

E-Healthcare System Using Smart Card

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ABSTRACT: This project aims to build a secure E-Healthcare system that uses smart cards to provide quick and safe access to patient medical records. Each patient will be issued a smart card, similar to an Aadhaar card, with a unique ID and QR code containing personal and medical details. Doctors, hospitals, insurance providers, and pharmacies can access the patient's records after a two-step verification process, ensuring that only authorized users can view or update sensitive data. The system is designed as a web-based application in Java with centralized data storage, making medical information accessible globally. The proposed system includes multiple modules such as Patient, Hospital, Doctor, Insurance, Pharmacy, and Admin. A patient can generate a smart card from a nearby hospital and use it for booking appointments, consultations, insurance claims, and purchasing medicines. By providing secure, centralized, and reliable healthcare data management, this system reduces paperwork, prevents fraud, and improves the efficiency of healthcare services. It ensures that patients receive fast, accurate, and safe medical support while maintaining data privacy and security. The system is developed using Java web technology and integrates modules for Patients, Doctors, Hospitals, Insurance, Pharmacy, and Administration. It features a two-step authentication mechanism to ensure data privacy and prevent unauthorized access. By combining digital health records with smart card technology, this project enhances data security, simplifies access to healthcare services, and promotes a globally connected healthcare ecosystem.

KEYWORDS: E-Healthcare, Smart Card, QR Code, Centralized Database, Patient Records, Secure Access, Java Web Application, Two-Step Verification, etc.

I. INTRODUCTION

The healthcare industry is evolving rapidly, and digital transformation plays a vital role in improving patient care and data management. In traditional healthcare systems, patient records are usually stored in separate hospital databases, making it difficult to share or access medical information across different healthcare providers. To address these challenges, this project introduces a secure E-Healthcare System that uses smart cards to manage and access patient health data efficiently. The smart card contains a unique ID and QR code that help authenticate users and link them to their centralized medical records stored on the server. Doctors, hospitals, pharmacies, and insurance providers can access authorized data through a web-based Java application, ensuring convenience and security in medical record handling. 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 interface built using Java technology. Hospitals and health care 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

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.

A. 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.



Fig.1: QR Code Technology

B. 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.

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

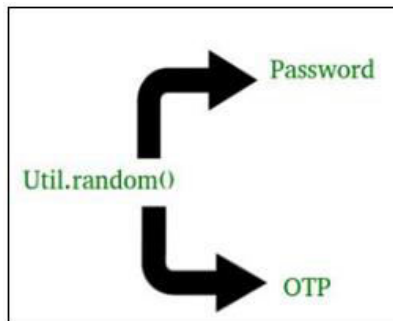


Fig.2: One Time Transfer (OTP) Protocol

D. 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.

E. System Architecture: -

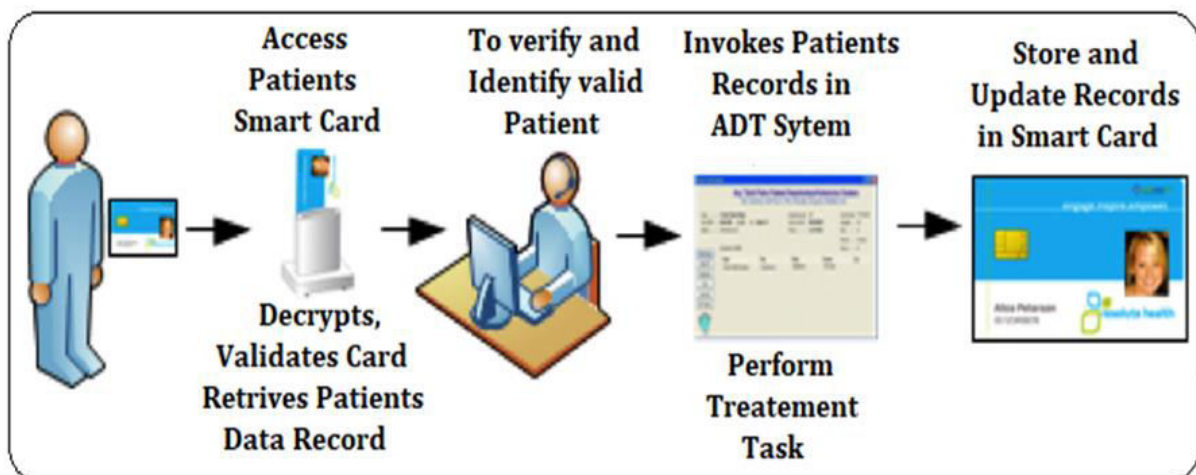


Fig.3: System Architecture Design

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. SYSTEM 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.

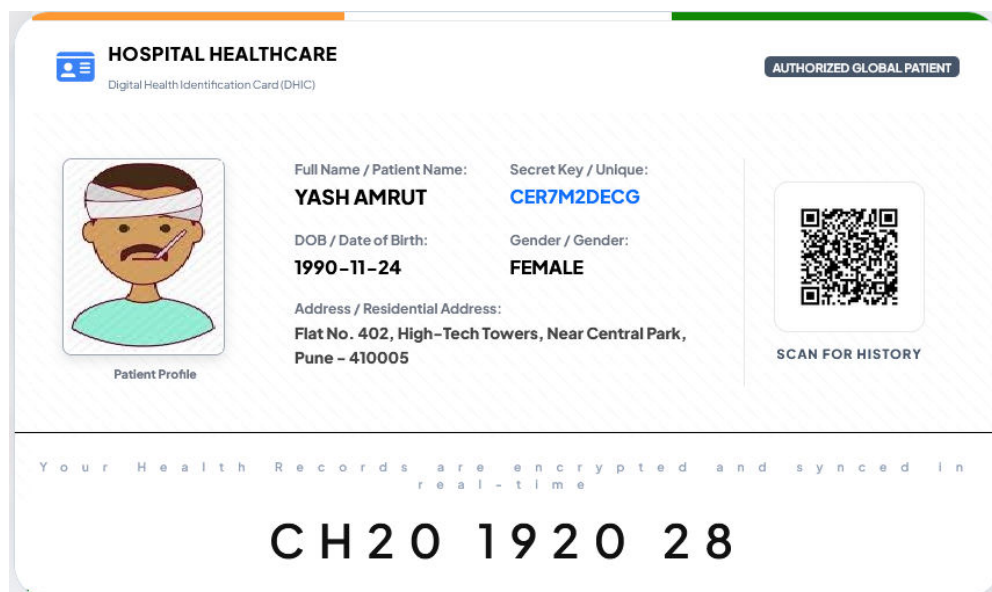


Fig.4: Smart Healthcare Card

V. CONCLUSION AND FUTURE SCOPE

In this paper, we have presented the concept of sharing emergency information through QR codes. The Secure E-Healthcare System Using Smart Cards provides a secure, efficient, and user friendly platform for managing patient medical records. By using smart cards containing unique IDs and QR codes, the system ensures authorized access to sensitive medical information. The centralized database allows doctors, hospitals, insurance agents, and pharmacies to access patient records worldwide in a safe and organized manner. The system successfully implements key functionalities such as smart card generation, appointment scheduling, two-step verification, medical record access, and insurance or pharmacy services. It reduces manual errors, prevents unauthorized access, and speeds up healthcare processes, making it a reliable solution for modern e-healthcare services.

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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