Project 21: Westcoast Health- Electronic Prescription System

About the Client

Westcoast Health is the major provider of acute, maternity, sub-acute, mental health, specialist, community and home-based services in Melbourne's rapidly growing outer north.

Services are provided through our fifth main campuses:

Westcoast Hospital Epping, Broadmeadows Hospital, Bundoora Centre, Craigieburn Centre, and Kilmore District Hospital. In addition, Mental Health Services are provided at Epping, Broadmeadows, Jacana, Preston, Mill Park and Coburg.

Our emergency department treats over 110,000 patients each year and supported over 35,000 patients in the Virtual ED. Westcoast Health cares for over 97,000 patients admitted to hospital each year (over 35,000 arriving by ambulance) and assists with the delivery of over 3,300 babies.

The Westcoast Health catchment includes three of the state's six growth areas: Hume, Whittlesea and Mitchell. The swift development of new suburbs in the north will see our population grow over 74% (more than 290,000 people) by 2036.

Westcoast Health cares for a diverse community, born in more than 185 countries, who speak over 107 different languages and follow over 90 different religions or beliefs.

Westcoast Health has over 8,000 dedicated professional staff and has annual revenue turnover of over $900 million.

Project Brief & Business Problem Specifications:

Westcoast Health is facing challenges in securely issuing and managing prescriptions. Paper-based or unverified digital prescriptions can be forged, lost, or altered, leading to:

- Medication errors
- Fraudulent use of controlled substances

- Administrative overhead for manual validation

Pharmacies at Westcoast Health need a reliable way to verify prescription authenticity before dispensing. Without a centralised, secure system, both patients and healthcare provider are exposed to avoidable risks and inefficiencies.

System Modules Requirements

User Management

- User registration and login
- Role-based access control
- User profile management
- Secure password hashing and reset
- User roles:
    - Doctor
    - Pharmacist
    - Patient
    - Admin

Patient Management

- Patient registration (by admin or doctor)
- View and update patient profiles
- Link users to patient records
- Manage demographic and medical information

Prescription Management

- Doctor creates new prescription:
    - Medicine details
    - Dosage instructions
    - Duration and notes

- Unique prescription ID generation
- QR code generation with secure token
- View, edit, or delete prescriptions before dispensing
- PDF generation with embedded QR code
- Prescription listing for doctor and patient

QR Code Generator

- Generate QR codes upon prescription creation
- Encode:
    - Prescription ID
    - Secure validation token
- Store QR image on server or generate on-the-fly
- Embed QR code in prescription PDF

Pharmacy Validation and Dispensing

- Pharmacist scans or enters QR data
- System verifies:
    - Prescription exists
    - Token is valid
    - Not previously dispensed
- Display prescription details
- Mark prescription as dispensed with pharmacist ID and timestamp
- Log dispensing action

Patient Portal

- Secure patient login
- View list of personal prescriptions
    - Drug name
    - Dosage instructions

    - QR code
    - Status (pending or dispensed)
- Download or print prescription PDF

Audit Log

- Record key system actions:
    - Logins and logouts
    - Prescription creation
    - QR validation attempts
    - Dispense confirmations
- Admin view and search of audit logs

Admin Dashboard

- Manage user accounts:
    - Add, edit, delete users
- View system logs and audit trails
- Manage system settings
- Generate reports:
    - Total prescriptions issued
    - Dispensed vs pending
    - Doctor and pharmacist activity

Notifications

- Email or SMS notifications:
    - When a prescription is issued
    - When a prescription is dispensed
- Customisable notification templates

Reports Module

- Admin reports:
  - Total prescriptions by doctor
  - Dispensed vs pending status
  - Top medications prescribed
- Export reports as CSV or PDF

Security Module

- Password hashing
- CSRF protection for forms
- Input validation and sanitisation
- HTTPS enforcement
- Secure QR validation tokens (HMAC or UUID)

User Modules (User Frontend):

Developers need to research and discuss with the client to finalise the modules and requirements.

UI Design

User Interface Design is concerned with the dialogue between a user and the computer. It is concerned with everything from starting the system or logging into the system to the eventually presentation of desired inputs and outputs. The overall flow of screens and messages is called a dialogue.

UI Design Requirements

1. The system user should always be aware of what to do next.
2. The screen should be formatted so that various types of information, instructions and messages always appear in the same general display area.
3. Message, instructions or information should be displayed long enough to allow the system user to read them.
4. Use display attributes sparingly.
5. Default values for fields and answers to be entered by the user should be specified.
6. A user should not be allowed to proceed without correcting an error.
7. The system user should never get an operating system message or fatal error.

The aim of proposed system is to develop a system of improved facilities. The proposed system can overcome all the limitations of the existing system. The system provides proper security and reduces the manual work.

- Security of data.
- Ensure data accuracy's
- Proper control of the higher officials.
- Minimize manual data entry.
- Minimum time needed for the various processing.
- Greater efficiency.
- Better service.
- User friendliness and interactive.
- Minimum time required.

Functional Requirements:

User Authentication and Management

- User registration and login with secure password hashing
- Role-based access control for Doctor, Pharmacist, Patient, and Admin
- Admin management of user accounts (create, edit, delete)
- Password reset functionality

Patient Management

- Creation and management of patient records by Doctors and Admins
- Storage of patient demographic details (name, date of birth, contact info)
- Linking of patients to user accounts for secure login
- Patient access to personal records

Prescription Creation (Doctor Module)

- Doctors create new prescriptions for selected patients
- Capture of medicine name(s), dosage instructions, duration, and notes
- Generation of unique Prescription IDs
- Creation of secure validation tokens
- Generation of QR codes containing Prescription ID and token
- View, edit, or delete prescriptions before dispensing
- Downloadable PDF prescriptions with embedded QR codes

QR Code Generation and Storage

- Automatic generation of QR codes on prescription creation
- Encoding of Prescription ID and secure validation token
- Storage or dynamic generation of QR images
- Display of QR codes in prescription details

Prescription Listing and Search

- Doctor access to lists of issued prescriptions
- Patient access to personal prescriptions
- Pharmacist search functionality by Prescription ID, patient name, doctor name, or date

Pharmacy Validation and Dispensing

- QR scanning or manual entry of prescription data by Pharmacists
- Verification of Prescription ID, token validity, and dispense status
- Display of prescription details on successful validation
- Marking of prescriptions as dispensed with pharmacist ID and timestamp
- Error handling for invalid, expired, or previously dispensed prescriptions

Patient Portal

- Secure patient login
- Viewing of prescription details including medicine info, dosage, QR code, and dispensing status
- Download and print options for prescription PDFs

Audit Logging

- Logging of key actions such as logins, logouts, prescription creation and editing, QR validation attempts, and dispensing
- Admin access to view and search audit logs

Admin Dashboard

- User account management
- Viewing and searching of system logs
- System settings management
- Reports on prescriptions issued, dispensing status, and activity by doctor and pharmacist

Notifications

- Email or SMS notifications to patients when prescriptions are issued or dispensed
- Configurable notification templates

Reporting

- Generation of reports on total prescriptions per doctor, dispensed vs pending status, and top medications
- Export options for CSV or PDF

Security Features

- Secure password hashing for all user accounts
- HTTPS enforcement for all communication
- Input validation and sanitisation to prevent SQL injection
- CSRF protection for forms
- Tamper-resistant QR validation tokens (e.g., HMAC or UUID)

Non Functional Requirements

There are a lot of software requirements specifications included in the non-functional requirements of the system, which contains various processes, namely Security, Performance, Maintainability, and Reliability.

Security:

- Cybersecurity Implementation: Identify ethical risks in database design and

implement the actions of mitigation.

- Cybersecurity Implementation: Provide evidence that you have implemented the data encryption and anonymization of data.
- Cybersecurity Implementation: Perform 'Data Protection Impact assessment' to help ensure compliance, facilitate a privacy by-design approach and identify better practice.
- Cybersecurity Implementation: Implement the secure methods for data encryption, data security and data breach to maintain the privacy of end users.
  - Password hashing
  - HTTPS enforced for all client-server communications
  - CSRF protection for all forms
  - Input validation and sanitisation to prevent SQL injection
  - Secure QR code validation tokens using HMAC or UUID
  - Role-based access control enforcing least privilege
  - Audit logs for all critical actions (creation, validation, dispensing)

Performance

- Page load times under 2 seconds for typical user actions
- Support for at least 100 users without significant slowdowns
- Prescription QR validation in under 1 second

Scalability

- Database design supporting future growth to thousands of users
- Modular codebase to enable adding new features (e.g., API integration, mobile apps)
- Ability to expand to multiple clinics or pharmacy chains

Availability

- System uptime target of 99.5% excluding planned maintenance
- Clear maintenance schedule and user notifications for downtime

Reliability

- Accurate storage and retrieval of prescription data without loss or corruption
- Consistent QR code validation even under load
- Transactional integrity for updates (e.g., marking prescriptions as dispensed)

Maintainability

- Modular PHP code with clear separation of concerns (MVC or similar)
- Use of naming conventions and documentation for easier maintenance
- Database schema designed with foreign key constraints and indexes

Usability

- Intuitive and responsive web interface for all user roles
- Mobile-friendly design for patients and pharmacists
- Clear error messages and validation feedback for forms
- Downloadable prescription PDFs with embedded QR codes

Portability

- Compatible with common web browsers (Chrome, Firefox, Edge, Safari)

Audit and Compliance

- Logs of all critical actions stored securely and viewable by Admin
- Exportable audit logs for compliance purposes
- Traceability of prescription lifecycle from creation to dispensing

Hardware Requirement: Should be recommended by the developers.

Software Requirement: Should be recommended by the developers.