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# A Prospective Observational Study on Turnaround Time for Issue of Blood Components on Emergency Request in a Tertiary Care Teaching Hospital

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**Abstract**

**Introduction:** The efficiency of Blood Transfusion services have recently come under scrutiny due to awareness of blood transfusion and customer rights. Timeliness, which is commonly expressed as the Turnaround Time (TAT), is regularly used as yardstick for performance. The aim of this study is to evaluate the TAT and classify the causes which are directly associated in increasing the TAT during issue of blood components.

**Material and Methods:** A prospective observational study was undertaken in the Department of Transfusion Medicine at a tertiary care teaching hospital for a period of three months. The benchmark for turnaround time was set at 30 minutes for blood units to be issued after immediate spin crossmatch (ISCM). TAT of 750 blood requests was evaluated. Statistical analysis was performed using SPSS software (version 20). P value less than 0.05 was considered statistically significant.

**Results:** Among 750 blood components issued, 504 (67.2%) of total blood components issued fell between 11 to 30 minutes of TAT and 240 (32%) issues fell above 30 minute of TAT. Single packed RBC unit issue had a mean TAT of 27.71 minutes and the mean TAT for issue of multiple packed RBC was 37.54 minutes. In comparison to the mean TAT for packed RBC & fresh frozen plasma, the mean TAT for issue of platelet concentrates was less.

**Discussion:** The causes of increased TAT were request for multiple blood component for a patient, multiple orders from different departments received at the same time ,FFP thawing, etc Turnaround time or timeliness directly influences the patient treatment and faster TATs bring down the mortality and morbidity rate. However, though TAT may not be a reliable quality indicator; it will definitely help in regularising the blood transfusion services and thereby improving clinician satisfaction and patient management.

**Keywords:** Turnaround Time, Immediate spin crossmatch, Blood transfusion services.

## Introduction

The efficiency of Blood Transfusion services have recently come under scrutiny due to awareness of blood transfusion and customer rights. There are various indicators to assess the quality of blood transfusion services. From the clinician point of view, Timeliness, which is commonly expressed as the Turnaround Time (TAT), is regularly used as yardstick for performance. 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. Evaluation of TAT is crucial for maintaining quality of service and guarantee patient management. The treating clinicians regard 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".[1] Quality indicators in blood banks are essential for improving the services to the patients and to ensure the wellbeing of the patient.

Researchers portray TAT in different ways. The ''total testing cycle'' explains TAT as organization of nine steps: ordering, collection, identification, transport, preparation, analysis, reporting, interpretation, and action.[2] The turnaround time (TAT) in issuing packed red blood cell concentrates (RBCs) have surfaced as one of the major quality indicator.[3]

TAT is used to scrutinise transfusion services, thereby improving quality in patient services. The need of the hour is to bring down the TAT to an optimal level in all user departments based on the emergency and elective indications. The primary step is to find out the disparity of TAT in each department based on the blood component requested. The next step is to categorize the indication and identify the reasons for delay in services. Based on the above steps, preventive actions are to be taken to bring down the TAT. Above all, the blood bank medical officer should take in the consideration of the resources and technical personnel available, and decide the TAT for each indication of the user departments. Improving turnaround time (TAT) is a multifaceted task relating to training personnel, equipment purchase & usage and planning.[1] Turnaround time (TAT) is a noticeable and general standard by which clinicians evaluate and review the excellence of transfusion services.[4]

Even though, organizations that authorize blood banks and hospitals and provide accreditation for the efficiency with which blood bank services meet patients' needs, there are no norms to evaluate and determine the timeliness with which transfusion medicine & blood bank personnel issue blood components to operating theatres.[5,6] 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.[7] Statistics show that there is excessive over-ordering of blood components in 40% to 70% of recipients transfused.[8,9] Modern healthcare system regards transfusion of blood components as an essential part of managing patients. There is always a scarcity of blood during summer leading to demand in voluntary healthy blood donors. The performance of blood banks should be evaluated by TAT so that the resources are utilized optimally.[10] The aim of this study is to evaluate the TAT and classify the causes which are directly associated in increasing the TAT during issue of blood components.

**Material and Methods**

A prospective observational study was undertaken 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 blood sample with request form to the time at which the blood component was issued to the ward nursing assistant for delivering it to ward/operation theatre.

All emergency requests for Packed Red Cells (PRBC), fresh frozen plasma (FFP) and platelet concentrates (PC)

throughout this period were included. Elective indications for transfusion, extended Antihuman globulin (AHG) crossmatch, specialized products (eg. saline-washed RBCs) and crossmatch & reserve blood component requests were excluded from the study.

The TAT was analyzed on various phases:

1. Receiving the blood component request with sample and entering the receipt with date & time in the register,
2. Allotment of technician for crossmatching and crosschecking the sample & request for details of patient
3. Selecting the right 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.

Continuous time monitoring was done using single clock kept at the reception cum issue counter by noting down the time of receipt of request form along with sample and the time of issue of blood component. The benchmark for turnaround time was set at 30 minutes for blood units to be issued after immediate spin crossmatch (ISCM). The data were collected in real time using prepared excel worksheet.

To avoid bias, the study was conducted without the knowledge of the blood bank staff involved in receiving blood requests, crossmatching and issue of blood components. Data of all emergency requests were recorded throughout the day (7 am to 7am). The causes for TAT exceeding 30 minutes were noted and analyzed. The type and number of blood component were noted from the blood request forms.

**Statistical analysis**

Information was collected in a structured proforma. Data was entered in MS Office Excel format and 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.

**Results**

750 blood components which were issued after ISCM for 491 patients during the study period of three months were analyzed. Majority (84%) of cases belonged to surgical specialties which includes surgery, orthopaedics, cardiovascular thoracic surgery (CVTS), vascular surgery, gastroenterology and neurosurgery. Various other non-surgical specialties (16%) which needed blood on emergency include medicine, nephrology, haematology, medical gastroenterology etc. Among 750 blood components issued, 504 (67.2%) of total blood components issued fell between 11 to 30 minutes of TAT and 240 (32%) issues fell above 30 minute of TAT that is TAT extended beyond standard TAT. The delayed TAT issues had to be examined with extra care to find out the real cause behind the delay. The mean TAT for different components during different shifts was variable but was not significantly different (ANOVA with p=0.571). TAT for issue of multiple blood components was high than issue of single blood component which was as expected (Table-1).

Table-1: Turnaround Time according to issue of number of blood components:

| Components | No. of recipients | Mean of TAT | SD |
|---|---|---|---|
| PRC (single) | 212 | 27.71 | 6.087 |
| PRC (multiple) | 72 | 37.54 | 9.476 |

| | | | |
|---|---|---|---|
| FFP (multiple) | 40 | 34.13 | 7.645 |
| PC (multiple) | 63 | 27.98 | 8.322 |
| Multiple Components | 104 | 38.54 | 9.874 |

Single packed RBC unit issue had a mean TAT of 27.71 minutes and the mean TAT for issue of multiple packed RBC was 37.54 minutes. In comparison to the mean TAT for packed RBC & fresh frozen plasma, the mean TAT for issue of platelet concentrates was less. The major cause for delayed TAT was analyzed for each issue by root cause analysis and the reasons have been tabulated in Table number 2

Table-2: Causes of increased TAT in issue of blood components on emergency requests:

| Causes of Increases TAT | No. Of cases |
|---|---|
| Request for Multiple blood component for a patient | 27 |
| Blood sample labelling error | 19 |
| Blood request form errors | 18 |
| FFP thawing | 14 |
| Inadequate sample | 12 |
| Lysed samples | 12 |
| Compatible unit not matched & searching for compatible units | 11 |
| Hospital attender delay in receiving blood units | 11 |
| ABO Discrepency | 9 |
| multiple orders received simultaneously | 8 |
| Combination of above causes (> 1) | 63 |

**Discussion**

There has been a large focus on quality of blood banks in recent years. Turnaround time or timeliness directly influences the patient treatment and clinicians' satisfaction on blood bank.[11] There is increasing pressure from clinicians to improve the TAT. Improving and bettering the TAT, is a difficult multifaceted mission, which concerns trained technicians, proper equipments, following standard operating procedures and planning. As per the Directorate General of Health Services, evaluation of performance and quality of blood transfusion services are done by quality indicators which evaluate service from vein of donor to vein of recipient.[12] 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.[13] 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.[14] Statistics and studies by various agencies have revealed that there is a inclination on part of treating doctors to over-order blood components in surplus of utilization.[15] Some authors have reported a large deviation in TATs in their institutions.[6] 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 (RBCs) for transfusion is 30 to 90 minutes depending on the platform performed.[16] Jones et al observed TAT of 30 minutes for Red blood cell units for issue and another five minutes to delivery to ward/operation theatre.[17] Based on above studies, the TAT for issue of emergency request with immediate spin crossmatch was taken as 30 minutes which was appropriately followed as TAT in cases of emergency requests when the ordering clinician accepted crossmatch upto immediate spin phase for compatibility. The issues which had a TAT beyond this 30 minute time period was evaluated to locate the place of possible delay.

The TAT of the present study in comparison with other studies was difficult as the platform of testing [test tube method & column agglutination technology (gel card)] and steps of sample processing & crossmatch tests were different.

Lower TAT was observed in studies which did not take account of multiple blood component requests. In a study conducted by McClain et al3, the mean TATs for request of RBCs at study institutions were 10 ± 3.8 min in first Centre and 14 ± 7.2 min in the next centre. However, the eligibility criteria for the cases were completed type & screen results with request of four or lesser blood units.[3]

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.[18,19]

Weiskopf et al reported a shorter TAT of less than five minutes to operation theatres in previously crossmatched blood units (i.e Type, crossmatch & save method). This was different from the present study as we had treated the request from receiving the sample, processing the sample, immediate spin crossmatch and issue of blood components.[16]

Similarly, the TAT for fresh frozen plasma was longer as the FFP had to be thawed before issue. Thawing was one of the major reasons for prolongation of TAT whenever FFP was ordered with other blood components.

Fish bone analysis established the various reasons for delayed TAT and the reasons are tabulated in Table number 2. 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]

A study by Khan K analysed delayed TAT was due to lack of trained technical staff and human resources management.[22]

Stotler BA and Kratz A carried out an interventional study with an objective that delayed TAT may be due to imbalance between sample load and technical staff available in clinical laboratory. The study results showed that adding two clerical staff improved TAT during peak time in daytime shifts.[23]

Based on the present study and various conclusions from other valuable studies conducted at similar bigger institutions, lack of automation and staff support was considered as an important factors. Automation for sample transport by vacuum shuttles and hospital information interface systems can be implemented to bring down the TAT.[24,25,26]

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**

Blood component transfusion remains one of the major treatment strategies for emergency indications. 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 will bring down the TATs. However, though TAT may not be a reliable quality indicator; it will definitely help in regularising the blood transfusion services and thereby improving clinician satisfaction and patient management. 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.

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