**Blood Bank System Web Application**

**Project by Team - 06**

**Aparna Marepally – S562910**

**Chandra Venkata Vijaya Gopal Raju Kalidindi – S559007**

**Manoj Vamanaguntla - S560460**

**Pooja Sri Ramineni - S559300**

**Praveen Babu Narni – S562887**

**Sandhya Paladugu – S558643**

**Contents:**

* Introduction
* Problem Statement
* Use Cases
* Functional Requirements
* Non-Functional Requirements
* Architecture diagram
* Data management plans
* Prototype demos
* Accomplishments
* Sprig 2024 Plan A hand holding a drop of blood

  Description automatically generated

**Introduction**

Regardless of technological advancements, the majority of blood bank systems still operate manually today. As a result, there is a general issue with the supply of necessary blood types.

In a world where each heartbeat echoes with the potential to save a life, the role of blood banks stands paramount. Imagine a seamlessly connected system that not only captures the essence of human generosity but also ensures the swift and precise flow of this precious life force to those in need. Welcome to the [Project Name] – an innovative and transformative Blood Bank System that goes beyond conventional boundaries.

In the realms of healthcare, the availability and efficient distribution of blood can make the difference between life and death. Our project aims to revolutionize the way blood banks operate, embracing cutting-edge technology to streamline processes, enhance accessibility, and ultimately save more lives.

Key Objectives of the Project:

* Efficient Blood Inventory Management: Harnessing the power of real-time data to manage and monitor our blood inventory with unprecedented accuracy and agility.
* Enhanced Donor Engagement: Fostering a community of dedicated blood donors through user-friendly interfaces and communication tools that inspire ongoing participation.
* Intuitive Donation Request Fulfillment: Implementing a seamless system for healthcare providers to place and track blood requests, ensuring timely responses and precise deliveries.
* Robust Data Security and Compliance: Prioritizing the confidentiality and security of donor and patient information, adhering to the highest standards of healthcare data protection.
* User-Friendly Interfaces: Designing intuitive and user-friendly interfaces for both donors and healthcare professionals, ensuring a positive and efficient experience for all stakeholders.

**Problem Statement**

* Many blood banks still rely on manual processes and outdated record-keeping systems, leading to inefficiencies, errors, and delays in providing life-saving blood products.
* To address these challenges, there is a pressing need for a modern, user-friendly, and secure web application for managing blood bank operations.
* Enhancing Blood Bank Management through Technological Innovation

Blood banks play a pivotal role in healthcare, serving as critical repositories of life-saving resources. However, the traditional methods of managing blood donation, inventory, and distribution often face challenges that hinder their effectiveness. The manual processes involved in donor registration, inventory tracking, and request fulfillment can lead to inefficiencies, delays, and potential errors. Moreover, the lack of a unified and technologically advanced system can result in missed opportunities for donor engagement and effective resource utilization.

**Challenges:**

**Manual and Time-Consuming Processes:**

* Traditional paper-based methods for donor registration and inventory management are time-consuming and prone to errors.
* Manual tracking of donation requests and blood inventory can lead to delays in critical situations.

**Limited Donor Engagement:**

* The absence of a user-friendly platform for donors may discourage regular blood donations.
* Lack of communication channels hampers efforts to encourage and recognize donor contributions.

**Inefficient Request Fulfillment**:

* Coordinating and fulfilling donation requests manually can result in delays and miscommunications.
* Difficulty in tracking blood availability and expiration dates may compromise the quality of distributed blood.

**Security and Compliance Concerns:**

* Ensuring the security and confidentiality of donor and patient information is challenging without a robust system.
* Compliance with healthcare data protection regulations may be compromised in manual systems.

**Lack of Data Analytics and Reporting:**

* Absence of data analytics tools hinders the ability to derive insights for better decision-making.
* Reporting mechanisms are often manual and may not provide real-time or comprehensive information.

**Opportunity:**

Implementing an advanced Blood Bank System offers a transformative solution to address these challenges. By leveraging technology, we can streamline processes, enhance donor engagement, improve request fulfillment, ensure data security and compliance, and empower decision-makers with valuable insights.

A blue circle with a computer and a device

Description automatically generatedA blue person with blue hair

Description automatically generated with medium confidenceA blue person with blue hair

Description automatically generated with medium confidence

**DISPLAY**

**SEARCH**

**POST DETAILS**

**BLOOD DONOR**

**REQUEST BLOOD**

**FINDS DONOR**

**WEB APPLICATION**

**DONOR**

**PATIENT**

**PROPOSED SOLUTION:**

The proposed Blood Bank System will introduce a user-friendly, automated platform that integrates all aspects of blood bank management. This includes efficient donor registration, real-time inventory tracking, seamless donation request fulfillment, robust security measures, and comprehensive reporting capabilities. By addressing these challenges, the system aims to optimize blood bank operations, save lives through timely and accurate blood distribution, and foster a stronger community of committed donors.

**Project Objectives:**

**Efficient Blood Inventory Management:**

* Implement a real-time inventory tracking system for accurate monitoring of blood levels.
* Minimize errors in inventory management through automated processes.

**Enhanced Donor Engagement:**

* Develop a user-friendly interface for donors, encouraging regular engagement and contributions.
* Implement communication tools to recognize and appreciate donor contributions.

**Seamless Donation Request Fulfillment:**

* Streamline the process of receiving and fulfilling blood donation requests.
* Ensure timely and accurate distribution of blood to healthcare providers.

**Security and Compliance:**

* Implement robust security measures to protect donor and patient information.
* Ensure compliance with healthcare data protection regulations.

**Use Cases:**

A diagram of a software application

Description automatically generated with medium confidence

Use cases are scenarios that describe how a system will interact with its users or other systems. Here are several use cases for the proposed Blood Bank System project:

**1. Donor Registration and Blood Donation:**

Actor: Donor

Description: A donor accesses the user-friendly interface to register for blood donation. The system captures personal details, medical history, and preferred donation times. The donor receives notifications about upcoming blood drives, allowing them to schedule appointments. After each successful donation, the donor's history is updated in the system.

**2. Blood Inventory Management:**

Actor: Blood Bank Staff/Administrator

Description: Blood bank staff access the system to monitor real-time inventory levels. They receive automated alerts for low stock or expiring units. Staff can easily update inventory records after receiving new donations or discarding expired units. The system provides a clear overview of available blood types and quantities.

**3. Donation Request Processing:**

Actor: Healthcare Provider

Description: A healthcare provider logs into the system to submit a donation request. They specify the required blood type, quantity, and urgency. The system checks the inventory, schedules a donation appointment if necessary, and generates notifications for the blood bank staff. The healthcare provider receives updates on the status of their request.

**4. Donor Engagement and Communication:**

Actor: Donor Relations Team

Description: The Donor Relations Team uses the system to engage with donors. They send personalized messages and notifications to donors about upcoming events, appreciation for donations, and general updates. Donors can respond to messages and schedule appointments directly through the system.

**5. Security and Compliance Checks:**

Actor: System Security Module

Description: The system's security module regularly conducts automated audits to ensure compliance with healthcare data protection regulations. It checks for unauthorized access attempts, encryption compliance, and adherence to security protocols. The system generates reports for administrators, highlighting any potential vulnerabilities.

**6. Data Analytics for Decision-Making:**

Actor: Administrator/Management

Description: System administrators and management access the analytics dashboard to gain insights into donor behavior, blood usage trends, and inventory levels. They can generate custom reports to inform strategic planning, resource allocation, and marketing efforts.

**7. Emergency Blood Request Handling:**

Actor: Blood Bank Staff/Administrator

Description: In response to emergencies, the system facilitates rapid communication with donors, prioritizes urgent donation requests, and ensures the efficient distribution of blood to healthcare providers.

**FUNCTIONAL REQUIREMENTS:**

**The system MUST:**  
1.The system MUST provide an assistance platform like live chat to contribute immediate assistance to the users.  
2.The system MUST make FAQs to the users.

**DONOR:**  
1.The system MUST allow donor to register as users.  
2.The system MUST authorize registered Donors if credentials are valid.  
3.The system MUST allow users to recover their password if they have forgotten.  
4.The system MUST maintain database of registered users securely.  
5.The system MUST allow donors to manage their profile.  
6.The system MUST allow the donors to manage their blood donation requests.

**PATIENT:**  
1.The system MUST allow patient to register as users.  
2.The system MUST authorize registered Donors if credentials are valid.  
3.The system MUST allow users to recover their password if they have forgotten.  
4.The system MUST allow users to search for blood donors by their blood type and location.  
5.The system MUST show matches of donors.  
6.The system MUST allow users to request blood donation.  
7.The system MUST allow users to Accept/deny response from the donor.  
8.The system MUST send notifications about the status of the request.  
9.The system MUST allow scheduling the appointment for the blood donation.

**ADMIN:**  
1.The system MUST authorize admins if credentials are valid.  
2.The system MUST allow admin to administrate the user profiles.  
3.The system MUST enable admin to administrate the donation relationship.  
4.The system MUST provide admin side customer support/chat functionality.  
5.The system MUST provide admin homepage functionality.

**The system SHOULD:**  
1.The system SHOULD allow users to search and filter for the donors and inventory by blood type and location.  
2.The system SHOULD offer a user-friendly interface for registering and updating user information.  
3.The system SHOULD enable donors to schedule blood donation appointments.

**The system MAY:**  
1.The system MAY offer a blood donation tracking feature with details on the journey of donated blood.  
2.The system MAY allow users to share their donation status on social media platforms.  
3.The system MAY include a blood donation scheduler that recommends optimal donation intervals.  
4.The system MAY implement a blood donation loyalty program for donors.

**The system SHALL NOT:**  
1.The system SHALL NOT share user personal information with third parties without user consent.  
2.The system SHALL NOT display donor information and records to unauthorized users.  
3.The system SHALL NOT store sensitive medical information beyond basic requirements.

**Non-functional Requirements:**

**Performance:**

Even under peak traffic conditions, the system should deliver responsive user interfaces and maintain acceptable response times. To maintain a good user experience, data retrieval and update activities must be efficient. During typical operations, the system should support a set number of concurrent users, such as 100.

**Scalability:**

The system should be scalable in order to accept increasing data volumes and users over time. It should be capable of horizontal and vertical scaling as needed.

**Security:**

All user data, particularly critical patient information, must be encrypted during storage and transfer. Access to the system should be controlled based on user roles, with strong authentication and permission processes. Security audits and penetration testing should be performed on a regular basis to detect and remedy vulnerabilities.

**Reliability and availability:**

The system should strive for high availability by avoiding downtime due to maintenance or unforeseen faults. A disaster recovery plan should be in place to ensure data integrity and system continuity. Real-time monitoring and notifications should be in place to handle possible concerns ahead of time.

**Compliance and Data Integrity:**

The system should ensure that the saved data is accurate and complete. Depending on the jurisdiction, it should comply with relevant healthcare and data protection requirements such as HIPAA or GDPR.

**User Interaction:**

The system's user interface should be simple to use and give a favorable user experience. Individuals with impairments should be able to use it in accordance with accessibility standards such as WCAG.

**Interoperability:**

The system should be able to exchange data and integrate with other healthcare systems and databases. Interoperability should be achieved through the use of industry-standard formats and protocols.

**Usability:**

The system should be user-friendly and provide clear and simple instructions to enable users navigate the system successfully.

**Maintainability:**

The system should be structured for easy maintenance and changes, with clear documentation for administrators and developers.

**Performance evaluation and reporting:**

The system should have performance monitoring capabilities to measure resource utilization and detect bottlenecks. It should generate periodical reports on system performance and usage information.

**Backup and recovery:**

The system should backup data on a regular basis and provide a well-defined mechanism for data recovery in the event of data loss.

**Network and infrastructure:**

The system should be able to execute satisfactorily in a variety of network situations, such as slow connections or congestion.

**Regulatory and Compliance Reporting:**

The system should enable the generation of reports required for compliance with blood bank regulations and standards.

**Load testing:**

Load testing should be performed on the system to verify its ability to manage concurrent user activities and peak demands.

**Audit Trail:**

To ensure accountability and security, the system should keep an audit trail of all user actions.

**Architecture:**

**Start**

**Main Page**

**Existing User**

**Register**

**Login**

**YES**

**NO**

**PATIENT**

**DONOR**

**Search for a Donor**

**View/Manage donation requests**

**Donor/Patient**

**TECHNOLOGIES & PLATFORMS USED:**

* VS CODE

A blue and black logo

Description automatically generated A white square with a leaf on it

Description automatically generated A white square with a logo on it

Description automatically generated A black background with green hexagons and letters

Description automatically generated

* MONGO DB
* GITHUB
* NODE JS

**FRAMEWORKS & LIBRARIES USED:**

* React js
* Bootstrap
* Express js
* Axios
* bcryptjs
* cookie-parser
* Cors
* dotenv
* Jsonwebtoken
* Mongoose
* Nodemon

**Hosting strategy and requirements:**

* We have configured the application locally with local configurations.
* We are planning to host the application on render which is one of the unified cloud to build and run all your apps and websites providing only the limited storage for **free.**

**DATAMANAGEMENT PLAN:**

* **Donor:** DonorID (unique identifier)
* **Patient:** PatientID (unique identifier)
* **Admin:** AdminID (unique identifier)
* **Blood Bank:** BloodBankID (unique identifier)
* **Request:** RequestID (unique identifier)

**Donor:**

* DonorID (unique identifier)
* Name
* Contact Information
* Blood Type
* Donation History
* Health Records

**Patient:**

* PatientID (unique identifier)
* Name
* Contact Information
* Medical History
* Blood Type

**Admin:**

* AdminID (unique identifier)
* Name
* Contact Information
* Role/Permissions

**Blood Bank:**

* BloodBankID (unique identifier)
* Name
* Location
* Blood Inventory

**Request:**

* RequestID (unique identifier)
* Requester (either Donor or Patient)
* Blood Type
* Requested Quantity
* Date and Time
* Status (e.g., pending, fulfilled)

**ER Diagram:**  
A diagram of a server

Description automatically generated

**Initial Data Security Measures:**  
  
  \* Implement role-based access control to limit access to certain data.  
  \* Donors, patients, and administrators should only access their own data, while administrators have additional privileges to run the system.  
  \* Data access should be tracked.  
  
**Encryption:**  
  
  \* Sensitive data, such as health records, medical histories, and personal information, should be encrypted both in transit and at rest.  
  \* Use encryption technologies such as HTTPS and database encryption features.  
  
**Regular Backups:**  
  
  \* Implement regular data backups to ensure data recovery in the event of data loss or system failure.  
  \* Maintain audit logs to document who accessed the data and when, assisting with data integrity and accountability.

**Mapping Functional Requirements to Data Storage:**

**Donor and Patient Data:**  
  
  \* These organizations keep track of donors' and patients' personal information as well as their medical histories.  
  \* They meet the criterion of tracking people' health and blood type data.  
  
**Admin:**  
  
  \* Admin data stores information about system administrators who manage the program.  
  \* It is related to the functional requirement of user management and system administration.  
  
**Blood Bank:**  
  
  \* The Blood Bank entity keeps track of blood inventory and its location.  
  \* This satisfies the criterion for controlling blood supply and assuring its availability.  
  
**Request:**  
  
  \* The Request entity is used to manage blood requests from patients and donors.  
  \* It is related to the functional requirement of blood request management and tracking.

A screenshot of a computer

Description automatically generated**PROTOTYPES DEMO – GUI MOCKUPS**

Registration Page

A screenshot of a computer

Description automatically generated

Login Page

**ACCOMPLISHMENTS:**

* **GUI and Web Interface Implementation for REGISTER/LOGIN:** An interface has been impended to support user registration and login.
* **Data base creation using MongoDB:** Created a database dedicated to the application to store the user details. This would support us to store the user credentials with password encrypted to authorize the users.
* **User profile creation:** Successfully worked towards the user profile creation once they are registered

**SPRING’24 PLAN:**

In GDP-2, we will be working on the below

* Search functionality for the patients will be done to search for a donor.
* Request management will be implemented to the donors to manage requests.
* FAQs and live chat feature will be added to the application to support user interaction with the application.
* Admin functionality will be implemented to management blood inventory, user requests.
* A great home page will be created and integrated with the existing functionalities for better user experience.