

Turnaround time of blood components in a blood bank of tertiary health care

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Abstract-

Introduction- In tertiary health care settings, where patient requirements are varied and frequently urgent, efficient management of blood components is critical to timely and effective healthcare delivery. Turnaround time is a crucial performance parameter for blood banks that has a direct impact on patient outcomes and resource utilisation. Our study's objective is to assess the blood components' turnaround time at a tertiary healthcare blood bank.

Material and methods- This study is a retrospective cohort analysis that collected data on blood requests and product usage at a tertiary care hospital between January 2021 and December 2021. The data was then analysed for turnaround times.

Results-

The turnaround times for packed red blood cells (PRBC) are 5 to 25 minutes, and the monthly issues range from 277 to 485 units. Turnaround times for fresh frozen plasma (FFP) range from 8 to 22 minutes, and between 181 and 330 units are produced per month. Platelets (PLT) are provided monthly in quantities of 116 to 303, with turnaround times ranging from 4 to 15 minutes. Furthermore, eleven reports of emergency problems were made during certain months.

Conclusion-

The information shows a considerable deal of variation in the number of blood components issued and the turnaround times for those components in a tertiary hospital environment in 2021. Comprehending these oscillations is essential for effective distribution of resources and inventory control. Furthermore, the occasional occurrence of emergency problems highlights how crucial it is for blood bank operations to be adaptable and well-prepared.

INTRODUCTION

Blood transfusions, or BTs, are a standard medical practice in contemporary hospitals and are seen as both a life-saving measure and a sign of high quality for medical facilities.¹ Unfortunately, there is a dearth of published research on this crucial quality metric, and there isn't a set national or worldwide standard for a BT's turnaround time (TAT).² TAT is the time it takes to finish a process cycle, and it should be computed from the moment a doctor orders a BT until the patient begins getting it.³

The study intends to determine how long it typically takes to arrange for a hospitalised patient to receive a red blood cell unit for transfusion and how many blood products are distributed on a monthly basis.

Agnihotri describes the standard procedures for a BT with a hospitalised patient. The BT procedure completes an orbit when it begins with the patient (the treating physician orders the BT) and concludes there as well. The initials "ORBIT"

also refer to the main quantifiable and time-consuming phases in a standard blood transfusion process: ordering, requisitioning, issuing (blood), and initiating transfusion. The total time needed to complete all of these processes is the minimum time for initiating BT to a patient in any setting.⁴ In this study we are noting the time from receipt of request till issue of the blood unit to the attendant.

MATERIAL AND METHODS

The study used a retrospective method, analysing recorded data from the blood bank's archives between January 2021 and December 2021. The information included average monthly issuance numbers for a variety of blood products, including packed red blood cells (PRBC), fresh frozen plasma (FFP), platelets (PLT), and emergency supplies. In addition, the study looked at the turnaround time of each blood product for each month within the defined term.

Data extraction entailed obtaining the blood bank data for each month of the research period. The reported data includes the average number of units issued for PRBC, FFP, PLT, and emergency circumstances every month.

Turnaround time statistics for each blood product category were also obtained, indicating the time it took from the start of a request to the issuance of the appropriate blood component.

Aggregating the monthly data revealed overarching trends and patterns in blood product issuance and turnaround time. Descriptive statistics were done by SPSS version 24, to determine averages and examine variability between months and blood product types.

RESULTS

MON THS of 2021	JAN	FEB	MAR	APR	MAY	JUN	JUL	Aug	Sep	Oct	Nov	Dec
Turn Around Time for issue of blood and blood components												
PRBC (in minut es)	8	7	7	13	5	5	9	6	7	5	9	6
Sum of time taken	3664	3108	2912	4225	1385	1900	3132	2388	2940	2425	3195	2292
Total no of PRBC issued	458	444	416	325	277	380	348	398	420	485	355	382
FFP (in minut es)	25 min	20 min	18 min	13 min	19 min	11 min	8 min	10 min	12 min	13 min	15 min	22 min
Sum of time taken	8025	6160	4014	1690	3439	2299	1544	2340	3084	4290	3855	6974
Total no of FFP issued	321	308	223	230	181	209	193	234	257	330	257	317
PLT (in minut es)	7 min	5 min	9 min	6 min	7 min	5 min	5 min	4 min	4 min	9 min	15 min	12 min
Sum of time taken	1232	900	1701	1818	812	785	815	984	1080	2574	1905	2256

Total no of PLT issued	176	180	189	303	116	157	163	246	270	286	127	188
Emergency Issue (in minutes)		13 min	17 min	-	-	12 min	20 min	10 min	10 min	--	--	--
Sum of time taken		52	35	-	-	24	20	10	10	--	--	--
No of blood issued in emergency basis	-	4	2	-	-	2	1	1	1	--	--	--

Table 1- A master chart showing TAT times of PRBC, FFP and PLT and emergency issues in 2021.

Turnaround time for various blood products- (Table 1)

In addition to emergency blood issues, the study examines turnaround times for fresh frozen plasma (FFP), packed red blood cells (PRBC), and platelets (PLT) over the course of many months. With some slight changes, the PRBC turnaround time ranges from 5 to 13 minutes (Average 7.25 minutes, Standard deviation [SD]- 2.3). There are substantial variances in the FFP turnaround time, which ranges from 8 to 25 minutes (average- 15.5 minutes, SD- 5.2). A PLT can be completed in four to fifteen minutes (average- 7.3 minutes, SD- 3.4). The turnaround time for emergency issues also varies, with monthly variations of 10 to 20 minutes (average- 13.6 minutes). (Figure 1)

In terms of turnaround time, PRBC is the fastest, followed by PLT and FFP. When compared to PRBC and PLT, FFP has the longest turnaround time and is more variable. The PLT turnaround time varies greatly from month to month; some exhibit quicker turnaround times than others.

PRBC, FFP, PLT and Emergency Issue

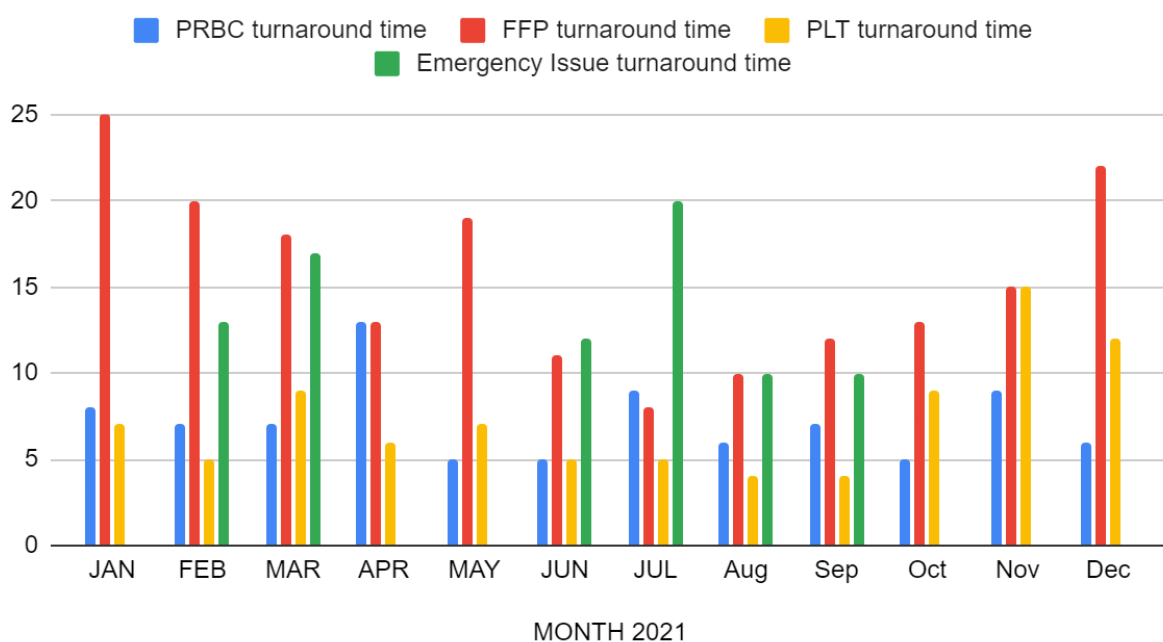


Figure 1- Showing TAT of various blood products over 2021 months.

Number of products issued over 12 months-(table 1)

The figures for 2021 show the monthly issuance of packed red blood cells (PRBC), fresh frozen plasma (FFP), platelets (PLT), and emergency units. PRBC issuance varied by month, with a peak of 485 units in October and a low of 277 units in May. Similarly, FFP issuance varied, reaching 330 units in October before declining to 181 units in May. Platelet issuance fluctuated as well, reaching a peak of 303 units in April and a low of 116 units in May. Interestingly, the data shows emergency issues in certain months, with 4 units in February, 2 units in March, and 1 unit in July, August, and September. However, no emergency issues were documented in April, May, October, November and December.

In 2021, the average number of items issued in each category was 390.7 with standard Deviation (SD) of 59 for PRBC, 255 (SD- 52.4) for FFP, 200 (SD- 61.7)for PLT, and 1.8 (SD-1.2) for emergency issues.(Figure 2)

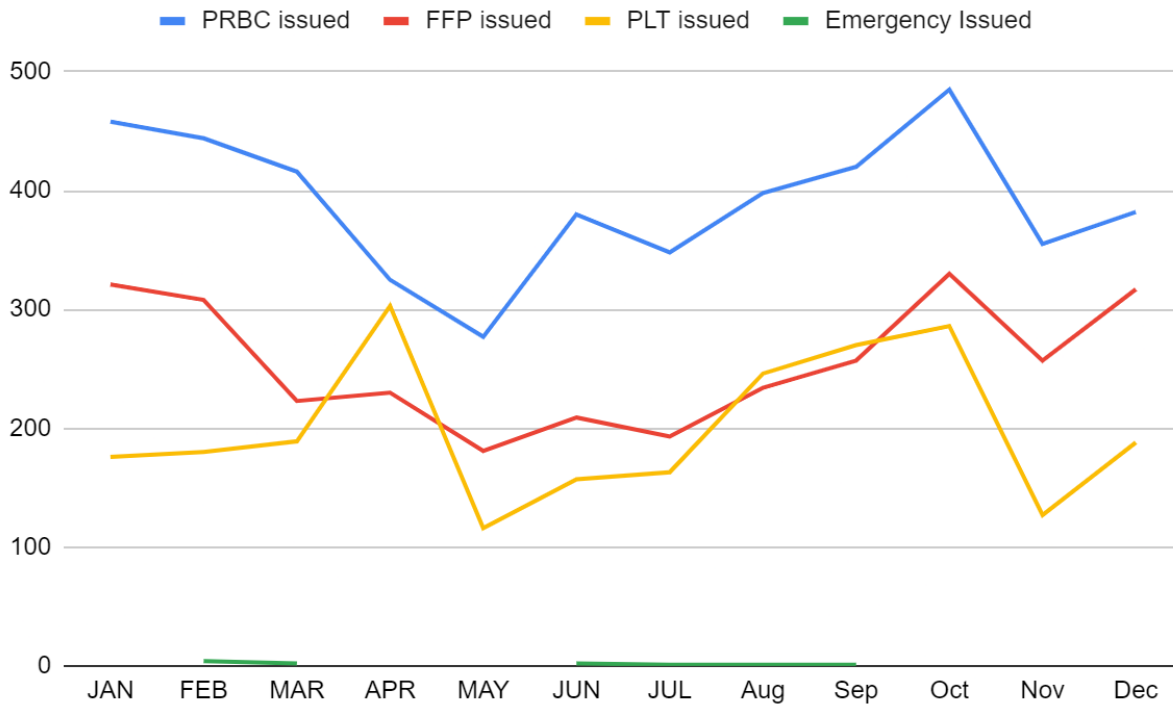


Figure 2- Number of blood products issued over the months in 2021.

DISCUSSION

In our 2021 study, 10,160 blood items were dispensed from the blood bank. On average, 846.67 blood items were distributed per month. The average monthly issuances were 391.5 units for PRBC, 253.33 for FFP, and 217.58 for PLT. Emergency issues happened in specific months, with an average of 1.17 units issued per month. Turnaround times vary monthly: PRBC from 5 to 13 minutes, FFP from 8 to 25 minutes, and PLT from 4 to 15 minutes.

In a study by Lee et al the average turnaround time (TAT) for issuing RBCs to the surgical room was 19.4 minutes. 14.1% of cases surpassed the internally mandated TAT threshold of more than 30 minutes, with extended compatibility testing and late courier arrival adding to the delays. The TAT objective of more than 90% compliance was met in 85.9% of instances.²

Agnihotri et al found out that the majority of blood transfusion delays are caused by processes that occur outside of the blood bank's facilities. A turnaround time of 135 minutes for commencing a blood transfusion was too long. Policy changes for blood/sample shipping and compatibility testing at the blood bank have the ability to decrease this TAT by almost 73%.⁴

McClain et al showed the average TATs for RBC orders were consistent across Vanderbilt University Medical Centre (10 ± 3.8 min) vs Stanford University Medical Centre (14 ± 7.2 min). The most prevalent causes of TAT delays were overlapping orders, medical technologists distracted with phone conversations, and pneumatic pipe station oversaturation.⁵ These results are comparable to our study.

A research by Novis et al of 12,647 units of red blood cells, FFP, and platelet-derived cells (PLTs) found that the median aggregate request-to-retrieval turnaround times (TATs) for these components varied from 30 to 35 minutes. The majority of TATs were taken by events before the components were released from blood banks. Shorter pre-release TATs were linked to surgical schedules, appropriate specimens, and completed operations. Institutions with quicker

TATs maintained cross-matched RBCs on a daily basis, had PLTs on hand for unexpected usage, and had laboratory workers bring components to the operating room.⁶

There are very few studies like ours in which we investigated the turnaround time (TAT) of all blood products separately. March 2021 saw the commencement of the COVID-19 pandemic, which raised the demand for blood and its components. This is research from that historical period. There are a few limitations to the study. We investigated the TAT for only one year. A five-year research would have provided a more comprehensive knowledge of the COVID epidemic and its aftermath. It is a single-institution retrospective study. The involvement of several health care institutes from various places in India over a lengthy period of time will provide a wide estimate of real turnaround time in India.

CONCLUSION

The outcomes of this retrospective analysis give important insights regarding blood product issuance and turnaround times in a tertiary hospital setting in 2021. With an average of 846.67 blood products distributed every month, there were variances in demand and turnaround times for packed red blood cells (PRBC), fresh frozen plasma (FFP), and platelets. Emergency issues, albeit unusual, highlight the need for prompt blood product supply. Understanding these trends enables informed strategies for optimising inventory management and resource allocation within the blood bank, eventually improving patient care and guaranteeing an efficient response to clinical demands.

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