

# BLOOD BANK INVENTORY

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**Abstract** - Blood transfusion safety is a relevant and significant public health issue in India. Since most blood banks are still in paper-based system, various disadvantages are experienced by various stakeholders, which endanger the lives of patients and damage the healthcare system. This web-based application allows hospitals in India to make inventories of their blood bags online, subsequently, allowing each hospital to check the availability of blood bags anytime. Based on the findings and results, it was found out that these stakeholders perceived online blood bank management system is much better than the manual system. Therefore, with the use of online blood bank management system, blood transfusion process is safe and secured. Threats on improper blood donor documentation, or misplaced records will be totally eradicated. Also, processes involving recording about blood donors, blood bag collection, storage, and inventory will be systematized and organized, hence, improving the healthcare management for blood banks.

## Key words:

Online Blood Bank Management System, Blood Bank Management, Blood Donation, Blood Transfusion Safety, Web-Based Application

## I. INTRODUCTION

Blood transfusion safety remains an important public health concern in India. A total of eight major blood groups for red cells namely, A<sup>+</sup>, A<sup>-</sup>, B<sup>+</sup>, B<sup>-</sup>, AB<sup>+</sup>, AB<sup>-</sup>, O<sup>+</sup>, and O<sup>-</sup>. The availability of blood products of all blood types and the provision of its safety ensure public trust. It's an excellent healthcare system. However, lack of availability of these blood products and provision of unsafe blood products still impacts morbidity and mortality. Through the use of online blood bank management system, blood transfusion safety is expected to be enhanced or improved. Risks on improper blood donors' documentation, and misplaced records can be minimized or totally avoided. Also, processes involving blood bag collection, storage, inventory will be systematized and organized, hence improving the healthcare management. The demand-supply gap for blood/components continues to persist in many healthcare institutions in India. However, this gap has been decreasing due to so constant effort from the government and other agencies. Voluntary donations increased from

54.4% in 2006–2007 to 83.1% in 2011–2012, and 2016 approximately 10.9 million units.

Donated against a requirement of 12 million units.

The blood supply chain as a system is very complex and depends on multiple factors like supply and demand, donor management, issue policies as well as inventory age.

Efficient management of blood inventories and logistics can contribute to a reduction in the overall cost and wastage of blood. Blood inventory management demands a fine balance between ensuring blood availability and keeping wastage to a minimum. Identifying and analyzing various factors that contribute to wastage will provide an insight into ideal inventory management.

Therefore, it is necessary to track and administer the blood bag from the time the donor donates the blood to the point where it is transfused to the patient.

**Background of the Study:** For hospitals, a blood bank known as blood collection Centre, also is an area in which collected blood bags are stored and preserved. For future use in blood transfusion services. Blood transfusion is a medical operation where a patient requires blood or blood products as a life saving measure. In an article published in Times of India in 2014, it was reported that of total amount of blood donated annually in India is approximately 25,000 units. Department of Blood Services is functioning at full capacity to meet the demands in the Maharashtra. Most blood banks are still running manual system in its processes. As such, there is a lack of efficiency because it is still paper based in collecting information about donors, inventories of blood bags, and blood transfusion services. The lack of proper documentation may endanger patients' health due to the possibility of having contaminate blood bags. Contamination happens when there is an incomplete donors' medical history record and the blood bags' shelf life is not monitored properly. Hence, a web-based blood bank management system might be needed to address these issues and problems encountered to ensure blood transfusion safety. Simple rule of thumb practices, the experience of staff, training, clear policy on stock keeping and allocation, daily stock review, record-keeping, monthly performance review, automation, adoption of information system, regular communications, and leadership emerged as factors contributing to inventory management.

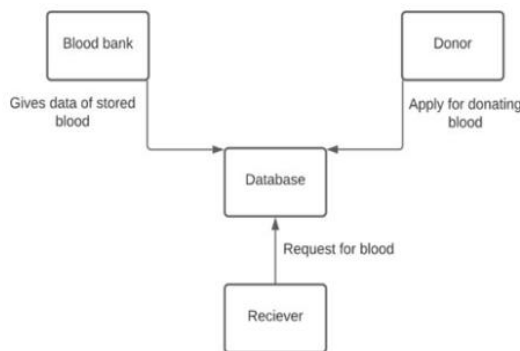


Figure 1: Working of blood bank management system

## II. Literature Survey

The four research papers provided in references address the topics of automated blood bank management systems, blood donation and transfusion, and the use of technology in blood banks. These papers highlight the significance of managing the inventory of blood banks, minimizing wastage, and ensuring the safety of donated blood.

“The Optimization of Blood Donor Information and Management System” [1] is a Blood donor app notifies the latest news or information about blood donation camp details. A better connection via the mobile application at places where there is slow internet connection.[4] The appointment can be fixed by the volunteers are reserved for the day and session that they want or free to make blood donation. The system provides authenticated and authorized features to the current system where private and confidential data can only be viewed by authorized user. The system provides the recording function for every process of the blood in order to keep track of the blood stock accurately.[1]

“Smart Blood Bank Based on IoT: A Review”, The author proposed short message services-based blood bank system, it consists of two modules as data processing module and packet account module. The data processing module responds to the user request, and the packet count module checks the availability of the blood samples.[2] The user can communicate with the system via SMS whenever. He also describes the system based on the RFID and ubiquitous sensor network. The system helps to ensure the error-free blood transfusion process. This system is developed and demonstrated for the continuous report of blood packet temperature and track the location of blood bags.[6] The LTS unit of the system is a useful way to track the location of moving blood banks and time required of the medical staff was reduced. This system makes managing blood bags simple and reliable.[7]

“Short message service (SMS) based blood bank”. They proposed a system in which services of blood bank will be accessed via SMS. If someone needed blood then they have to request for blood via SMS and then packet count module

of their system will check for availability of blood and response will be given by data processing module. It is easy to use and access.[3]

“Blood Donation Management System” provides an overview of a software system that manages the blood inventory and donor information for a blood bank.[9] The study highlights the importance of technology in blood banks and how a software system can help streamline processes and reduce errors. The paper also discusses the challenges faced by blood banks, such as the shortage of blood supply and the need for proper testing and screening of donors.[8]

But the most important advantage of this last paper is that it allows the System to manage information about donors and patients and only authorized persons have authority to use that information and it also has easy access of information as well as it has security which is very essential which the other three don't give.

Overall, these four papers provide insight into the challenges faced by blood banks and the importance of automated systems and technology in managing the inventory and operations of blood banks. These studies emphasize the need for efficient management of blood banks to ensure a safe and adequate supply of blood for patients in need.

## III. SYSTEM OVERVIEW

Firstly, the blood is sent to the blood bank and whenever there is a need for blood, a request is made by the patient. Then according to the request, the blood is transfused to the patient by donor. At the donor module, the patient by donor first registers with all his details & information then he is assigned a donor ID.

After the blood is collected from donor, information such as blood type, date of donation, donor ID, etc. is written to an RFID tag and attached to the blood bag containing blood donated by donor. When the blood bags sent to the blood bank/hospital, tests are performed on the donated blood. If the blood types are not matching or if the blood is found to be infected, a message can be sent to the donor and the data in the RFID tag can be updated or erased if blood is found to be infected, so that the tag can be reused.

If everything is correct, the blood bag is sent for storage. The RFID tag attached to the blood bag and the RFID tag attached to patient's should be checked. Once again that they both match. If it matches, the blood is transfused; otherwise, the blood bag is sent back for storage.

Therefore, we have a 3-step authentication process to avoid mis transfusion:

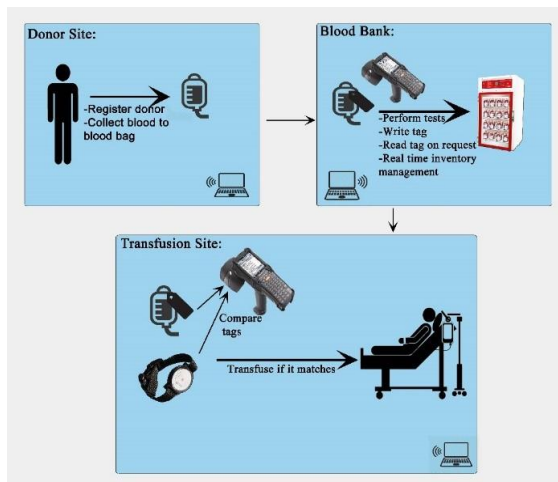


Fig 2. System architecture

#### IV. FUNCTIONALITIES

##### A. At donor site

The donor has to first register with all his details. After the blood is collected from him, a RFID tag is attached to the blood bag with details such as date of donation, donor ID, blood type etc., as shown in fig



The form is titled "Write tag" and includes the following fields:

- Blood Bag: Patient Tag (selected)
- Blood Group: O- (selected)
- Donor ID: 1
- Rack no: 13
- Date of donation: 2014-05-30

A "Write" button is at the bottom right. A message at the bottom states: "write was successful at Wed Apr 30 09:02:16 IST 2014".

Fig. 3 writing data to RFID tag

##### B. At blood bank

The blood that is sent from the donor site is first tested to check if the blood type is the same as specified by the donor and it is also tested for basic infections. If a problem is found, the donor will be informed about the same. Otherwise, the blood is sent for storage. This process also checks for conditions such as expiry date. If the blood bag is not expired, it is sent to the transfusion site.



The form is titled "Blood Tag: Patient Tag" and displays the following data:

- Blood Group: O-
- Date of donation: 2014-01-01
- Donor id: 1
- Rack no: 13

A red banner at the bottom states: "The blood has expired". A "READ" button is at the bottom center.

Fig 4: reading data from RFID tag.

##### C. At transfusion site

After the blood reaches the transfusion site, the RFID tag attached to the patient's wrist is removed from the blood bag. Both the tags are placed on the RFID scanner, which then reads the data from both the tags and compares them. If the blood type matches, the blood is transfused to the patient, otherwise it is sent back to storage.



Two side-by-side screens showing the result of an RFID tag comparison:

- Match:** Patient: A+, Blood bag: O-. The word "Match" is displayed in large red letters.
- No match:** Patient: A+, Blood bag: AB+. The words "No match" are displayed in large red letters.

Both screens have a "Compare" button at the bottom.

Fig. 5 check Data RFID tag

##### D. Inventory tracking

This module tracks the current stock of the blood bank in real time as shown in fig.6. If the stock of any particular blood type goes extremely low, a mail will be automatically sent to the registered donor of that blood type, requesting for donation. The blood bank administrator can also set the minmax threshold based on the requirement of the blood in the blood bank. Once the number of blood bags decreases below the threshold that is set, the notification of a red-light blinking is displayed on the screen which indicates the requirement of the particular blood type.

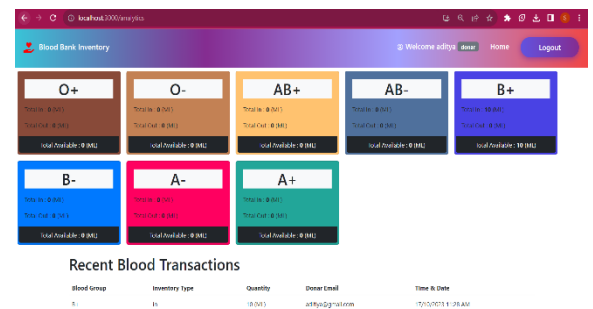


Fig: 6 Real time status of the stock

#### V. OVERALL DESCRIPTION

- Registration form for blood bank, donor, and Hospitals
- Login form for blood bank, donor and Hospital
- Dashboard form for Blood bank, Donor and hospital where blood bank and hospital can see all data about their firm.



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