

Analysis of Turnaround Time During Emergency Issue of Blood Products: Prospects and Pitfalls

Dr. Subhasish Das¹, Mr. Shabeer Ahamed Khan², Mrs. Shabreen Taj³

¹M.D., Ph.D., Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

²Senior Laboratory Technologist, Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

³Senior Laboratory Technologist, Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

Corresponding Author: Dr. Subhasish Das, M.D., Ph.D., Sri Devaraj URS Medical College, Tamaka, Kolar-563101, Karnataka, India

E-mail: daspathology@gmail.com

Abstract

While turnaround time (TAT) is a universally accepted quality indicator (QI) for Blood Transfusion services (BTS) there is a lack of standardised criteria for its measurement. TAT was calculated from receipt of blood issue request till the time the blood unit got crossmatched and kept ready for transfusion. As delay in TAT affects the patient safety and clinical outcomes directly monitoring of TAT is essential.

Aim: Evaluate TAT and Identify factors that contribute towards delay by assessing PRBC requests and propose measures to improve efficiency.

Materials and method: A retrospective observational study was conducted from January to December 2025 in a NABH- accredited tertiary care blood centre by only including the PRBC requests. For 10 percent of randomly selected monthly requests were used for assessing TAT using Excel randomisation. The requests were categorised as routine (< 3 hours), emergency (< 60 minutes) and lifesaving (< 15 minutes). SPSS v22.0 was used to analyse the data with mean values having a confidence interval of 95%. Comparison was done using unpaired t- test and ANOVA.

Results: An average of 45-74 routine requests were received per month. The emergency and lifesaving requests ranged from 8-20 and 1-10 respectively. Mean TAT for routine was between 129.2-164.2 minutes whereas Emergency and lifesaving TAT were between 30.3-53.3 minutes and 8.0-13.0 minutes respectively, all with in NABH benchmark. 58 cases were delayed due to pre analytical, operational and technical errors.

Conclusion: Delay can be reduced by regular monitoring of TAT, ensuring strengthened preanalytical practices and overcoming other errors. Addressing these factors will ensure patient safety and better clinical outcomes and ensure compliance to accreditation standards.

KEY WORDS: Turnaround Time, Accreditation, Quality Indicators

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Introduction

Turnaround time (TAT) related to Blood Transfusion Services (BTS) is defined as the time taken to complete a transfusion cycle.^[1,2] Although TAT is universally accepted as a quality indicator (QI) of BTS.^[3] No consensus exists regarding the globally accepted criteria for estimating TAT.^[4] Therefore, we undertook the study to assess TAT and identify the factors influencing TAT during routine blood banking services as TAT has a direct effect on patient safety and customer satisfaction.^[5,6,7]

AIM:

Our study has the following objectives

1. To evaluate TAT for blood centre samples
2. To ascertain the causes of delay of TAT
3. To suggest remedial measures to reduce TAT

Materials and Methods

Our study is a non-interventional observational retrospective study with effect from 1st January 2025 to 31st December 2025. In the blood centre attached to a tertiary care NABH accredited postgraduate Teaching Hospital. Our blood centre has also received NABH accreditation and NABH Quality Indicators including TAT are regularly monitored.

TAT was calculated from the receipt of blood issue request till the time the blood unit get crossmatched and kept ready for transfusion. In our centre blood requests were segregated into three categories, namely a) lifesaving (15 min) b) emergency with 60 minutes and routine with 3 hours as per Standard Operating Protocols.

Estimation of TAT was restricted to PRBCs and remaining blood components namely FFP, platelets and cryoprecipitate were not included in the study. Calculation of TAT was done based on the random audit of 10 percent of all monthly requests for PRBCs received in the blood centre. Using a randomiser in excel the data was randomly distributed.

Blood centre staff regularly tracked the samples regarding maintenance of TAT. Real time data collection was done on a prepared spread sheet. The purpose of the study was not disclosed to the staff to prevent bias.

Statistical Analysis

Data was collected via excel sheets. SPSS software version 22.0 was utilized to analyse the collected data. Mean was used to report continuous data with a confidence interval of 95%. Unpaired t-test and

analysis of variance was used to compare mean values.

Results.

A total of 1000 PRBC requests that was selected from 10 percent of random monthly audit were analysed from month of January 2025 to December 2025. Categorised as Emergency, Life Saving, Routine with TAT being calculated from the time of receipt of the request to the time the blood unit got crossmatched and ready for issue for transfusion. [Table 1] shows the month wise distribution of cases Majority of the requests consists of routine category, with an average of 45 to 74 requests per month. Number of emergency requests ranges from 8 to 20 whereas lifesaving requests are 1 to 10 per month. These variations reflect the various clinical demands of the institute. [Table 2]

Routine TAT remained within acceptable limits as per NABH standards while many a times it was noticed that it was reaching the upper limits. The range was between **129.2 to 164.2 minutes**, with February having the shortest Mean TAT of 129.2 minutes and the longest mean TAT was observed in January with 164.2 minutes.

For emergency requests the mean TAT ranged from 30.3 to 53.3 minutes. With the shortest TAT in May (30.3 min) and the longest in November (53.3 min). All the requests met the acceptable limits as per NABH standards.

TAT for life saving requests reflects prioritization of critical transfusion by remaining within the benchmark as per NABH standards, with average TAT value ranging from 8 minutes to 13 minutes.

TAT for PRBCs were observed to fall within the acceptable TAT ranges across all categories of requirement in our blood centre. A total of 58 cases faced delays due to various reasons, analysis of these TAT outliers provided us with valuable feedback regarding identification of the factors prolonging TAT. [Table 3]

Delay in TAT can be broadly attributed to pre-analytical errors, technical and operational error. Technical factors include unit integrity problems, pre issue inspection, equipment breakdowns etc. Sample related issues include haemolysis, insufficient volume, improper labelling. Operational reasons contributing to delayed TAT were ABO/Rh discrepancies, irregular antibody, detection and extended phenotyping etc.

Discussion

Timely blood transfusion is a critical lifesaving intervention which involves multiple steps in execution with the help of various staff at different stages of implementation.^[8] As our health facilities improve, customer awareness coupled with mandatory accreditation standards of health services have reemphasized the importance of TAT.

Although several measures have been taken including full automation^[9], and routine application of exclusive blood bank software application,

maintenance of TAT remains a challenge as it compromises both the patient treatment and customer satisfaction.

According to Devi et al^[7] blood and blood products are randomly ordered by the clinicians without sufficient justification and thereby further compromising the TAT by putting extra burden over limited blood bank staff which ultimately further prolongs the TAT.

The analysis of TAT outliers has provided valuable feedback regarding identification of the factors prolonging TAT and to initiate corrective and preventive measures in this regard.

According to Agnihotri et al^[6] a considerable delay in arranging blood occurs due to activities occurring outside the blood centre which can be improved by taking remedial steps with regard to preanalytical variables such as better transportation and submission of adequately filled blood requisition forms etc.

According to Pati and Singh^[1] better manpower management along with initiation of standard operative procedures for sample identification, customer service and management of multiple requests etc in the blood centre will be useful in the maintenance of TAT.

Ngo et al^[10] suggested proper emphasis on automation as increasingly blood samples as being processed for additional testing such as irregular antibody screening, Du Test, extended phenotyping etc, in order to comply with better quality standards. Hence these factors may have to be accounted for estimating TAT.

Ramanathan et al^[7] suggested to create sufficient awareness among clinicians regarding preanalytical variables such as proper labelling of the samples, adequately filling up the forms and proper identification of the patients.

With increasing emphasis on mandatory accreditation maintenance of quality indicators along with proper estimation of TAT for various blood bank activities remains crucial. Accreditation demands standardization of all blood centre activities ranging from sample received, collection and processing along with donor infectious disease testing. Optimization of blood requests for both elective and emergency surgeries require establishment of benchmarks and quality assurance standards as per NABH. Due to accreditation Blood Transfusion Services are expected to uphold high standards of accuracy, precision and discipline and punctuality to ensure efficient delivery.^[2,3]

Conclusion

Regular monitoring, feedback analysis of donors, proper training of staff along with allocation of sufficient manpower will go a long way in improving TAT and improve patient care particularly during emergencies. The above measure will also improve the risk of hazards associated with blood transfusion.

References

1. Pati HP, Singh G. Turnaround time (TAT): Difference in concept for laboratory and clinician. *Indian J Hematol Blood Transfus* 2014;30:81-4.
2. Gupta A, Gupta C. Role of National Accreditation Board of Hospitals and Healthcare Providers (NABH) core indicators monitoring in quality and safety of blood transfusion. *Asian J Transfus Sci* 2016;10:37-41.
3. Gnanaraj J, Kulkarni RG, Sahoo D, Abhishekh B. Assessment of the key performance indicator proposed by NABH in the blood centre of a tertiary health care hospital in southern India. *Indian J Hematol Blood Transfus* 2022;38:761-7.
4. Pfunter A Wier LM, Stocks C. Most Frequent Procedures Performed in U.S Hospitals, 2010. HCUP statistical brief #149. Rockville MD: Agency for health care research and quality; February, 2013.
5. Devi KM, Sharma AB, Singh LD, Vijayanta K, Lalhriatpuii ST, Singh AM. Quality indicators of blood utilization in a tertiary care center in north-eastern India. *J Dent Med Sci* 2014; 13:50-2.
6. Agnihotri N, Agnihotri A. Turnaround time for red blood cell transfusion in the hospitalized patient: A single-center “blood ordering, requisitioning, blood bank, issue (of blood), and transfusion delay” study. *Indian J Crit Care Med* 2018;22:825-30.
7. Ramanathan T, Shaiji PS, Usha KC. Turnaround time for issuing blood products in an emergency—A prospective real-time study in a regional blood transfusion centre. *Int J Contemp Med Res* 2017;4:688-91.
8. Lee AJ, Kim SG. Analysis of turnaround time for intraoperative red blood cell issues: A single center study. *Lab Med* 2017;48:277-81.
9. Sackett K, Kjell A, Schneider AM, Cohn CS. A field analysis trial comparing the turnaround times of routine and STAT red blood cell immunohematology testing. *Immunohematology*. 2017 Jan;33(1):1-5. PMID: 28425748.
10. Ngo LT, Bruhn R, Custer B. Risk perception and its role in attitudes toward blood transfusion: A qualitative systematic review. *Transfus Med Rev* 2013;27:119-28.

Table 1 Number of cases per month

Month	Routine	Emergency	Life saving
January	45	20	10

February	60	10	4
March	73	15	7
April	67	12	2
May	69	18	8
June	63	15	2
July	68	11	1
August	60	8	4
September	74	14	8
October	71	10	6
November	60	9	7
December	74	8	7

Table 1 shows the month-wise distribution of PRBC requests categorized as routine, emergency, and lifesaving. Routine requests were highest throughout the year, while emergency and life-saving requests showed lower but variable monthly demand.

Table 2 TAT in minutes for each month

Month	Routine TAT (min)	Emergency TAT (min)	Life-saving TAT (min)
January	164.2	41.3	9.9
February	129.2	38.0	12.0
March	164.1	39.7	9.9
April	158.5	35.0	9.0
May	153.0	30.3	13.0
June	154.1	47.7	8.0
July	155.7	48.6	10.0
August	153.7	39.4	12.0
September	158.8	42.1	11.8
October	153.1	40.5	12.5
November	150.8	53.3	11.1

December	152.7	38.8	10.6
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Table 2 summarizes the month-wise mean turnaround time for PRBC requests across routine, emergency, and life-saving categories. All categories remained within the defined benchmark limits, with routine requests showing the longest TAT and life-saving requests the shortest throughout the study period.

Table 3		
TAT Range	No. of Cases	Reasons for Delay (Adapted to Your Centre)
31–35 min	19	1. Simultaneous requests for multiple components (PRBC + FFP/platelets) 2. Delay due to porter/attender unavailability 3. Technician diverted to urgent phone queries or clinician clarifications 4. Incomplete or improperly filled blood request forms 5. Sample labeling discrepancies (name/MR number mismatch) 6. Patient identifiers not tallying with requisition
36–40 min	11	1. Additional processing time for thawing FFP 2. Multiple emergency requests received simultaneously 3. Delay due to absence of bystander/porter for collection 4. Workforce shortage during peak hours
41–45 min	12	1. Request form misplaced or not traceable immediately 2. Sample labeling errors requiring re-verification 3. Hemolyzed sample requiring repeat collection 4. Unit

		leakage or integrity issues detected during issue check 5. Additional time required for thawing FFP 6. Limited technical staff available during shift change
45–50 min	2	1. Inadequate sample volume received 2. Temporary equipment malfunction (centrifuge/gel card station) 3. Difficulty identifying compatible unit (rare group/low inventory)
≥ 50 min	14	1. Sample misplaced or not found in reception/storage area 2. ABO/Rh discrepancy requiring repeat testing 3. Unit damage detected during pre-issue inspection 4. Healthcare professional not available for collection 5. Hemolyzed or clotted sample requiring recollection 6. Improper sample labeling requiring verification 7. Power interruption affecting processing workflow 8. Time lost in locating appropriate units in inventory 9. Multiple simultaneous emergency requests (massive transfusion scenario)

Table 3 summarizes the distribution of delayed TAT cases across different time ranges and highlights the associated pre-analytical, technical, and operational factors contributing to delay. The highest number of delayed cases was observed in the 31–35 minute range, while delays beyond 50 minutes were mainly associated with sample-related issues, compatibility challenges, workflow interruptions, and simultaneous emergency requests.