

Software Requirements Specification (SRS)

Blood Bank System

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1 Introduction

1.1 Purpose

The purpose of a Blood Bank System is to facilitate the efficient collection, storage, management, and distribution of blood and its components, ensuring that hospitals, clinics, and other healthcare institutions have timely access to the required blood types for medical procedures. The system aims to maintain a reliable, organized, and secure process for managing blood donations and supplies, improving transparency, reducing wastage, and ensuring the safety and well-being of both donors and recipients

1.2 Scope

The scope of the Blood Bank System defines the boundaries, functionalities, and objectives of the system, detailing what it aims to achieve and how it will interact with its users and stakeholders. The system will be designed to cater to various aspects of blood donation, storage, and distribution, ensuring a smooth and effective workflow for both donors and healthcare providers. Scope of the Blood Bank System:

Donor Registration and Management: Allows individuals to register as blood donors by providing personal information, medical history, and blood type. Tracks donor eligibility based on donation frequency, health checks, and other criteria. Facilitates communication with registered donors for upcoming donation drives and eligibility reminders.

Blood Collection Management: Manages the scheduling and coordination of blood collection from donors. Records details about the blood collection process, such as location, date, donor information, and blood type. Ensures blood samples are properly labeled, stored, and tested before being made available for distribution.

Blood Inventory Management: Maintains a real-time inventory of available blood units, including blood types (A, B, AB, O) and components (plasma, platelets, red blood cells). Monitors the shelf life and expiration dates of stored blood units, ensuring that outdated units are discarded or used for non-human purposes. Tracks blood storage conditions (e.g., temperature, storage location) to ensure quality and safety.

Blood Testing and Quality Assurance: Ensures that donated blood undergoes required testing (e.g., for infectious diseases, blood type confirmation) before being approved for transfusion. Records and tracks test results to ensure that only safe blood is distributed to patients. Manages any blood recall or disposal processes if quality issues are detected.

Blood Request and Distribution: Enables hospitals, clinics, and healthcare providers to request specific blood types or components for patients. Tracks requests, ensuring that the correct blood units are delivered to the appropriate healthcare facilities in a timely manner. Manages the logistics of delivering blood units from storage locations to hospitals, including monitoring transportation

conditions.

Blood Donation Campaign Management: Supports the planning, scheduling, and promotion of blood donation campaigns and events. Allows organizers to track donor participation and monitor the success of campaigns. Facilitates coordination with external organizations and volunteers for large-scale donation drives.

Reporting and Analytics: Provides detailed reports on blood inventory levels, donation trends, blood usage, and donor demographics. Allows administrators to monitor and analyze key metrics such as blood shortages, donor retention rates, and regional demand for specific blood types. Generates statistical data to support decision-making for resource allocation and campaign planning.

User Management and Access Control: Offers role-based access to the system, ensuring that only authorized users (e.g., administrators, technicians, healthcare providers) can access sensitive data. Ensures privacy and data security by protecting donor information and blood testing records.

Notifications and Alerts: Sends automatic notifications to donors when they are eligible to donate again. Alerts healthcare providers when requested blood units are ready for pickup or delivery. Notifies blood bank staff about low inventory levels, upcoming blood expirations, or testing results.

Integration with External Systems: Allows integration with hospital management systems (HMS), laboratory systems, and government health databases for seamless data exchange. Facilitates communication with mobile apps or websites where donors can view their donation history and upcoming donation events.

Exclusions:

The system does not perform blood tests or physical screenings but stores and tracks the results. It does not handle payment transactions or any financial aspects related to blood services. The system does not directly manage emergency medical services or patient care beyond the provision of blood units.

By focusing on these functional areas, the Blood Bank System will ensure that blood donation and distribution processes are streamlined, safe, and tran

1.3 Definitions, Acronyms, and Abbreviations

- **API:** Application Programming Interface
- **SRS:** Software Requirements Specification
- **UI:** User Interface

1.4 References

- World Health Organization(WHO).
- National Health Service (NHS) Blood and Transplant – United Kingdom.

1.5 Overview

The Blood Bank System is a comprehensive, digital platform designed to manage the lifecycle of blood donation, from donor registration and collection to inventory management and distribution. It aims to streamline the processes involved in handling blood donations, ensuring the availability of safe, tested, and properly stored blood for hospitals, clinics, and other medical facilities. The system also ensures compliance with healthcare standards and regulations while optimizing efficiency in blood collection, storage, and supply. Key Functions of the Blood Bank System:

Donor Registration and Management: Donors can register online or at donation centers, providing their details such as personal information, medical history, and blood type. The system tracks donor eligibility, ensuring compliance with donation intervals, health status, and any restrictions. It allows the blood bank to communicate with donors about upcoming drives, eligibility, and thank you messages after donations.

Blood Collection and Testing: The system schedules and manages blood collection, ensuring that donors are processed efficiently at donation centers or during mobile drives. Blood units are labeled, and information about each unit (blood type, collection date, and donor ID) is logged in the system. Blood undergoes mandatory testing for infectious diseases, quality, and safety. The results are recorded and only safe units are marked for distribution.

Inventory Management: Blood units are stored and tracked in real-time using the system, categorizing them by blood type (A, B, AB, O) and components (red blood cells, platelets, plasma). The system monitors the storage conditions and expiry dates of blood units to prevent waste and ensure timely usage. It alerts staff when blood units are nearing expiration or when certain blood types are in short supply, helping to manage inventory levels effectively.

Blood Requests and Distribution: Hospitals, clinics, and other medical institutions can request specific blood types or components through the system. The system processes requests, checks inventory availability, and schedules delivery or pickup of blood units. It tracks the delivery of blood from the blood bank to healthcare providers, ensuring that the right blood is delivered on time for medical procedures.

Donor and Donation Event Management: The system helps organize and manage blood donation drives, ensuring proper coordination of donors, venues, and staff. Donors can register for events and receive reminders. Event data (number of donors, blood collected) is tracked and reported for future planning. It supports campaigns for specific needs, such as rare blood types or emergency drives during crises.

Reporting and Analytics: The system generates detailed reports on blood usage trends, donation frequencies, donor demographics, and inventory levels. Analytics help in identifying blood shortages, predicting demand for specific blood types, and planning donation events accordingly. Reports provide insights to management, allowing for data-driven decisions on resource allocation and operational improvements.

Safety and Compliance: The system ensures compliance with healthcare standards, such as the screening of donors and testing of blood units. It helps maintain a safe and transparent workflow by tracking every step, from donation to distribution, ensuring accountability and reducing errors. Security features ensure that donor and patient information is protected, adhering to data privacy regulations.

Users of the System:

Donors: Individuals who donate blood can register, view their donation history, and receive notifications about their eligibility for future donations. **Blood Bank Staff:** Manage the day-to-day operations, including donor registration, blood collection, inventory management, testing, and reporting. **Healthcare Providers:** Hospitals and clinics use the system to request and receive blood units for patient treatments. **Administrators:** Oversee system operations, generate reports, manage blood donation campaigns, and ensure compliance with medical standards.

Benefits:

Efficiency: Automates processes like donor management, inventory control, and blood requests, reducing manual effort and errors. **Real-Time Monitoring:** Offers real-time insights into blood inventory levels, enabling proactive decision-making and minimizing shortages. **Safety and Quality Control:** Ensures that only safe, properly tested blood is stored and distributed, improving patient outcomes. **Improved Donor Engagement:** Allows communication with donors through notifications, event invitations, and reminders, improving donor retention rates. **Data-Driven Decisions:** Reporting and analytics features support better planning, resource management, and strategic decisions for blood bank operations.

Conclusion:

The Blood Bank System enhances the entire blood donation and distribution process, ensuring that safe blood is readily available to patients in need. By leveraging technology, the system improves operational efficiency, reduces errors, and ensures compliance with healthcare standards, ultimately contributing to saving lives and improving the overall healthcare ecosystem.

2 Overall Description

2.1 System Environment



Figure 1: fig:1

2.2 Product Functions

2.2.1 Hospital (Blood Donor)

- Registration and Login
- Add Blood Sample
- View Blood Requests
- Update/Delete Blood Samples

2.2.2 Receiver (Blood Seeker)

- Registration and Login
- Request Blood Sample
- Search for Blood:

2.2.3 Common Functionalities (Hospitals and Receivers)

- Homepage
- Profile Management

2.3 User Characteristics

2.3.1 Hospital (Donor) Users

- Role: Registered hospitals that manage their blood banks, including adding, updating, and managing blood samples available for donation.
- Technical Knowledge: Basic familiarity with web browsers and form submission. No specialized technical skills required.
- Access Level: Can log in, manage blood stock, view and respond to blood requests from receivers.

2.3.2 Receiver Users

- Role: Individuals who are in need of blood. They can search for available blood samples and request blood from registered hospitals.
- Technical Knowledge: Basic knowledge of web navigation, form filling, and search functionalities.
- Access Level: Can search for blood, request blood samples, and view responses from hospitals.

2.3.3 Admin (Optional)

- Role: (If applicable) An administrative user to manage the overall system, including approving hospitals and monitoring blood stock.
- Technical Knowledge: Familiarity with basic web-based administrative tools and data management.
- Access Level: Full access to the system, including management of users, blood stock, and requests.

2.4 Constraints

- Data Security
- Scalability
- Browser Compatibility
- Database Integrity
- Response Time
- Legal Compliance
- Limited Internet Dependency
- User Authentication:

2.5 Assumptions and Dependencies

- User Access to Internet
- Basic Technical Literacy
- Hospitals Manage Blood Inventory
- Availability of Blood Donors
- Secure Data Entry by Hospitals
- Regular System Maintenance

3 Specific Requirements

3.1 Functional Requirements

3.1.1 User Registration and Login

- **FR-1:** The system shall allow hospitals and receivers to register by providing necessary information (name, email, contact information, etc.).

- **FR-2:** The system shall validate user input during registration (e.g., email format, password strength).
- **FR-3:** The system shall allow users to log in using a valid email and password.
- **FR-4:** The system shall provide password recovery functionality in case users forget their password.

3.1.2 Hospital (Blood Donor) Functionalities

- **FR-1:** The system shall allow hospitals to add blood samples by specifying the blood type, quantity, date of collection, and expiration date.
- **FR-2:** The system shall allow hospitals to view, update, and delete blood samples in their blood bank.
- **FR-3:** The system shall notify hospitals via email when a receiver requests a blood sample.
- **FR-4:** The system shall allow hospitals to approve or reject blood requests made by receivers.

3.1.3 Receiver (Blood Seeker) Functionalities

- **FR-1:** The system shall allow receivers to search for blood samples based on blood type, location, and availability.
- **FR-2:** The system shall allow receivers to request a specific blood sample from a hospital.
- **FR-3:** The system shall notify receivers via email when their blood request is approved or rejected by the hospital.
- **FR-4:** The system shall allow receivers to view the status of their requests (approved, pending, or rejected).

3.1.4 Search and Filter

- **FR-1:** The system shall provide a search feature that allows users to search for blood samples based on blood type, hospital location, and availability.
- **FR-2:** The system shall provide sorting options for search results (e.g., by most recent, by hospital proximity).
- **FR-3:** The system shall display relevant information about each blood sample, including the hospital name, blood type, quantity, and collection date.

3.1.5 Profile Management

- **FR-1:** The system shall allow users (hospitals and receivers) to update their profile information (contact details, location, etc.).
- **FR-2:** The system shall allow users to change their password through a secure password update process.

3.1.6 Admin Functionalities

- **FR-1:** The system shall allow the administrator to manage (view, update, or delete) both hospital and receiver accounts.
- **FR-2:** The system shall allow the administrator to monitor all transactions (blood sample additions, requests, approvals, rejections).
- **FR-3:** The system shall allow the administrator to generate reports on blood availability and user activity.

3.1.7 Notifications

- **FR-1:** The system shall send email notifications to hospitals when a blood request is made.
- **FR-2:** The system shall send email notifications to receivers when their request is approved or denied.
- **FR-3:** The system shall provide confirmation emails upon successful registration.

3.2 Non-Functional Requirements

3.2.1 Usability

- User-friendly and intuitive interface with easy navigation.
- Responsive design using Bootstrap to support mobile and desktop users.

3.2.2 Performance

- Quick loading of pages and smooth search functionality for large databases of blood samples.
- Scalability to handle multiple hospitals and receivers concurrently.

3.2.3 Security

- User passwords should be encrypted using hashing algorithms like bcrypt.
- Secure session management for logged-in users.
- Data validation and sanitization to prevent SQL injection, cross-site scripting (XSS), and other web vulnerabilities.

3.2.4 Data Storage

- Blood sample details, user profiles, and blood request information should be stored in a MySQL database.
- The database should have relationships.

3.2.5 Backup and Recovery

- Automated backup of the database to prevent data loss.

3.3 External Interface Requirements

The system will interact with external APIs for geolocation and third-party authentication (e.g., Google OAuth).

4 Other Non-Functional Requirements

4.1 Performance Requirements

The system should handle up to 1000 concurrent users without significant performance degradation.

4.2 Safety Requirements

The system must ensure that no data is lost in case of unexpected shutdowns or crashes.

4.3 Security Requirements

All sensitive data must be encrypted using AES-256.

4.4 Software Quality Attributes

The system should be maintainable, scalable, and capable of being updated without requiring system downtime.

5 Appendices

5.1 Appendix A: Glossary

- **Task:** An item that represents work that needs to be completed.
- **User:** An individual interacting with the system.