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A Retrospective Study on the Evaluation of Platelet Utilization Practices at a Tertiary Care Facility

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Abstract:

Objective: Platelets have a relatively brief shelf life of 5 days and are infrequently available. Periodic audit of blood component utilization is necessary to ensure that corrective measures are taken to increase the proper and rational utilization of each component. Aim: To study the transfusion practices of platelets in a tertiary care center.

Material and Methods: A retrospective analysis was conducted from January 2023 to December 2023. Demographics, indications, and appropriateness were assessed. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were utilized.

Results: The total platelets utilized were 1206. A total of 368 patients received 1206 platelets, which accounted for 409 episodes of transfusion. The male–female ratio was 3:1. The maximum utilization of platelets was seen by the Department of Medicine, 550 (45.6%), followed by Emergency Medicine and Traumatology, 263 (21.8%), Surgery, 148 (12.2%), and Cardiovascular and Thoracic Surgery (CVTS), 94 (7.8%). The most common indication for platelet transfusion was acute bleeding, 85 (20.7%), acute febrile illness (malaria, dengue cases), 68 (16.6%), followed by DIC and Sepsis (9.0%), and hematological conditions, 35 (8.6%); 11.9% of episodes were pre-procedural, 65.7% were prophylactic, and 15.1% were therapeutic.

Conclusion: This retrospective assessment of platelet utilization has provided insight into our existing platelet preparation, utilization, and transfusion policies, helping us to promote evidence-based practices by aligning the established guidelines with transfusion practices.

Keywords: appropriateness, pattern, platelet, utilization

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Introduction

Platelet concentrates are a valuable blood component because they are rarely seen in large quantities and have a brief shelf life of only 5 days[1].

Platelets are issued to patients of all age groups to arrest or manage bleeding in patients with quantitative or qualitative platelet defects[2].

Maintaining an adequate, secure, and efficient supply of blood components for therapeutic uses is the primary goal of modern transfusion services[3].

According to Koh et al., an appropriate transfusion is characterized as a blood product requested with a specific indication that meets the established criteria[4].

While there are multiple guidelines regarding the proper use of platelet components, the indications for transfusion and the policies can differ between institutions and among healthcare providers, resulting in improper utilization of this product[5].

Strategies should be undertaken to minimize the need for platelet transfusions as much as possible and to judiciously use valuable human resources, as platelets are often limited[6].

An essential component of the quality assurance program, a clinical audit is a management tool for evaluating and justifying the suitability and efficacy of transfusion therapy. It can yield the data required to enhance transfusion medicine practice[7].

With this aim, this retrospective study was conducted to assess the utilization of platelet concentrate by various departments and its appropriateness, so that the proper corrective measures could be taken.

Material and Methods

In the Transfusion Medicine Department of a tertiary care facility, a retrospective audit of platelet transfusion procedures was carried out between January and December 2023. The specialties and subspecialties that use platelets the most in this hospital include general surgery, cardiovascular and thoracic surgery, neurology, emergency medicine, and traumatology.

Inclusion criteria

All random donor platelet (RDP) units were issued to patients registered in our hospital.

Exclusion criteria

- All RDP units were issued to storage centres.
- All RDP units returned and not utilized.

Platelet concentrates

A platelet unit made from a single blood unit (350/450 ml) is known as a random donor platelet. It was prepared as a buffy-coat reduced platelet concentrate (BC-PC) or a platelet-rich plasma platelet concentrate (PRP-PC).

Random donor platelets were kept in a platelet incubator/agitator at 22±2 0C for a maximum of 5 days while being gently shaken horizontally at a rate of 70±5 oscillations per minute.

Data collection

The requisition form was used to record demographic information. Patient requisition forms and the Blood Centre Issue Register for platelets were used to gather information about platelet transfusions, including the indication for transfusion, the patient's diagnosis, the patient's pre-platelet count, the number of units of RDP transfused, the blood group, and whether the transfusion was group-specific or across the group.

After that, all of the requests were divided into preventative and therapeutic categories. Various specialties and subspecialties were used. Every request was examined for suitability in accordance with the criteria.

Departmental records had information about platelets being discarded for a variety of reasons, including transfusion transmitted infection (TTI) positive, leakage, or expiration. For quality control, one percent of the monthly platelet preparations were submitted

The British Committee Standards in Haematology and the Directorate General of Health Sciences served as a basis for the institute's policy recommendations regarding platelet transfusion criteria[2,8]. These are the guidelines used to assess the appropriateness of platelet utilization.

Criteria to assess the appropriateness of platelet transfusion

Pre-procedure

Platelet transfusion with <50000/ul is a minor invasive procedure (liver biopsy, epidural anesthesia, insertion of the central line, gastroscopy, etc.).

Prophylactic platelet transfusion with <100000/µl for undergoing neuro or ophthalmic surgery.

Prophylactic

1. Prophylactic platelet transfusion with <10000/µl without any additional risk factors.

2. Prophylactic platelet transfusion with <20000/µl with additional risk factors (fever, sepsis, splenomegaly, on chemotherapy).

3. Platelet count less than 100X10 /L in patients with massive transfusion.

Therapeutic

In patients with active bleeding from the oral cavity, mucosal bleeding, or any other site, or with platelet dysfunction, irrespective of the platelet count.

Platelet dosage

In adults, the dosage of RDPs to be transfused varies between 4 and 6 units. The platelet transfusion dosage for neonates and pediatric patients is 5–10 ml/kg or 1 whole blood-derived (WBD) unit/10 kg (for patients weighing more than 10 kg).

Only with the Institutional Ethical Committee's ethical consent was this study conducted. On March 11, 2024, approval number DHR-EC/2024/02/01 was issued.

Statistical analysis

All data were first entered into Microsoft Excel (Microsoft Corp., USA) and subsequently analyzed using SPSS version 20. Descriptive statistics, including frequencies, percentages, means, and standard deviations, were utilized.

Results

During the one-year study period, which spanned January 2023 to December 2023, 5100 blood units were collected from both indoor and outdoor blood donation camps. The PRP and BC-PC techniques were used to prepare 1437 of these platelets. There were 1206 platelets used in all. In total, 368 individuals received 1206 platelets, leading to 409 transfusion episodes. No single donor platelets were produced during the study period. With a mean age of 38.21 years, patients receiving platelet transfusions ranged in age from birth to 83 years. The men-to-women ratio was 3:1. Table 2 shows patient distribution by age and gender across various age groups.

Of the patients who had platelet transfusions, 443 (36.7%) received transfusions across the blood group, while 763 (63.2%) received group-specific transfusions. The frequency of blood groups in decreasing order was as follows: B 128 (34.7%), O 113 (30.7%), A 90 (24.4%), and AB 37 (10.0%). Only 2.4% of patients were in the Rh-negative group, compared to 97.5% who were Rh-positive. The Department of Medicine used the maximum platelets (550, 45.6%), followed by Emergency Medicine and Traumatology (263, 21.8%), Surgery (148, 12.2%), and CVTS 94, 7.8%. (Table 3)

The most frequent indications for platelet transfusion were acute bleeding, 85 (20.7%), followed by acute febrile illness, 68 (16.6%), DIC and sepsis, 36 (9.0%), and hematological disorders, 35 (8.6%).

In 41.8% (171) of episodes, patients also received other components apart from platelets; out of these, in 20.7 % (85) of episodes, patients received all 3 components, i.e., packed red cells, fresh frozen plasma, and platelets as part of a massive transfusion.

As per the criteria for appropriateness mentioned in the Methods section, the details are below.

The transfusion episodes in the pre-procedure category were 49 (11.9%), prophylactic 269 (65.7%), and therapeutic 62 (15.1%). The dose of platelets was appropriate in 92.1% and inadequate in 7.8%. Among the prophylactic transfusion, in 113 (27.6%) episodes, the pre-transfusion platelet count was <20,000/µl with additional risk factors (fever, sepsis, splenomegaly, on chemotherapy) and in 71 (17.3%) episodes, prophylactic platelet transfusion was received when the platelet count was <10000/µl, and in 85 (20.7%) episodes, platelet concentrate was received with platelets counts less than 100X10 /L in patients with massive transfusions. The majority of transfusion episodes were appropriate (90.46%), as per the guidelines (Table 1).

Table 1 Age and gender-wise distribution of patients who utilized platelet concentrate

Gender	Age group (Yrs)	≤18	19-40	41-65	>65	Total
Male		31	122	86	33	272
Female		16	41	31	8	96
Total		47	163	117	41	368

In 392 episodes, the pre-transfusion platelet count was available, while in 17 episodes, no platelet count was mentioned.

Table 2 Distribution of platelet utilization department-wise

Department	Episodes (%)	Number of platelets (%)
Medicine	132 (32.2)	550 (45.6)
Emergency medicine &Traumatology	126 (30.8)	263 (21.8)
Cardiology/CVTS	29 (7.0)	94 (7.7)
Surgery	48 (11.7)	148 (12.2)
Paediatrics& neonatology	47 (11.4)	61 (5.0)
Other(Ortho/Obgy/ Anaesthesia)	12 (2.9)	40 (3.3)
Neurosurgery	8 (1.9)	19 (1.5)
Outside	7 (1.7)	31 (2.5)
Total	409	1206

CVTS=Cardiovascular and Thoracic Surgery

Table 3 Indications/Guidelines for platelet /transfusion

Indications	Number of episodes	Percentage (%)
Pre-procedure	49	11.9
Prophylactic platelet transfusion with <10,000/ul without any additional risk factors	71	17.3
Prophylactic platelet transfusion with <20,000/ul with additional risk factors (fever, sepsis, splenomegaly, on chemotherapy)	113	27.6
Platelet counts less than 100000/ul in patients with massive transfusion	85	20.7
Therapeutic	62	15.1
Not as per any indication	29	7.0
Total	409	100

Discussion

The review of blood component consumption aimed to improve the uniformity and appropriateness of transfusion practice, minimize the overall number of transfusion-related complications, and maximize the use of a limited resource[9].

Due to their limited shelf life, blood components—particularly platelet concentrates are frequently in low supply. Therefore, it is desirable to use blood components sparingly in order to guarantee their availability for patients who require them and to prevent patients from being

unnecessarily exposed to the risk of transfusion reactions and acquiring transfusion-transmitted infections.

The appropriateness of several studies varied from 80 to 94 percent. It was 90.4 percent in the current study. Table 4 compares and displays the findings of different studies[10–15]. It is crucial to strictly follow the platelet transfusion protocols. This percentage can be raised even more with frequent training sessions for doctors and residents. Inappropriate transfusions accounted for 9.5 percent. The platelet inventory has been further depleted by these unnecessary transfusions. Sixty-three percent of the platelet concentrate in the study was in the transfused group. Chenna et al.[14] found that 59.6% of the platelet concentrates transfused were group-specific. The results are comparable to those of our research.

The results of the current study are lower than those of a study by Saluja et al.[16], which found that 95.0% of platelet concentrate was transfused with the identical groups. When there was a therapeutic need and a supply shortage, platelets were transfused across the group. Although transfusion of ABO group-specific platelets is always advised, transfusion of platelets across the ABO blood group is acceptable to reduce waste and expiration rate[2].

When it comes to treatment planning, the pre-transfusion platelet count is crucial. The pre-transfusion platelet count in this study was 95.8%.

Chenna et al.[14], Verma et al.[10], and Eikenboom et al.[17] found that platelet counts were done prior to transfusion in 93.6%, 91.8%, and 95.7% of cases, respectively.

The results of these studies are in concordance with the present study.

In this study, the department of medicine used the most platelets (45.6%), followed by emergency medicine and trauma (21.8%). Conversely, a study by Chenna et al.[14] found that the departments with the highest platelet transfusion rates were medicine (38.6%) and medical oncology (19.8%). According to the current study, the most frequent reasons for platelet transfusion were acute bleeding (85,

Table 4 Appropriateness of the use of platelet concentrate compared with different studies

Author	Type of Study	Guidelines used for platelet transfusion	No of episodes	Appropriate %	Inappropriate %
Verma A, et al. [10]	Prospective	Hospital Guideline	343	274 (80.0 %)	69 (20.0%)
Greeno E, et al. [11]	Retrospective	Instituitional Transfusion guidelines	2093	1841(88.0%)	252 (12.0%)
Charlewood R [12]	Prospective	The Australian & New Zealand society of Blood transfusion (ANZSBT) guidelines.	388	338 (87.0%)	50 (13.0%)
Bhat, et al. [13]	Prospective	Instituitional Transfusion guidelines	198	163 (82.3%)	35 (17.7%)
Chenna, et al.[14]	Prospective	Instituitional Transfusion guidelines derived from DGHS & BCSH.*	2586	2420 (93.6%)	166 (6.4%)
Bhardwaj K, et al. [15]	Retrospective	Instituitional Transfusion guidelines	1000	839 (83.9%)	161 (16.1%)
Present study	Retrospective	InstituitionalTransfusion guidelines derived from DGHS & BCSH.*	1206	1091 (90.4%)	(115.5%)

*DGHS=Transfusion Medicine Technical Manual by Directorate General of Health Services, *BCSH=British Committee Standards in Hematology

20.8%), acute febrile illness (68, 16.6%), sepsis and DIC (9.0%), and hematological disorders (35, 8.6%). In a study by Chenna et al.[14], patients with hematooncological diseases accounted for 30.3% of the patients who underwent platelet transfusions, followed by febrile illness (13.0%), sepsis and DIC (11.8%), and acute bleeding (11.2%).

Platelet transfusions can be used therapeutically to stop bleeding that is already occurring or prophylactically to lower the risk of bleeding. According to estimates from the American Association of Blood Banks (AABB), over 70.0% of platelet transfusions were done as a prophylactic measure[18]. In a Chenna et al.[14] study, 26.2% of platelet transfusions were therapeutic and 73.8% were prophylactic. According to Qureshi et al.[19]'s nationwide comparative audit of platelet use in the UK, 57.0% of platelet transfusions are prophylactic.

According to the re-audit of platelet usage in hematology, 15.0% (497/3296) of episodes were pre-procedural, 69.0% (2283) were prophylactic, and 13.0% (412) were therapeutic[20]. Pre-procedural episodes comprised 11.9% of the current study, prophylactic episodes comprised 65.7%, and therapeutic episodes comprised 15.1%. Estcourt et al.[21] (69.0%), Saluja et al.[16] (73.0%), and Greeno et al.[11] (82.0%) all reported a comparable percentage of prophylactic transfusions.

Limitation

As this is a single-center study, the results cannot be generalized to other healthcare facilities.

Conclusion

The study emphasizes the necessity of reducing needless platelet transfusions, ensuring that this limited resource is utilized carefully. The retrospective audit revealed the current transfusion practices of utility and transfusion of platelet concentrate. Such audits help to find the practice gaps and facilitate the application of corrective actions that enhance the appropriate use of blood components. By coordinating clinical usage with accepted transfusion standards, evidence-based practices can be promoted, particularly in setups with limited resources. Regular lectures, resident training, and ongoing requisition form monitoring can all help prevent unnecessary transfusions.

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Conflict of interest

There are no potential conflicts of interest to declare.

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