International Conference on Advances in Modern Technology of Research in Engineering Field (AIMTREF) April, 2026
Organized By: SKN Sinhgad Institute of Technology& Science, Kusgaon (Bk), Lonavala, Pune

International Journal of Science, Engineering and Technology
ISSN: 2348-4098, P-ISSN: 2395-4752

Medical Data Privacy and Security in Wireless Networks via Smart Health Card

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Abstract- In the present generation, healthcare has become the foremost imperative sector in today's medicinal eon. The massive private documents, responsive details are kept in a scalable manner. The healthcare industry has become more competitive in the digital world. As a thriving industry, it's challenging for doctors to understand the moving technology in the healthcare sector. This also deals with the patient's nursing and maintains their portfolios. The overview of the project depicts a role played by the doctors, patients, management, and resource suppliers by implementing cloud- technology in the healthcare industry. The platform was designed and developed for user-friendly interactions where patients can connect with the management and doctors at any corner of the world. The peculiarity of the project was to withdraw the pen-paper method followed by the sector for ages. Cloud computing (CC) has played a vital role in the project that helped and managed to store, secure large data files. The features while operating the system were QR codes, generating e-mails, SMS text, and free-trunk calls. This approach assists on track with each individual's health-related documents, henceforward approving with the doctors to access the knowledge throughout the flow of emergency and firmly access policy. Besides the facts, it rescues the lifetime of the patients and mutually helps the doctors figure it out comfortably. The utilization of mobile aid applications may be a dynamic field and has received the attention of late. This development provides mobile technology additional enticing for mobile health (m-health) applications. The m-health defines as wireless telemedicine involving the utilization of mobile telecommunications and multimedia system technologies and their integration with mobile health care delivery systems. As well as human authentication protocols, whereas guaranteeing, has not been straightforward in light-weight of their restricted capability of calculation and remembrance.

Keywords: QR Code Technology, QR (Quick Response) Code, Healthcare, Health Monitoring, Mobile health (m-health), Medical Records, etc.

I. INTRODUCTION

In today's digital world, healthcare systems are rapidly evolving to provide faster, more secure, and easily accessible medical services. However, traditional healthcare record management still faces challenges such as data duplication, lack of accessibility across regions, and privacy concerns. To address these issues, the proposed system introduces a smart card–based E-Healthcare model that allows patients to store and access their medical records in a secure, centralized manner. The use of smart cards ensures that authorized individuals like doctors, hospitals, and insurance companies can instantly access accurate medical data whenever needed, reducing paperwork and saving valuable time during emergencies.

The proposed Secure E-Healthcare System Using Smart Cards allows each patient to have a unique smart card embedded with a QR code and smart card number, which acts as a key to their medical data. The system maintains a centralized database that can be accessed globally through a secure web

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interface built using Java technology. Hospitals and healthcare professionals can use the card to view medical histories, prescriptions, reports, and other relevant details. Furthermore, insurance providers can verify claims quickly, and pharmacies can validate prescriptions using the same system, ensuring a connected and efficient healthcare ecosystem.

This project emphasizes security and privacy through multi-level authentication, including QR code scanning and two-step verification for user identity validation. It aims to create a unified healthcare network that not only enhances patient convenience but also improves the accuracy and efficiency of medical services. By integrating modern web technologies and smart card solutions, the system transforms traditional healthcare management into a more intelligent, accessible, and secure platform that benefits both patients and healthcare providers.

II. PROBLEM STATEMENT

In today's healthcare systems, patient records are often scattered, insecure, or paper-based, making it difficult for doctors, hospitals, pharmacies, and insurance providers to access accurate information quickly. This leads to delays in treatment, duplication of records, and even misuse of patient data. There is no secure and centralized method to manage patient records that can be accessed reliably across different healthcare providers. Therefore, there is a need for a secure E-Healthcare system using smart cards that allows patients to carry a unique smart card with QR code and ID, enabling authorized users to access medical records through two-step verification, ensuring both security and efficiency in healthcare services.

III. SYSTEM OVERVIEW

The proposed system is designed to create a secure and centralized platform that enables patients, doctors, hospitals, insurance companies, and pharmacies to interact and share medical information efficiently. The main objective of this system is to provide a smart and digital alternative to traditional health record management, where a patient's entire medical history can be accessed using a unique smart card. This smart card acts like an Aadhaar card for healthcare, containing a unique identification number and QR code linked to the patient's data stored in a centralized database. The use of a web-based Java application allows authorized users to access and update patient information from any registered hospital or medical center, ensuring seamless healthcare service delivery.

The system architecture consists of several interconnected modules — Patient, Doctor, Hospital, Pharmacy, Insurance, and Admin — each performing a specific role in the healthcare process. The Patient module allows users to register, generate their smart card, and book appointments. The Doctor module enables doctors to verify a patient's identity using the QR code or smart card number and then access medical history for diagnosis and treatment. The Hospital module manages overall system activities, including patient registration and record maintenance. The Pharmacy module uses the same smart card verification process to validate prescriptions and dispense medicines accurately. Meanwhile, the Insurance module helps verify patient records for claim processing, ensuring transparency and reducing fraud. The Admin module supervises and maintains the overall system, managing users, permissions, and security protocols.

The system ensures secure data storage and communication using a centralized database hosted on a secure local server (localhost). Every access request is verified through a two-step authentication process to ensure that only authorized personnel can view or modify sensitive medical data. This structure not only guarantees data privacy but also allows global accessibility of medical records, enabling healthcare professionals to provide better and faster treatment regardless of location. The

International Journal of Science, Engineering and Technology
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web application's interface is designed to be user-friendly, ensuring ease of use for both medical staff and patients. Overall, the proposed system provides an integrated and secure platform that modernizes healthcare management, reduces paperwork, enhances data accessibility, and improves the efficiency of medical services worldwide.

IV. PROPOSED WORK

The proposed project focuses on developing a secure, centralized, and efficient platform that enables hospitals, doctors, insurance companies, and pharmacies to access a patient's medical information using a smart card. The main objective of this system is to eliminate the need for manual record handling and ensure that patient data can be accessed anytime, anywhere through a smart card that functions similarly to an Aadhaar card. The smart card contains a unique identification number and QR code linked to the patient's centralized health database, which can be securely accessed by authorized healthcare professionals.

This system is implemented using Java technology as a web-based application with centralized data storage managed on a secure local server. The project includes multiple modules such as Patient, Doctor, Hospital, Insurance, Pharmacy, and Admin, each performing specific tasks in the healthcare process. The patient can generate a smart card at a nearby hospital by providing personal and medical information. During a hospital visit, the doctor scans the smart card and QR code, performs two-step verification to confirm identity, and accesses the patient's health record for diagnosis and treatment. Similarly, insurance and pharmacy modules use the same verification process to access relevant medical or claim information. This smart card–based approach ensures data privacy, quick access to records, and improved coordination between healthcare sectors.

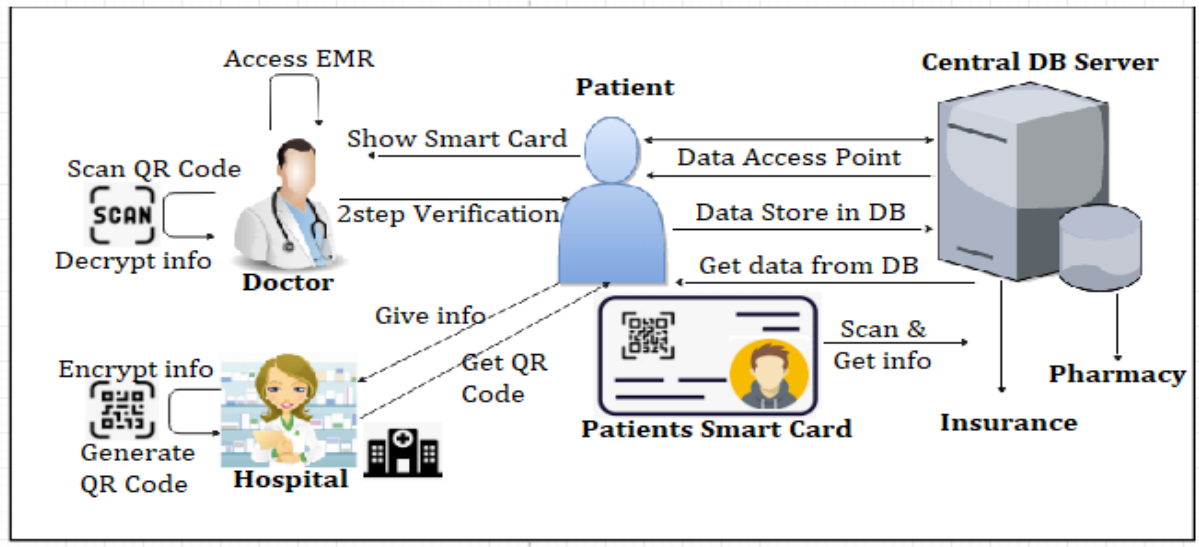

Fig.1: System Architecture Design

V. RESULT ANALYSIS

The developed Secure E-Healthcare System using Smart Cards shows effective performance in managing and accessing patient medical records in a secure and efficient way. The system successfully allows patients to register, generate smart cards, and store their medical data in a centralized database. Doctors and hospitals can easily access patient records by scanning the QR code and verifying the smart card details, which reduces manual work and saves time.

International Journal of Science, Engineering and Technology
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The system also ensures better security by using a two-step verification process before accessing sensitive patient information. Different modules like doctor, hospital, pharmacy, and insurance work smoothly together, providing a complete healthcare solution. The system improves communication between different healthcare services and makes the process faster and more reliable.

Table 1: Result Analysis

Parameter	Result
System Efficiency	High
Data Access Speed	Fast
Security Level	High (2-step verification)
User Friendliness	Easy to Use
Data Accuracy	High
Integration of Modules	Successful
Error Rate	Low

Key Observations

- The system reduces manual record handling and improves efficiency.
- Smart card with QR code enables quick and easy access to patient data.
- Two-step verification improves security and prevents unauthorized access.
- Centralized storage allows data access from different locations.
- All modules (doctor, pharmacy, insurance) are well integrated and work smoothly.

VI. CONCLUSION

In this paper, we have presented the concept of sharing emergency information through QR codes. The customer has to enter all his personal and medical information by him/herself. Consumer will be more loyal towards the service provider. The QR code can be scanned through any QR code scanner app across any platforms. Hereby, we ensure that the number of deaths due to accidents will be reduced. In this paper, based on the analyses of the security shortcomings of medical management technology, we exploit the idea of applying Quick Response (QR) code to secure medical management and improve many medical management securities through utilizing information security technology, e.g., VSS, and the convenience of QR code.

Several schemes based on QR code secure technology are designed or applied to achieve user privacy protection on health record transparency, access control to view the medical privacy record, infusion bottle confirmation with technical authentication, secure patient wrist ID, and fast payment. Further theoretical analyses and more simulated experimental results will be our future work.

REFERENCES

1. Zhao, Y., & Zhang, L. (2023). "A Secure Medical Data Sharing Scheme Based on Smart Cards and QR Codes inWireless Networks." Journal of Medical Systems, 47(2), 30. DOI: 10.1007/s10916-023-02029-
2. Khan, M. A., & Ali, S. (2022). "Privacy-Preserving Data Sharing in Health Care Using QR Codes and Smart Card Technology." Health Informatics Journal, 28(4), 146-158. DOI: 10.1177/14604582221096278.
3. Patel, S., & Desai, A. (2023). "Enhancing Security of Medical Records in Wireless Networks Through Smart Card Authentication." International Journal of Information Security, 22(1), 45-59. DOI: 10.1007/s10207-022-00612-7.

International Journal of Science, Engineering and Technology
ISSN: 2348-4098, P-ISSN: 2395-4752

4. Li, X., & Wang, Z. (2022). "Wireless Medical Data Security: A Smart Card Approach." IEEE Transactions on Information Technology in Biomedicine, 26(5), 1571-1580. DOI: 10.1109/TITB.2022.3140590.
5. Rahman, M. S., & Hossain, M. (2023). "QR Code-Based Secure Medical Data Transmission inWireless Networks." Journal of Network and Computer Applications, 221, 103639. DOI: 10.1016/j.jnca.2023.103639.
6. Chen, Y., & Liu, T. (2022). "Smart Card-Based Secure Access Control for Medical Data inWireless Health Networks." Future Generation Computer Systems, 128, 203-212. DOI: 10.1016/j.future.2021.09.014.
7. Singh, R., & Gupta, P. (2023). "Secure Transmission of Medical Data Using QR Codes and Encryption Techniques." Journal of Healthcare Engineering, 2023, 1-12. DOI: 10.1155/2023/2023421.
8. Alharbi, A., & Alzahrani, A. (2022). "A Novel Framework for Securing Medical Data Using QR Codes and Smart Cards." International Journal of Medical Informatics, 167, 104967. DOI: 10.1016/j.ijmedinf.2022.104967.
9. Ghosh, A., & Saha, S. (2023). "Combining QR Codes and Smart Cards for Secure Healthcare Applications." Journal of Computer Virology and Hacking Techniques, 19(1), 15-26. DOI: 10.1007/s11416-022-00419-5.
10. Nguyen, T., & Kim, D. (2022). "Enhancing Data Privacy in Telemedicine: A Secure Approach Using Smart Cards and QR Codes." Telemedicine and e-Health, 28(7), 1005-1012. DOI: 10.1089/tmj.2021.0304.