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AUDIT OF 1000 PLATELET TRANSFUSIONS AT A TERTIARY CARE HOSPITAL OF NORTH INDIA

Pathology

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ABSTRACT

Background: Platelet Transfusions are life saving, so their appropriate usage ensures uninterrupted supply.
Aim: Audit for appropriateness of 1000 units of platelet transfusions in a tertiary care hospital of North India.
Materials and Methods: Platelet audit of 1000 units was carried out in year 2012-2013 to estimate its appropriate utilization. These were analyzed according to the age and sex of the patient, pre-transfusion platelet count, associated risk factors, bleeding status, indication and specialty from which transfusion was requested. Data was analyzed according to the British Committee for Standards in Haematology guidelines for their appropriateness.
Results: Out of total 1000 platelet units transfused to 216 patients in 284 transfusion episodes, 83.9% of overall platelet transfusions were appropriate, 77.8% prophylactic and 98.6% therapeutic transfusions were appropriate. Maximum appropriateness was seen in obstetrics & gynaecology (97.97%) and minimum in Pediatrics (75.6%).
Conclusions: Regular audit of platelet transfusions and sensitization of the clinicians regarding triggers for appropriate platelets usage will ensure maximum appropriate utilization of platelets.

KEYWORDS

Random Donor Platelet (RDP), Single Donor Platelet (SDP), Platelet Rich Plasma- Platelet Concentrates (PRP-PC), appropriate platelet usage.

INTRODUCTION

This is an era of blood component therapy. It has benefitted many patients by meeting their specific transfusion needs from a single blood donation.[1] The audit of blood components utilization aims to improve the consistency and appropriateness of transfusion practice; reduce the overall number of transfusion-related complications; optimize a limited resource.[2]

It is a well established treatment protocol. Platelets transfusion is widely employed in modern health care system for prevention and treatment of thrombocytopenic bleeding in patients with haematological malignancies; solid tumors; post chemotherapy, major surgeries; trauma and less often in patients with platelet dysfunction. Platelets usage during last two decades has increased with the advent of more aggressive chemotherapeutic regimens, bone-marrow and haematopoeitic progenitor transplantation.[3,4] Platelet transfusion may be prophylactic or therapeutic. Prophylactic platelet transfusions are typically administered prior to an invasive procedure to patients at a risk of bleeding due to thrombocytopenia. Therapeutic platelet transfusions are administered to patients who are bleeding due to either thrombocytopenia or platelet dysfunction.[5] Increase in platelet transfusions over last two decades is due to increased life expectancy leading to increased haematological malignancies, increased cardiac diseases and increased use of anti platelet drugs and polytrauma cases needing more aggressive platelet transfusions.

Blood components especially platelet concentrates due to their short shelf life are frequently in limited supply. Hence, appropriate use of blood components is required to ensure their availability for patients to whom they are really indicated, as well as to avoid unnecessary exposure of the patients to the risk of transfusion reactions and transmission of blood borne infections. Pre-operative cessation of any antiplatelet therapy will minimize the use of platelet transfusion. Platelet transfusion based solely on thrombocytopenia with the intent of preventing major bleeding (prophylactic platelet transfusion) is widely practiced in various healthcare settings around the world. Study conducted by the 'American Association of Blood Banks' Transfusion Practice Committee reported that over 70% of hospitals transfused platelets primarily for prophylaxis, with an arbitrary transfusion threshold of 20 x 10^9/L or higher. [6] Data from randomized clinical trials suggest that a decrease in platelet counts up to 10 x 10^9/L may be tolerated without the need for prophylactic platelet transfusion in the absence of major bleeding.[7]

The relevance of appropriateness of transfusion is becoming increasingly important, with increasing awareness of the complications of platelet transfusion, such as transfusion related acute lung injury (TRALI), bacterial infection and immunomodulation. In addition, due to the short shelf life of platelets, appropriate transfusion is important to maintain their adequate supply.

A regular audit or a blood utilization review is an effective way of increasing the likelihood of improving transfusion practices. Constitution of a hospital transfusion committee, with a constant communication, interaction and co-ordination amongst clinicians and transfusion medicine specialist, as well as continuing medical education for prescribing clinicians and blood transfusion personnel would also be helpful in promoting appropriate use of blood.[8]

MATERIAL AND METHODS

Platelet audit was carried out from October 2012 to May 2013 in the Blood Bank of a tertiary care hospital of North India. Audit was done in accordance to the platelet transfusion guidelines laid down by the British Committee for Standards in Haematology (BCSH) [9] (Table 1)

Random donor platelets (RDP) were prepared from a single blood unit (350 ml/450 ml) using a refrigerated centrifuge with swing out head and compatible bucket (CRYOFUGE 6000i). It was either in the form of platelet rich plasma -platelet concentrate (PRP-PC) or platelet rich plasma (PRP). Single donor apheresis platelet (SDP) was prepared from a single donor with the aid of automated cell separator using continuous flow centrifugation method by AMICUS, having a platelet dose equivalent to 4-6 RDPs. RDP and SDP were stored for a maximum period of 5 days at 22±2°C with continuous horizontal, gentle agitation (70±5 oscillations/min) in a platelet incubator-cum-agitator. Patient's demography regarding their age, gender, speciality, diagnosis, associated risk factors if any, platelet counts, transfusion episodes, therapeutic or prophylactic transfusions were obtained from requisition forms and platelet issue records. The platelets given according to platelet counts or associated problems mentioned in the

BCSH guidelines were considered appropriate and platelets transfused at a higher trigger without associated problems were considered inappropriate.

RESULTS

During this study period, 1000 units of platelet concentrate were transfused out of which 990 (99%) units were of RDPs and 10 (1%) units were of SDPs. These were transfused to 216 patients (RDP to 206 and SDP to 10 patients) in 284 transfusion episodes. Overall appropriate platelet transfusions were 83.9% (839/1000); prophylactic appropriate transfusion was 77.8% (551/708) & therapeutic appropriate transfusions was 98.6% (288/292). Maximum (100%) appropriate platelet transfusions were in patients with platelet counts < 10×10^9/L while maximum (100%) inappropriate platelet transfusions were in patients with platelet count > 100×10^9/L (Figure-1). Out of total 284 transfusion episodes, 227 (79.9%) were appropriate and 57 (20.1%) were inappropriate. RDP utilized per transfusion episode, was maximum by Obstetrics and Gynecology (OBG) (5.1±0.5) and minimum by Pediatrics (1.3±0.1).

The mean age for transfusion was 27.9 years for RDPs and 49.2 years for SDPs. The appropriate usage increased with age i.e. from 71.7% (43/60) at < 1 year to 85.1% (137/161) in >60 yrs. Male and female ratio was 2:1 for RDPs and 4:1 for SDPs. Medicine group of patients were having a lowest pre-treatment count and Surgery group of patients were having the highest pre-treatment platelet count. Medicine department was the main user [63.4% (628/990) of RDPs and 80% (8/10) of SDPs] of platelets.

SDP transfusions were 80% (8/10) appropriate; 33.3% (1/3) prophylactic & 100% (7/7) therapeutic. SDPs were maximally (70%) utilized therapeutically. Appropriate SDP usage was 100% in Surgery & OBG, while it was 75% in Medicine (Table-2). In Medicine, 5 SDPs were appropriately given to dengue patients; one prophylactically & 4 therapeutically. In patients suffering from other medical illness, one (100%) SDP utilized was therapeutically appropriate while 2 (100%) were prophylactically inappropriate. Surgery and OBG each used one unit of SDP therapeutically appropriately.

RDP transfusions were 92.3% (831/990) appropriate; 78.01% (550/705) prophylactic & 98.59% (281/285) therapeutic. RDPs were maximally (71.2%) utilized prophylactically. Prophylactic appropriate RDP usage was maximum by OBG (91.7%) followed by Medicine (79.1%) & Surgery (75.4%). Therepeutic appropriatness of RDPs was 100% in surgery, pediatrics & OBG while it was 96% in Medicine. Maximum overall appropriateness of RDPs was in OBG (98%) and minimum in Pediatrics (75.6%). (Table-3).

In leukemia during 9 transfusion episodes and in polytrauma patients all the 44 (100%) and 42 (100%) units respectively were appropriately given. In OBG in ante-partum hemorrhage (APH), in ante natal cases (ANC), in patients with intra uterine death with disseminated intravascular coagulation, (IUD-DIC), eclampsia, ectopic pregnancy, choriocarcinoma, 96 (100%) units were appropriately given. In newborn patients without septicemia, in 30 transfusion episodes, 30 units were given, out of which 17 (56.7%) were appropriate. (Table-4) One patient of liver cirrhosis with bleeding and platelet count of > $100X10^9$ /L received 4 units of RDPs, which were inappropriate. In a patient with post partum sepsis, 2 (100%) units were inappropriately given. The maximum inappropriate usage (43.3%) was in neonates where the indication of septicaemia was not mentioned. In Pediatrics, in newborns without septicemia appropriateness was minimum (56.7%) while in Medicine, in appropriateness was there (62.5%) in case of liver disease.

DISCUSSION

During the last two decades all over the world platelet utilization has increased more than the use of any other blood components.[3,4,9] Platelet concentrates have a very short shelf life. The ready availability of platelet concentrates is like a double edged sword which on one hand, allows the clinicians to give intensive treatment in the form of chemo and radiotherapy to the patients suffering from different malignancies and other thrombocytopenic conditions such as dengue, septicemia in newborns etc., on the other hand, wastage at blood bank level and inappropriate use at clinician's level is also prevalent.

Overall appropriateness in our study was 83.9% which was similar to study done by Bhat et al[10]; but varied from other studies[11,12].(Table-5) The appropriate use of platelets is increasing with time as more and more institutions are following the guidelines and regular audits being conducted in their local blood banks and some self educating requisition forms are being made available to guide the prescribing doctor about the appropriate use of blood components.[8,10,11,12]

Appropriate usage increased with age i.e. from 71.7 % in below 1 year of age to 85.1% in more than 60 years. It could be due to alternative thresholds for specific risk factors in new born and preterm infants.

In present study, 100% of SDPs prepared were utilized which was similar to study done by Saluja et al[13]. Therapeutic utilization of SDP was more in our study whereas prophylactic utilization was more in study conducted by Saluja et al[13]. (Table-6) Twice the number of SDPs were given to males as compared to females showing the will to spend more on males as compared to females in our society. Slichter et al[14] documented that there is substantial increase in costs of SDPs compared to pooled RDPs, as the quality of both the platelets whether prepared by Apheresis technique or by pooled RDPs was same, these two products can be interchangeably used, based on cost considerations and availability. But Ahluwalia[15] and Sharma[16], documented that refractoriness in dengue patients may be due to alloimmunisation to HLA and platelet specific antigens. So, dengue patients should preferably receive SDP and not RDP.

In present study, 78.01% of the prophylactic RDP transfusions were appropriate which was less as compared to Saluja et al[13]. Prophylactic RDP transfusion was more in the present study as compared to Saluja et al[13] in which therapeutic RDP transfusion was more (Table-6).

Maximum inappropriate usage was in Paediatrics department (24.4%) which was similar to study done by Bhat et al[10] (22%). It was due to incomplete requisition forms sent by the clinicians, not mentioning septicemia as an indication for platelet transfusion in some of the newborns. Appropriate RDP utilization was 81.8% in patients suffering from medical illness in our study which was quite similar to the study done by Bhat et al[10] (82.3%).

The therapeutic use of RDPs was 98.59% (281/285) appropriate except 4 units of RDPs which were transfused to a male patient with liver cirrhosis with bleeding and platelet count of 125 $X10^9$ /L. His condition did not improve after platelet transfusion as coagulation factors were needed to control bleeding, hence considered as inappropriate platelet transfusion.

Maximum RDP per patient were utilized by OBG department which was in accordance to excessive bleeding in APH / PPH in obstetrics patients who may need more platelets as a protocol of massive transfusion as compared to minimum RDP per patient in Pediatric age. The study showed highest pre-treatment platelet counts in Surgery, which was consistent with higher triggers in surgical patients as compared to patients suffering from medical illness.

As inappropriate utilization of platelets for prophylactic usage was maximum by Pediatrics department followed by Surgery & Medicine. So there is need for educating them specially pediatricians regarding triggers for appropriate platelet usage.

CONCLUSION

Platelets are life saving which should be used very cautiously and judiciously. Regular audit of platelet utilization and continuous sensitization of clinicians regarding triggers for appropriate platelet usage will ensure maximize appropriate utilization of platelets. It will also minimize wastage of platelets due to short shelf life.

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Conflicts of interest
There are no conflicts of interest.

Table-1
Indications for platelet transfusions as per British Committee for Standards in Hematology (BCSH) Guidelines[9]

Prophylactic
1. Platelets less than 10 X 10^9/L without any additional risk factor.
2. Platelet counts less than 20 X 10^9/L with risk factors like fever, sepsis, concurrent use of antibiotics, patient on chemo therapy or radio therapy or other abnormalities of haemostasis.
3. Platelet counts less than 50 X 10^9/L with minor invasive procedure, epidural anesthesia, gastroscopy and biopsy, insertion of indwelling lines, transbronchial biopsy, liver biopsy etc.
4. Platelets counts less than 100 X 10^9/L in patients with massive transfusion.
5. Platelet counts less than 100X10^9/L with major surgical procedures like on critical areas such as Brain, eyes.
Therapeutic
In patients with bleeding from oral cavity, mucous membranes or any other site with platelet dysfunction irrespective of their platelet counts.

Table-2
Specialty Wise Distribution of SDP

	Medicine		Surgery		Obstetrics	
	Appropriate No. (%)	Inappropriate No. (%)	Appropriate No. (%)	Inappropriate No. (%)	Appropriate No. (%)	Inappropriate No. (%)
Therapeutic	5 (100)	0 (0)	1 (100)	0 (0)	1 (100)	0 (0)
Prophylactic	1 (60)	2 (40)	0 (0)	0 (0)	0 (0)	0 (0)
Total	**6 (75)**	**2 (25)**	**1 (100)**	**0 (0)**	**1 (100)**	**0 (0)**

Table-3
Department Wise Distribution of Units RDP

	Medicine		Surgery		Pediatrics		Obstetrics	
	Appropriate No. (%)	Inappropriate No. (%)	Appropriate No. (%)	Inappropriate No. (%)	Appropriate No. (%)	Inappropriate No. (%)	Appropriate No. (%)	Inappropriate No. (%)
Therapeutic	98 (96.1)	4 (3.9)	88 (100)	0 (0)	21 (100)	0 (0)	74 (100)	0 (0)
Prophylactic	416 (79.1)	110 (20.9)	43 (75.4)	14 (24.6)	69 (70.4)	29 (29.6)	22 (91.7)	2 (8.3)
Total	**514 (81.8)**	**114 (18.2)**	**131 (90.3)**	**14 (9.7)**	**90 (75.6)**	**29 (24.4)**	**96 (98.0)**	**2 (2.0)**

Table-4
Indication Wise Appropriateness of RDP

Medicine	Indications	Appropriate Units	Inappropriate Units
		No. (%)	**No. (%)**
	Dengue	211 (81.5)	48 (18.5)
	Liver Disease	40 (62.5)	24 (37.5)
	Acute Febrile Illness	61 (88.4)	8 (11.6)
	Leukaemias on Chemo/Radiotherapy	44 (100)	0 (0)
	Pancytopenia/ Thrombocytopenia ± Bleeding	101 (78.9)	27 (21.1)
	Others	57 (89.1)	7 (10.9)
	Total	**514 (81.8)**	**114 (18.2)**
Surgery	Pre-Operative	65 (89.0)	8 (11)
	Post-Operative	24 (80.0)	6 (20)
	Polytrauma	42 (100)	0 (0)
	Total	**131 (90.3)**	**14 (9.7)**
Pediatrics	New Born With Septicemia	20 (83.3)	4 (16.7)
	Newborn Without Septicemia	17 (56.7)	13 (43.3)
	Others	53 (81.5)	12 (18.5)
	Total	**90 (75.6)**	**29 (24.4)**
OBG	Antepartum Haemorrhage	28 (100)	0 (0)
	Ante Natal Cases	28 (100)	0 (0)
	IUD/DIC	10 (100)	0 (0)
	Eclampsia	6 (100)	0 (0)
	Ectopic Pregnancy	6 (100)	0 (0)
	Choriocarcinoma	18 (100)	0 (0)
	Post Partum Sepsis	0 (0)	2 (100)
	Total	**96 (98)**	**2 (2)**

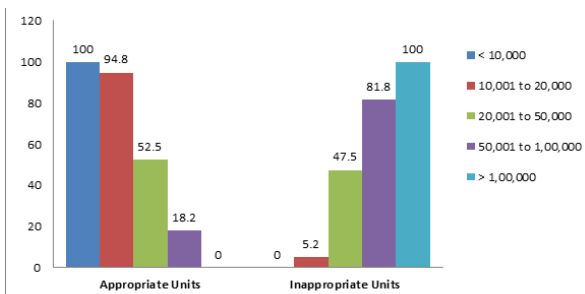
Table-5
Comparison of Appropriateness of Platelet Transfusions with Various Studies.

Author and Year of Study	Appropriate	Inappropriate
Pallavi et al[8] (2011)	45 (63.4%)	26 (36.6%)
Birchal et al[11] (2011)	2039 (61.9%)	1257 (38.1%)
Bhat et al[10] (2012)	163 (82.3%)	35 (17.7%)
Gomathi et al[12] (2012)	51 (92.7%)	4 (7.3%)
Present Study (2014)	839 (83.9%)	161 (16.1%)

Table-6
Comparison of various parameters of Platelet transfusion with previous study

Parameters	Saluja et al[13] (2007)		Present Study (2014)	
	RDPs	SDPs	RDPs	SDPs
No. of units prepared	5444 (98.5%)	81 (1.5%)	1630 (99.4%)	10 (0.6%)
% Utilisation	3859 (70.8%)	81 (100%)	990 (60.7%)	10 (100%)
% Utilisation Prophylactic	26.2%	77.8%	71.2%	30%
% Utilisation therapeutic	73.8%	22.2%	28.8%	70%
Wastage	29.2%	Nil	39.3%	Nil
Prophylactic appropriate transfusions	88%	--	78.01%	--

Figure 1
Appropriateness of platelet transfusion according to the platelet count (Nx10^9)



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