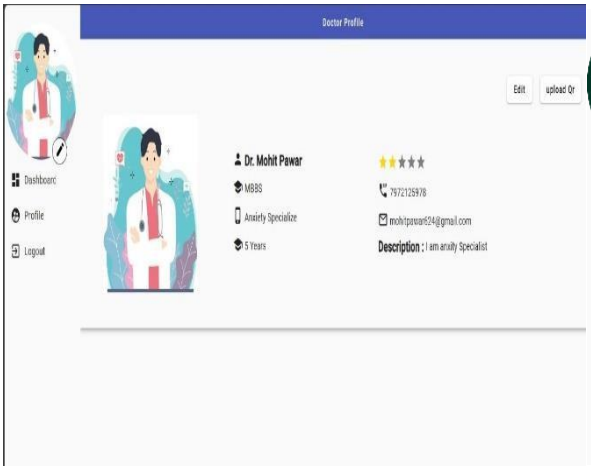


**Fig: 6** Doctor Page

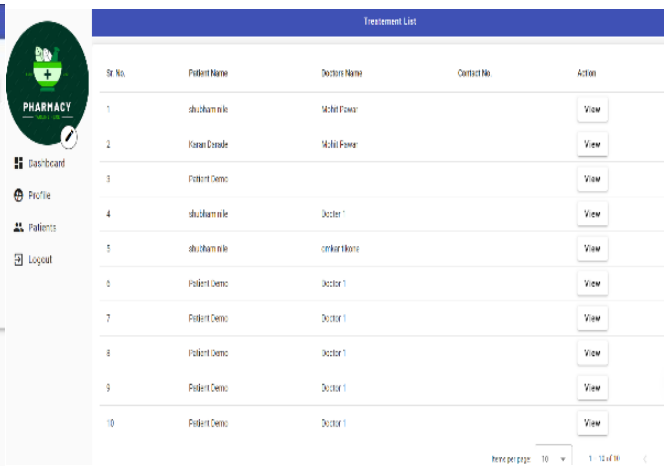


**FIG. 7** Pharmacy Page

The The doctor page serves as a comprehensive platform within the blockchain-based healthcare system, offering healthcare professionals access to essential tools and information to streamline patient care and management. Upon accessing the doctor page, healthcare providers are presented with a user-friendly interface featuring various tabs and options to efficiently manage their patient interactions. The patient list tab provides doctors with an overview of their current roster of patients, including pertinent details such as medical history, appointment status, and any ongoing treatments or prescriptions. This feature enables doctors to track patient progress and prioritize care effectively. Additionally, the appointment details tab allows doctors to view upcoming appointments, access patient records, and prepare for consultations in advance.

## 7. CONCLUSION

The healthcare domain is crucial for maintaining and improving human health, advancing medical knowledge, driving economic growth, and promoting social well-being. It is a multifaceted field that requires ongoing attention, investment, and collaboration to address evolving health challenges and meet the diverse healthcare needs of individuals Despite its many challenges, blockchain technology and the internet are the panacea for such a future. In a no-trust, no third-party environment, patients will be connected to doctors and medical suppliers. Continuous access to all data and secure sharing of patient medical information with full patient control over who can access and use their information. The patient's end of the process enables the patient to schedule appointments and access prescriptions. Based on the symptoms that the patient has entered, the system predicts the diseases. Thus by using Blockchain, Machine Learning technique and integrating the three modules: Doctors, Patients and the medical store we can get a secured, efficientandimproved healthcareapplication. The The pharmacy page serves as a central hub within the blockchain- based healthcare system, providing pharmacists with essential tools and information to streamline medication dispensation and billing processes. Upon accessing the pharmacy page, pharmacists are presented with a user-friendly interface featuring various tabs and options to efficiently manage patient prescriptions and medication orders. The patients who did their appointment tab provides pharmacists with a comprehensive list of patients who have completed their appointments and require medication fulfillment. Pharmacists can access patient profiles, view prescription details, and prepare medications accordingly. Additionally, the prescriptions tab enables pharmacists to review and manage patient prescriptions within the platform. Pharmacists can verify prescription authenticity, dispense medications, and track medication orders in real- time. Moreover, the medicines recommended by doctors tab provides pharmacists with a list of medications prescribed by healthcare providers for specific patients.

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