International Research Journal of Engineering and Technology (IRJET) e-ISSN: 2395-0056
Volume: 12 Issue: 09 | Sep 2025 www.irjet.net p-ISSN: 2395-0072

Digital Medical Prescriptions & Automatic Delivery of Drugs

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Abstract - A QR Code is a two-dimensional matrix code designed with two objectives: it must contain more data than one-dimensional barcodes, and it must have the ability to adapt quickly via phones, tablets, or computer cameras equipped with QR Code scanning software. Each QR Code has a distinct pattern. Doctors in hospitals and clinics issue medical prescriptions to patients that contain the patient's name, date of visit, name of medicines, number of doses, and other pertinent medical information. However, not all information about the medication is provided in the prescription. In such a circumstance, digitalisation of the prescription paradigm becomes necessary. Making digital prescriptions will not only give patients all important information about their medications, but it will also save paper, make the process of writing prescriptions more economical, and eliminate worries about fake prescriptions. Ideally, when patients are done consulting with the doctor, they must proceed to the receptionist to make their payment. They then head to the pharmacy to purchase medications. This represents an excessive effort for the patient, and it might cause stress. As a result, the purpose of this study is to create a solution that allows a patient to easily access all information about their medication prescribed by a medical professional and simply purchase the prescribed medicines without having to go to the pharmacy by directly delivering the prescription medications to the patient's home.

Key Words: Medicines, Authentic Prescriptions, QR Codes, Pharmacy Supply Chain

1.INTRODUCTION

Digitisation and automation are extremely crucial in our daily lives. The process of converting information into a digital format is known as digitisation. Automation encompasses a broad range of technologies that assist in the reduction of human involvement in processes.

A quick response code is a black-and-white square image that can hold data for a locator, identifier, or tracker that is linked to an application or a website. Anyone with a smartphone can conveniently scan it and access the information linked with the code.

The main objective of this study is to digitise medical prescriptions in order to make all prescribed details easily available to patients seeking medication and to automate the process of purchasing medicines from pharmacies. We are attempting to reduce the amount of work a patient has to do in this process by automating the payment steps for purchasing medications from a pharmacy.

2. Literature Review

1. QR Code to Secure Medical Management

Utilising visual secret sharing (VSS) technology and the functionality of QR codes, this paper first evaluates the current state of medical management technology and its unpatched vulnerabilities prior to actually discussing the possible applications of quick response (QR) code to secure medical management administration and enhance medical management security.

2. A Jin-Based Solution for E-Prescriptions

The main goal of this research is to concentrate on this problem and describe a Jini-based prototypical solution for electronic prescriptions, which enables their wireless transmission to in-range pharmacies and the enhancement of the service levels provided to the user, for example, by providing the patients with information about queue lengths and anticipated waiting times. High levels of agreement were identified in the therapeutic and user assessments of the prototype's performance, simplicity, and utility.

3. Quick Response Code: Medical Prescription

The creation of a medication prescription QR code is one of the study's goals. Analysis, design, implementation, testing, deployment, and maintenance phases are all included in the approach. This research describes Medication Prescription QR codes, which provide patients with concise and easy-to-access information about prescribed drugs.

4. Pharmacy Supply Chains Models

This study assesses prospects for pharmaceutical supply chain (PSC) reconfiguration driven by manufacturing technology advancements and new, patient-centred delivery models. In order to identify, define, analyse, and classify PSC models, a critical synthesis of both academic and practical literature is used.

In order to provide information on a wider range of OR activities, from conceptual to mathematical modelling and model solution, up to implementation, a systems view of operations research is adopted from a theoretical perspective.

5. Authenticated Prescriptions Using Digital Signature

This research focuses on the usage of a cryptographic signature technique for electronic prescriptions in order to protect against cybercrime concerns such as robbery, tampering, and unauthorised access. In this research, the RSA 2048-bit algorithm was utilised in Java programming and an Android-based system. A Secure Electronic Prescription (SEP) application of this type is meant to integrate specialised services such as nondisclosure, authentication, and non-repudiation.

6. Medical Prescription Model Based on a Web Application

This paper proposes a medical prescription model for the issuing of an automatic prescription according to certain symptoms, which will be authorised by a doctor in charge. The model is implemented within a web application that permits the collection of the patient's medical record and symptomatology in order to ease their treatment and the prescription of medical prescriptions. It should be mentioned that the patient is autonomous in recording their medical record and symptoms, which are compared with the online application's database to create the automatic medical prescription. The issue stems from patients' inability to make a medical visit to a health facility, as well as Peru's high prevalence of self-medication.

7. E-Prescriptions Using Blockchain Technology

E-Prescription refers to the electronic transfer of a prescription from a doctor to a pharmacy for the patient's retrieval. A system like this would improve overall medical prescription administration by publicly registering them using blockchain technology in such a fashion that an electronically issued medical prescription may be recognised by any pharmacy or healthcare professional. The article describes a potential implementation of a system for issuing and tracking electronic medical prescriptions.

8. Medical Handwritten Prescription Using CRNN

Reading a doctor's handwritten prescription is a barrier that most patients and some pharmacists encounter; an issue that can result in adverse effects in some situations owing to incorrect prescription decoding. Doctors adopt Latin acronyms and medical vocabulary that most people do not understand, which contributes to the difficulty in interpreting their prescriptions. This research shows how Artificial Neural Networks (ANN) are used to create a system smart enough to recognise handwritten English medical prescriptions. Input photos are segmented and processed to recognise characters and categorise them into the 64 distinct preset characters using the Deep Convolutional Recurrent Neural Network to train this supervised system.

9. Patient Satisfaction with Online Pharmacy Services

The satisfaction evaluations of 323 patients with online pharmacy services are presented in this study. Patient satisfaction was high with online pharmacy services in general (67.8% of respondents), medicine prices (70.9% of respondents), transportation charges (55.1% of respondents), home delivery of medicines (62.5% of respondents), and pharmacists' professional skills (77.7% of respondents). Patient satisfaction with advice obtained by phone (47.1% of respondents) or e-mail (48.3% of respondents) from pharmacists with information on their drugs was poor.

10. QR Code for Identity Tag System

This study evaluated and implemented a QR Code Identity Tag system for healthcare in Turkey. The Identity Tag System uses a QR code for the healthcare system, according to this study. It was utilised for medication identification notifications and a patient identification system. The researchers reported that the QR Code Identity Tag was connected to the healthcare system. Each member of the medical system will be allocated a QR code tag, which will be worn as a bracelet or necklace or carried as an ID card, and each QR code will be unique. Additionally, patients must always wear the QR code identification wristbands while in the hospital since this QR code bracelet is linked to the QR code identity website.

Review Summary

Overall, the fundamental distinction between the two concepts is the incorporation of QR codes for prescriptions in the online pharmacy. This tool can assist patients to speed up the drug pickup procedure and enhancing medication adherence. Furthermore, the availability and company behind the platform may differ between the two concepts, and patient data security is a crucial factor for both.

3.METHODOLOGY

The research is divided into five stages. The procedures are categorised as follows: analysis, design, implementation, and deployment. These stages contribute significantly to the successful execution of the proposed idea.

1. Analysis

The analysis of the proposed system includes the following steps:

- Evaluation of the proposed system: The suggested approach entails a patient obtaining a medical prescription from a doctor digitally via a website or a mobile app, where both physicians and patients must be logged in using their phone numbers.
- Comparison with existing systems: In the current system, the patient consults a doctor to obtain medication and receives a medical prescription on traditional printed paper. To purchase medications online, they must physically take a picture of the prescription and upload it to the site.

This is a long and exhausting process in which the patient does the majority of the effort. In addition, it takes quite some time to authenticate the prescription by the system.

In comparison, our recommended system looks after the user from the time he or she obtains a medical prescription from the doctor until the time they pick up drugs from pharmacies in person or purchase medicines online in the same manner they do groceries.

2. Requirements

This study execution incorporates the use of both the web app and the mobile app. The online app includes choices for doctors and pharmacists for administering prescriptions, medicines, and payments. The mobile app is more patient-centred. The requirements are classified as follows:

- Doctors

Doctors can sign up by providing their phone numbers and the doctor's registration number. The doctor's registration number will be essential as that is how we can authenticate doctors. Doctors will be authorised by providing their registration number to the National Medical Commission's Indian Medical Registry Search using an HTTP POST request to the website.

Once the doctors are authenticated, they can further head on to build their profile. The profile must include the credentials of the hospital the doctor works in and the credentials of the doctor. These credentials will be used in

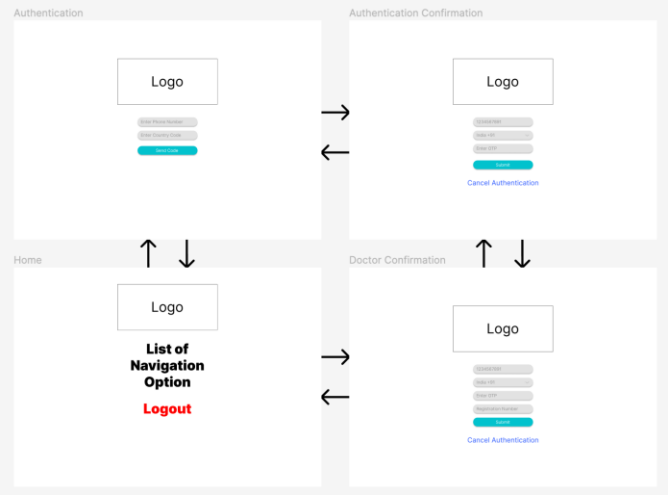

Fig. 1: Wireframes for Authentication of Doctors

- Pharmacy Stores

Pharmacies can register by providing their phone numbers and licenses. To get started, the store must wait for a couple of business days for verification. We must perform the authentication manually due to the fact that there is no registry where the validity of pharmacies can be confirmed.

- Patients

To get started, patients must sign up with the mobile app using their mobile numbers. Patients must also provide proof of identification, such as a government ID. We will use the Aadhaar Card for this research, which is a 12-digit person-identifying number issued by the Unique Identifying Authority of India on behalf of the Government of India. After signing up, patients must enter their home addresses in order for their orders to be executed. They will also be provided an option to delete their account or log out.

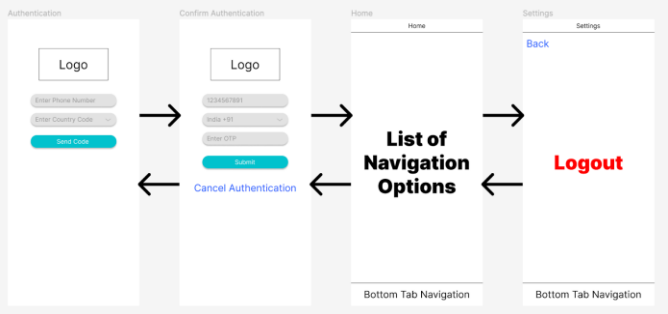

Fig. 2: Wireframes for Authentication of Users

3. Design

The suggested system's implementation includes the frontend, backend, cache, and database. The backend will contain all API endpoints beginning with api/v1. The front end will then perform CRUD (Create, Read, Update, and Delete) calls to these backend APIs.

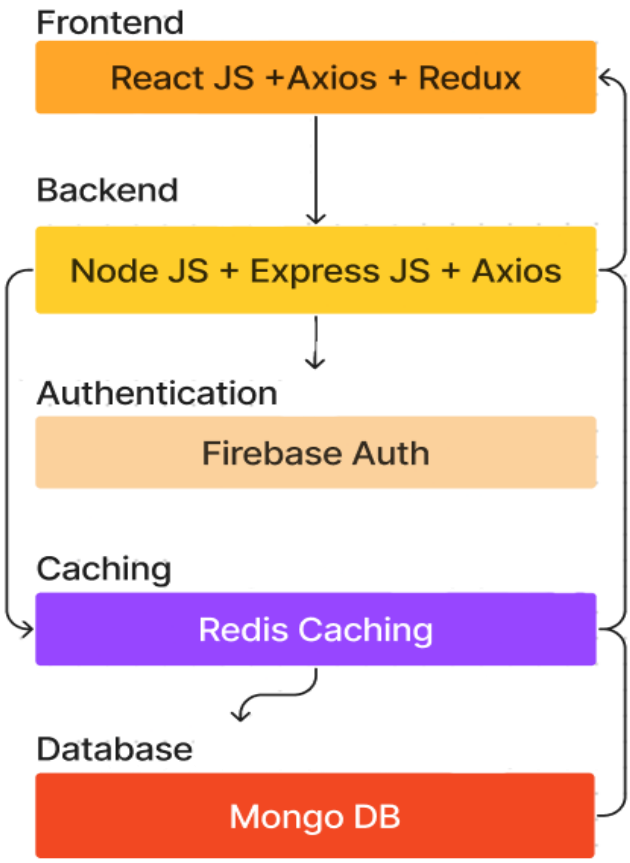

Fig. 3: Tech Stack used in the proposed system

React JS will be the framework used on the front end for this project, along with enablers including Axios JS for calling APIs (Application Programming Interfaces) from the backend and Redux JS for state management.

We aim to leverage Node.js with Express JS in the backend to develop and deliver APIs. Axios JS will also be essential in the implementation of third-party APIs. Firebase Auth will be used to manage user authentication via phone numbers or email for users.

For caching, we will be incorporating Redis Cache in order to not make unnecessary database queries. By adding Redis Cache, it will make it possible for the entire system to run faster.

MongoDB is the database that we want to use. It is an open-source, cross-platform, document-oriented NoSQL database. It uses JSON-like documents with schemas that are optional. We will use Mongoose, an object data modelling library, to integrate MongoDB with NodeJS and ExpressJS.

4. Implementation

The implementation includes the patient seeing a doctor, who writes up the prescription on the proposed system's web/mobile app and saves it in order to generate a new medical prescription with a QR Code for the patient. The prescription is subsequently reflected on the patient's phone.

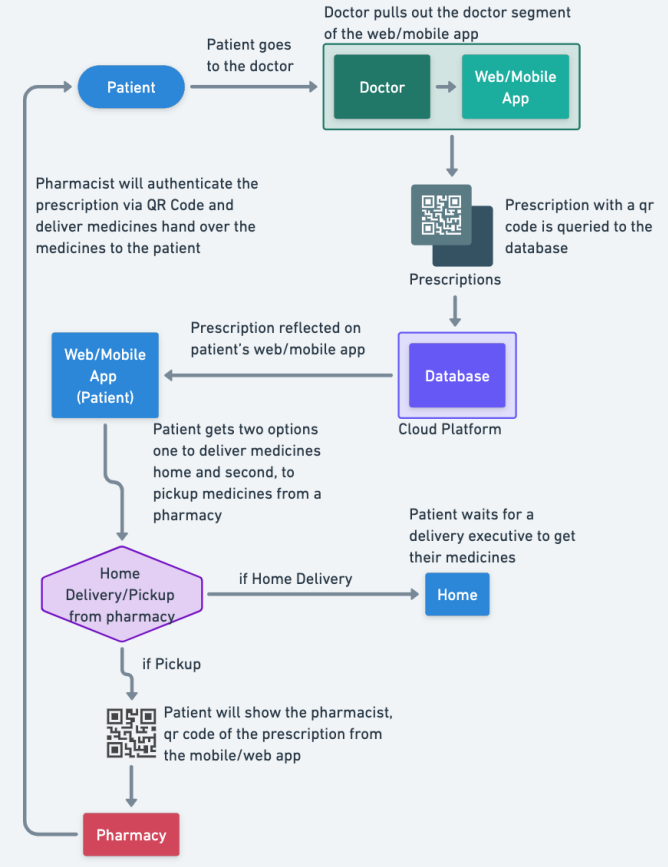

Fig. 4: Full Flow of the Proposed System

Once the patient has received the prescription, they get two options on the mobile app/website. First, it will send the prescription to a pharmacist and keep the medicines ready. Second, it will deliver medicines to the patient's home via a delivery executive.

By clicking on the pickup options, the user will be given a list of medical stores within a ten-kilometre radius. These stores will be sorted based on the availability and cost of medicines, as well as the closeness of the medical store to the user's current location. The user can then select a desired medical store and tap the authorise button to confirm payment. All the user has to do now is to go to the pharmacy, show their prescription's QR code from the

mobile app to the pharmacist and pick up the medicines. Note that the pharmacist will use the mobile app interface of the proposed system in order to scan and validate each prescription's QR code.

By selecting the home delivery option, our systems will locate the medical stores nearest to the patient's residence that provide the best pharmaceutical prices to the customer. The chemist will automatically get the patient's prescription by this time. They may simply validate the prescription and send it to the patient via a delivery executive using this method. All the user has to do now is tap on the authorise button, go home and wait for medicines.

Ultimately, the online pharmacy with QR codes for prescriptions was implemented through a rigorous process of requirements gathering, design, programming, testing, deployment, and maintenance. The final platform was created to fulfil the medication management demands of patients and healthcare providers while also protecting patient data confidentiality and privacy.

Not only does the app's patient segment provide a convenient platform for users to effortlessly monitor and manage their dosages, but it also empowers patients to actively participate in their healthcare journey. By meticulously keeping track of their medication intake through this intuitive feature, individuals gain invaluable insights into their treatment progress, fostering a sense of ownership and responsibility. Furthermore, this comprehensive data repository serves as a valuable resource for healthcare providers, enabling them to assess the level of commitment and adherence displayed by patients toward their prescribed medications. With this enhanced understanding, doctors can make informed decisions, tailor treatment plans, and offer personalised guidance to optimise patient outcomes and overall well-being.

E. Deployment

The suggested system design comprises the frontend, backend, cache, and database layer. Where the front end will be containerised using Docker, a development operations tool. This makes shipping the frontend container as a serverless function a breeze.

The backend will also be containerised using Docker and delivered as a serverless function for seamless container maintenance and updates.

The Redis cache layer will be hosted on a cloud server, while the front end and back end will be deployed as serverless services. It is not a good idea to distribute the cache layer with the backend container since it will create issues when making modifications or upgrading the server.

The database will also be hosted on a remote cloud server for effective administration and maintenance of MongoDB, which is a No-SQL or Document-based database.

4. CONCLUSION

The creation of an online pharmacy that accepts prescriptions with QR codes has the potential to revolutionise how patients handle their medication. By utilising a QR code, patients can easily access their prescriptions and swiftly collect their medications at the pharmacy. This innovative platform also features a robust patient segment, empowering individuals to actively monitor and manage their dosages, promoting adherence and treatment efficacy. The user-friendly interface fosters a sense of control and engagement, encouraging patients to take ownership of their healthcare. Additionally, the comprehensive data collected within the patient segment provides valuable insights to healthcare providers, enabling them to make informed decisions, tailor treatment plans, and optimise patient outcomes. Alongside the convenience of QR code-based prescription retrieval, the platform facilitates online prescription orders and offers delivery options, enhancing accessibility for those preferring home delivery. This seamless integration of technology and pharmaceutical services reshapes medication management, empowering patients to actively participate in their treatment journey while supporting healthcare providers in delivering personalised care and informed decision-making.

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