BUSINESS & HEALTHCARE CASE COMPETITION

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Think about the journey of a single unit of blood—from the donor's vein to the patient's vein. It's a race against time, precision, and need. Our challenge today is to ensure that this journey is seamless, reliable, and life-saving at every step.

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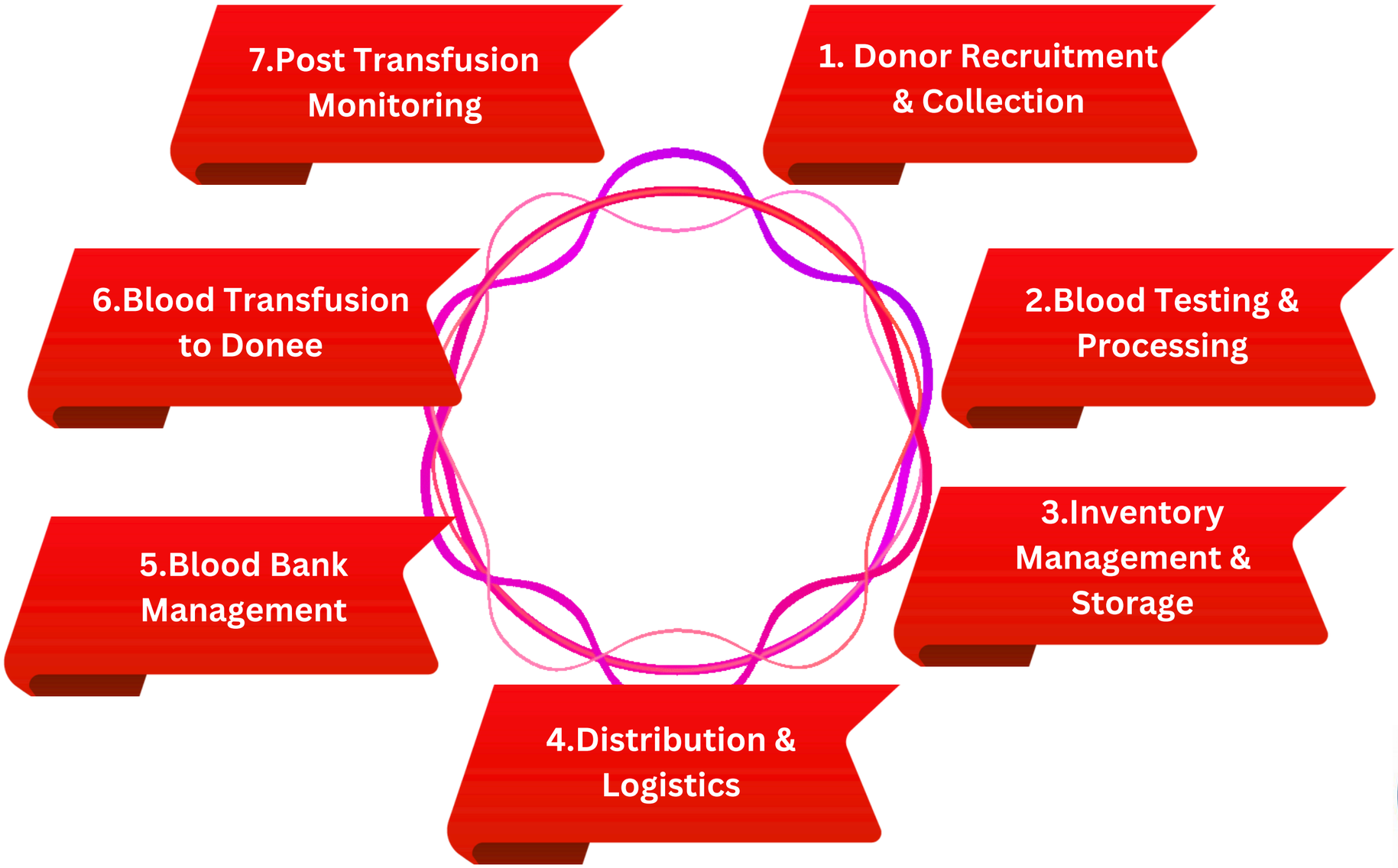
DATA ANALYSIS

Area	Analysis
Red Blood Cell (RBC) Demand and Inventory	RBC demand and collection trends show fluctuations, with a sharp decline during the COVID-19 pandemic. Inventory levels also fluctuated, showing excess discards during low-demand periods and shortages during high-demand periods. Discards were influenced by limited storage life (42 days).
Product Outdates (RBC & Platelets)	RBC and platelet outdate rates show variation over time, with notable spikes in RBC discards in 2020 and high platelet discard rates due to their shorter shelf life (7 days). Platelet discard rates have fluctuated around 15-20%, indicating room for waste reduction.
Plasma and Immunoglobulin Demand	Immunoglobulin (IG) demand has seen steady growth, averaging about 10% year-over-year increases. Plasma donation rates are relatively stable, but there is a need to increase donation frequency and attract new donors to meet growing demand for IG production.
Donor Base and Frequency	The donor base has grown slightly, but donation frequencies vary, with most whole blood donors donating 2-4 times per year and most plasma donors contributing 5-9 times. A small percentage donate frequently (20+ times), indicating potential to increase collection from less frequent donors.

DATA ANALYSIS

Area	Analysis
National Inventory Management	Inventory levels of RBCs are maintained at 14,000-17,000 units daily, but balancing collection and demand remains challenging. Pandemic-related challenges demonstrated the need for adaptive inventory policies to avoid supply-demand mismatches and reduce outdates.
Cost and Inventory Financials	Cost of RBCs and other blood products indicates high expenses associated with maintaining inventory, particularly with frequent outdates. Cost per RBC unit is CAD 400, underscoring the need for efficient use and minimal wastage.
Hospital Inventory Levels by Province	Distribution of hospitals varies by province, with Ontario and Quebec having the largest numbers. This variance impacts regional blood supply needs and presents challenges in inventory management across regions.
COVID-19 Impact on Supply Chain	The pandemic led to a sharp reduction in donor attendance and collections, significantly impacting blood supply. Recovery has been steady, but CBS must be prepared for future disruptions in donor behavior and collection logistics.

VEIN TO VEIN



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VEIN TO VEIN

1. Donor Recruitment & Collection

Donor recruitment and Engagement

Campaigns & outreach to recruit new and repeat donors.

Appointment Scheduling

Donors schedule appointments online or via apps.

Blood Collection

Collected at fixed centers or mobile units.

Types: Whole blood, plasma, platelet apheresis.

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VEIN TO VEIN

2.Blood Testing & Processing

Initial Testing

Blood tested for infectious diseases (e.g., HIV, Hepatitis B/C) to ensure safety.

Component Separation

Whole blood processed into red blood cells (RBCs), plasma, and platelets.

Specialized Processing

Additional steps (e.g., pathogen reduction, cryoprecipitation) as needed.

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VEIN TO VEIN

3.Inventory Management & Storage

Inventory Segregation

Red Blood Cells: Stored at 4°C for up to 42 days.

Plasma: Frozen at -18°C or colder for up to 1 year.

Platelets: Stored at room temperature with agitation for up to 7 days.

Inventory Monitoring

Real-time tracking of inventory levels at collection and distribution centers.

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VEIN TO VEIN

4.Distribution & Logistics

Inventory Assessment

Daily evaluation to determine required blood product quantities across regions.

Transport Logistics

Cold Chain: Maintains RBCs and plasma at required temperatures.

Agitation Equipment: Ensures platelet viability during transport.

Delivery to Hospitals

Blood products delivered to hospital blood banks or transfusion services.

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VEIN TO VEIN

5.Blood Bank Management

Inventory Reception

Blood products scanned and entered into the hospital's inventory system.

Compatibility Testing

Cross-matching to ensure compatibility with patient's blood type.

Storage & Monitoring

Blood stored and continuously monitored to maintain temperature and quality.

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VEIN TO VEIN

6.Blood Transfusion to Donee

Clinical Use

Red Blood Cells: Treat anemia or blood loss.

Plasma: For clotting disorders or to increase blood volume.

Platelets: For low platelet counts, often during cancer treatment.

Documentation & Tracking

Each transfusion is documented, including blood product type, donor ID, and patient details.

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VEIN TO VEIN

7.Post Transfusion Monitoring

Patient Monitoring

Patients are observed for adverse reactions after transfusion.

Outcome Tracking

Hospitals report usage details and patient outcomes to CBS.

Data Analysis

CBS analyzes data to enhance inventory management, donor engagement, and supply chain efficiency.

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ANSWER TO QUESTION 1

01

Digital Tracking System (BloodTrack+)

Donor Perspective: Track blood progress (e.g., "Your blood is en route to Hospital A").

Donee Perspective: Patients and hospitals track blood request lifecycle (e.g., "Blood will arrive in 2 hours").

02

Blockchain Technology

Log every event (collection, testing, storage, transfusion) in a tamper-proof ledger.

Use QR codes linked to blockchain for complete blood unit history.

03

IoT Integration

Temperature sensors in transport containers ensure cold chain integrity.

Alerts for temperature breaches (e.g., platelets at 20-24°C with agitation).

04

Integration with Hospital Systems

Sync transfusion data with CBS for improved hemovigilance (via LIS integration).

05

Value Chain Alignment

Step 1: Use BloodTrack+ for donor engagement.

Step 4: Monitor logistics with IoT for cold chain compliance.

Step 6 & 7: Secure tracking and post-transfusion analysis via blockchain.

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ANSWER TO QUESTION 2

01

Predictive Analytics

Use AI models (e.g., TensorFlow) to predict demand during flu seasons or disasters.

Example: Predict increased plasma demand during dengue outbreaks.

02

RFID & Barcode Scanning

Automate blood unit tracking.

Example: RFID tags enable automatic scanning during transport and hospital storage.

03

Cloud-Based Platforms

Centralize data from CBS, hospitals, and labs using cloud solutions (e.g., AWS, Azure).

Example: Real-time inventory updates across provinces.

04

AI-Driven Inventory Systems

Automate hospital inventory replenishment with AI algorithms.

Example: AI monitors usage patterns and sends automated orders when stocks are low.

05

Value Chain Alignment

Step 3: Use RFID for inventory tracking.

Step 5: Integrate LIS with AI for hospital inventory automation.

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ANSWER TO QUESTION 3

01

Enhanced Testing

Adopt technologies like Mirasol Pathogen Reduction Technology (PRT) to reduce contamination risks in platelets and plasma.

Example: PRT eliminates pathogens like Hepatitis B and C for safer transfusions.

02

Real-Time Alerts

Use IoT devices to notify stakeholders of condition deviations during transport.

Example: IoT alerts logistics team if RBC temperature drops during transport.

03

Training Programs

Provide training on adverse event reporting and cross-matching protocols.

Example: Quarterly workshops on new transfusion guidelines and hemovigilance practices.

04

Value Chain Alignment

Step 2: Enhanced pathogen reduction improves testing safety.

Step 5: Training ensures compatibility testing accuracy and reduces patient risks.

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ANSWER TO QUESTION 4

01

Predictive Analytics

Use historical data and predictive models to plan collections.

Example: Forecast platelet needs based on winter demand spikes.

02

Regional Redistribution Protocols

Set up inter-province stock-sharing agreements.

Example: Redistribute plasma from high-donor provinces (Ontario) to high-demand regions (Quebec).

03

Shelf-Life Extensions

Collaborate with research institutions to extend platelet shelf life from 7 to 10 days.

Example: Develop improved preservation solutions for platelets.

04

Vendor-Managed Inventory (VMI)

CBS directly manages hospital inventories.

Example: Automated inventory checks and replenishments via BloodTrack+.

05

Value Chain Alignment

Step 3: Reduce waste with predictive tools and shelf-life extensions.

Step 4: Optimize logistics for better redistribution.

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ANSWER TO QUESTION 5

01

AI-Based Demand Models

Use machine learning to analyze donor trends, patient needs, and clinical schedules.

Example: Predict plasma demand surges during flu season based on epidemiological data.

02

Adaptive Policies

Implement flexible collection systems that scale based on real-time demand.

Example: Organize emergency blood drives during disasters like wildfires or floods.

03

Data Sharing Agreements

Partner with hospitals to share data on upcoming surgeries and patient volumes.

Example: Hospitals provide monthly projections for transfusion needs.

04

Value Chain Alignment

Step 1: Use AI to optimize donor scheduling and recruitment.

Step 3 & 4: Integrate predictive tools to align inventory with projected demand.

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BLOODTRACK+

01

Dual User Profiles

- Donor Profile
- Donee Profile

02

Real-Time Tracking Dashboard

- Current process stage
- Includes geolocation for live tracking of blood in transit.

03

Push Notifications

- Donors: Updates at each stage
- Donees: Notifications for request approval, etc.

04

Messaging System

- Hospital CBS connect
- Donor/Donee engagement

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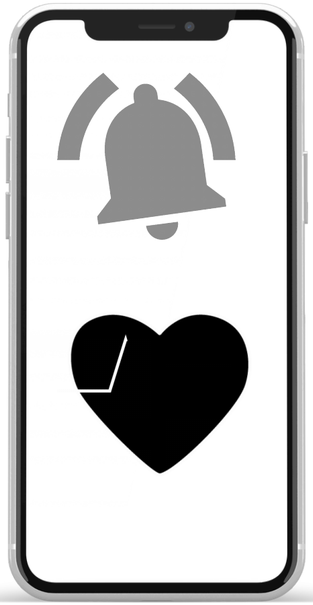
DONOR , DONEE VIEW

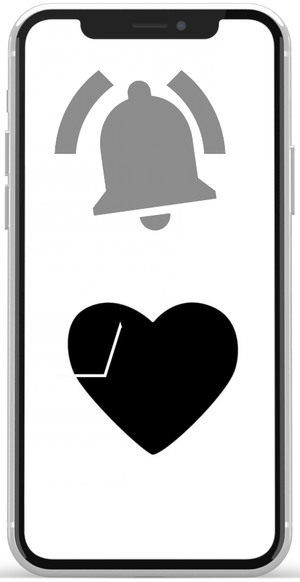
1. Donor Recruitment & Collection



Your appointment is confirmed! Thank you for being a hero.

You are a step closer to saving someone's life.

DONOR VIEW



We've started the process to fulfill your request.

Your life-saving blood request is one step closer to fulfillment.

DONEE VIEW

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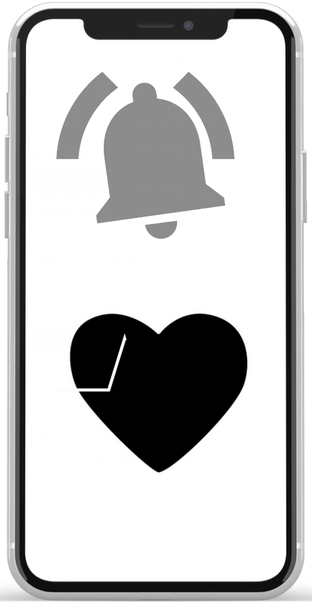
DONOR , DONEE VIEW

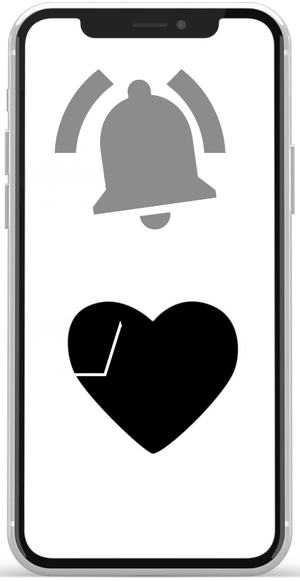
2.Blood Testing & Processing



Great news! Your donation passed all safety tests and is being prepared for use.

Your blood is being tested for safety and quality. Thank you for your trust!

DONOR VIEW



The blood units are now verified for safety and quality.

Testing in progress to ensure the safety and compatibility of your requested blood.

DONEE VIEW

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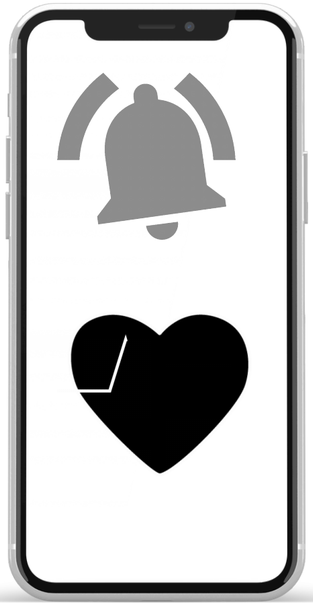
DONOR , DONEE VIEW

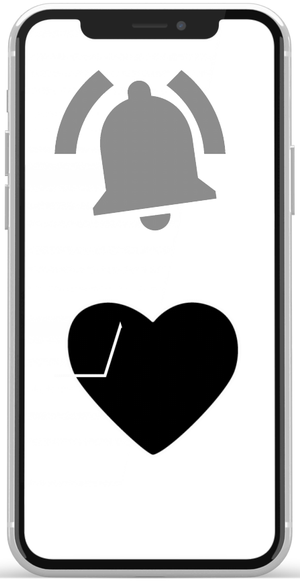
3.Inventory Management & Storage



Your donation is now in storage, preserving life for future use.

Your blood is securely stored and ready to help those in need.

DONOR VIEW



Your requested blood units are safely stored and being prepared for dispatch.

Blood units have been safely stored and are ready to support your needs.

DONEE VIEW

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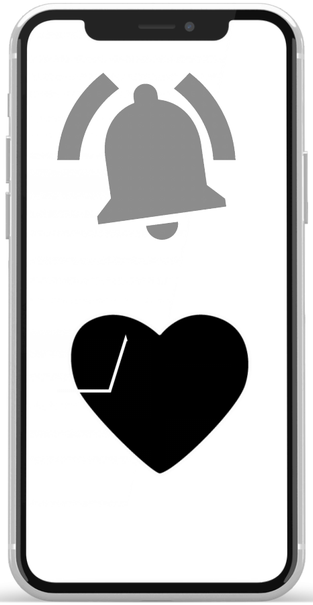
DONOR , DONEE VIEW

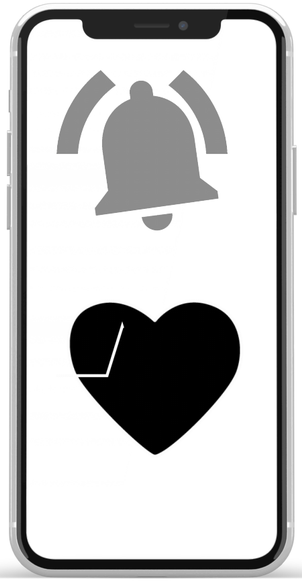
4.Distribution & Logistics



Your blood is now en route to a healthcare facility!

Your donation is on its way to make a difference.

DONOR VIEW



Good news! Your request is in transit and will arrive shortly.

Your requested blood units are on their way.

DONEE VIEW

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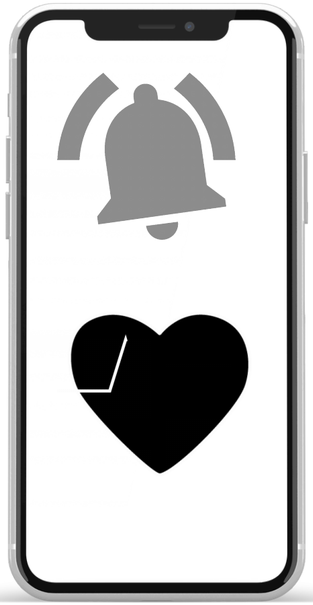
DONOR , DONEE VIEW

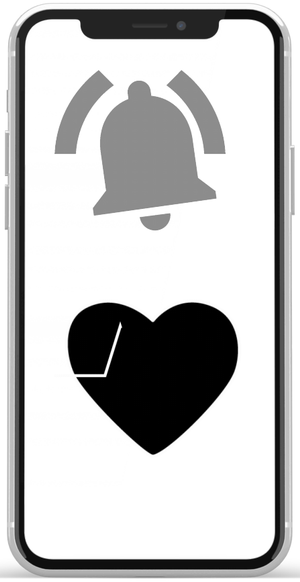
5.Blood Bank Management



Your donation has been received at the hospital blood bank!

Your blood is now at the hospital, ready to save a life

DONOR VIEW



The blood units are now available and ready for compatibility testing.

The requested blood has been delivered to the hospital blood bank

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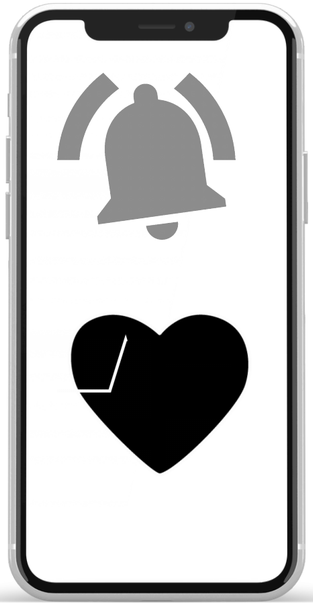
DONOR , DONEE VIEW

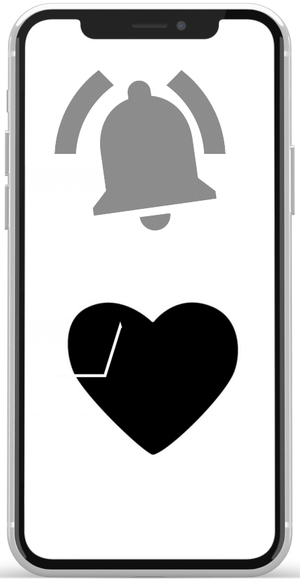
6.Blood Transfusion to Donee



A life has been touched by your generosity. Your blood is now helping someone recover.

Your donation is being transfused to someone in need.

DONOR VIEW



The requested blood is now being transfused to you or your loved one.

Your transfusion is in progress.

DONEE VIEW

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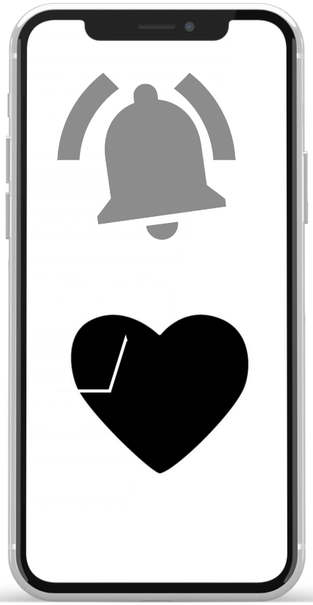
DONOR , DONEE VIEW

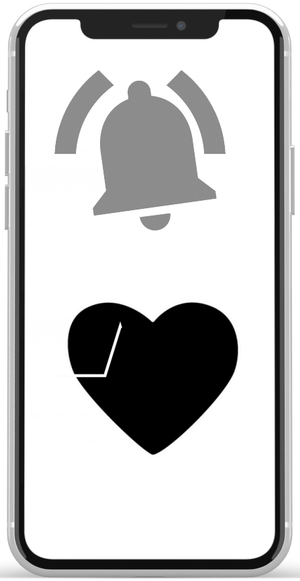
7.Post Transfusion Monitoring



Your donation’s impact has been recorded. Together, we’ve made a difference.

Your donation’s journey is complete. Thank you for saving a life.

DONOR VIEW



Your transfusion was successful! Thank you for trusting us with your care.

Post-transfusion monitoring is complete.

DONEE VIEW

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IMPLEMENTATION

Phased Rollout Based on Regions with Higher Digital Maturity

Start with Digitally Advanced Regions: Focus on areas with better digital infrastructure and cooperative hospitals to test and refine processes.

Pilot Projects in Urban Areas: Begin in urban centers with manageable challenges to establish a model for wider implementation.

Hybrid Distribution Model

Decentralized Hubs: Establish regional hubs for localized management while maintaining oversight from CBS.

Leverage Existing Infrastructure: Partner with organizations that have temperature-controlled networks to reduce costs and setup time.

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IMPLEMENTATION

Low-Cost Technology Solutions

Mobile Applications: Create apps for hospital staff to log data, reducing errors and manual labor.

Interoperability Middleware: Develop middleware to connect various hospital systems without costly overhauls.

Strategic Partnerships and Collaboration

Engage Provincial Authorities: Align goals with health departments and create incentives for participation.

Public-Private Partnerships: Partner with tech companies for app development and logistics firms for optimized transportation.

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IMPLEMENTATION

Incremental Funding Model

Government and Philanthropic Funding: Secure funding through grants, donations, and public campaigns.

Cost-Benefit Analysis: Demonstrate long-term savings from reduced waste and improved efficiency to justify budget increases.

Data Collection Simplification

Automated Tools: Provide barcode scanners and mobile devices for easier data collection.

Standardized Templates: Use templates to ensure consistent and efficient data reporting across hospitals.

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IMPLEMENTATION

Crisis-Ready Infrastructure

Emergency Stockpiles: Prepare reserves in high-risk areas for rapid response during disasters.

Flexible Crisis Protocols: Develop adaptable plans for prioritizing deliveries and accessing international networks when needed.

Stakeholder Engagement and Change Management

Workshops and Training: Educate hospital staff about system benefits and address concerns through continuous training.

Incentives: Offer recognition and funding to hospitals that excel in adopting the new system.

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FINANCIALS

Supply Chain Improvement Step	Estimated Budget ($)	Rationale
1. Preparation (Donor Recruitment and Collection)	1,500,000	Supports donor growth with mobile units and app, addressing 10-15% annual donor increase goal.
2. Problem Formulation (Blood Testing and Processing)	2,000,000	Investment in advanced testing technology for safety and compliance with increased donor volume.
3. Participation Strategy (Inventory Management and Storage)	1,000,000	Implement predictive analytics and automation to reduce wastage and improve inventory management.
4. Assessment (Distribution and Logistics)	2,500,000	Enhance cold chain integrity with specialized vehicles and 3PL partnerships for stable regional supply.
5. Evaluation (Hospital Blood Bank Management)	1,000,000	Upgrade LIS and pilot VMI system in select hospitals to ensure accurate tracking and reporting.
5. Decision (Blood Transfusion to Donee)	800,000	Implement outcome tracking tools and clinician training to ensure transfusion safety.
6. Post-Transfusion Monitoring	1,000,000	Develop hemovigilance dashboards and automated reporting for improved transparency and efficiency.

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We’ve mapped out a clearer, faster, and more efficient path for this journey. By implementing these strategies, we’re not just optimizing logistics; we’re saving lives, one journey at a time.

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THANK YOU

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