EJPMR, 2026, 13(4), 535-539 **Research Article** **Impact Factor: 8.158**

EUROPEAN JOURNAL OF PHARMACEUTICAL AND MEDICAL RESEARCH

www.ejpmr.com

ISSN (O): 2394-3211
ISSN (P): 3051-2573
Coden USA: EJPMAG

EVALUATION OF TURNAROUND TIME FOR ISSUING BLOOD COMPONENTS ON EMERGENCY REQUESTS AT A TERTIARY CARE TEACHING HOSPITAL – AN SYSTEMATIC STUDY

Raja Kumar N.[1], Ruth Jenila A.*[2]

[1]Professor & HOD, Department of Transfusion Medicine, Sri Lalithambigai Medical College and Hospital, Chennai, India.
[2]Assistant Professor, Stanley Medical College & Hospital, The Tamil Nadu Dr. MGR Medical University, Chennai, India.

***Corresponding Author: Ruth Jenila A.**
Assistant Professor, Stanley Medical College & Hospital, The Tamil Nadu Dr. MGR Medical University, Chennai, India. **DOI:** https://doi.org/10.5281/zenodo.20156845

How to cite this Article: Raja Kumar N.[1], Ruth Jenila A.*[2] (2026). Evaluation Of Turnaround Time For Issuing Blood Components On Emergency Requests At A Tertiary Care Teaching Hospital – An Systematic Study. European Journal of Pharmaceutical and Medical Research, 13(4), 535–539.

This work is licensed under Creative Commons Attribution 4.0 International license.

Article Received on 21/02/2026 **Article Revised on 11/03/2026** **Article Published on 01/04/2026**

ABSTRACT

Blood transfusion played a vital role in modern healthcare, particularly in emergency and surgical settings where timely availability of compatible blood significantly influenced patient outcomes. This study evaluated the turnaround time for issuing blood and blood components in a tertiary care medical college and identified factors contributing to delays to establish a benchmark for improving transfusion service efficiency. The study assessed the workflow involved in transfusion services by analysing the time interval between receipt of transfusion requests or samples and the issue of compatible blood units. Different stages of the process, including pre-analytical, analytical, and post-analytical phases, were examined to determine sources of delay. Special attention was given to compatibility testing procedures and operational practices within the blood bank. The findings showed that turnaround time was affected by multiple factors such as sample handling, transportation delays, compatibility testing procedures, manpower availability, and inappropriate or excessive requisition of blood components. Variations in turnaround time were observed across clinical scenarios, with emergency cases requiring shorter processing times. Inefficiencies in workflow and suboptimal resource utilization were identified as major contributors to delays. The study concluded that turnaround time served as an important indicator of quality in transfusion services and had a direct impact on patient safety and healthcare delivery. Continuous monitoring and targeted interventions, including process optimization, staff training, and standardized protocols, were essential to improve efficiency, reduce delays, and enhance patient care outcomes.

KEYWORDS: Blood transfusion, Turnaround time, Transfusion services, Compatibility testing, Blood bank workflow, Quality indicators.

INTRODUCTION

Blood transfusion (BT) is one of the most commonly performed procedures in modern hospitals.[1] In surgical or medical emergencies, providing cross matched blood on time is vital to ensure smooth and effective transfusion services.[2]

Quality indicators in blood banks are essential for improving the facilities to the patients and to ensure the wellbeing of the patient. Several indicators are used to evaluate the quality of blood transfusion services. Turnaround time (TAT) is one of the ten key quality indicators for blood banks.[3]

The treating clinicians consider TAT from the "time the blood component request is given to staff nurse at ward to issue of blood component" while the blood bank professionals view TAT as the "time the specimen is received in blood bank to issue of blood components". In emergencies, Quicker TATs have a role in saving precious lives and delayed TATs increases the probability of late treatment. In elective situations, Quicker TATs have a role in bringing down total

expenditure for the patient and delayed TATs increases the possibility of belated treatment and increased expenditure. Therefore, assessment of TAT is crucial for maintaining quality of service and guarantee patient management.[4]

The ‘‘total testing cycle’’ explains TAT as organization of nine steps: ordering, collection, identification, transport, preparation, analysis, reporting, interpretation, and action.[5]

Blood components are often requested without appropriate scrutiny of the real situation of the patient, as this will lead to wastage of components and loss of blood inventory. This practice of indiscreet over-ordering of blood can trouble the blood inventory, reagents and human resources of a health care service and thereby increase the expenditure of medical care.[6] Statistics show that there is excessive over-ordering of blood components in 40% to 70% of recipients transfused.[7,8]

Our institution is a tertiary care medical college. The aim of the study is to identify the factors which leads to increased TAT in our Centre in issuing blood and blood components. Our aim was to establish an appropriate benchmark for TAT with regular monitoring, which is also important for customer satisfaction and quality management.

MATERIALS AND METHODS

This was a prospective observational study in the Department of Transfusion Medicine at a tertiary care teaching hospital in Chennai for a period of three months. Turnaround time was defined as the time from the receipt of request form with blood sample to the time at which the blood component was issued to the ward nursing assistant of the patient.

Inclusion criteria

All emergency requests for Packed Red Cells (PRC), fresh frozen plasma (FFP) and platelet concentrates (PC) during this period were included.

Exclusion criteria

Those who needed Antihuman globulin (AHG) crossmatch, elective cases, cross matched for reservation and units that required additional special handling (e.g., washing, irradiation).

The process of issuing blood was analysed and was divided in various phases :

1. Receiving the blood request form with sample and entering it in the register with date & time
2. Allotment of technician for cross matching and crosschecking the sample & request for details of the patient
3. Selection of the correct blood component and compatibility testing
4. Blood component labelling and delivering to issue counter.
5. Entry of Delivery of blood component in the issue register and delivering the component to ward nursing assistant.

Time of receipt of request form along with sample and the time of issue of blood component were recorded using single clock kept at the reception cum issue counter. Standard turnaround time was fixed as 30 minutes for blood units issuing after immediate spin cross match(ISCM) from previous literature. The data were collected in real time using prepared excel worksheet. To avoid bias, the nature of the study was not disclosed to the blood bank staff who is involved in receiving blood requests, cross matching and issue of blood components.

Data of all emergency request was recorded during all shifts in a day (Forenoon shift:7am- 1pm, Afternoon shift:1pm-7pm and Night shift:7pm-7am). Cases with prolonged TAT more than 30 minutes were noted and Root cause analysis was done for these cases, and factors contributing to product delay were identified. The type and number of blood component were noted from the blood request forms.

Statistical Analysis

Data was entered daily in MS Office Excel format and Information was gathered in a structured proforma. Statistical analysis was performed using SPSS software (version 20). Independent t test and Analysis of Variance was used to compare mean values. P value less than 0.05 was considered statistically significant.

RESULT

For 335 patients 566 blood components were issued after ISCM during the study period of three months were analysed. Majority (79 %) of cases belonged to surgical specialties which includes surgery, orthopaedics, cardiovascular thoracic surgery (CVTS), paediatric surgery, neurosurgery, vascular surgery, surgical gastroenterology. Various other non-surgical specialties (21%) which needed blood on emergency includes medicine, nephrology, medical gastroenterology etc.

Among 566 blood components that were issued after ISCM, 202 (35.75%) blood components falls above 30 minute of TAT i.e. extended beyond standard TAT. The delayed TAT needs further evaluation to identify the causes of the delay. Root cause analysis done for delayed TAT and the reasons have been tabulated in Table number 1.

Table 1: Root cause analyses for delay in TAT.

Causes for delay in TAT	No of cases
Errors in Blood request form	18
Request for multiple blood components for a patient	24
Multiple blood request form received simultaneously	9
Errors in Blood sample labelling	15
Lysed sample	11
Inadequate sample	19
Thawing of FFP	14
ABO discrepancy	9
Incompatible crossmatch & searching of compatible units	7
Delay in receiving blood units by hospital attender	12
Combination of above causes (>1)	64

Table 2: shows Distribution of TAT according to number of components issued.

Component	No of cases	Mean of TAT
PRC (single)	156	28.17
PRC (multiple)	49	35.78
FFP (multiple)	27	36.33
PC (multiple)	31	28.12
Multiple components	72	37.65

Single packed RBC unit issue had a mean TAT of 28.17 minutes and the mean TAT for issue of multiple packed RBC was 35.78 minutes. In comparison to the mean TAT for packed RBC & fresh frozen plasma, the mean TAT for issue of platelet concentrates was less. TAT is more for FFP than for PRC and Platelet concentrates, since FFPs are issued as multiple units and need time for thawing. The mean TAT for different components during different shifts were not significantly different.

DISCUSSION

Our tertiary care hospital handles a large number of emergency cases every day in the casualty, with multiple operating theatres running at the same time. In such a setting, the most crucial factor is the TAT especially during emergency transfusions using immediate-spin cross matching. Keeping track of turnaround time (TAT) in transfusion medicine helps improve patient safety by ensuring timely and safe blood transfusions, and directly influences the patient treatment and clinicians' satisfaction on blood bank.[9]

There is increasing pressure from clinicians to reduce the TAT. Improving and bettering the TAT, is a difficult multifaceted mission. The first step is to look at how it varies across different departments, types of blood components, and staff duty shifts in the blood centre. Then It is also important to address the delay which concerns trained technicians, proper equipment's, following standard operating procedures and planning. As per the Directorate General of Health Services, the performance and quality of blood transfusion services are assessed using quality indicators, which track the entire process from the donor's vein to the recipient's vein.[10]

The American association for blood bank states quality indicators as performance measures used to monitor processes during a defined time which indirectly reflects the services of the blood transfusion services.[11] The World Health Organization have stated that each year, the demand for blood components in hospitals far exceeds the collection of blood by blood banks.[12]

Statistics and studies by various agencies have revealed that there is an inclination on part of treating doctors to over-order blood components in surplus of utilization.[13] Richard et al documented that the time required to carry out ABO and Rh typing, antibody screening & immediate spin cross-matching and later issue packed red blood cells for transfusion is 30 to 90 minutes depending on the platform performed.[14] In an another study by Bruce et al noticed that median turnaround times of 30 minutes for RBC units to be issued and 35 minutes for delivery of RBC units to the operating room following an emergency request to the blood bank.[15]

Based on above studies, the TAT for issue of emergency request with immediate spin crossmatch was taken as 30 minutes which we set in our study. The issues which had a TAT beyond this 30 minute time period was evaluated to locate the place of possible delay.

While comparing the TATs across institutions the platform of testing, steps of sample processing & compatibility tests, type and screen policy should be considered. Lower TAT was observed in studies which did not take account of multiple blood component requests. Colt M. McClain et al, compared the mean TATs at the two institutions for orders of RBCs. They found that mean TAT for emergency blood issue were 10 ± 3.8 min in one Centre and 14 ± 7.2 min in another. But they included cases eligible for analysis had completed type-and-screen results with requests for four or fewer RBC units. Patients with a positive antibody screen had

serologically cross matched units prepared and reserved for intraoperative use in advance resulting in emergency TAT of 10 to 15 minutes.[16]

Cox C et al and Cheng G et al reported a shorter TAT on issue of blood units as the selection and compatibility of blood units were done beforehand and on request blood was issued based on electronic blood banking.[17,18]

Study by Weiskopf et al described TAT for a procedure which involved previously cross matched blood units which needed only issue to operating room.82% of units issued reached the operating room within 2 minutes of request, 91% arrived within 3 minutes, and 100% arrived within 4 minutes.(14)In another study, Ramanathan et al, TAT was analysed during 3 shifts but difference was not found to be statistically significant (p=0.86).[19]

Fish bone analysis established the various reasons for delayed TAT and the reasons are tabulated in Table number 1. In concordance with the other studies, present study reported the causes of increased TAT were request for multiple blood component for a patient, multiple orders from different departments received at the same time simultaneously, mass casualties with simultaneous massive transfusion protocol, FFP thawing etc.[20,21]

Stotler et al performed an interventional study with a hypothesis that the delays occurred because of a disproportion between the patient sample workload and the number of employees available in the emergency preanalytic area to handle this workload. They demonstrated that the addition of 2 clerical staff would significantly improve TAT in our emergency preanalytic area during day shifts on weekdays.[22]

In an Indian study by Kalyan Khan, various staff problems related to manpower management and staff preferences were found to be an important contributing factor for delayed TAT.[23] Sharma *et al*. show that various staff problems related to human resources management contributed to delayed TAT.[24]

In our setting, the higher TAT is likely due to the lack of automated sample transport systems and dependence on manual documentation. Similar issues have been noted in studies from large, high-workload centres that are yet to adopt full automation, while those with automation report significantly lower TAT. Based on our findings and evidence from comparable institutions, limited automation and inadequate staff support appear to be key factors. Introducing systems like pneumatic tube transport and integrated hospital information systems could help reduce the TAT.[25-27]

Limitations in the present study were there was exclusion of elective requests for blood components, some shifts were less staffed and frequent auditing made the technical staff conscious of the study which could be a bias in the study. Apart from automation, with available resources and manpower, the study made us to identify the pitfalls in our services and steps were taken to improve the process.

CONCLUSION

We observed a wide variation in Turn Around Time in Emergency cases and for cases which extended beyond the standard TAT, by identifying root causes , we can develop strategies to narrow the TAT . Faster TATs bring down the mortality and morbidity rate in such conditions. There is frequent over ordering leading to demand of blood. Thus, rationale use of blood components with regular training of technical personnel with automation in blood banking, education to clinical staff by demonstration regarding requesting blood units and sample labelling, strict adherence to SOPs, improving work force distribution, Reassigning the duties to manage multiple request and massive transfusion protocol will bring down the TATs. This study serves as a starting point for establishing a benchmark for TAT in issuing blood units in our blood bank. The clinicians at the same time should understand the difficulty in arranging rare negative blood group donors, procedure time for crossmatch, thawing of fresh frozen plasma and give the blood bank personnel the space to improve the blood transfusion services.

Declaration by Authors

Ethical Approval: Approved.
Acknowledgement: None.
Source of Funding: None.
Conflict of Interest: The authors declare no conflict of interest.

REFERENCES

1. Pfuntner A, Wier LM, Stocks C. Most frequent procedures performed in U.S. hospitals, 2010. HCUP Stat Brief. 2013; (149). Rockville (MD): Agency for Healthcare Research and Quality. Available from: http://www.hcup-us.ahrq.gov/reports/statbriefs/sb149.pdf
2. David Novis Consulting. Operating room blood delivery turnaround time [Internet]. Available from: https://www.davidnovis.com/operating-room-blood-delivery-turnaround-time-2/
3. Accreditation standards on blood banks/blood centres and transfusion services: quality indicators, 2013.
4. Howanitz JH, Howanitz PJ. Timeliness as a quality attribute and strategy. Am J Clin Pathol, 2001; 116: 311-5.
5. Lundberg GD. Acting on significant laboratory results. JAMA. 1981; 245: 1762-3.
6. Chawla T, Kakepoto GN, Khan MA. An audit of blood cross-match ordering practices at the Aga Khan University Hospital: first step towards a maximum surgical blood ordering schedule. J Pak Med Assoc, 2001; 51: 251-4.

7. Lowery TA, Clark JA. Successful implementation of maximum surgical blood order schedule. J Med Assoc Ga. 1989; 79: 155-8.
8. Hardy NM, Bolen FH, Shatney CH. Maximum surgical blood order schedule reduces hospital costs. Am Surg. 1987; 53: 223-5.
9. Breil B, Fritz F, Thiemann V, Dugas M. Mapping turnaround times to a generic timeline: a systematic review of definitions in clinical domains. BMC Med Inform Decis Mak, 2011; 11: 34.
10. Directorate General of Health Services. Transfusion medicine technical manual, 2nd ed, 2003.
11. Roback JD, Grossman BJ, Harris T, Hillyer CD, editors. Technical manual. 17th ed. Bethesda (MD): American Association of Blood Banks; 2011; 21-4.
12. World Health Organization. Handbook on the clinical use of blood in medicine, obstetrics, paediatrics, surgery and anaesthesia, trauma and burns, 2002; 88.
13. Friedman BA, Oberman HA, Chadwick AR, Kingon KI. The maximum surgical blood order schedule and surgical blood use in the United States. Transfusion, 1976; 16: 380-7.
14. Weiskopf RB, Webb M, Stangle D, Klinberg G, Toy P. A procedure for rapid issue of red cells for emergency use. Arch Pathol Lab Med, 2005; 129: 492-6.
15. Jones BA, Novis DA. Nongynecologic cytology turnaround time. Arch Pathol Lab Med, 2001; 125: 1279-84.
16. McClain CM, Hughes J, Andrews JC, Blackburn J, Sephel S, France D, et al. Blood ordering from the operating room: turnaround time as a quality indicator. Transfusion, 2013; 53: 41-8.
17. Cox C, Enno A, Deveridge S. Remote electronic blood release system. Transfusion. 1997; 37: 960-4.
18. Cheng G, Chiu DS, Chung AS, et al. A novel system for providing compatible blood to patients during surgery: self-service electronic blood banking by nursing staff. Transfusion. 1996; 36: 347-50.
19. Ramanathan T, Shaiji PS, Usha KC. Turnaround time for issuing blood products in emergency: a prospective real-time study in a regional blood transfusion centre. Int J Contemp Med Res, 2017; 4(3): 688-91.
20. Storrow AB, Zhou C, Gaddis G, Han JH, Miller K, Klubert D, et al. Decreasing laboratory turnaround time improves emergency department throughput and decreases emergency medical services diversion: a simulation model. Acad Emerg Med, 2008; 15: 11.
21. Fernandes CMB, Worster A, Hill S, McCallum C, Eva K. Root cause analysis of laboratory turnaround times for patients in the emergency department. Can J Emerg Med, 2004; 6: 116-22.
22. Stotler BA, Kratz A. Determination of turnaround time in the clinical laboratory. Am J Clin Pathol, 2012; 138: 724-9.
23. Khan K. Root cause analysis of prolonged laboratory turnaround time in a tertiary care setup. J Clin Diagn Res, 2014; 8(4).
24. Sharma M, Arora S, Malhotra A. Analysis of turnaround time for issuance of blood products in emergency: a prospective study in a tertiary care centre in Jammu. J Med Sci Clin Res, 2018; 6: 231-6.
25. Jalili M, Shalileh K, Mojtahed A, Mojtahed M, Moradi-Lakeh M. Identifying causes of laboratory turnaround time delay in the emergency department. Arch Iran Med, 2012; 15: 759-63.
26. Goswami B, Singh B, Chawla R, Gupta VK, Mallika V. Turnaround time as a benchmark of laboratory performance. Indian J Clin Biochem, 2010; 25: 376-9.
27. Dada A, Beck D, Schmitz G. Automation and data processing in blood banking using the Ortho AutoVue Innova system. Transfus Med Hemother, 2007; 34: 341-6.