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Evaluation of Blood Ordering Practice for Packed Red Blood Cells in A Tertiary Care Hospital

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Abstract

Introduction: Blood is a valuable resource and blood transfusion is life saving in many situations. However blood transfusions carry the risk of transfusion transmitted infections, allergic reactions, hemolytic reactions and introduction of foreign antigens. So monitoring of blood transfusion practice is necessary for the rationale use of blood components. The aim of this study was to evaluate the appropriateness of blood ordering practice for Packed Red Blood Cells (PRBC) as per National Blood Transfusion Guidelines.

Materials & Methods: The study was conducted in a tertiary care hospital in Tamilnadu. A total of 4236 blood request forms were analyzed over a period of 12 months. Number of units requested were noted and the appropriateness of the requested transfusion was assessed according to the National guidelines on transfusion [3]. Request forms of neonates and children up to 18 years of age (in whom Transfusion guidelines are different) were excluded from the study. Cross match to Transfusion ratio (CT ratio) was also calculated.

Results: A total of 4236 blood request forms were analyzed out of which 76.6 % (n=3246) were for PRBC, and hemoglobin values were mentioned in 68.8% (n=2235) and not mentioned in 31.2% (n=1011) of request forms. Anemia, surgery and bleeding were the most common indications for which transfusions were requested. There were 3246 PRBC requests out of which 53.5% (n=1736) requests were considered appropriate, 38.6% (n=1254) were considered inappropriate and 7.9% (n=256) requests could not be assessed due to inadequate details on Hemoglobin and clinical relevance. CT ratio was 1.5.

Conclusion: In this study, it was noted that significant percentage (38.6%) of inappropriate PRBC transfusions were given and 7.9% forms could not be assessed due to inadequate investigation details. Regular audits and CMEs should be conducted in this hospital to rationalize the use of blood components.

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Introduction

Blood is a valuable resource and blood transfusion is life saving in many situations. Although there are lots of commercial preparations for many products, till date, there is no substitute, which has all the properties of the human blood. That is why blood conservation is of concern. The idea of blood transfusion appeared in 15th & 16th centuries. James Blundell in 18th century along with Dr. Leacock concluded that only humans should serve as source of human blood transfusion. The transfusion practice has evolved over the centuries significantly especially during the last decade to reach the present scenario. The use of whole blood has reduced and been replaced by use of specific blood components for appropriate and rational use of blood in modern medicine [1].

Transfusion is considered appropriate when it is used to treat conditions leading to significant morbidity and mortality and which cannot be prevented or managed effectively by other means. Due to easy availability of sophisticated blood banking services, increase in donor awareness through mass campaigns and for preventing unwanted complications, physicians sometimes order in excess of blood components than actually required. So monitoring of blood transfusion practice is necessary to ensure the rational use of blood components [2]. The aim of this study was to evaluate the appropriateness of blood ordering practice of PRBC as per National blood transfusion guidelines so that inappropriate use of blood can be minimized by forming guidelines.

Materials & Methods

The study was conducted in Ponnaiyah Ramajayam Institute of Medical Sciences, a tertiary care hospital in Tamilnadu after obtaining Institutional ethical Committee clearance (PRIMS ET031-16). A total of 4236 blood request forms were analyzed over a period of 1 year out of which 76.6% (n=3246) were for PRBC. Number of units requested was noted and the appropriateness of the requested transfusion was assessed according to the National guidelines on transfusion [3].

Each transfusion was classified as one of the following categories:

1. Transfusion appropriate and number of units transfused appropriate
2. Transfusion appropriate but number of units transfused inappropriate
3. Transfusion considered inappropriate
4. Quality of documentation did not allow an accurate decision regarding appropriateness [4].

Request forms of neonates and children up to 18 years of age (in whom transfusion guidelines are different) were excluded from the study.Blood utilization indices were computed with the following equation. (i) Cross match to transfusion ratio (CT ratio) = number of units cross matched/number of units transfused. Microsoft Excel was used for data entry and analysis. Adequacy of documentation and appropriateness of various blood components are expressed in percentages and depicted in form of tables.

Results

A total of 4236 blood request forms were analyzed, out of which 76.6 % (n=3246) were for PRBC. Out of 3246 PRBC requests, hemoglobin values were mentioned in 68.8% (n=2235) and not mentioned in 31.2% (n=1011) of forms. There were 3246 PRBC requests out of which 53.5% (n=1736) requests were considered appropriate, 38.6% (n=1254) were considered inappropriate and 7.9% (n=256) requests could not be assessed due to inadequate details on Hemoglobin and clinical relevance. (Tables 1, 2) (Figure 1)

Out of 4236 blood requests from various wards, 53.8% (n=2283) were appropriate, 37.3% (n=1583) were inappropriate and in 8.7% (n=370) transfusion appropriateness could not be assessed due to inadequate clinical and investigation details. The blood components requested from surgery wards were 731 out of which transfusions were appropriate in 44.4% (n=324), inappropriate in 49.9% (n=365) and could not be assessed in 5.7% (n=42).

Out of 38.6 % (n=1254) inappropriate transfusions, in 16% (n=516) cases, transfusion was appropriate but number of units transfused were inappropriate and in 22.8% (n=738) transfusion was considered inappropriate. (Table 3)

Table 1. Indications for transfusions

Indications	Number	Percentage
Anemia	1378	44.2%
Surgery	1364	32.2%
Thrombocytopenia	336	7.9%
Bleeding	263	6.2%
Raised PTINR	243	5.7%
Shock	19	0.4%
Pancytopenia	13	0.3%
Miscellaneous	12	0.3%
Could not be traced	110	2.5%

Table 2. Ward wise distribution of appropriateness

Ward	Appropriate		Inappropriate		Could not be assessed		Total
	No.	%	No.	%	No.	%	No.
Surgery	324	44.4%	365	49.9%	42	05.7%	731
Medicine	461	68.0%	156	23.0%	61	09.0%	678
Observation	428	65.1%	166	22.9%	83	12.0%	677
Oncology	376	57.3%	239	36.4%	41	06.2%	656
Gynecology	209	40.9%	259	50.6%	43	08.4%	511
ICU	217	62.3%	73	21.0%	58	16.6%	348
Orthopaedics	85	32.2%	169	64.0%	10	03.8%	264
Private	108	56.3%	69	36.3%	14	07.4%	191
Emergency	69	40.5%	85	50.0%	16	09.4%	170
Others	06	60.0%	02	20.0%	02	20.0%	10
Total	**2283**		**1583**		**370**		**4236**

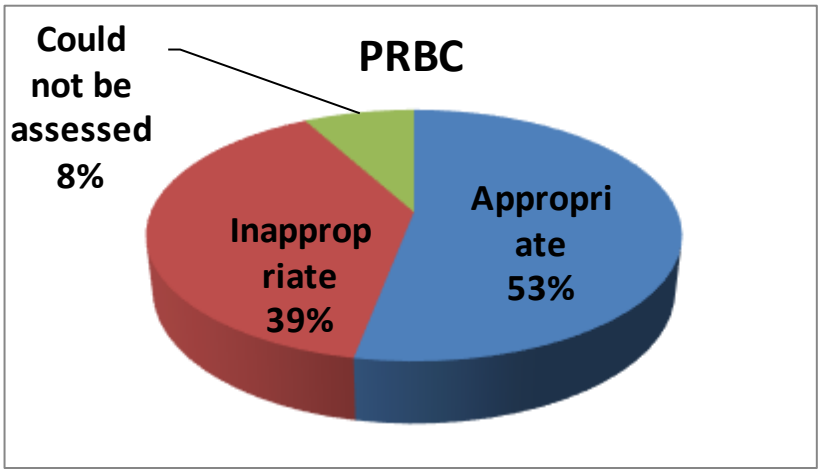

Figure 1. Appropriateness of PRBC transfusions

Table 3. Ward wise distribution of inappropriate transfusions

Ward	**2***		**3***		**Total**
	Number	**Percentage**	**Number**	**Percentage**	
Surgery	130	35.6%	235	64.4%	365
Medicine	87	55.8%	69	44.2%	156
Observation	99	60.0%	67	40.0%	166
Oncology	109	45.6%	130	54.4%	239
Gynecology	79	30.5%	180	69.5%	259
ICU	43	59.0%	30	41.0%	73
Orthopaedics	45	26.6%	124	73.4%	169
Private	36	52.1%	33	47.8%	69
Emergency	31	36.5%	54	63.5%	85
Others	02	100.0%	00	00.0%	02
Total	**661**		**922**		**1583**

Each transfusion was classified as one of the following categories:

1. Transfusion appropriate and number of units transfused appropriate
2. Transfusion appropriate but number of units transfused inappropriate
3. Transfusion considered inappropriate
4. Quality of documentation did not allow an accurate decision regarding appropriateness.

Out of this 3246 PRBC request forms, 6427 units of PRBCs were ordered for cross match and 4377 were issued and CT ratio was 1.5. (Figure 2)

Discussion

Blood has no substitute and blood transfusion is life saving in many situations [4]. However blood transfusions carry the risk of transfusion transmitted infections, allergic reactions, hemolytic reactions and introduction of foreign antigens [5]. Appropriate selection of blood components prevents unnecessary transfusions, minimizes the risks for adverse transfusion events, improves management of limited blood bank resources and decreases the cost of health care. Indiscriminate use of blood components is on the rise due to easy availability of sophisticated blood banking services. Many studies suggest that monitoring of blood transfusion practice and its healthy criticism have brought a positive response among clinicians and thus decrease in the number of inappropriate transfusions [6]. This study was therefore conducted to evaluate appropriate usage of blood and its components and thus may lead to formation of standard guidelines for transfusion practice in this hospital.

A study conducted in the same hospital in 2007-2008 showed that indications of transfusion in descending order are anemia accounting for 41.1% (n=176), followed by surgery which was 28.8% (n=123), bleeding in 11.9% (n=51), deranged PT in 8.9% (n=38), thrombocytopenia in 8.9% (n=38), exchange transfusion in 0.2% (n=1) followed by shock in 0.2% (n=1) [7]. In the present study, anemia in 44.2%, surgery in 32.2% and bleeding in 6.2% were the major causes of transfusion which is almost similar to the earlier study conducted in this hospital. Since this is a tertiary referral centre and has well developed oncology department, surgery was a common indication. Anemia followed by chemotherapy and nutritional deficiency could be the cause.

In a study conducted by Minal wade et al, out of 110 PRBC transfusions, 90% (n=99) were considered appropriate and 10% (n=11) as inappropriate [8]. In a study conducted by Metz et al on appropriateness of various blood components, it was stated that 16% of PRBC were considered inappropriate. It was suggested in that study that PRBC was used inappropriately most frequently in association with a surgical procedure [9].

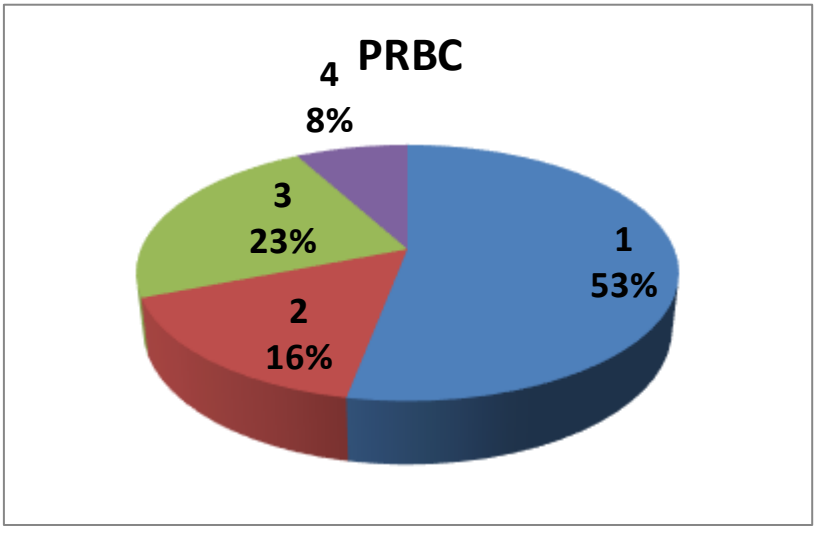

Figure 2. Appropriateness of PRBC transfusions

In a study conducted by Shander et al regarding allogenic RBC transfusions, they stated that 11.8% (n=53) were considered appropriate, 59.3% (n=267) as inappropriate and 28.9% (n=130) as uncertain [10]. In a study conducted by Barr et al, 23% of transfusions were considered inappropriate. They concluded that younger patients, those undergoing surgery, and those with lower comorbidity and higher Hb values were most likely to have an inappropriate transfusion. Among 77% of patients appropriately transfused, 19% were overtransfused [11]. In a retrospective study conducted by So-osman et al in postpartum patients, they stated that 95% of patients were transfused 1 or more PRBC units within 48 hours of delivery. Out of the total 311 transfusions, 46% (n=143) were inappropriate, partly due to overtransfusion [12]. In a study conducted by Rubin et al to assess RBC transfusions, he did 2 audits within a gap of 1 year. At first audit, 35% of RBC transfusions were assessed as inappropriate. He found small reductions in inappropriate transfusions at the second audit however the change was insignificant. About 5% of patients received a single RBC unit and 40% of single-unit transfusions were inappropriate. More RBC transfusions were inappropriate in surgical patients than in those treated by other specialities. So he concluded that about a third of RBC transfusions were assessed as inappropriate and the interventions had only a small effect on transfusion appropriateness [13]. In the present study, there were 3246 PRBC requests out of which 53.5% (n=1736) requests were considered appropriate, 38.6% (n=1254) were considered inappropriate and 7.9% (n=256) requests could not be assessed due to inadequate details on Hemoglobin and clinical relevance. RBC appropriateness was more or less similar to few of the studies compared [13].

Out of 38.6 % (n=1254) inappropriate transfusions, in 16% (n=516) cases, transfusion was appropriate but number of units transfused were inappropriate and in 22.8% (n=738) transfusion was considered inappropriate. Among the inappropriate transfusions, number of cases in which transfusion was considered inappropriate, category No.3 was more than the appropriate transfusions with wrong dosage, category No.2. This indicates that more than 50% of inappropriate transfusions were given to patients in whom transfusion itself was not indicated. This issue has to be addressed and inappropriate transfusions should be avoided. This can be achieved by regular CME programmes, educational visits to various departments and development of hospital transfusion guidelines which has to be agreed and followed by clinicians.

In a study conducted by Prasun Bhattacharya, maximum blood requests were from oncology wards accounting for 43% (n=45), followed by elective surgery wards, which was 30% (n=32), 11% (n=12) from surgical emergency wards, 5% (n=5) from medical emergency wards, 5% (n=5) from gynecology wards, 5% (n=5) from pediatric wards and 1% (n=1) from transplant surgery wards [14]. In a study conducted at this hospital in 2007-2008, there were 428 requests from different wards. Majority of requests were from surgical wards accounting for 22.2% (n=95), followed by medicine in 21.7% (n=93), 12.6% (n=54) from orthopedics, 11.9% (n=51) from neurosurgery, 9.5% (n=41) from gynecological wards, 9.3% (n=40) from nephrology wards, 5.6% (n=24) from pediatric wards, 3.3% (n=14) from ENT wards, 2.1% (n=9) from other wards and 1.6% (n=7) from CTVS wards [15]. In a study conducted by Mathoulin-Pelissie et al, most of the blood requests were from oncology and surgical wards accounting for around 48% collectively, followed by medical wards mostly for musculoskeletal disorders scoring for 37% followed by other wards (CTVS, CCU & ICU) consuming 15% [16]. In this present study, out of the total 4236 blood requests, 17.2% (n=731) were from surgery wards, 16% (n=678) were from medicine wards, 16% (n=677) from observation and IMC wards, 15.4% (n=656) were from oncology wards,12% (n=511) were from gynecology wards, 8.2% (n=348) from ICU, 6.2% (n=264) were from orthopaedic wards, 4.5% (n=190) were from private wards, 4% (n=170) from emergency and 0.2% (n=10) from other wards. Maximum requests in this study was from surgery, medicine and oncology wards which was almost similar to other studies stated above [15].Most appropriate transfusion episodes were planned in medicine, observation and ICU. Maximum number of inappropriate transfusions were seen in orthopaedics, gynaecology and emergency wards. Maximum number of inadequately filled forms were received from ICU, observation and gynaecology wards. Among the inappropriate transfusions, maximum number of

unjustifiable transfusions were seen in orthopaedics, gynaecology and surgery.

A C/T ratio of <=2.5 is indicative of significant blood usage. A C/T ratio of >2.5 means that less than 40% of cross-matches are transfused [17]. In a study conducted by Singh et al, overall C:T ratio was 3.7:1 [18]. In another study conducted by Chawla et al, C/T ratio was around 2.5 [19]. In a study conducted by Abayomi et al, CT ratio was 2.1:1 [20]. In the present study, C/T ratio was 1.5 for PRBCs. This indicates that there was significant blood usage in this hospital. The blood bank in this hospital conducts CMEs and made departmental visits and meetings to explain significance of rational blood usage and this may be one of the reasons for good CT ratio in this hospital.

It was found in this study that hemoglobin values are not mentioned in as much as 31.2% of blood request forms. Most common indication for blood transfusion were anemia and surgery. Amongst inappropriate transfusions, transfusion was not indicated in most of the cases and dosages were inappropriate in other cases. Most number of inappropriate transfusions were seen amongst patients of orthopaedics, emergency and gynaecological wards.

Conclusion

In the present study, it was noted that significant percentage (38.6%) of inappropriate transfusions were given and 7.9% forms could not be assessed due to inadequate clinical details and hemoglobin values. Out of 38.6 % (n=1254) inappropriate transfusions, in 16% (n=516) cases, transfusion was appropriate but number of units transfused were inappropriate and in 22.8% (n=738) transfusion itself was considered inappropriate. Regular audits and CMEs should be conducted and developments of standard hospital transfusion guidelines are the measures which can be incorporated in this hospital to rationalize the use of blood components. Clinicians and residents should take a little more time and complete blood requisition forms adequately so that the transfusion specialist could understand the emergency and for assessment of appropriateness.

Conflict of interests

None

Source of Funding

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Ethical Approval

The study was duly approved by the ethics committee of Ponnaiyah Ramajayam Institute of Medical Sciences (PRIMS ET031-16)

References

1. Venkatachalapathy TS. A Prospective Audit of Blood Transfusion Reactions in Tertiary Care Hospital for the Use of Blood and Blood Components. J Blood Disorders Transfusion. 2012; 3: 118.
2. Sheikholeslami H, Kani C, Fallah-Abed P, Lalooha, Mohammadi N. Transfusion audit of blood products using the World Health Organization Basic Information Sheet in Qazvin, Islamic Republic of Iran. EMHJ. 2010; 16(12): 1257-62.
3. Saran R K. Transfusion Medicine Technical Manual. Second Ed. Mehta Offset Pvt Ltd.2003;193-223.
4. Joy P J, Bennet S J. The appropriateness of blood transfusion following primary total hip replacement. Ann R Coll Surg Engl. 2012;94(3): 201–3.
5. WHO Clinical Uses of Blood. http://www.who.int/ bloodsafety/ clinical_use/en/Manual_EN.pdf.
6. Verlicchi F. Evaluation of clinical appropriateness of blood transfusion.Blood Transfus. 2010; 8(2): 89–93.
7. Gaur D S, Negi G, Chauhan N, Kusum A, Khan S, Pathak V P. Utilization of blood and components in a tertiary care hospital.2009; Indian J Hematol Blood Transfus25(3):91-5.
8. Wade M, Sharma R, Manglani M. Rationale Use of Blood Components – an Audit. Indian J Hematology Blood Transfusion. 2009; 25(2): 66-9.
9. Metz J, McGrath K M, Copperchini M L, Haeusler M, Haysom H E, Gibson P R, Millar R J, Babarczy A, Ferris L, Grigg A P. Appropriateness of transfusions of red cells, platelets and fresh frozen plasma. An audit in a tertiary care teaching hospital. Med J Aust. 1995; 162(11):572-3, 576-7.
10. Shander A, Fink A, Javidroozi M, Erhard J, Farmer SL, Corwin H, Goodnough L T, Hofmann A, Isbister J, Ozawa S, Spahn D R. International Consensus Conference on Transfusion Outcomes Group.

Appropriateness of allogeneic red blood cell transfusion: the international consensus conference on transfusion outcomes. Transfus Med Rev. 2011;25 (3):232-46.

11. Barr P J, Donnelly M, Cardwell C R, Parker M, Morris K, Bailie K E. The appropriateness of red blood cell use and the extent of overtransfusion: right decision? Right amount?Transfusion. 2011; 51 (8):1684-94.
12. So-Osman C, Cicilia J, Brand A, Schipperus M, Berning B, Scherjon S. Triggers and appropriateness of red blood cell transfusions in the postpartum patient-a retrospective audit. Vox Sang. 2010;98 (1):65-9.
13. Rubin G L, Schofield W N, Dean M G, Shakeshaft A P. Appropriateness of red blood cell transfusions in major urban hospitals and effectiveness of an intervention. Med J Aust. 2001;175 (7):354-8.
14. Bhattacharya P, Marwaha N, Dhawan H K, Roy P and Sharma R R. Transfusion-related adverse events at the tertiary care center in North India: An institutional hemovigilance effort. Asian J Transfus Sci. 201; 5(2): 164–70.
15. Gaur D S, Negi G, Chauhan N, Kusum A, Khan S, Pathak V P. Utilization of blood and components in a tertiary care hospital.2009; Indian J Hematol Blood Transfus25(3):91-5.
16. Mathoulin-Pelissier S, Salmi L R, Verret C, Demoures B. Blood transfusion in a random sample of hospitals in France. Transfusion. 2000 ;40 (9):1140-6.
17. Friedman B A, Oberman H A, Chadwick A R, Kingon K I. The maximum surgical blood order schedule and surgical blood use in the United States. Transfusion. 1976; 380-7.
18. Singh J K, Singh P. Routine pre-operative cross-match for elective colorectal resections: an appropriate use of resources? Surgeon. 2011;9(1): 8-12.
19. Chawla T, Kakepoto G N, Khan M A. An audit of blood cross-match ordering practices at the Aga Khan University Hospital: first step towards a Maximum Surgical Blood Ordering Schedule. J Pak Med Assoc. 2001; 51(7):251-4.
20. Abayomi E A, Zibwe G, Adewuyi J O, Mandisodza A, Cakana A Z. Use of packed red cells in a major hospital in Harare, Zimbabwe. Cent Afr J Med. 1999;45(3):54-6.