Original Articles

Use of platelet components: An observational audit at a tertiary care centre

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ABSTRACT

Background. Platelets should be transfused appropriately, based on the cause of thrombocytopenia. The practice and policies of transfusion vary among institutions and even among clinical practitioners, leading to inappropriate use of platelets, which might increase the risk of transfusion-related complications to recipients, and lead to a shortage of platelets. An audit of platelet components helps to determine the effectiveness and appropriateness of their use and in improving transfusion practices. We did an audit of the use of platelet transfusions at our centre.

Methods. We conducted a prospective concurrent audit of the platelet transfusion practices. The audit cycle had four steps: (i) defining the standards; (ii) data collection; (iii) comparison against the standards; and (iv) presenting them to clinicians for further improvement.

Results. Platelet components were used appropriately in 93.6% (2420/2586) of episodes. The platelet count was not done before transfusion in only 6.4% (165/2586) of episodes. The dose of platelets was given appropriately in 84.3% (2180) of episodes of transfusion. Indications for appropriate transfusion classified as pre-procedure, prophylactic and therapeutic transfusions were 11.3% (293), 66.1% (1450) and 13% (412), respectively. Medicine and medical oncology were the specialties with the highest level of appropriateness.

Conclusion. An audit of transfusion practices benefits transfusion services and clinicians in terms of judicious use of platelet components and better inventory management.

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INTRODUCTION

Platelet concentrates are a valuable resource among all the blood components. Platelets have a relatively short shelf-life of 5 days and are not always freely available.[1] The cause of bleeding is not always thrombocytopenia, and platelet counts alone should not be the basis for platelet transfusion. The patient's condition and other risk factors for bleeding such as the presence of fever, sepsis, associated coagulopathies, and other comorbid conditions such as liver and/or renal failure and the rate of fall in platelet count should also be considered.[2] The cause of thrombocytopenia should be determined before transfusing platelets, and the decision should be appropriate.

As per Koh *et al*., 'An appropriate transfusion is defined as a blood product ordered with an indication, which does satisfy the criteria'.[2] The timing and the dose of platelets transfused are important in providing safety from bleeding as well as decreasing allogeneic product exposure.[3] Although there are a number of guidelines on the appropriate use of platelet components, the trigger for transfusion and policies among institutions and even among clinical practitioners vary, leading to inappropriate use of this product.[4]

Platelet transfusions account for the majority of transfusion reactions, and their inappropriate use may develop refractoriness to platelet transfusions in patients. Inappropriate use of platelets increases the risk of transfusion-related complications to recipients, and contributes to non-availability or shortage of platelets when required. The Serious Hazards of Transfusion (SHOT) 2016 report noted that 114 of 450 were avoidable transfusions. Among them, 23 were platelet transfusions with 6 avoidable transfusions due to inappropriate clinical indication. The report noted that 70/253 acute transfusion reactions and 3/10 transfusion-associated dyspnoea were due to platelet transfusions.[5] It is, therefore, important to reduce unnecessary transfusions through appropriate clinical use of platelets. In addition, increasing awareness about complications associated with platelet transfusion such as transfusion-related acute lung injury and bacterial infection and the appropriateness of transfusion are emphasized among healthcare professionals.

An audit of platelet components helps to determine the effectiveness and appropriateness of use of this component, thus improving transfusion practices. We did an audit of the appropriateness of platelet transfusions at our centre.

METHODS

We conducted a prospective concurrent audit on platelet transfusion practices from November 2013 to June 2015 at a tertiary care hospital in southern India. A concurrent audit is a

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review of individual transfusion requests within 12–24 hours following a transfusion episode. This type of audit does not alter the current transfusion event but seeks only to alter future transfusion practice.[6] The study was approved by the institutional ethics committee.

The audit cycle had four steps: First, the standards were defined for platelet transfusion practices as per the institutional guidelines derived from the Directorate General of Health Sciences and British Committee Standards in Haematology as given below.[7,8]

Pre-procedure

1. Platelet transfusion with <50 000/µl with minor invasive procedure (liver biopsy, epidural anaesthesia, insertion of the central line, gastroscopy, etc.)
2. Prophylactic platelet transfusion with <100 000/µl undergoing neuro or ophthalmic surgery

Prophylactic

1. Prophylactic platelet transfusion with <10 000/µl without any additional risk factors
2. Prophylactic platelet transfusion with <20 000/µl with additional risk factors (fever, sepsis, splenomegaly, on chemotherapy)

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.

The dose of platelets to be transfused ranges from 4 to 6 units of random-donor platelets (RDPs) or 1 unit of single-donor platelet (SDP) in adults. The neonate or paediatric dose of platelet transfusion is 5–10 ml/kg or 1 whole blood derived (WBD) unit/10 kg (patients ≥10 kg).

Second, data were collected for each transfusion episode for a patient. (An episode was defined as each time we issued one or more therapeutic/prophylactic doses of platelets to a patient.) Data pertaining to demographic information such as age, sex and weight were recorded. Information related to platelet transfusions, namely, indication for transfusion, pre-platelet count of the patient, number of units transfused, RDP or SDP, age at which the component was issued and group-specific or non-group-specific status, was collected from the patient requisition form and the issue details from blood bank management software. Third, the data collected were compared against the set standard to know how well the standards were met with respect to appropriateness. Finally, the data were presented to the treating clinicians and implementation of any changes was done, if required.

Descriptive statistics were obtained using Microsoft Excel version 2016.

RESULTS

A total of 1190 patients received platelet transfusions (8445 RDP and 246 SDP units), which accounted for 2586 episodes. The age of patients who received platelet transfusions ranged from <1 to 90 years and 65.9% were men. The majority of the patients had blood group O (38.2%) followed by B (29.6%), and Rh-positive patients were 94.5%. Sixty-five per cent of platelets were transfused before day 3 of shelf-life.

More than half (59.6%) of RDPs were transfused to group-specific patients, whereas all SDPs were transfused to group-specific patients. A single transfusion was received by 59.9% of patients and 40.1% patients received two or more transfusions. Platelets were issued for both medical and surgical conditions. The major users of platelets at our centre were the departments of medicine (38.6%), medical oncology (19.8%) and paediatrics (17.9%; Table I). The most common group of patients who received platelet transfusions were those with haemato-oncological conditions (30.3%), followed by febrile illness (13%), sepsis and disseminated intravascular coagulation (DIC) (11.8%), and acute bleeding (11.2%). More than one-third of the patients (37.6%) also received transfusion of other blood components along with platelets.

Pre-procedural transfusion episodes were 293 (11.3%), prophylactic in 1450 (66.1%) and therapeutic in 677 (26.2%). The majority of transfusion episodes (93.6%) were considered appropriate (Table II). The dose was appropriate in 2180 (84.3%) episodes of transfusion, was less than that required in 351 (13.57%) episodes and more than that required in 55 (2.12%) episodes.

The most common broad conditions where appropriate platelet transfusions were used included patients with haemato-oncological conditions (30.9%), sepsis and DIC (11.6%) followed by acute bleeding (11.4%). Medicine (38.3%) and medical oncology (20.8%) were the departments with the highest number of appropriate transfusions.

Among the prophylactic transfusions, in 1071 (41.4%) episodes, the pre-transfusion platelet count was <20 000/µl

TABLE I. Distribution of department-wise platelet transfusion among patients and events

Department	Patient *n* (%)	Event *n* (%)
Medicine	506 (42.5)	997 (38.6)
Surgery	92 (7.7)	160 (6.2)
Medical oncology	123 (10.3)	512 (19.8)
Orthopaedics	51 (4.3)	92 (3.6)
Cardiology/cardiothoracic surgery	90 (7.6)	128 (4.9)
Plastic surgery	9 (0.8)	13 (0.5)
Paediatrics and neonatology	172 (14.5)	462 (17.9)
Obstetrics and gynaecology	44 (3.7)	82 (3.2)
Neurosurgery	43 (3.6)	55 (2.1)
Nephrology	50 (4.2)	71 (2.7)
Others	10 (0.8)	14 (0.5)
Total	1190 (100)	2586 (100)

TABLE II. Indications for platelet transfusion

Indication	Number of episodes, *n* (%)	Median (IQR) pre-platelet count ($\times 10^3$)/µl
Pre-procedure	293 (11.3)	29 (14–75)
Prophylactic platelet transfusion with <10 000/µl without any additional risk factors	379 (14.7)	7 (5–9)
Prophylactic platelet transfusion with <20 000/µl with additional risk factors (fever, sepsis, splenomegaly, on chemotherapy)	1071 (41.4)	13.00 (8–17)
Therapeutic	677 (26.2)	36.50 (11–111)
Not as per any indication	166 (6.4)	57 (35.5–76)
Total	2586	

IQR interquartile range

with additional risk factors such as fever, sepsis, on chemotherapy and in 379 (14.7%) episodes, prophylactic transfusions were received when the count was <10 000/µl without any additional risk factors. The overall trigger for platelet count prior to prophylactic transfusions was 21 770/µl and for therapeutic transfusions, it was 78 360/µl.

In 2421 (93.6%) episodes of transfusions, the pre-platelet counts were available. In 169 (6.4%) episodes, pre-transfusion platelet count was not available, 138 of these were prophylactic and 31 were therapeutic.

DISCUSSION

An audit is a review of practices and policies to ensure safe and appropriate blood transfusion. Conducting an audit and reviewing practices, informs the transfusion services regarding the judicious use of components and gaining confidence in maintaining the inventory. Although there are many guidelines for platelet transfusion therapy both internationally and nationally, non-compliance is commonly observed.[7,9] Ours is a large study conducted in southern India over a period of 1.5 years.

The pre-transfusion platelet count dictates the appropriateness for prophylactic conditions. The majority of platelet transfusions were done when the counts were <50 000/µl.[1,10] In our study, the majority of platelet transfusions were done when the platelet count was <10 000/µl (34.8%), adding to the appropriateness of platelet transfusions and avoiding unnecessary transfusions.

Recording of platelet count prior to transfusion is necessary for treatment planning. Audits reported as low as 43% to as high as 99% of this practice of performing pre-transfusion platelet counts before transfusion.[1,11–13] In our study, 93.6% of platelet transfusions were done after doing a platelet count. Among the 6.4% episodes of transfusions that were done without prior platelet count, 138 were prophylactic and 31 episodes were therapeutic. Among the prophylactic transfusions, majority were in children (<1–15 years). This could be a strategy to prevent iatrogenic anaemia by avoiding multiple laboratory investigations as phlebotomy-induced blood loss approximates 10%–90% of circulating blood volume of infants.[14,15]

The most common condition that required platelet transfusions was haemato-oncological conditions (29.7%), which was similar to earlier studies.[1,16,17] Platelet transfusions are used either prophylactically to reduce the risk of bleeding or therapeutically to control active bleeding. The American Association of Blood Banks (AABB) estimated that more than 70% of platelet transfusions were performed prophylactically.[18] A national comparative audit of the use of platelets in UK by Qureshi *et al*. has reported 57% of platelet transfusions to be prophylactic.[19] A lesser amount of prophylactic transfusions were seen in New Zealand where only 44% of transfusions were prophylactic.[17] A higher percentage of prophylactic transfusions were reported by Estcourt *et al*. (69%), Saluja *et al*. (73%) and Greeno *et al*. (82%).[20–22] In our study, 73.8% of platelet transfusions were prophylactic, which was similar to earlier studies.

The re-audit of usage of platelets in haematology reported that 15% (497/3296) of episodes were pre-procedural, 69% (2283) were prophylactic and 13% (412) were therapeutic, which are similar to the present study.[16]

The most common indication for prophylactic transfusion was a platelet count <20 000/µl with additional risk factors (41.4%). The overall trigger for prophylactic platelet transfusion in our study was 22 000/µl and for therapeutic platelet transfusion, it was 78 000/µl.

TABLE III. Appropriateness of the use of platelet concentrates in different studies

Location	Type of study	Number of episodes	Appropriateness (%)
New Zealand (2007)[17]	Prospective	388	87
UK (2007)[19]	Prospective	4421	57
New Zealand (2008)[23]	Prospective	398	72
South Africa (2012)[1]	Retrospective	187 in 107 patients	66
Sydney (2000)[10]	Retrospective	414	67
South Australia (2002–03)[24]	Prospective	829	88
India (2005)[13]	Prospective	343	80
India (2007)[22]	Retrospective	2093	88
Our study (2013–15)	Prospective	2586	93.6

The appropriateness reported in various national and international studies ranged from 57% to 88%. It was 93.6% at our centre, reflecting strict adherence to guidelines of platelet transfusion practices (Table III). The most common indication in inappropriate transfusions was febrile illness (28.1%), sepsis (15%) and other miscellaneous conditions (14.4%). Although in haemato-oncological conditions, inappropriate platelet transfusions were high (11.4%), yet the proportion of episodes of inappropriateness was the least (2.5%) in these conditions (19/769 episodes). The reason for inappropriateness was a decision to transfuse at a platelet count above the trigger level for an invasive procedure or without any risk factors for bleeding. In our study, 6.4% of platelet transfusions were avoidable accounting for the preparation of an additional 700 units of RDPs and increasing the burden on our inventory. The high degree of appropriateness of platelet transfusions was because of the adherence to guidelines by clinicians and following best clinical practices. The report of the present audit was presented at the hospital transfusion committee meeting to the clinicians and they were made aware of avoidable transfusions and the increasing burden on the inventory.

Conclusion

An audit of transfusion practices benefits transfusion services and clinicians in the judicious use of platelet components.

Conflicts of interest. None declared

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