

PulseSaver- Medical Emergency Donation Network

Prof. Bhagwati Galande, Parth Bhosale, Sakshi Bathe, Aditi Gadhave, Prathamesh Amrutkar

Infotmation Technology Smt.Kashibai Navale College of Engineering Vadgaon. Pune, India.

Abstract- PulseSaver is designed to fix this. It's an all-in-one digital network that acts as an emergency lifeline, instantly bringing together people who need help with people who can give it. We are building a single platform to manage donations of blood, organs, and money—all in real-time. We use smart AI technology to cut out the waiting. The system automatically and instantly matches the patient with the closest, most compatible, and fully verified donor or resource. Everything is secure and transparent: we rigorously verify all users and requests to build trust and ensure ethical donation practices. The main goal of PulseSaver is simple: to save lives by speeding up the emergency response and making sure critical resources get to the people who need them most, especially those in remote or underserved communities.

Keywords- Medical Donation Network , Emergency Response, Real-time Matching, AI-driven Matching, Blood , Donation, Organ Donation, Financial Aid / Fund Donation, Donor Verification, Centralized Platform , System Transparency, Scalability.

I. INTRODUCTION

The contemporary global healthcare landscape is marked by critical disparities in accessing time-sensitive, life-saving medical resources. In emergency situations, immediate access to blood transfusions, compatible organs for transplant, and sufficient financial aid is essential, yet obtaining these resources is often hampered by systemic failures. Current donation management is largely fragmented, relying on manual processes or separate, non-communicative platforms that individually address blood, organ, or financial needs. This decentralized structure causes critical delays, inefficiencies, and ultimately contributes to preventable loss of life.

The PulseSaver - Medical Emergency Donation Network project is driven by the urgent need for a unified solution that addresses two core problems: the delay in accessing life-saving resources during emergencies and the need to connect resources with those who cannot afford the medical fund.

Fragmentation and Delay: Existing blood donation apps often track availability but lack the real-time donor-patient connection needed during emergencies. Organ donation systems involve slow, manual matching and limited public access.

Health Inequity in Funding: Medical crowdfunding frequently reflects and reinforces existing socioeconomic disparities, resulting in lower success rates for campaigns from rural or low-income areas.

Lack of Verification: Manual, helpline-based solutions lack a centralized, automated infrastructure for ensuring the legitimacy and integrity of donation requests. PulseSaver provides a centralized, secure platform that rapidly connects verified donors with recipients who raise requests for funds, blood, and organs. The project's objectives are:

Integrated, Real-Time Matching: Implement an AI-driven matching engine to instantly connect recipients with the nearest, most compatible, and verified donors for all three critical resources.

Robust Verification and Trust: Ensure transparency and ethical practice by requiring secure user registration and mandatory document verification, cross-checked using Hospital Authentication and Admin validation.

Enhanced Accessibility: Specifically focus on enabling secure and traceable financial aid/fund donation to help people who cannot afford medical funds and ensure accessibility for patients in rural and low-income areas.

Workflow Automation: Automate the entire process—from initial request validation to donor notification and transaction confirmation—to significantly accelerate the emergency workflow. By utilizing technologies such as React, Node.js, and an AI Services Layer, PulseSaver will create a resilient and scalable donation network, ultimately contributing to building a more equitable and effective emergency healthcare support system.

II. LITERATURE REVIEW

The development of the PulseSaver platform is informed by a review of existing digital systems and research highlighting the current challenges in donation management and healthcare financing. This survey identifies critical gaps in existing solutions that PulseSaver is designed to bridge.

A. Blood Donation Management Systems

Existing web-based systems for blood donation primarily focus on connecting donors, patients, and administrators to improve overall donation efficiency. Systems like e-RaktKosh and Red Cross apps help track blood availability but often lack the sophisticated, real-time donor-patient connection necessary during sudden emergencies. Research confirms that while centralized systems with donor registration and blood request management exist, a significant gap remains in improving real-time accessibility of blood in emergencies. Furthermore, studies on medical students show that while willingness to donate blood is high (91%), the actual donation rate is low (22.9%) due to barriers like lack of approach.

B. Organ Donation and Awareness

Organ donation systems are typically centralized and legally regulated (e.g., NOTTO), but they often involve slow, manual matching processes and limited public access. Research in India shows that while awareness about organ donation is relatively high (79.17%), the actual sign-up rate remains critically low (3.33%). The main barriers to organ donation include a lack of awareness, religious beliefs, and poor infrastructure. These findings underscore the need for a modern, digitized system to simplify the process and improve infrastructure efficiency.

C. Health Inequities in Financial Aid

The necessity for a verified fund donation module stems from the inherent inequities in medical crowdfunding. Systematic reviews indicate that medical crowdfunding often reflects and reinforces existing socioeconomic disparities. Disparities exist across factors like race, gender, and geography, with campaigns in rural or low-income areas consistently having lower success rates. This highlights the need for a verified, direct, and centralized financial aid mechanism to ensure equitable distribution of funds.

In summary, existing platforms function independently for blood, organ, or money; PulseSaver proposes a solution to handle all three emergency needs within one integrated system.

B. AI-Driven Matching and Verification

The core innovation is the AI Services Layer, which automates critical decision-making processes.

ML Matching: Algorithms are used to calculate the compatibility and proximity match score for blood types, organ donations, and geographic location, ensuring quick and suitable connections.

OCR (Optical Character Recognition): This technology is used to extract and validate data from uploaded medical reports, streamlining the document verification process for both requests and donations.

Verification Protocol: Secure user registration is mandatory, and all requests for organs or funds are verified by the Admin and cross-referenced with Hospital/NGO integration to ensure legitimacy.

C. Workflow Automation (End-to-End Flow)

The methodology is designed to automate the emergency process (Registration → Request Validation → Matching → Notification → Tracking):

Request Initiation: A Recipient logs in and submits an urgent request (e.g., O+ blood).

Matching: The Backend calls the AI Matching Engine, which finds the closest, most compatible verified Donor.

Notification: The Notification service instantly alerts both the matched Donor and the Recipient.

Confirmation: The relevant Hospital/Blood bank verifies the details and confirms resource availability.

Completion: The transaction is completed (blood donation or fund transfer), and the status is updated.

III. METHODOLOGY

The PulseSaver system employs a robust, technology-driven methodology focused on automation, intelligent matching, and rigorous verification to ensure rapid and ethical service delivery.

A. System Architecture and Implementation Stack

The project utilizes a modern, scalable architecture designed for high availability and real-time data exchange.

Frontend: Developed using a framework like React to ensure a responsive and intuitive interface for web and mobile

applications, including features like map views and a chatbot.

Backend: Utilizes Node.js + Express for efficient handling of business logic, authentication (JWT), and communication with the AI matching engine.

Database: MongoDB is selected for its flexibility and scalability in storing dynamic data such as users, requests, funds, and match history.

Integration: Relies on external APIs for essential services, including secure Payment Gateways for fund donations and SMS/Email Gateways for instant donor alerts.

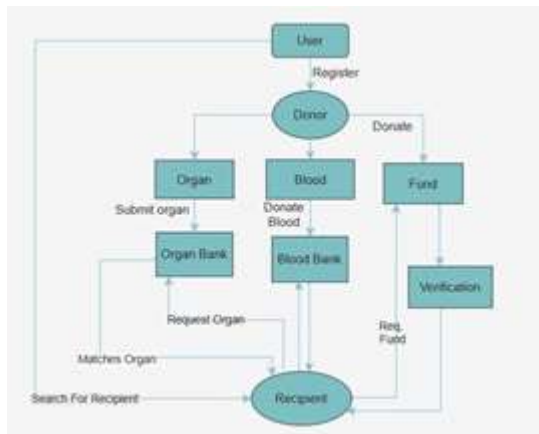


Figure 1 System Architecture Initial Access and Role Assignment

A User first interacts with the system. The User must Register. After registration, the user assumes the role of either a Donor or a Recipient (or potentially both).

2. Donor Submission Paths

The Donor can choose one of three parallel paths to offer resources:

Organ Donation: The Donor can Submit organ information, which is stored in the Organ Bank.

Blood Donation: The Donor can Donate Blood, which is managed by the Blood Bank.

IV. MOTIVATION

The reason we created PulseSaver is simple: We want to stop preventable deaths by cutting out the time wasted in emergencies.

When someone has a sudden medical crisis and needs blood, an organ, or money for a hospital bill, the current system fails them.

1. The Human Cost of Waiting

Saving Seconds, Saving Lives: Right now, getting a life-saving resource is slow because systems for blood, organs, and money don't talk to each other. We are motivated to use smart technology (AI) to connect the patient to the donor instantly, making the response time minutes, not hours.

One Lifeline for Everything: Instead of forcing people to call different places for blood, organs, and funds, PulseSaver puts it all in one spot. This unified approach is designed to eliminate confusion and speed up the entire process.

2. Fairness and Trust

We are also deeply motivated by the need to make sure help goes to the people who need it most, regardless of their bank account.

Helping the Poorest: We know that people in rural or low-income areas often struggle the most to raise money for medical emergencies. PulseSaver is motivated to provide a safe, direct, and fair way for them to receive financial aid.

Making Sure It's Real: We are motivated to build trust. By requiring official verification (like checking documents with a hospital), we ensure that every request for an organ or funds is legitimate and that every donor is safe and verified.

In short, PulseSaver is driven by the mission to make emergency medical help fast, reliable, and available to everyone.

V. FUTURE SCOPE

We've built a strong foundation, but PulseSaver can grow into an even more powerful, life-saving network. Our plans for the future involve adding cutting-edge technology to make the system smarter, faster, and more trustworthy.

1. Smarter Decisions with AI

Predictive Matching: The system won't just match needs; it will use AI to predict which donors are most likely to be available before an emergency even happens.

Forecasting Demand: We'll use AI to forecast when and where specific types of blood or organs will be needed, helping administrators prepare proactively.

2. Deeper Connections

Hospital Hook-up: We plan to directly connect the system with hospitals, ambulances, and official health registries. This

means verification of a patient's need and resource availability will be instant and automatic.

3. Total Trust and Security

Blockchain Tracking: We will use blockchain technology to record every single donation (blood, organ, and fund) in a secure, transparent, and unchangeable digital ledger. This ensures total honesty and traceability for everyone involved. These future steps will ensure PulseSaver is a reliable and completely transparent network for emergency medical support.

VI. CONCLUSION

The PulseSaver - Medical Emergency Donation Network successfully establishes a secure, unified, and technology-driven platform designed to overcome the critical delays and fragmentation inherent in existing emergency resource management systems. By integrating the management of blood, organs, and financial aid onto a single platform, PulseSaver provides an accelerated and streamlined emergency response.

The system achieves its core objectives by:

Ensuring Quick Response: Utilizing AI-driven real-time matching and priority alert systems to instantly connect patients with verified, suitable, and nearby donors.

Promoting Equity and Trust: Implementing mandatory document and hospital authentication to guarantee transparency, security, and ethical compliance with medical standards, specifically aiding those who cannot afford care and addressing existing health inequities.

Scalability: The robust architecture is designed to be scalable to handle large-scale emergencies and facilitate potential nationwide adoption.

PulseSaver ultimately contributes to building a resilient, life-saving donation network that utilizes intelligent automation to save lives in critical situations.

REFERENCES

1. Berliner LS, Kenworthy NJ. Producing a worthy illness: Personal crowdfunding amidst financial crisis. *Soc Sci Med* 2017;187:233-42
2. Zenone M, Snyder J. Fraud in medical crowdfunding: A typology of publicized cases and policy recommendations. *Policy Internet* 2018;11:188.
3. Bhat LD, Panneer S, Bhagyalakshmi R, Kantamaneni K, Nayar KR, Rice L. Medical crowdfunding in India: The need for a strong legal enforcement system. *Indian J Public Health* 2024;68:441-3.
4. Chauhan R, Kumar R, Thakur S. A study to assess the knowledge, attitude, and practices about blood donation among medical students of a medical college in North India. *J Family Med Prim Care* 2018;7:693-7
5. Tamuli RP, Sarmah S, Saikia B. Organ donation – “attitude and awareness among undergraduates and postgraduates of North-East India”. *J Family Med Prim Care* 2019;8:130-6.
6. Organ Donation. p. 30. Available from: https://www.en.wikipedia.org/wiki/Organ_donation. [Last accessed on 2018 Mar 27].
7. Odusanya OO, Ladipo CO. Organ donation: Knowledge, attitudes, and practice in Lagos, Nigeria. *Artif Organs* 2006;30:626-9.
8. About Organ Donation. Available from: <https://www.timesofindia.indiatimes.com/aboutorgandonation.cms>. [Last accessed on 2017 Aug 30].
9. Christopher Updated; 2022. Available from: <https://www.ketto.org/blog/success-of-from-u-2-them-fundraiser-on-ketto>. [Last accessed on 2022 Apr 08].
10. M. J. Renwick and E. Mossialos, “Crowdfunding our health: Economic risks and benefits,” *Social Sci. Med.*, vol. 191, pp. 48–56, Oct. 2017.
11. P. Jin, “Medical crowdfunding in China: Empirics and ethics,” *J. Med. Ethics*, vol. 45, no. 8, pp. 538–544, Jun. 2019
12. P. Priya et.al, “The Optimization of Blood Donor Information and Management System by Technopedia”, *International Journal of Innovative Research in Science Engineering Technology*, vol 3, Issue 1, February 2014, pp: 390–395, ISSN(online): 2319-8753, ISSN(print): 2347-6710
13. Ali, A., Jahan, I., Islam, A. and Parvez, S., 2015. Blood donation management system. *American Journal of Engineering Research*, 4 (6), pp. 123 - 136.
14. R. R. Mahalle, and S. S. Thorat, “Smart Blood Bank Based On IoT: A Review,” *International Research Journal of Engineering and Technology (IRJET)*, vol. 05, no. 01, 2018.