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Enhancing Medical Data Privacy and Security in Wireless Networks via Smart Card and QR Code

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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 an era where healthcare data is increasingly stored and transmitted over wireless networks, ensuring the privacy and security of medical information has become a critical challenge. This project focuses on developing an advanced framework that enhances medical data privacy and security through the integration of smart card technology and QR codes, leveraging Aadhar card authentication mechanisms. The proposed framework utilizes smart cards to securely store patient information and facilitate access control, while QR codes provide a user-friendly method for data sharing and verification. By incorporating Aadhar card authentication, the system ensures robust identity verification, preventing unauthorized access to sensitive medical data. The framework aims to address vulnerabilities associated with wireless networks, offering a comprehensive solution that safeguards patient privacy while maintaining the efficiency of healthcare services. Through a combination of innovative technologies, this project seeks to create a secure environment for managing medical data, ultimately fostering trust in digital health solutions and protecting patients' rights to privacy.

In medical management, more and more information technologies are applied to improve work efficiency. For example, the hospital information management system is used to carry out a patient's basic information and medical

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management, the wrist one-dimensional QR code is employed to quickly read or input a patient's identity (ID) and so on. Information technology brings convenience while at the same time there are certain secure drawbacks in several typical scenarios because of immature technology or management vulnerability, such as, the health record transparency leaks user privacy, access to view the medical privacy record is not strictly controlled, infusion confirmation is without technical authentication, patient wrist ID is easy to be forged, payment is not convenient and so on.

The objective of this project is to develop a system where a person can enter his/her medical information. The system mainly focuses on the ability to quickly access information in case of any emergency. The users will be able to see the details of the person who needs any kind of medical attention. The system provides the information of the person, which includes his recent medical records and also personal details.

II. PROBLEM STATEMENT

There are many reasons people fail to recognize the symptoms and secure medical data storage about any disease and because of that or lack of knowledge, peoples will not get proper treatment or help immediately, so it will prove hazardous to people's health. So to overcome these problems we implement this system using which user/patient will hide his/her information inside the QR Code in the Smart Card like Aadhar Card the system will store the data of doctor with that patient/user. Doctor will recognize the symptoms as well as Scan that QR Code and assign treatment to the patient. Chemist will scan that QR Code ads give medicine to patient/user.

III. SYSTEM OVERVIEW

We implement and creating an application, which uses a login form to authenticate the user into his personal account where he provides all the personal details and information of his medical records. The details are then saved in the database and a QR code is generated which contains the required details of the user. In the case of emergencies, the QR code can be scanned and the details stored in the database are retrieved. This saves the time to start the treatment of a patient admitted at an emergency. This saves time taken to complete all medical procedures in order to start operating the patient. It is also a safe and secure data storage and retrieval. By applying this method, it not only saves the life of the victim but also helps the physicians to work at ease. In order to shorten the paperless work procedures when a patient visiting regularly or seen in the emergency case, we will be retrieving their information which is scanned with the help of a QR Code containing a link of the victim's emergency information stored in database. When patients first visits to hospital, perform registration process with system. After that doctor scan QR Code that will display all the information which is stored the previous history/ treatment for that patient. Doctor will perform check-up of patient and update current information into QR Code each and every time and also medical treatment task like (CT Scan, MIR, Blood Test, X ray) will also scan that QR Code and perform treatment and gives the medicine, if required we will add digital wallet for online and instant payment purpose. Using QR Code we generate unique tag for patients all information instated of carrying reports and documents.

QR Code Technology: - QR code [1], abbreviated from Quick Response Code, is the trademark for a type of matrix barcode or two dimensional barcode. A QR code uses four standardized encoding modes (numeric, alphanumeric, byte/binary, and kanji) to efficiently store data; extensions may also be used. A QR code consists of black modules (square dots) arranged in a square grid on a white background, which can be read by an imaging device (such as a camera, scanner, etc.) and processed using Reed–Solomon error correction until the image can be appropriately interpreted. The required data are then extracted from patterns that are present in both horizontal and vertical components of the image.

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Fig.1: QR Code

QR Code Representation: - Nowadays, when smart phones equipped with cameras are very common, conveying message via QR code has become popular. As the aim was to transfer data from a document to a mobile phone in a feasible way it was a rational choice to apply this standard to our purposes. This standard of graphical data representation, established in 1994, can hold even 2953 Bytes on a 177 by 177 modules pattern. It possesses an attribute in encoding data resistant for slight code distortions. There were set up four error correction levels and the higher the level, the less is storage capacity. [5] The levels L, M, Q and H allow retrieving the whole message when up to 7, 15, 25 and 30% respectively of the QR image is destroyed. The priority was in getting as much space for data as possible, not particularly in damage resistance. That is why the level L was acclaimed as sufficient.

One Time Password (OTP): - You may go through Generate a One Time Password or Unique Identification URL article before this for better understanding.

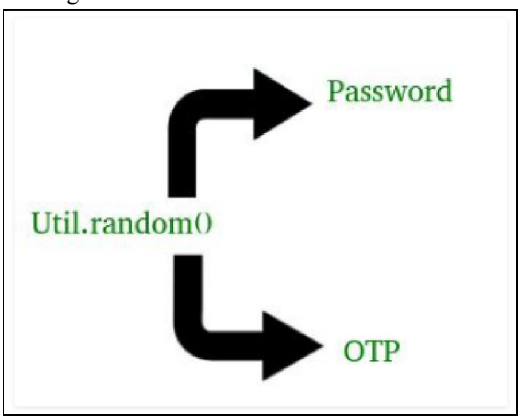

Fig.2: OTP

AES Encryption: -

AES algorithm encrypts the medical data upto 128 bits. Patient who want their laboratory report first of all he has to take the personal key during its first visit in the laboratory. So, at that time patient having labSeq-p application to encrypt and decrypt the data and load into in database.

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System Architecture: -

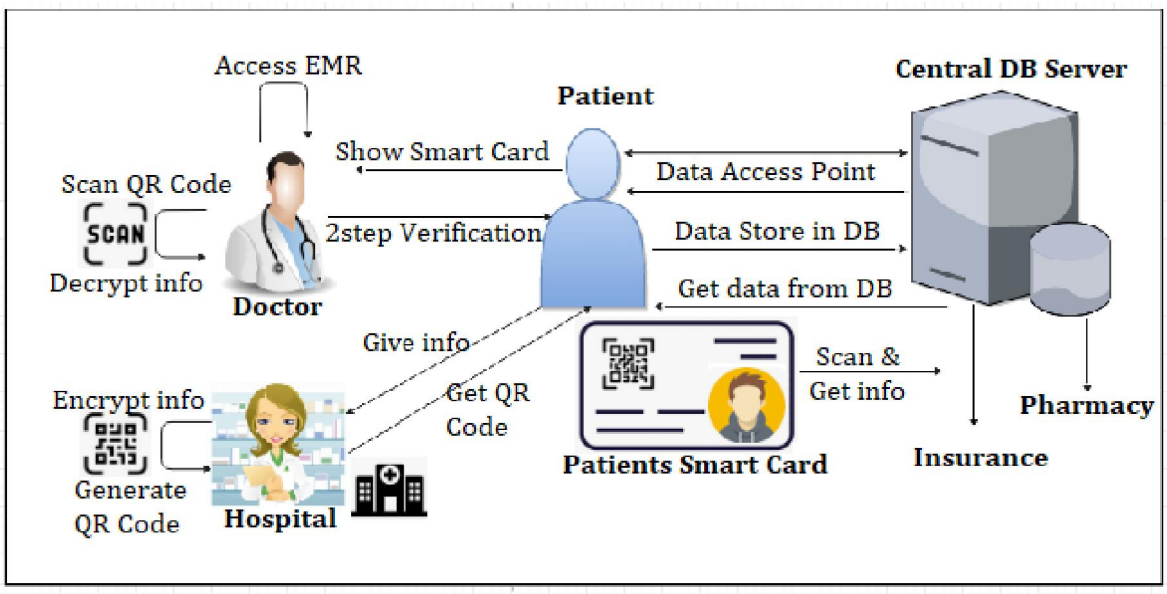

Fig.3: System Design

The architecture of the system is simplified and represented in the figure b. This schematic representation of the architecture shows the processes, services and related activities that happen in the entire system. This is a consolidated representation of what happens at what point of time in which device in the system.

IV. IMPLEMENTATION

In order to shorten the paperless work procedures when a patient visiting regularly or seen in the emergency case, we will be retrieving their information which is scanned with the help of a QR Code containing a link of the victim's emergency information stored in database. When patients first visits to hospital, perform registration process with system. At the time of login there are two step one is password based and another is OTP based, in password based he will enter his username/ email with password. In second step the system will ask the OTP displayed the normal keypad which is visualized and respected OTP and the actual pattern of that keypad is sent to user's email ID upon successfully entering the correct email and password of that user. Upon successful login, user will his check-up details and submits and system will generate the QR of that user's information and that QR will be keep at admins records and user will get the ID for his record. When user visits the hospital he will tell only his ID and admin will scan respected ID's QR code and proceeds accordingly. If any change in user's details, then he will login to his account and do changes then system will generate new QR code. And next time admin will use that newly generated QR code. The admin or hospital person who handling this system can view all the details of all the users registered with that system as he is only authorized person.

V. CONCLUSON AND FUTURE SCOPE

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.

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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.

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