

Inventory management practices in the blood bank of an institute of national importance in India

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ABSTRACT

Background: The demand and supply gap in blood and components has always existed in healthcare facilities. Blood inventory management is crucial to meet the demand and to minimize wastage. This study explores the blood inventory management practices at the blood bank of an institute of national importance in India. **Methods:** The technicians of the blood bank were interviewed on the practices they followed on blood inventory management and records were reviewed where required. **Results:** 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. **Conclusion:** The blood bank follows simple procedures and relies on the experience of its staff to manage its inventory. Rigorous training, strict oldest-unit-first-out (OUFO)/first-in-first-out (FIFO) principle for stock management, stringent allocation policy, diligent record-keeping, daily stock review, and monthly performance reports were identified as the key drivers for inventory management. Other measures like regular preventive maintenance of equipment, robust blood bank information system, communication with stakeholders, and effective leadership were found to contribute indirectly to inventory management practices.

Keywords: Blood Inventory, Hospital Blood Bank, Inventory Policy, Inventory Management

Introduction

The demand-supply gap for blood/components continues to persist in many healthcare institutions in India. However, this gap has been decreasing due to constant effort from the government and other agencies. Voluntary donations increased from 54.4% in 2006–2007 to 83.1% in 2011–2012, and by 2016, approximately 10.9 million units were donated against a requirement of 12 million units.^[1] 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.^[2] 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. This study attempts to find out the blood inventory control practices that are being followed at one of the largest and most advanced blood banks in the country which is attached to an apex tertiary care medical institute.

Materials and Methods

A representative sample of 20 technicians of various cadres was identified by purposive sampling. Interview by way of open-ended un-coded questions was followed and record review was done to obtain retrospective data. The interview protocol comprised of six sections and aimed to obtain responses

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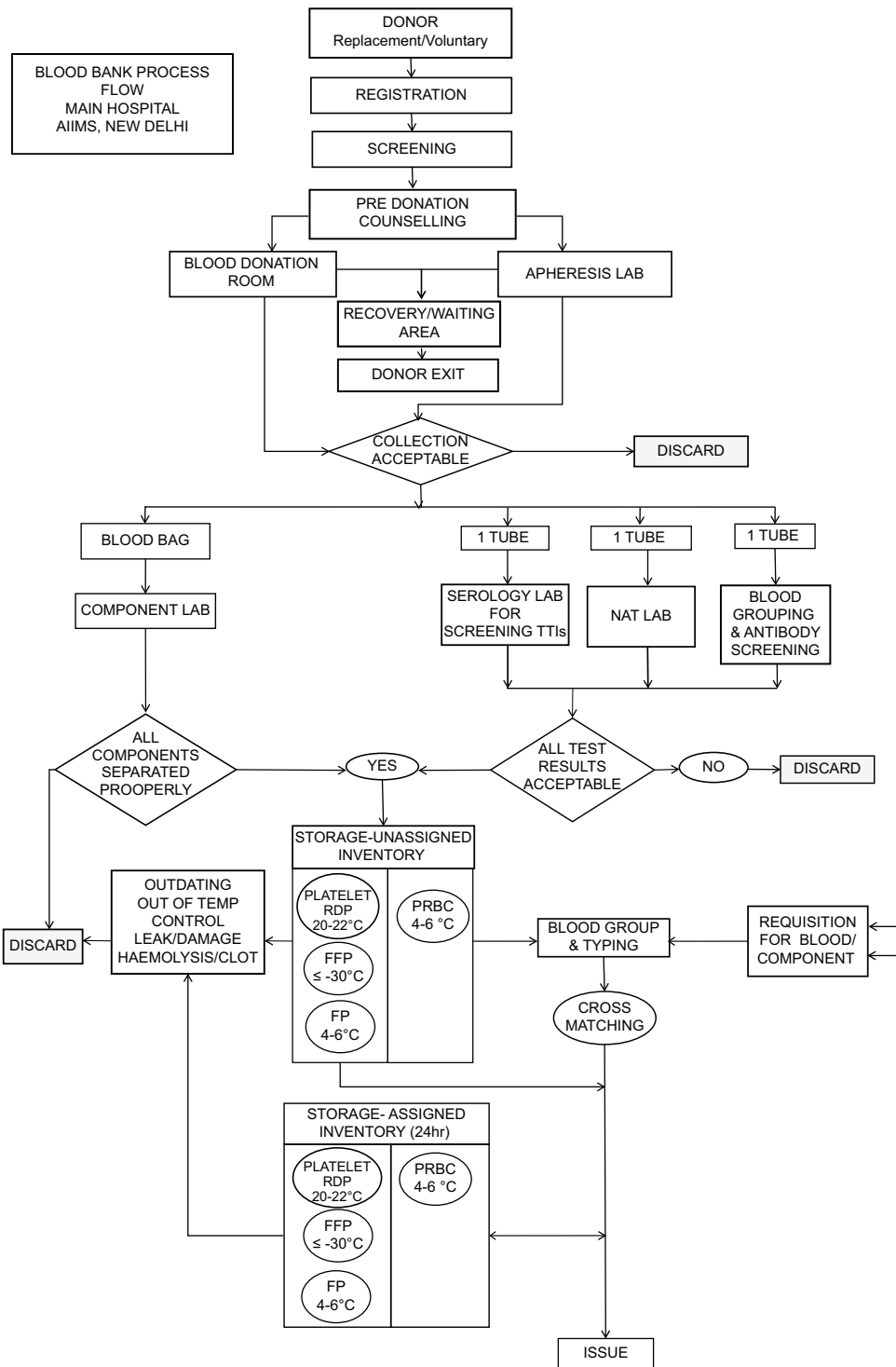
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pertaining to (a) Setting Stock Levels, (b) Replenishment of Stock Levels (c) Allocation of Blood Units (d) Operations and Training (e) Internal Collaboration with Hospital Staff, and (f) Use of Information Technology. Interview transcripts were reviewed to obtain key themes on inventory management practices. This was supplemented with site visits and review of records. Consent was taken from each of the participants and ethical approval was taken.

Observations and Results

The basic process flow is described in Flowchart 1. The following major themes emerged regarding inventory management practices:

1. *Simple Inventory Monitoring Procedures*: None of the staff mentioned using any complex models or equations to readjust stock levels. They were unanimous that the basic objective was to keep time expiry to a minimum while ensuring that stock levels are high enough to ensure supply. To achieve this, target stock levels have been established based on the experience and are adjusted continuously over time. These levels are not rigid and are adjusted dynamically on a daily basis. The experience of the staff played an important role to make the right decision for the ideal stock level.
2. *Transparency of Inventory*: Detailed information about the locations and quantities of blood components lead to more accurate decisions about replenishment and issue, and hence, lower wastage. This has been achieved by adapting a blood bank software and incorporating bar-coding as an essential part of blood bag labeling. To prevent the mismatch of stock, a tally of inventory on software and physical identification is done on a regular basis.
3. *Regular Stock Review and OUEA/FIFO Principle*: Use of a strict oldest-unit-first-out (OUFO) policy or first-in-first-out (FIFO) policy was mentioned as the most important method in reducing wastage. The blood/component stock in the refrigerators is sorted by age (i.e., remaining shelf life) so that the oldest units closest to expiry are used first. The software and bar-coding enable segregating units as per age/freshness. The stock is reviewed daily and decisions to replenish are taken based on the demand, replacement donor availability, voluntary donations, etc.
4. *Strict Replacement Donation and Periodic Voluntary Donation*: In India, the concept of voluntary donation has not caught up and the only source of blood is either replacement donation or periodic voluntary blood donation camps that are organized by blood banks. Thus, to keep up with the demand, the blood bank follows a strict replacement donor policy. Any patient needing elective blood transfusion has to provide a replacement donor against at least 50% of units requisitioned, except in the case of emergency and lifesaving situations.
5. *Strict Blood/Component Allocation Policy*: As per departments' requisition, the required quantities of blood/components are booked for the particular patient. These "booked" or "allocated" units are physically separated from the main inventory and kept separately only for 24 h. If the allocated units are not issued within this stipulated period, then they are returned to the main inventory. A Transfusion Medicine specialist discusses the blood/component need with the treating team to rationalize the demand and prevent excess inventory to be blocked under "allocated" stock. An MSBOS (Maximum Surgical Blood Ordering Schedule) was under development, which would be a final solution to this issue.
6. *Standard Operating Protocols (SOPs)*: SOPs were available for each and every process and were segregated according to the type of lab concerned. The staff was encouraged to refer to the SOPs when required. The SOPs were reviewed annually or when required.
7. *Monthly Performance Reports*: The blood bank generates multiple operational reports on a monthly basis. These reports not only helped to measure the performance but also helped in deciding future improvement plans. As per the statutory guidelines, a monthly report was submitted to the State Blood Transfusion Council.
8. *Human Resource Training*: This was mentioned by all the participants as the most important element for good performance since the impact of staff decisions affected the whole supply chain. Rigorous hands-on training and constant supervision by seniors together with the use of detailed SOPs were found to be standard practice. An important motivating factor for all technical staff to undergo diligent training was job security and assured career progression.
9. *Equipment Maintenance and Calibration*: All equipment, instruments, refrigerators, etc., including the walk-in cold room were under diligent preventive maintenance to ensure maximum uptime. It was a policy to incorporate 5-year warrants followed by 5-year annual maintenance for every piece of equipment during procurement. The calibration was maintained by a third-party vendor on a regular basis.
10. *Leadership and Communication*: The blood bank was headed by a transfusion medicine specialist with a management degree from a prestigious institute. There was also a Hospital Transfusion Committee comprising representatives from the Blood Bank, Clinical Disciplines, Lab Medicine, and Administration. This committee met regularly to attend issues faced in the blood bank and plan for future development.
11. *Internal Collaboration*: Regular collaboration with medical/surgical staff and all stakeholders was important in enhancing performance and also to reduce the just-in-case orders, and hence, wastage.
12. *Digitalization and Information Technology*: Adoption of professional blood bank software with the incorporation of bar-coding and hand-held scanners made it possible to trace every unit. It also made record-keeping convenient and various reports could be automatically generated. Many pieces of the equipment were now online and the manufactures directly monitored their performance thereby ensuring maximum uptime. The integration of the equipment with the



Flowchart 1: Schematic flow chart showing basic process flow from donation to issue

information system allowed lab reports and quality checks to be automatically picked up and stored against each unit.

Discussion

The literature on inventory management within the blood supply chain is rather limited, and there have been two major periods of activity: the 1970s and then the 2000s.^[3] In 1973, Jennings

was the first to identify three key measures of blood supply chain performance: shortage, outdating/wastage, and cost of information and transportation.^[4] Subsequently, a few authors have proposed different mathematical models for ideal inventory management.^[5,6] This study revealed that this major blood bank follows the simple rule of thumb principles to effectively manage inventory. Decisions are based on the experience and judgment of the technical staff. This finding is similar to that pointed out

by Stangeret *et al.* (2012)^[3] who mention that though literature asserts that good inventory performance can be achieved by the use of complex inventory models and algorithms but found that in practicality, good performance is driven by the quality of transfusion laboratory staff, who must be skilled, regularly trained, and experienced. This study has also pointed out that a lot of emphasis is given to the training of the technical staff. Similarly, Lowalekar *et al.* (2013)^[7] mention that the application of Operation Research techniques in the area of blood inventory management has been very active and useful, however, the real-life implementation of these applications in India is rarely documented. Another finding of this study regarding the freshness of stock and strict adherence to OUFA/FIFO principle as a key driver for inventory control has also been reported by Bedi *et al.* (2016)^[4] where the authors suggest that the report of soon to be outdated blood components should be generated and a strict FIFO policy must be followed. This study also mentions digitalization and adaption of blood bank information systems as a key element in the proper management of blood inventory and processes. This is also mentioned by Lowalekar *et al.* (2013)^[7] where the authors state that the role of computerized information systems with decision-making support has been quite significant in the management of regional blood banks. Ramadhan *et al.* (2019)^[8] also propose a Blood Bank Management System (BBIS) based on cloud computing that can communicate with individual donors in Indonesian to maintain blood supply availability. Bedi *et al.* (2016)^[4] also mention that the lack of functional hospital information system and awareness among the clinicians further aggravate the challenges in maintaining a consistent inventory in the public sector blood banks in India. A similar finding has been mentioned in this study. Similar to the finding of this study, Butch *et al.* (1985)^[9] have reported that blood banks must regularly communicate with physicians so as to rationalize blood ordering. Chapman *et al.* (2004)^[2] have also mentioned that blood inventory management is a complex process and depends on factors like blood inventory age, demand-supply gap, donor management, and issue policies. Our study brings out the fact that even in a good institute, the blood bank inventory methods are being neglected and there is a need to revamp the system. This study also highlights some of the good practices like using the bar code and also details that user comfort is important in handling/inventory management. This study applies to all blood banks which form an important aspect of public health wherein it becomes important to save the blood from getting wasted. The lacunae highlighted in the study can be implemented at the national level to make the blood bank efficient in handling loads of blood.

Conclusion

This study explored the inventory control practices in a major blood bank in the country. The results revealed that simple procedures to manage inventory greatly depend on the insights of highly trained and experienced staff. No complicated Operations Research methods or mathematical formula is followed. It strictly follows an oldest-unit-first-out policy, stringent allocation

policy, and daily review of stock. Tremendous focus is paid to the training of the staff on the SOPs. All wastage is carefully monitored through monthly performance reports. All equipment has a rigorous preventive maintenance schedule. A robust professional blood bank information system with complete digital integration of all equipment offers a key advantage. Effective leadership, regular communication, and internal collaboration are instrumental in augmenting inventory management practices.

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Declaration of patient consent

The authors certify that they have obtained all appropriate patient consent forms. In the form the patient(s) has/have given his/her/their consent for his/her/their images and other clinical information to be reported in the journal. The patients understand that their names and initials will not be published and due efforts will be made to conceal their identity, but anonymity cannot be guaranteed.

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Conflicts of interest

There are no conflicts of interest.

References

1. Marwaha N. Voluntary blood donation in India: Achievements, expectations and challenges. *Asian J Transfus Sci* 2015;9(Suppl 1):S1-2.
2. Chapman JF, Hyam C, Hick R. Blood inventory management. *Vox Sang* 2004;87(Suppl 2):143-5.
3. Stanger SH, Yates N, Wilding R, Cotton S. Blood inventory management: Hospital best practice. *Transfus Med Rev* 2012;26:153-63.
4. Bedi RK, Mittal K, Sood T, Kaur P, Kaur G. Segregation of blood inventory: A key driver for optimum blood stock management in a resource-poor setting. *Int J App Basic Med Res* 2016;6:119-22.
5. Beliën J, Forcé H. Supply chain management of blood products: A literature review. *Eur J Oper Res Elsevier* 2012;217:1-16.
6. Prastacos GP, Brodheim E. Computer-based regional blood distribution. *Comput Oper Res* 1979;6:69-77.
7. Lowalekar H, Ravichandran N. Blood bank inventory management in India. *Opsearch* 2014;51:376-99.
8. Sahid Ramadhan MN, Amyus A, Fajar AN, Sfenrianto S, Kanz AF, Mufaqih MS. Blood bank information system based on cloud computing in Indonesia. *J Phys Conf Ser* 2019;1179. doi: 10.1088/1742-6596/1179/1/012028.
9. Butch SH. Blood inventory management. *CE Updat-Immunohematology I Laboratory Med* 1985;16:17-20.