Medilink Health Card System

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***Abstract*—The MediLink Health Card System is a smart healthcare solution designed to digitize, secure, and streamline the management of patient medical records. This system integrates smart card technology with a centralized electronic health record (EHR) database, enabling patients to carry a portable digital health card that links directly to their complete medical history. The system incorporates role-based access control, ensuring that only authorized personnel, such as doctors, nurses, or administrative staff, can access or modify patient data, thus maintaining data security and privacy.By providing quick and reliable access to patient history, prescriptions, laboratory results, and vaccination records, the system reduces administrative delays and minimizes errors caused by manual record-keeping.Additionally, it supports efficient communication between healthcare providers and facilitates timely decision-making, ultimately enhancing the overall quality of healthcare services. The MediLink Health Card System represents a significant step toward modernizing healthcare infrastructure, offering a scalable, secure, and patient-centric solution for managing medical records in smart healthcare environments.**

Keywords *— QR Code, Electronic health record (EHR), health card system, healthcare information system, patient data management, role-based access control, secure medical records*

INTRODUCTION

The Medilink Health Card System is introduced as a modern digital solution aimed at improving the management and accessibility of healthcare information through the use of Electronic Health Records (EHR)[1]. In traditional healthcare systems, patient records are often scattered across multiple hospitals and maintained in paper or isolated digital formats, leading to delays, data loss, and inefficiencies in medical care. The Medilink system addresses these challenges by providing a centralized platform where patient data is securely stored and linked to a unique health card[2].This allows authorized healthcare professionals to quickly access accurate medical information, supports better clinical decision-making, reduces paperwork, and enhances the overall efficiency and quality of healthcare services[4]. Additionally, the system ensures data security and privacy through role-based access control, allowing only authorized users to view or update sensitive information. By promoting seamless data sharing and continuity of care, Medilink contributes to safer, faster, and more reliable healthcare delivery based platforms[3].

In essence, the MediLink Health Card System aims to transform healthcare delivery by creating a secure, reliable, and patient-centric framework for managing medical records[9] It represents a significant step toward digital healthcare transformation, supporting both healthcare providers and patients with streamlined, safe, and efficient access to vital medical data[8].

LITERATURE SURVEY.

Electronic Health Record (EHR) systems have become an essential component of modern healthcare, enabling digital storage and efficient sharing of patient medical information. Several studies have highlighted that EHR systems improve clinical efficiency and reduce medical errors; however, issues related to data privacy, security, and interoperability remain major concerns [1], [2]. Centralized EHR architectures are particularly vulnerable to unauthorized access and data breaches if proper security mechanisms are not implemented.

To overcome limitations of traditional identification methods, researchers have explored the use of QR code–based healthcare systems. QR codes provide a low-cost, fast, and reliable mechanism for patient identification and data access. Studies in [3], [4] propose QR code–enabled smart health cards that allow healthcare professionals to retrieve patient medical records instantly. These systems significantly reduce paperwork and improve emergency response, but they require secure access control to prevent misuse.

Security and privacy of patient data are critical challenges in QR code–based EHR systems. Several researchers have focused on role-based access control, authentication mechanisms, and encryption techniques to protect sensitive health information. The authors in [5] emphasize that without proper authorization, QR code systems may expose confidential patient data to unauthorized users, thereby violating privacy regulations.

Recent research has introduced blockchain technology as a solution to enhance the security and integrity of EHR systems. Blockchain-based healthcare frameworks provide decentralized, tamper-resistant storage and improve trust among stakeholders [6], [7]. While blockchain ensures data immutability and transparency, its high computational overhead and complexity limit its adoption in real-time healthcare environments.

To address these challenges, hybrid approaches combining QR codes with secure centralized or semi-decentralized architectures have been proposed. Studies in [8], [9] demonstrate that integrating QR code identification with controlled authorization mechanisms improves data accessibility while maintaining confidentiality and integrity. However, many existing systems lack efficient admin-level access control and patient-centric authorization.

From the literature, it is evident that although QR code–based EHR systems enhance accessibility and efficiency, issues related to secure access control and data privacy still persist. This motivates the development of a secure QR code–based Medilink Health Card System with admin-controlled authorization and centralized EHR management to ensure confidentiality, integrity, and controlled access to patient medical data. many systems are hospital-specific, lack standardization, and rely heavily on manual processes. These limitations contribute to delayed diagnosis, repeated medical tests, and increased operational costs.

Motivation For The Medilink Health card System:

Based on the literature review, there is a clear need for a secure, centralized, and integrated healthcare system that combines EHR technology with a unique health card. The Medilink Health Card System is motivated by the need to overcome the limitations of existing systems by providing centralized data storage, role-based access, and easy retrieval of patient information.

PROBLEM FORMULATION

The Medilink Health Card System addresses the problem of fragmented and inefficient management of patient medical records across multiple healthcare facilities. Traditional systems lack centralized storage, quick accessibility, and proper security, leading to delays, errors, and repeated tests. This project aims to provide a secure, centralized EHR system linked to a unique health card for efficient and reliable healthcare data management.

PROBLEM DEFINITION

The Medilink Health Card System is a centralized Electronic Health Record (EHR) platform that securely stores and manages patient medical information. It provides a unique digital health card for each patient, enabling authorized healthcare professionals to quickly access accurate medical records and improve the efficiency and quality of healthcare services.

OBJECTIVE OF PROJECT

- To design and develop a centralized Electronic Health Record (EHR) system for secure storage of patient medical data. .
- To provide each patient with a unique Medilink health card linked to their electronic medical records.
- To reduce paperwork and eliminate fragmented medical records across healthcare facilities.
- To enable quick and accurate access to patient information for authorized healthcare professionals.

SCOPE OF PROJECT

The scope of the Medilink Health Card System includes the development of a centralized EHR platform for securely storing and managing patient medical records with role-based access. It supports health card-based enabling authorized healthcare staff to quickly retrieve and update patient information.

DRAWBACKS OF EXISTING SYSTEM

- Patient medical records are scattered across multiple hospitals and departments.
- Heavy reliance on paper-based records leads to data loss and damage.
- Limited data sharing between healthcare providers
- Inadequate security and access control for sensitive patient information.

PROPOSED SYSTEM

The proposed Medilink Health Card System introduces a centralized Electronic Health Record (EHR) platform to securely store and manage patient medical data. Each patient is issued a unique health card linked to their digital records for easy identification and access. The system provides role-based access to ensure data security and privacy. This approach reduces paperwork, improves data accessibility, and enhances the efficiency of healthcare services.

Key Features of the Proposed System

1. Centralized EHR

- Stores all patient medical records in a single secure database.

2. Unique Health Card

- Each patient is issued a digital health card linked to their records.

3. Role-Based Access Control

- Ensures only authorized users (doctors, admin, staff) can access patient data or update data.

4. Quick Data Retrieval

- Enables fast access to patient medical history, prescriptions, emergency information and lab reports of the patient.

5. Data Security And Privacy

- The system incorporates secure authentication, encrypted data storage, and audit trails to prevent unauthorized access, ensuring compliance with healthcare privacy standards

6. Enhanced Clinical Decision-Making

- With accurate and complete medical records readily available, doctors and healthcare providers can make faster and more informed clinical decisions.

SYSTEM DESIGN

The Medilink Health Card System follows a modular and centralized design that ensures secure storage and efficient management of patient medical records. The system is divided into three main modules, each corresponding to a type of user, and all modules interact with a central database to maintain data consistency. .

Key Components:

- **Patient Module:** The Patient Module allows users to register in the MediLink Health Card System and create a digital health card. Through this module, patients can view their personal health details and basic medical information. It helps patients access their records easily without maintaining physical documents.

- **Doctor Module:**The Doctor Module enables doctors to register and access patient medical records after approval. Authorized doctors can view patient history, reports, and health data required for diagnosis and treatment. This module supports faster and more accurate medical decisions.

- **Admin Module:**The Admin Module is responsible for managing the entire system. It controls user accounts, approves doctor registrations, and monitors system activities. This ensures data security, proper access control, and smooth system operation.

- **Central DataBase:** The Central Database stores all patient records, doctor details, and system-related information. It acts as a common storage point for all modules. Centralized data storage ensures consistency, security, and quick retrieval of information.System enhances healthcare efficiency, coordination, and quality of patient care.

The **MediLink Health Card System** is implemented by integrating secure software modules with digital identification technologies to automate the process of patient registration, health record management, access control, and data retrieval. The system is designed to provide a **secure, user-friendly, and efficient healthcare record management solution**

1. System Integration

- The system integrate4.s patient and doctor interfaces with a centralized application server and database server.

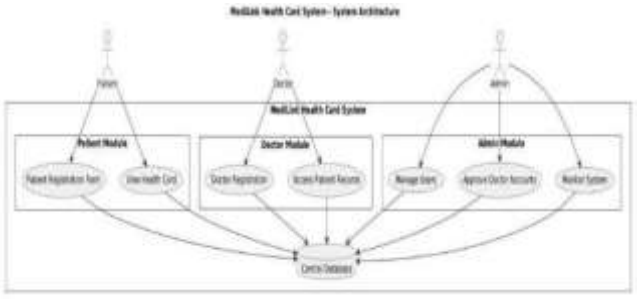

FIG.1. ARCHITECTURE DIAGRAM

Workflow :

1. Patient registers in the system using the Patient Module

2. The system generates a unique digital health card for the patient

3. Doctor registers in the system through the Doctor Module.

4. Admin verifies and approves the doctor account.

5. Approved doctors access patient health records when required.

6. All patient and doctor data is stored and retrieved from the Central Database.

The MediLink Health Card System follows a systematic methodology to digitalize and manage patient healthcare records efficiently. The process begins with **user registration**, where patients enroll in the system and are issued a **unique digital health card**. This health card serves as a single identity for accessing all medical records. Doctors also register in the system but require **admin verification and approval** before gaining access, ensuring only authorized medical professionals can handle sensitive data.

Once registered, all patient-related information such as personal details, medical history, prescriptions, lab reports, and treatment records are securely stored in a **centralized database**. The system implements **role-based access control**, allowing different levels of access to patients, doctors, and administrators. Patients can view their own health information, while doctors can view and update medical records for diagnosis and treatment. Administrators manage users, monitor system activity, and enforce security policies.

During a medical consultation, the doctor retrieves the patient's health information using the digital health card. Any updates made by the doctor are saved in real time to the central database, ensuring data consistency and accuracy. The system also maintains data security through authentication, authorization, and controlled access mechanisms.

Overall, this methodology minimizes paperwork, reduces redundancy, improves data accuracy, and enables fast and

- QR code–based digital health cards are used to uniquely identify patients and enable quick access to medical records across healthcare facilities.

2. Health Card and Data Management

- A unique QR-based health card is generated during patient registration..
- The health card is linked to electronic health records (EHR).
- Doctors can view and update patient data with proper authorization.

3. QR Code and Health Card Module

- this module generates a unique digital health card with a QR code for each patient.
- It is integrated with the backend and database to link the QR code to the patient's Electronic Health Record.
- Scanning the QR code triggers secure data retrieval based on user authorization.

4. Security and Access Control

- This module ensures role-based access control across the system.
- It validates user credentials, restricts unauthorized actions, and protects sensitive medical data
- It integrates with all user-related modules to enforce security policies.

5. Integration and Deployment

- All modules are integrated and tested as a complete system
- After successful testing, the application is deployed on a server.
- Users access the system through web browsers using secure communication protocols.

6. System Efficieny and control

- Centralized data storage ensures quick data retrieval.
- Reduces redundancy and manual paperwork.
- Improves accuracy and reliability of healthcare information.

Testing:

The testing process verifies that all modules such as patient registration, MediLink ID generation, QR code creation and

scanning, Electronic Health Record (EHR) management, insurance integration, and role-based access control work as intended. It also ensures that the system meets both functional and non-functional requirements.

- Ensure the MediLink Health Card System works correctly and securely
- It verifies system functionality, data accuracy, and user access control.
- Both functional and non-functional aspects are tested

Implementation and Results

The **MediLink Health Card System** successfully achieved the intended objectives of digitalizing patient health records and improving healthcare data accessibility. The system was able to generate **unique QR-based digital health cards** for patients, enabling quick and secure identification. Patient registration, doctor authorization, and admin management functions worked accurately as designed.

QR Authorized doctors were able to **retrieve and update patient medical records in real time**, while patients could securely view their own health information. The centralized database ensured consistent and reliable storage of electronic health records, reducing data redundancy and manual paperwork. Role-based access control effectively prevented unauthorized access to sensitive medical data.

FIG 6 : Patient Registration

Figure 6 illustrates the patient registration module of the MediLink Health Card System. In the proposed system, patient registration is performed digitally with automatic generation of a unique Health ID and QR-based health card.

In existing healthcare systems, patient registration is mostly paper-based or maintained in isolated hospital databases, leading to duplication of records and manual errors. Compared to such systems, MediLink provides a centralized and secure registration process, reducing paperwork and improving data accuracy.

FIG 7: DOCTOR *REGISTRATION PAGE*

Figure 7 presents the doctor registration module of the MediLink Health Card System, where doctors are granted access only after administrative verification. This ensures secure and authorized handling of patient data.

Existing systems often lack strict access control mechanisms, increasing the risk of unauthorized access. Compared to existing approaches, the proposed system enforces role-based access control, thereby improving security and accountability..

FIG 8:ADMIN DASHBOARD BOARD

Figure 8 demonstrates the admin dashboard of the MediLink Health Card System, which enables centralized monitoring of users and system activities through real-time statistics.

In traditional healthcare systems, administrative operations are typically decentralized and manually maintained. Compared to such systems, MediLink offers centralized administration, resulting in improved efficiency and better system control.

FIG 9: QR CODE GENERATED BY THE SYSTEM

The figure illustrates the **MediLink Health Card**, a digital health identity that displays essential patient details such as name, age, gender, and a unique 16-digit Health ID. This Health ID serves as a permanent medical identifier, ensuring accurate and quick identification of the patient across healthcare facilities.

Figure 9 depicts the QR-based digital health card generated by the MediLink Health Card System. The QR code allows authorized medical professionals to securely access patient records.

Existing healthcare systems rely on physical documents or hospital-specific identifiers, which are inefficient during emergencies. Compared to these systems, the QR-based approach enables faster identification and real-time access to centralized electronic health records.

FUTURE SCOPE

The future scope of the Medilink Health Card System includes the development of mobile applications for patients and doctors to enable easy access to health records and QR code scanning through smartphones. Advanced security features such as biometric authentication and two-factor verification can be added to strengthen data privacy. The system can be enhanced with data analytic and artificial intelligence to support disease prediction and better clinical decisions. Additionally, integration with hospital systems, insurance platforms, pharmacies, and government health services can make the system more comprehensive and improve overall health.

CONCLUSION

The Medilink Health Card System provides an effective digital solution for managing patient medical records by replacing traditional paper-based methods with a centralized Electronic Health Record (EHR). By issuing a unique health card with a QR code to each patient, the system allows quick and secure access to medical information, improving efficiency and accuracy in healthcare services. The system ensures data security through role-based access for patients, doctors, and admins, with doctor access controlled by admin approval.

REFERENCES

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[1] J. Adler-Milstein and E. Pfeifer, "Information blocking: Is it occurring and what policy strategies can address it?" Milbank Quarterly, vol. 95, no. 1, pp. 117–135, 2017.

[2] A. Meigs and M. Solomon, "Electronic health record use: A bitter pill for many physicians," Perspectives in Health Information Management, vol. 13, pp. 1–11, 2016.

[3] S. Sharma and A. Gupta, "QR code based smart healthcare system," International Journal of Computer Applications, vol. 181, no. 49, pp. 1–5, 2018.

[4] R. Patel et al., "QR code applications in healthcare systems," Journal of Medical Systems, vol. 43, no. 9, pp. 1–10, 2019.

[5] P. Kumar and H. J. Lee, "Security issues in healthcare applications using wireless medical sensor networks," Sensors, vol. 12, no. 1, pp. 55–91, 2012.

[6] A. Azaria et al., "MedRec: Using blockchain for medical data access and permission management," in Proc. IEEE OBD, 2016, pp. 25–30.

[7] Y. Zhang et al., "Blockchain-based secure electronic health record sharing," IEEE Access, vol. 6, pp. 483–492, 2018.

[8] R. Dwivedi and S. Vyas, "Secure patient data management using QR code technology," IJERT, vol. 10, no. 5, pp. 210–215, 2021.

[9] M. Kaur et al., "Patient-centric healthcare systems using secure access control," International Journal of Healthcare Information Systems, vol. 7, no. 2, pp. 45–52, 2020.

[10] L. Chen, W. Sun, and F. Huang, "A Secure and Efficient Electronic Medical Record Data Sharing Scheme based on Blockchain and Proxy Re-Encryption," Journal of Cloud Computing, vol. 13, art. 44, 2024.

[11] J. Merhej, H. Harb, A. Abouaissa, and L. Idoumghar, "Toward a New Era of Smart and Secure Healthcare Information Exchange Systems," Applied Sciences, vol. 14, no. 19, 8808, 2024