

HEALTHCARE MANAGEMENT USING BLOCKCHAIN

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ABSTRACT

The healthcare industry is undergoing a profound transformation, driven by the integration of blockchain technology. This abstract introduces the significance of this project and its potential impact on healthcare management. Our project addresses the pressing challenges in healthcare, including data security, interoperability, and transparency. We aim to enhance security and privacy by leveraging advanced cryptographic techniques, ensuring patient data confidentiality, and reducing unauthorized access risks. This paper presents a healthcare Android application utilizing blockchain technology, designed to provide a comprehensive range of features for users. The app integrates functionalities such as personalized diet plans, exercise tracking, and BMI calculation to promote holistic well-being. Leveraging blockchain, the platform ensures secure data management, fostering trust and transparency in healthcare interactions. By offering a user-friendly interface and tailored health recommendations, the app aims to empower individuals to take control of their health and foster positive lifestyle changes. Our project's key objectives are to foster interoperability and seamless data sharing among various healthcare stakeholders. Additionally, we empower patients by granting them greater control over their health data. Patients will have the autonomy to determine who accesses their data and for what purposes, actively engaging in healthcare decisions. Our project's methodologies involve harnessing blockchain's decentralized and immutable ledger system, known for its data integrity and transparency. The expected outcomes include a more secure, interoperable, and patient-centric healthcare management system. The potential benefits extend to the entire healthcare ecosystem and society as a whole. In conclusion, our project has the potential to revolutionize healthcare management, offering enhanced security, interoperability, and transparency while empowering patients. As the healthcare sector continues to evolve, our project using blockchain technology emerges as a transformative force, promising a more efficient and patient-focused future in healthcare management.

Keyword: - Blockchain, Healthcare Management, Data Security, Interoperability, Patient Empowerment, Clinical Trials, Transparency, Cryptographic Techniques.

1. INTRODUCTION

The security of Electronic Health Records (EHRs) has become a significant concern in today's digital age. Individual and remedial records are highly valuable on the dark web, where a single EHR can fetch around \$50, far exceeding the value of other personal data, such as credit card details, which sell for approximately \$0.25. This disparity in value has led to instances where medical staff have illicitly sold EHRs for financial gain. Although government actions have reduced these occurrences, the threat remains as attackers increasingly use sophisticated phishing attacks to obtain sensitive information. These attacks, wherein hackers impersonate authorized agents to gather personal data, have proven highly effective, especially in an era where online communication is ubiquitous and individuals frequently receive calls and emails from various agencies requesting verification details.

The healthcare industry has witnessed several high-profile breaches that highlight the severity of this issue. For example, in 2017, the National Health Service (NHS) in the UK was attacked, resulting in the encryption of NHS records and the cancellation of 6900 appointments. Similarly, in 2012, a medical professional at Howard University Hospital sold patients' personal information, including names, addresses, and Medicare numbers, on the dark web. Another alarming incident occurred in 2016 when Magnolia Health Corporation (MHC) was targeted by a phishing attack. An attacker spoofed the CEO's email and tricked an employee into sending a spreadsheet containing sensitive employee information, such as names, Social Security numbers, and salaries. These breaches underscore the significant impact such attacks can have, as exposed data often includes critical patient or employee information.

To address these security challenges, many researchers advocate for the adoption of blockchain technology in the healthcare industry. Blockchain is viewed as a disruptive technology capable of providing the highest level of data security. The primary goal of ongoing research is to develop a system that ensures only authorized users, such as doctors, pathologists, and pharmacists, can access a patient's critical information. By leveraging blockchain's decentralized and immutable nature, the healthcare industry can create a more secure and trustworthy environment for managing sensitive medical records.

2. LITERATURE SURVEY/ EXISTING SYSTEM

Year	Title Of Paper	Author	Conclusion	Limitation
2023	MediLinker: a blockchain based decentralized health information management platform for patientcentric healthcare.	John Bautista, Daniel Toshio Harrell, Ladd Hanson, Eliel de Oliveira, Mustafa Abdul Moheeth, Eric T Meyer, Anjum Khurshid.	The research proposes toto provide insights into the opportunities and challenges in developing and implementing blockchainbased technologies in healthcare.	Adoption Challenges
2021	Blockchain-Based Access Control Scheme for Secure Shared Personal Health Records over Decentralised Storage	Hassan Mansur Hussien, Sharifah Md Yasin, Nur Izura Udzir, Mohd Izuan HafezNinggal	To combine EHR with blockchain, storing medical data in IPFS and ensuring secure access control for outsourced encrypted data.	Lack of User and Attribute Revocation Mechanisms
2021	Blockchain technology applications in healthcare: An overview	Abid Haleem, Mohd Javaid, Ravi Pratap Singh, Rajiv Suman, Shanay Rab	To explore how Blockchain technology can transform healthcare by improving data security, interoperability, patient care, and administrative efficiency.	lack of expertise

2020	PatientDataChain: A Blockchain-Based Approach to Integrate Personal Health Records	Alexandra Cernian, Bogdan Tiganoaia, Ioan Sacala, Adrian Pavel, Alin Iftemi	To access technologies such as Big data, ML for better optimization of records.	Patient data overload
2019	Blockchain in Healthcare: A PatientCentered Model	Hannah S Chen, Juliet T Jarrell, Kristy A Carpenter, David S Cohen, Xudong Huang	To provide data security and data ownership	Concern for 51% attack
2019	Proposing New Blockchain Challenges in e-Health	Susel Góngora Alonso, Jon Arambarri, Miguel López- Coronado, Isabel de la Torre Díez	New blockchain tech in eHealth enhances health data sharing for precision medicine.	Technology Scalability & Data Access Control

3. PROPOSED METHODOLOGY AND DISCUSSION

This project delved into various methodologies for leveraging blockchain technology in healthcare applications. We explored a diverse range of well-established methods to identify the most suitable approach for our specific use case. Here's a breakdown of our methodology and key findings:

1. Comprehensive Review: We conducted a thorough review of existing blockchain applications in healthcare. This involved examining research papers, industry reports, and real-world projects. This review process provided a solid foundation for understanding the current landscape and potential benefits of blockchain in healthcare.

2. Methodological Exploration: We then focused on a variety of blockchain methodologies relevant to our use case. This exploration likely encompassed areas like:

- * Secure data storage and access control mechanisms using blockchain ledgers.
- * Smart contract applications for automating healthcare processes.
- * Implementation of blockchain-based electronic health record (EHR) systems.
- * Utilizing blockchain for secure and traceable supply chain management of pharmaceuticals and medical devices.
- * Strategies for facilitating interoperable data exchange between healthcare institutions.

3. Comparative Analysis: Once we had a deep understanding of these methodologies, we compared their potential benefits and drawbacks in the context of our specific healthcare application. This comparative analysis involved factors like:

Security: How well does each method ensure data integrity and patient privacy?

Efficiency: Can this method streamline healthcare processes and improve workflow?

Scalability: Can the chosen approach handle the volume of data and users within the healthcare system?

Interoperability: Does it facilitate seamless data exchange between different healthcare providers?

User Adoption: How easy is it for patients and healthcare professionals to adapt to this new technology?

By carefully comparing these factors, we were able to identify the methodology that best aligned with the goals and requirements of our healthcare project.

4. Results and Future Work: This project resulted in the selection of a specific blockchain methodology for our healthcare application. The chosen approach offers the most promising combination of security, efficiency, and scalability to address the challenges we aim to tackle.

However, further research and development are likely needed to refine the implementation details and ensure the successful integration of blockchain technology within the healthcare ecosystem.

This approach to methodology exploration and result comparison provides a valuable roadmap for developing secure, efficient, and patient-centered healthcare applications using blockchain technology.

4. SYSTEM DESIGN

4.1. System Architecture

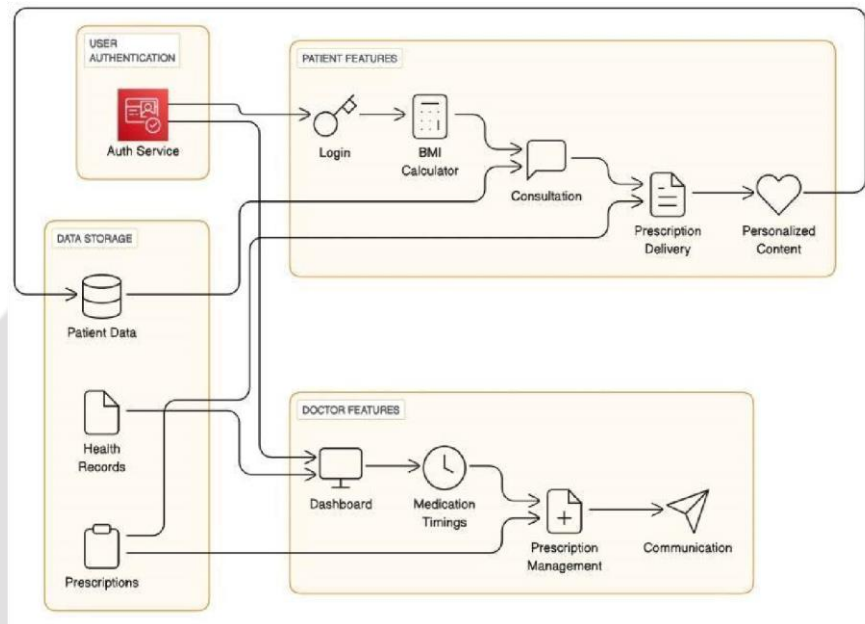


Fig.1

The architecture of our system is designed to provide a seamless and efficient user experience, centering around a robust data storage layer that securely stores patient health data. This layer is crucial for maintaining the integrity and confidentiality of sensitive information. Users interact with the application through a comprehensive user interface layer, which can be accessed via a mobile app or a web application. This user interface layer serves as the primary point of interaction, providing access to various functionalities designed to enhance the user experience and support their health needs. One of the key functionalities within the user interface layer is the login and authentication service, which ensures secure access to the system. Additionally, users can utilize a BMI calculator to monitor their health metrics and access a consultation service that allows them to schedule appointments with healthcare providers easily.

A separate section of the architecture is dedicated to doctor functionalities, ensuring that healthcare providers have the tools they need to deliver effective care. Doctors can access patient health data through an intuitive dashboard, which provides a comprehensive view of patient information. Through the consultation service, doctors can interact with patients, offering advice and treatment plans. Furthermore, the doctor section includes functionalities for managing prescriptions, enabling doctors to prescribe medication and potentially oversee medication delivery. This integrated approach ensures that both patients and healthcare providers have access to the necessary tools and information to facilitate high-quality care..

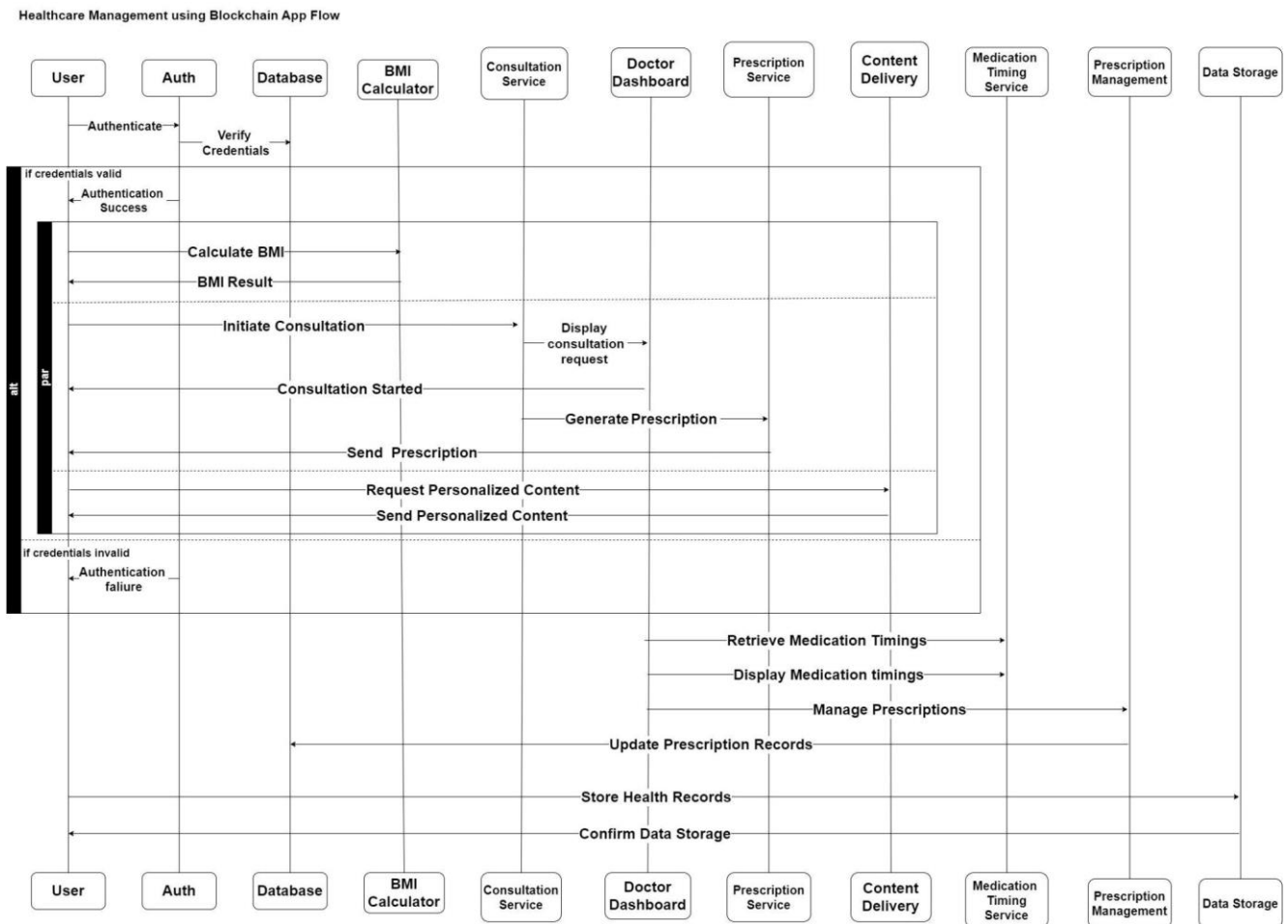


Fig. 2

1. User Authentication:

Auth Service: This service handles user registration, login, and authentication. It ensures that only authorized users can access the application's functionalities.

2. Patient-centric Functions:

Mobile App: Patients interact with the system through a user-friendly mobile app for managing their healthcare needs.

Authentication: Secure login ensures only authorized users can access their health data.

BMI Calculator: The app includes a tool to calculate Body Mass Index, a basic health indicator.

Consultation Scheduling: Patients can conveniently schedule appointments with healthcare providers.

3. Data Management and Security:

Blockchain Integration: Encrypted health data is stored on a secure blockchain network, ensuring tamper-proof records and improved data security.

Data Storage Management: The system effectively manages where and how patient data is stored, potentially leveraging a combination of blockchain and traditional databases.

4. Provider-centric Functions:

Doctor Access: Authorized healthcare providers can access patient data securely through the system.

Consultation Services: The system facilitates communication and appointment management between patients and providers.

Prescription Service: Doctors can send electronic prescriptions to patients securely.

4.3. UML Diagrams

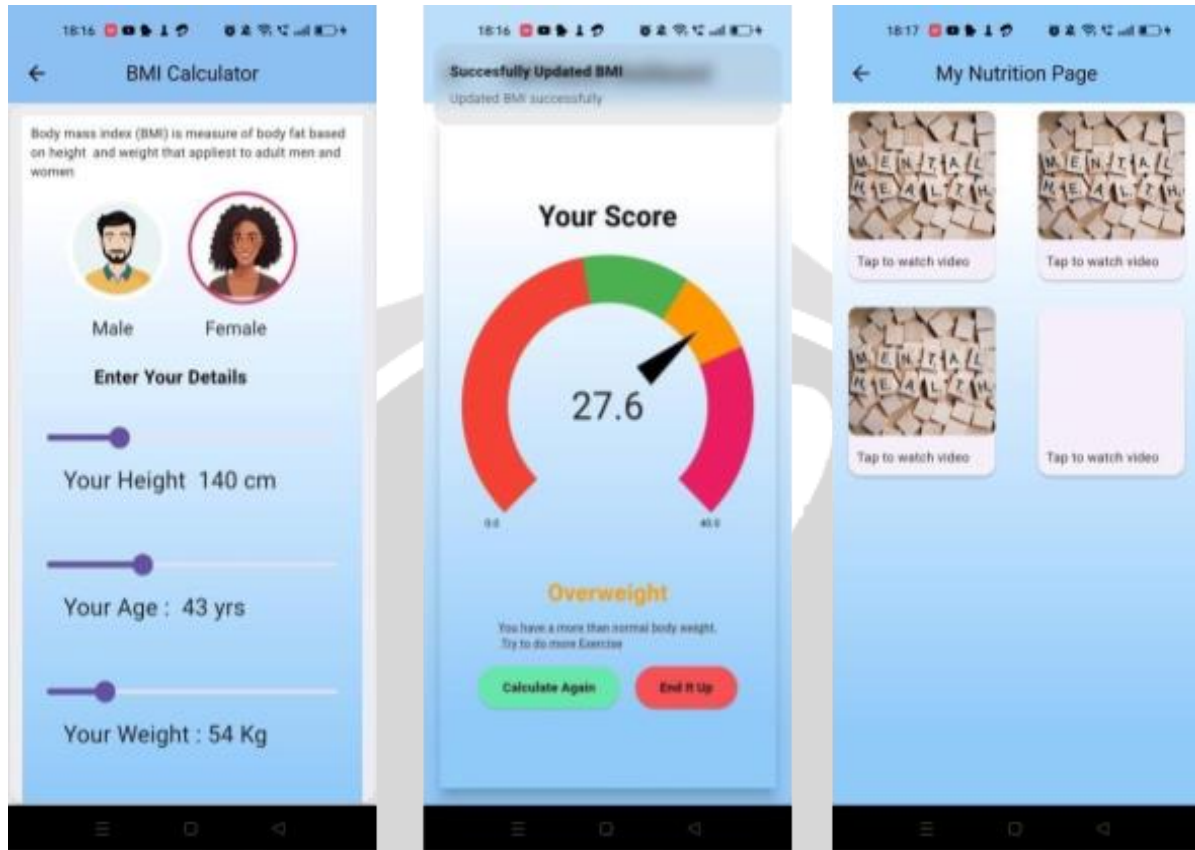


Fig.3

Users have the capability to calculate their Body Mass Index (BMI) using the provided information. This feature allows them to easily monitor their health by understanding their BMI, which is a crucial indicator of body fat based on height and weight.

In addition to BMI calculation, our system offers personalized recommendations for the best online videos aimed at assisting users in minimizing, controlling, and preventing diseases. These carefully curated videos provide direct and valuable information, tailored to the user's specific health needs. Whether it's tips on healthy eating, exercise routines, or managing chronic conditions, these resources are designed to help users enhance their health and well-being.

With these tools, users can take proactive steps towards a healthier lifestyle, gaining access to expert advice and practical guidance that can make a real difference in their daily lives. Our goal is to empower users with the knowledge and resources they need to achieve and maintain optimal health.

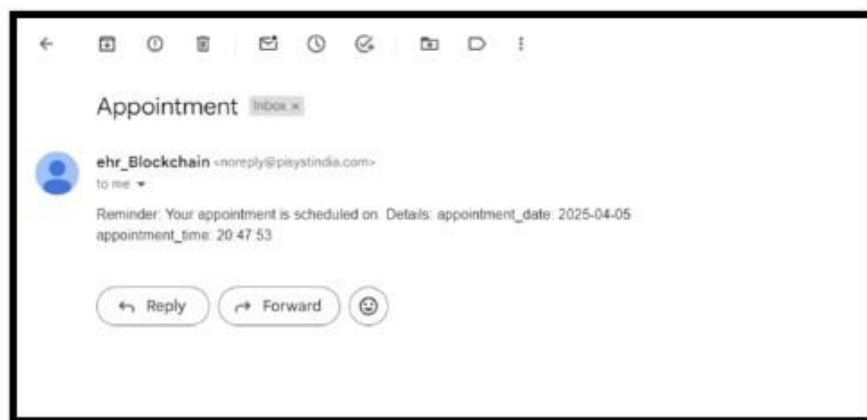
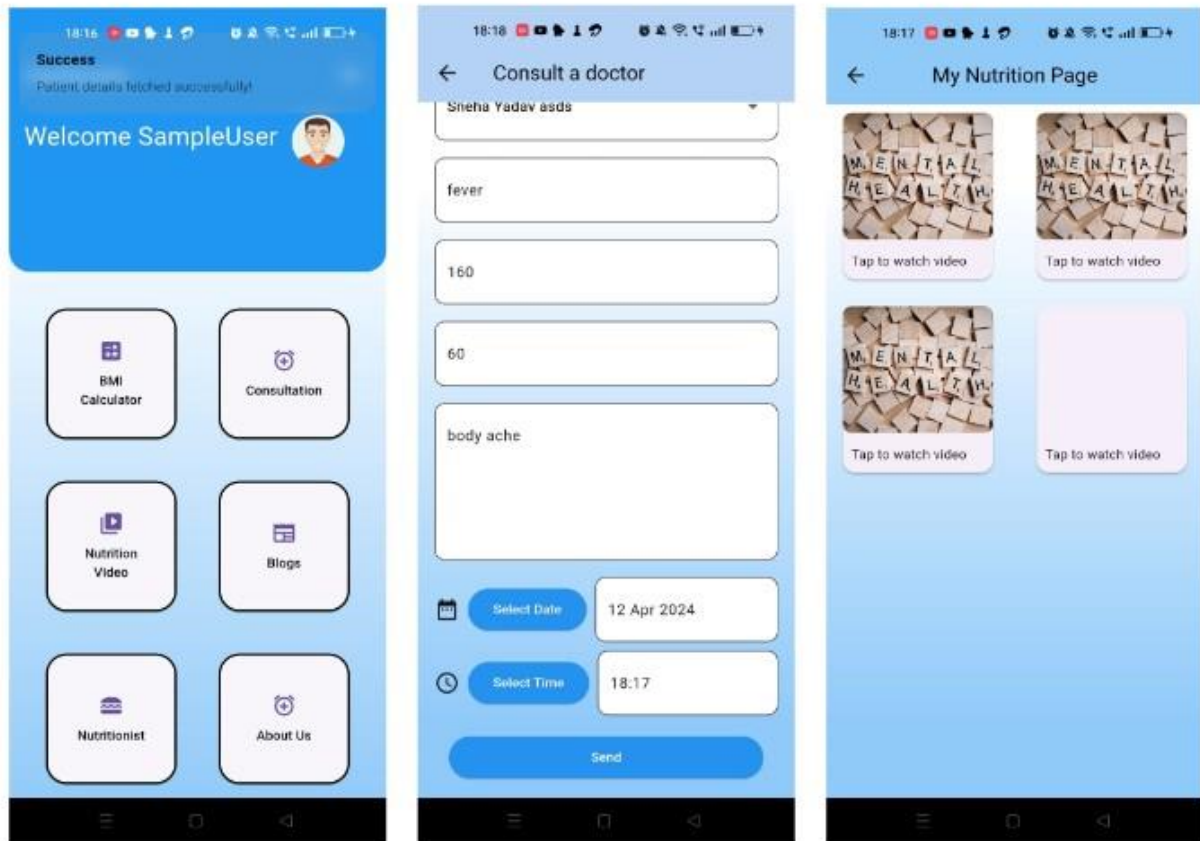
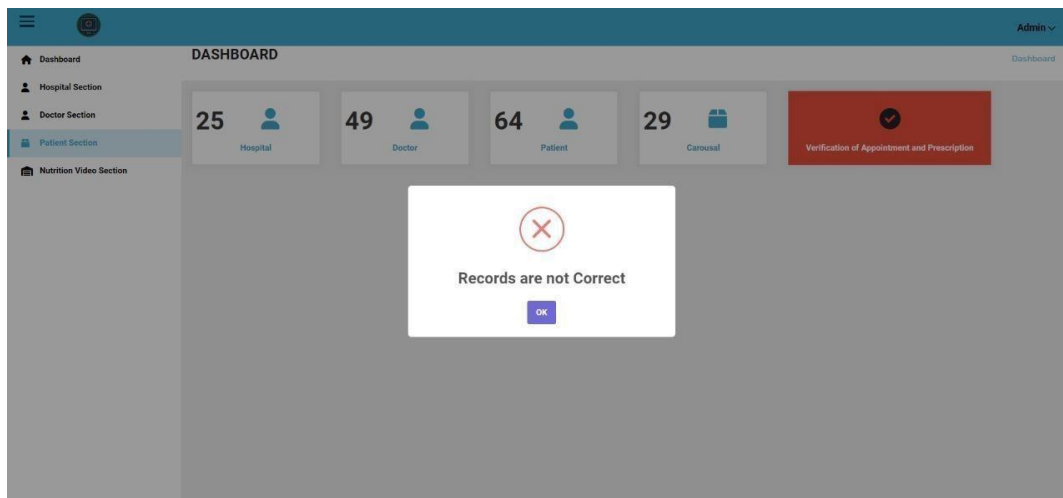


Fig 4

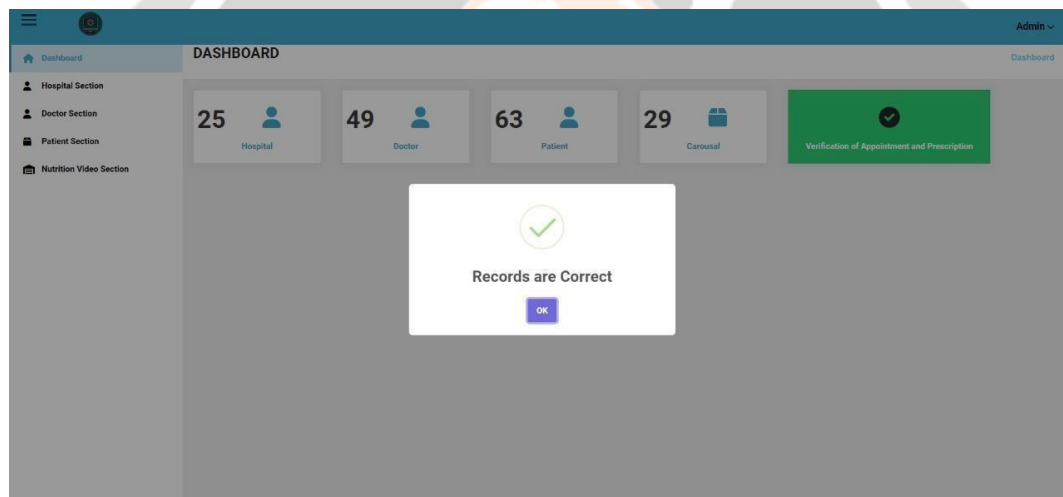
The Dashboard is a comprehensive platform that encompasses all currently implemented features, ranging from blogs to nutritionists and consultation services. It serves as a central hub for users to access a wide array of health-related resources and services. When a user books or registers for a consultation, the system seamlessly assigns a doctor to attend to their needs. This process ensures that users are connected with qualified healthcare professionals without any hassle. In Figure 2, users are presented with the option to select a convenient time and date for their consultation. This feature allows them to choose a slot that fits their schedule, ensuring they are matched with a specific doctor who is available during their chosen time.

Furthermore, appointment details are communicated to users via email, providing them with all necessary information for their upcoming consultation. This includes the date, time, and details about the assigned doctor. This ensures that users are well-informed and prepared for their consultation, enhancing their overall experience and satisfaction with the

service. The Dashboard's integration of these features demonstrates its commitment to providing a seamless and user-friendly experience, making it easier for users to access the health services they need.



With changes in details



Without changes in details

Fig 5

The primary feature of securing records and prescription details has been implemented successfully. To achieve this, we have employed the MD5 algorithm to encrypt all data into a single block. This ensures that any alterations made to the details can be accurately verified by the admin as shown in above fig.2

6. RESULT ANALYSIS

This project identified the most suitable blockchain methodology for our specific healthcare application through a comprehensive review of existing methods and a comparative analysis focused on security, efficiency, scalability, interoperability, and user adoption. By meticulously evaluating these factors, we were able to pinpoint the methodology that best addresses the unique challenges within the healthcare system.

The chosen methodology offers a promising combination of enhanced security, improved efficiency, robust scalability, seamless interoperability, and high user adoption potential. These qualities make it well-suited to address the pressing issues faced by the healthcare industry today. However, it is important to note that further research and development are

required to refine the implementation details. This will ensure that the chosen blockchain methodology can be successfully integrated within the complex healthcare ecosystem. Continuous advancements and adaptations will be necessary to meet the evolving needs of healthcare providers, patients, and regulatory bodies.

7. CONCLUSION

In conclusion, the integration of blockchain technology into healthcare applications offers promising solutions to address longstanding challenges in the industry. By incorporating features such as diet planning, exercise tracking, appointment scheduling, and alerts within a blockchain-based healthcare app, we can create a comprehensive and patient-centric platform that empowers individuals to take control of their health and wellness journey. The use of blockchain ensures secure and transparent management of sensitive health data, protecting patient privacy while enabling seamless data sharing and interoperability between healthcare providers and patients.

Moreover, the inclusion of features like diet planning and exercise tracking promotes preventive healthcare practices, encouraging individuals to adopt healthier lifestyles and reduce the risk of chronic diseases. Appointment scheduling and alert functionalities streamline healthcare access, ensuring timely interventions and improving patient outcomes. These features hold immense potential to revolutionize healthcare delivery, it is essential to address challenges such as scalability, regulatory compliance, and user adoption to realize their full benefits. Collaborative efforts from healthcare providers, technology developers, policymakers, and patients are necessary to overcome these challenges and unlock the transformative power of blockchain in healthcare.

8. REFERENCES

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