From One-Time to Lifeline: Encouraging Repeat Blood Donations Through Behavioral Nudges – Part I

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Abstract

Donating blood is one of the most powerful yet simple ways to save lives. Whether for surgeries, emergencies, or chronic conditions, a reliable blood supply is critical—but a significant gap remains between the number of people who can donate and those who do. Many eligible donors never give blood, and among those who do, only a small fraction return to donate again. This study explores two key questions: how many people are truly eligible to donate, and how can we encourage past donors to become regular contributors?. One effective strategy involves sending thoughtful, timely SMS reminders—on birthdays, national holidays, or special occasions—to encourage individuals to donate again gently. These small, personalized nudges can help turn one-time donors into repeat supporters. To support this, we outline a secure, multi-step system for managing donor information, beginning with protected online registration and eligibility checks based on verified medical data. In emergencies, real-time alerts notify nearby eligible donors, enabling quick action. Throughout, privacy and data security are carefully maintained. By combining clear eligibility tracking with meaningful communication, this approach builds a more dependable and responsive blood donation system—ensuring that help is available whenever and wherever it's needed most.

Keywords: Donor motivation, Behavioural nudges, SMS reminders, Blood supply management, Health communication, Public health strategy, Mobile health interventions

I- Introduction:

Blood donation is one of the simplest and most powerful ways a person can save a life. Whether it's used in surgeries, during medical emergencies, or for patients battling long-term illnesses like cancer or thalassemia, donated blood is often the difference between life and death. And yet, despite growing awareness and improvements in healthcare, there's still a major gap between how much blood is needed and how much is donated.

The truth is, many people are eligible to donate blood—but most never do. And among those who donate once, very few come back to donate again. This presents a huge, untapped opportunity to improve donation rates—not just by finding new donors, but by encouraging those who already qualify to give more regularly.

This paper looks at two key questions: First, how many people are eligible to donate blood? And second, how can we encourage more of them—especially past donors—to come back and donate again? One promising way is by sending kind, motivating messages at the right moments, like birthdays, national holidays, or other personal milestones. These small nudges, especially through something as simple as an SMS, can make a big difference in turning good intentions into real-life action.

By better understanding who can donate and how to inspire them, we can take meaningful steps toward building a stronger, more reliable blood donation system—one that helps save lives every single day.

This paper involves a structured, multi-phase process designed to ensure efficient, secure, and ethical management of donor-related activities. Participants enter their personal and medical information through an online portal that is secured by authentication procedures during the safe registration phase. Then, while closely adhering to privacy and consent laws, data is gathered from various sources, such as wearable technology, medical records, and direct input. In order to prepare it for eligibility checks, where a participant's suitability for donation is assessed based on predetermined medical and logistical criteria, this data is processed and cleaned using analytical tools. Eligible donors are contacted in an emergency via real-time channels like SMS or app notifications, with priority assigned according to availability and proximity. A confirmation step completes participation and modifies the system by the donor's response. Through process standards, the system ensures data security, traceability, and compliance with relevant data protection laws, enabling reliable, prompt responses in an emergency.

II- Related Work:

Quick access to blood donors during emergencies can make all the difference. Numerous studies have produced applications that facilitate real-time identification and communication with nearby eligible donors, accelerating life-saving responses [5]. Others have employed machine learning to more accurately predict which donors are eligible to donate plasma, which has sped up and improved the efficiency of the process [6]. Blockchain technology has emerged to maintain transparent and unchangeable records—from donor registration to blood transfusion—to increase trust and security in blood donation [1]. By evaluating recent and historical data, cloud-based AI systems also assist hospitals in

more precisely predicting blood demand, cutting down on waste, and guaranteeing that blood is available when needed [2]. Blockchain-enabled IoT device integration enhances communication between healthcare providers, donors, and recipients while further protecting medical data [3]. Some solutions use blockchain, IoT, and RFID to automatically verify donors, track blood units in real time, and make the entire process safer and more effective from donation to transfusion [4]. Applications such as DWORLD and RAKTAMITRA, which use GPS to match patients with verified donors in the area, make it simpler and faster for users to locate blood in an emergency [7][8]. Additionally, these apps maintain donor data current and secure [9].

By employing AI to instantly match healthy donors, platforms such as SaveUs go beyond social media appeals. They're even planning to include food donations and emergency support, creating a broader humanitarian network [10]. With capabilities like COVID plasma donation and robust privacy protections, other online systems easily link patients, hospitals, and organisations [11].

Smart blood bank systems assist in coordinating donation drives, providing prompt emergency alerts, and promoting consistent donations to maintain stable and easily accessible blood supplies in crowded cities such as Mumbai [12]. Beyond the technical aspects, giving blood is a genuinely amazing act of compassion that unites communities and saves lives when it counts most [13].

Patient safety may be severely impacted by the delays, inaccurate data, and communication errors that frequently accompany manual blood bank systems. In order to address these problems, a digital platform has been developed that unifies blood banks, hospitals, and donors in a single, intuitive interface. All users will find the process faster, safer, and more reliable thanks to this platform, which was created with ReactJS and Firebase and guarantees accurate data handling and secure management of blood donations [14].

Many blood banks in India suffer from persistent shortages, high demand, and restricted accessibility. The collection, distribution, and storage of blood can be revolutionised cost-effectively and practically with cloud computing.

Blood transfusion services can be made more effective, accessible, and reliable by switching to cloud-based solutions, which will benefit patients, donors, and medical professionals nationwide [15].

Blockchain technology has been implemented to further improve security and trust in blood donation systems. This technology strengthens confidence among all stakeholders by guaranteeing that sensitive data stays transparent and impenetrable. Blockchain is used by the Blood Bank Management System to track blood stock, manage donor appointments, protect personal data, and facilitate easy communication between donors, recipients, and medical staff—all through an easy-to-use platform [16].

Quick access to blood in an emergency remains a major concern despite technological advancements, particularly in the absence of real-time updates and public awareness.

To address this, Blood Hub was developed—a reliable and easy-to-use web and mobile application that instantly connects donors and recipients. With real-time location tracking and immediate blood request features, the platform ensures timely access to life-saving support when it matters most [17].

Efficiently handling donations is crucial in fast-paced cities like Mumbai, where there is a constant need for blood. The introduction of a digital blood bank management system has made it easier for donors to find camps in their area and gives hospitals real-time access to blood availability data. For a steady and reliable supply of blood, it also has an emergency notification system and employs machine learning to find and keep regular donors [18].

A secure cloud-based system driven by AWS has been developed to link hospitals in real-time in underserved and rural areas, where access to blood is frequently delayed. This system guarantees that all donor data is securely stored while facilitating quick identification of blood needs, compatibility matching, and post-donation testing. Particularly in remote and urgent situations, it offers a dependable and scalable way to help close the blood supply gap [19].

The kind act of giving blood is at the core of all these innovations. It symbolises compassion, solidarity, and human kindness and goes beyond simple medical necessity. Blood donation unites individuals, builds communities, and gives those in need hope. As a reminder that even modest deeds of kindness can save lives, this small gesture can have a profound effect [20].

III- Methodology:

Fig. 1 says the study follows a carefully structured, step-by-step approach that mirrors how real-world donor systems operate in urgent situations. Registration is the first step in the process, during which people safely register and supply necessary personal and health information. Data collection follows, which involves obtaining users' and verified sources' pertinent health and contact information. Data processing comes next, during which the gathered data is sorted, cleaned, and made ready for usage. During the Eligibility Criteria Checking phase, participants are evaluated according to particular logistical and medical needs to ascertain their suitability for donation. The Critical Request Communication step guarantees that qualified donors are promptly notified in the event of a critical need. Donors can easily reply during the Confirmation phase, and their availability is recorded to help plan the following steps. This process guarantees that the system respects privacy, consent, and the urgency of real-world situations, in addition to being effective and responsive.

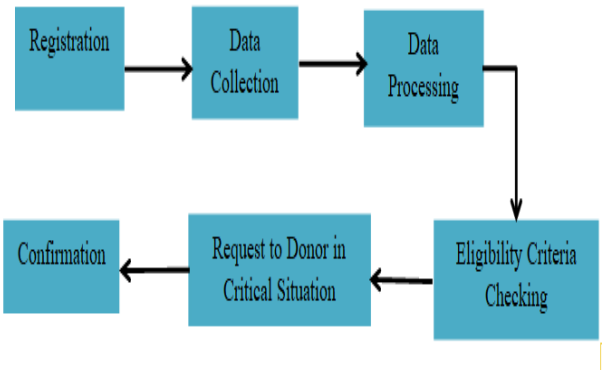

Fig. 1 Registration to Donor Confirmation Process Flow

Data collection, shown in Fig. 2, involves people voluntarily giving their contact, medical, and personal information via a secure online platform. Establishing a reliable donor database requires this information. After receiving the data, the system runs a Criteria Check to see if the individual satisfies the predetermined eligibility requirements, which include blood type, age, and medical condition.

The process ends for the person if they don't fit the requirements at this point, and their data is either marked for future review or safely archived.

The system confirms the identity and consent of those who pass the criteria check in the next step, authentication. This guarantees that every participant is authentic and has consented to use the system. Following successful authentication, their data is kept in a secure database that is guarded by access controls and encryption.

The In-Emergency protocol is started by the system when a critical event takes place, like a medical emergency that calls for immediate donor assistance. It looks up nearby and qualified donors in the database. Following identification, the Alert Message step promptly contacts the identified individuals, requesting that they confirm their availability via email, SMS, or app alert.

Only verified and eligible individuals are contacted during emergencies thanks to this flow, which makes it possible to mobilise donors quickly, reliably, and ethically when time is of the essence.

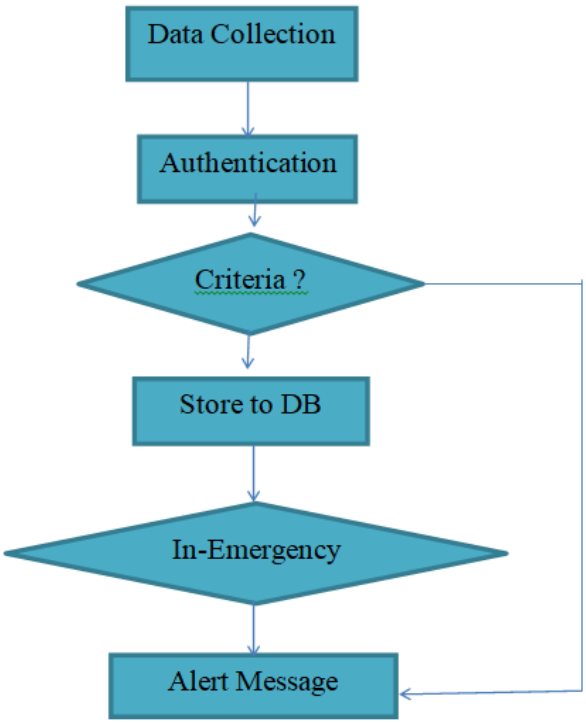

Fig. 2 Donor Engagement and Emergency Response System Flow Chart Description

IV- Results and Discussion

Table 1 describes that blood donation is a compassionate act that plays a vital role in modern healthcare. Every unit collected contributes to life-saving procedures, from emergency surgeries to cancer treatments. However, certain eligibility requirements must be fulfilled in order to safeguard the donor and recipient. Based on a donor's health, lifestyle, and medical history, these rules guarantee the efficacy, safety, and quality of donated blood.

People must first fulfil the fundamental eligibility requirements, which include age, weight, and frequency of donations. While 16-year-olds may donate in some areas with parental permission, the majority of donation centres require donors to be at least 17 years old. To make sure that the volume of blood extracted does not adversely affect the donor's health, a minimum weight of 50 kilogrammes (110 pounds) is required. Additionally, donation intervals are controlled to give the body enough time to heal; normally, whole blood donations occur every eight weeks, plasma donations occur every 28 days, and platelet donations occur every seven days.

Vital signs are another important indicator of donor readiness. To prevent post-donation anaemia, haemoglobin levels must be at least 13.0 g/dL for men and 12.5 g/dL for women. The healthy range for blood pressure is 90/50 to 180/100 mmHg, and the range for pulse rates is 50 to 100 beats per minute. It is easier to determine that the donor is not suffering from a fever or an active infection if their body temperature is lower than 37.5°C (99.5°F).

A thorough examination is also conducted of the donor's medical history and general health. Donors must be healthy and free of infections such as the flu or the common cold on the day of the donation.

Category	Parameters
Basic Criteria	Age, Weight, Donation Interval
Vital Signs	Haemoglobin, Blood Pressure, Pulse Rate, Body Temperature
Health & Medical	General Health, Chronic Illnesses, Medications, Recent Surgery, Pregnancy/Postpartum, Menstruation
Infectious Diseases	HIV/AIDS, Hepatitis B/C, Tuberculosis, COVID-19, Malaria
Lifestyle Factors	Tattoo/Piercing, Alcohol Use, Smoking, IV Drug Use
Vaccination History	Live Vaccines, Inactivated Vaccines
Travel & Other	Travel to Endemic Areas, Blood Transfusion/Transplant, Mild Allergies, Severe Allergies/Anaphylaxis

Table 1: Classification of Eligibility Parameters for Blood Donation

Chronic conditions that cause disqualification include uncontrolled diabetes, heart disease, or active cancer. Blood thinners and acne medications like isotretinoin need to be temporarily or permanently deferred. Typically, donors who have had surgery, are pregnant, or have just given birth are asked to wait six to twelve months. Generally speaking, menstruation does not disqualify a donor unless they are ill or have low haemoglobin.

Infectious disease history is particularly critical. People with HIV/AIDS or hepatitis B or C are permanently deferred to protect recipients from transmission. Temporary deferrals apply to those recovering from COVID-19, tuberculosis, or malaria, with waiting periods ranging from two weeks to a year, depending on the illness and exposure.

Lifestyle factors also affect eligibility. Tattoos and piercings can lead to a deferral of three to six months unless done in sterile, certified facilities. Alcohol should be avoided 24 hours before donating, and while smoking is not a disqualifier, it is discouraged around donation time. Recreational intravenous drug use results in permanent deferral.

Vaccination and travel history are also reviewed. Live vaccines require a short waiting period, whereas inactivated vaccines like flu or COVID-19 usually do not. Travel to areas with high rates of malaria or Zika may lead to temporary deferral, as can recent blood transfusions or organ transplants. Individuals with mild allergies are typically eligible, while those with severe reactions may need medical review.

Fig. 3. In reviewing a group of 20000 individuals, we found an interesting mix of blood types that reflects what we often see in broader populations. The most common blood group in this sample was A+, seen in nearly a third of the participants. O+ wasn’t far behind, showing up in about a quarter of the group.

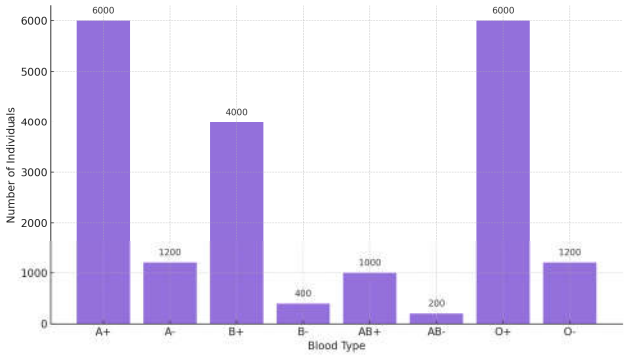

Fig. 3 Distribution of Blood Groups Among 20,000 Individuals

B+ was also fairly common, making up roughly one in five people. Less frequently, we found individuals with AB+, O−, A−, B−, and AB− blood types, with each of these representing a smaller portion of the group. These rarer blood groups—especially the negative types—are less common but incredibly important for emergencies and specific transfusion needs. When we visualize the data in a bar graph, it's clear that positive blood types are far more prevalent, while negative types are much less so. This kind of insight is a helpful reminder of why blood donation from a wide range of donors is so important—especially from those with less common blood types, who may be the match someone urgently needs.

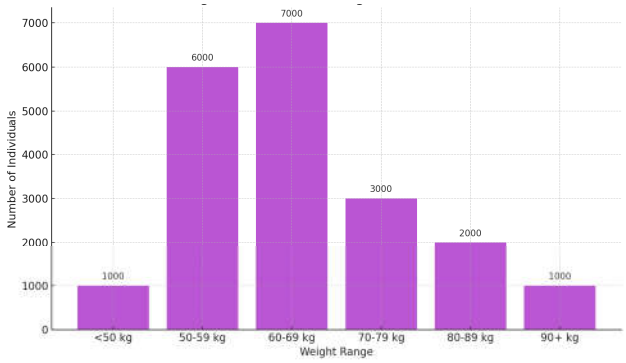

Fig. 4 Weights Distribution Among 20,000 Individuals

Figure 4 reviewed the weight data from a large group of 20,000 individuals; a clear and reassuring pattern stands out. The majority of people fall within the 50 to 70 kg range—an ideal zone that not only reflects a common weight range in the general population but also comfortably meets the minimum requirement for safe blood donation. This suggests a sizable pool of potentially eligible donors, which is encouraging for any blood donation campaign.

As we would expect from larger samples, a healthy percentage of people weigh between 71 and 90 kg. The general trend is encouraging, even though a smaller percentage surpasses 90 kg and a few are slightly under 50 kg. This is effectively represented by the bar graph, which makes it evident that the majority of people fall within the safe, advised range for blood donation.

This distribution is more than just numbers; it's a visual reminder that weight, despite being frequently disregarded, is important in making sure that giving blood is both safe for the donor and advantageous for the recipient. Retaining knowledge about weight eligibility promotes the success of life-saving transfusions as well as the health of donors.

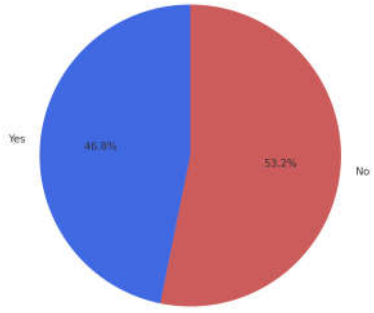

Fig. 5 Blood Donor Willingness (Sample Size: 20,000)

Details of the 20,000 people asked if they would be interested in donating blood are shown in Fig. 5; the answers showed a nearly equal distribution. About 46.8% of respondents indicated that they would be willing to donate, demonstrating a strong sense of compassion and social responsibility.
These individuals represent a hopeful base of potential donors who are already open to making a life-saving contribution. On the other hand, 53.2% indicated they were not currently interested in donating. While this group forms the slight majority, their responses may reflect common barriers—such as fear, health concerns, or simply a lack of awareness about the process. When visualized in a pie chart, the data shows that the community is divided almost down the middle, highlighting both the encouraging level of interest and the opportunity to engage those who may just need more information, reassurance, or support to consider becoming donors in the future.

Among those in Fig. 6 who shared that they're not currently interested in donating blood, their reasons tell a meaningful story. Out of 20000 individuals surveyed, about one-third said no to donation, and many of them gave honest, personal explanations. Several people mentioned that they feel too weak, are underweight, or struggle with low haemoglobin levels—all of which can understandably affect confidence in donating safely. Others talked about having ongoing health issues, which naturally make them cautious. Some simply said they have personal matters taking priority right now, and a few admitted they're just afraid of needles, a common and very human fear.

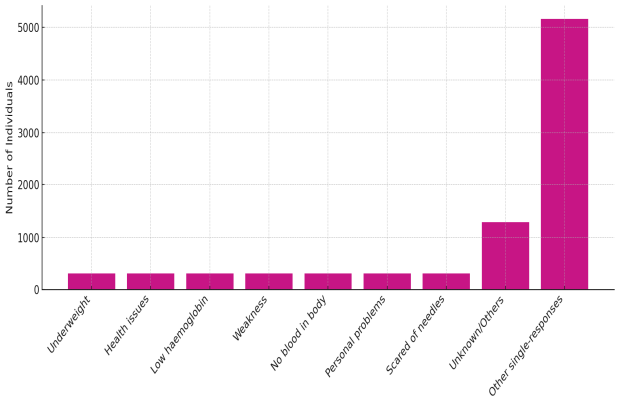

Fig. 6 Reasons for Not Donating Blood (Scaled to 20,000 individuals)

There were even light-hearted but genuine responses like "I don't think I have enough blood in my body," which reflect a mix of anxiety and misunderstanding. When these responses are plotted in a bar chart, distinct trends start to show that most people are expressing concerns that could be resolved with support, education, or reassurance rather than out of disinterest. These observations help create more inclusive and perceptive fundraising campaigns.

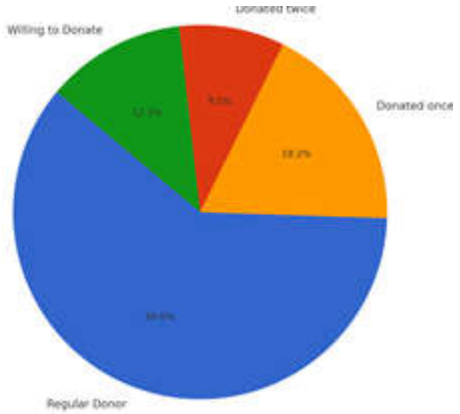

Fig. 7: 20,000 People's Experiences Donating Blood

The responses from 20,000 people regarding their experiences donating blood are reviewed in Figure 7, and the findings were encouraging. Approximately 12120 participants, or just over 60.6%, reported being regular donors, demonstrating a strong commitment to giving back and supporting others through steady donations. Numerous people have already taken significant steps to become regular donors, as evidenced by the smaller percentage of respondents—roughly 18.2%, or 3640 people—who reported having donated once and 9.1%, or 1820 people, who reported having donated twice. Thankfully, 12.1% of respondents, or about 2420 people, stated that they have not yet made a donation but would be open to doing so in the future. A pie chart representing these answers shows a community that is generally active but still has space for expansion. The combination of seasoned contributors and eager newcomers points to a strong basis for developing more robust donation initiatives.

With continued awareness and encouragement, many of those who've donated once—or are just thinking about it—could easily become lifelong contributors.

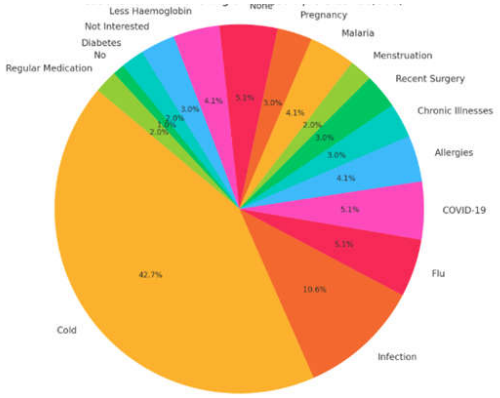

Fig. 8 Reasons for Not Donating Blood (Sample Size: 20,000)

Fig. 8 lists the medication details of 20000 individuals; a wide range of personal and health-related reasons emerged explaining why some were unable or unwilling to donate blood. The most common reason, shared by 42.7%, was having a cold—a minor illness but one that understandably leads people to postpone donation until they feel fully recovered. Another 10.6% mentioned dealing with an infection, again highlighting how temporary health issues can impact donor readiness. Beyond these, participants pointed to other concerns like malaria, pregnancy, low haemoglobin levels, and being on regular medication—all valid medical reasons that require caution or deferral. A few individuals noted more long-term issues, such as diabetes, while others simply said they were not interested at the moment. Some people reported no issues at all, suggesting they may be open to donating in the future if encouraged. When visualized in a pie chart, these responses help illustrate the real-life barriers people face—not due to unwillingness, but often due to temporary or manageable conditions. This insight is valuable for designing outreach efforts that are not only informative but also compassionate and supportive of individuals' health situations.

V- Conclusion

This research set out to explore two essential questions: Who is eligible to donate blood, and how can we encourage more people—especially past donors—to become regular contributors? What we discovered reinforces a powerful truth: blood donation is not just a medical process; it's a deeply personal and humanitarian act that connects people in moments of urgent need. And yet, even with growing awareness, there remains a significant gap between potential and actual donors.

The insights gathered from 62 individuals revealed a range of health statuses, attitudes, and behaviours around donation. Encouragingly, the majority of participants fell within healthy weight limits, making them physically eligible to donate. The distribution of blood types also reflected what we see on a larger scale—with common types like A+, O+, and B+ dominating. However, less common blood groups were also represented, reminding us of the ongoing need for diversity in our donor base to meet all patient needs.

When asked about their willingness to donate, just under half of the respondents said they were interested, while a slightly higher percentage were not. But rather than a flat "no," their reasons revealed something deeper. Many cited real challenges—such as feeling too weak, living with chronic conditions, or managing low haemoglobin levels. Others shared personal fears or life circumstances that felt overwhelming at the time. These responses remind us that behind every statistic is a human story, and that increasing donation rates isn't about pressure—it's about empathy, education, and support.

At the same time, a hopeful picture emerged: over 60% of those who had donated before described themselves as regular donors. Others had donated once or twice and were open to doing so again. A smaller but important group hadn't donated yet, but said they were willing to start. These individuals represent a powerful opportunity to build long-term donor relationships, especially with the right outreach and encouragement.

That's where behavioural nudges come in. Thoughtful, well-timed SMS messages—sent on birthdays, holidays, or other meaningful days—can gently remind people of their capacity to help. These messages don't demand action but offer a personal, timely cue to give. They're a simple but effective tool that respects the donor's autonomy while inspiring continued participation.

The process model outlined in this study—from secure registration through to eligibility screening and emergency outreach—offers a practical and ethical framework for managing blood donation. It's designed to protect privacy, ensure safety, and respond quickly when lives are on the line.

In the end, what this research shows is that many people are willing—and even eager—to help. They just need the right moment, the right message, and the right support. If we meet them with compassion and clarity, we can transform occasional donors into lifelong heroes. Because every donor matters. And every donation has the power to save a life.

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