

After Hour Blood Transfusions: A Transfusion Service Perspective

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Abstract Optimal functioning of blood transfusion service during after hours with limited resources are highly challenging. Best transfusion practice guidelines recommends to avoid non-urgent transfusions during out-of-core hours for the concern of patient's safety. This study aimed to evaluate the after hour packed red cell transfusion practice and to identify the proportion of avoidable transfusions in our center. The transfusion requests received, cross-matched and issued between 8 p.m. and 8 a.m. from September 2015 to August 2016 were analysed and categorized into 3E's based on the clinical need as Group I—evident need, Group 2—empirical need and Group 3—elective need. The proportion of avoidable transfusion in each group was noted based on BCSH guidelines on red cell transfusion including the patient's clinical, laboratory parameters and transfusion details. The proportion of PRBC requests received, crossmatched and issued between 8 p.m. and 8 a.m. were 24.45%, 23.84% and 27.15% respectively. The rationale for PRBC transfusion documented for evident, empirical and elective need were 56.95%, 29.34% and 13.71% respectively. Out of which, 19.21% [876/4559] was identified as avoidable transfusions

providing no immediate clinical benefit to patients. This study highlights the proportion of avoidable transfusion during after hours in our center and emphasizes the need for transfusion guidelines that recommends to restrict after hour transfusions to those patients with active bleeding or urgent clinical need in order to prevent transfusion related adverse events and improve patient safety.

Keywords Blood transfusion · Patient safety · Transfusion safety · Night hour transfusion

Introduction

Provision of right blood to the right patient at the right time remains a formidable challenge to transfusion specialists worldwide. Blood transfusion is a complex process that involves a lot of human factors from blood collection, processing to until the transfusion of intended product to the recipient making it vulnerable for errors to occur [1, 2]. Any error in the transfusion process may result in life-threatening consequences to the patients. Serious hazards of transfusion (SHOT) report 2005 has stated that 37% of transfusion errors occurred during 'out of core' hours [3]. Considering the fact that blood transfusion carries a significant amount of inherent risks and less human resources are available both at laboratory and bedside during night hours, we carried out this study to evaluate the after hour packed red blood cell (PRBC) transfusion practice in our tertiary care center and to identify the avoidable proportion of red cell transfusions, if present in order to improve patient safety. To the best of our knowledge, this study is the first of its kind in India to draw attention on transfusion safety in this aspect.

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Materials and Methods

This was a retrospective observational study conducted in the Department of Immunohematology and Blood transfusion at 2032 bedded tertiary care hospital. Institutional ethical committee clearance was obtained and the data required for the study was retrieved from the departmental software. The study involved collection of data on the number of transfusion requests received, cross-matched and issued for packed red blood cells in the blood bank between 8 p.m. and 8 a.m. from September 2015 to August 2016. The transfusion requests which were received before 8 p.m. but crossmatched and issued between 8 p.m. and 8 a.m. were also included in the study. This time interval (8 p.m. to 8 a.m.) was considered as ‘after hour’ as it corresponds to the night shift duty hours of our blood bank during which two technicians are on duty. The cross-matches were performed by column agglutination technique using LISS/Coomb’s Anti IgG + C3d gelcard (Bio-rad). The rationale for after-hour transfusions was categorised into 3E’s based on the clinical need documented in the transfusion request form as Group 1—Evident clinical need (Patients with acute blood loss or severe anemia), Group 2—Empirical need (Oncology/Hematology transfusion-dependent patients, patients receiving sequence unit transfusion, patients on dialysis) and Group 3—Elective need (Patients with chronic anemia, pre-operative/procedural transfusion and others). The proportion of avoidable transfusion in each category was noted based on British committee of standards for hematology (BCSH) guidelines on red cell transfusion [4] including clinical/hemodynamic status of the patient, laboratory parameters, sequence of transfused unit and the time interval between pre-transfusion hemoglobin (Hb) report and the transfusion request raised by the clinician (time interval of more than 12 h was considered avoidable transfusion unless the delay was justified). The data on clinical specialty that has raised the request, average turn around time for PRBC issue and transfusion reactions to PRBC reported during the study period were noted.

Results

During the study period, a total number of PRBC transfusion request received, crossmatched and issued were 32,537, 28,438, 16,693 respectively out of which 7949, 6787 and 4559 units were between 8 p.m. and 8 a.m. Hence, the proportion of after-hour transfusion requests received, crossmatched and issued were 24.45% (7949/32,537), 23.84% (6787/28,438), 27.15% (4559/16,693) respectively (Table 1). A total of 3961 patients with

Table 1 Transfusion requests received, crossmatched and issued between 8 p.m. and 8 a.m. during the study period (August 2015–September 2016)

	Total Number	Mean/month	
		(N)	%
Request received			
Day	24,588	2049	75.56
Night	7949	662.41	24.45
Total	32,537		
Crossmatched			
Day	21,651	1804.25	76.13
Night	6787	565.58	23.84
Total	28,438		
Issued			
Day	12,134	1011.16	72.68
Night	4559	379.92	27.15
Total	16,693		

median age of 46 years (range < 1–99 years) were included in the study and the ratio of male to female in this study was 1.9:1. The order of utilization of PRBC by various clinical departments was observed as 20.35% by medicine, 15.35% by surgery, 13.73% by orthopaedics, 8.66% by medical oncology followed by other departments (Table 2). The rationale of PRBC transfusion documented for evident clinical need in group 1 was 56.95% (2593/4559), for empirical need in group 2 was 29.34% (1340/4559) and for elective need in group 3 was (626/4559) 13.71% (Table 3). The proportion of avoidable transfusion in each group was nil in group 1, 31.86% (427/1340) in group 2 and 71.72% (449/626) in group 3 respectively accounting for overall avoidable transfusion of 19.21% (876/4559). Of the total PRBC units issued during after hour, the time interval between pre-transfusion Hb report and the transfusion request raised by the clinician was observed as less than 8 h in 31.4% (1432/4559) of units, between 8 to 12 h in 52.37% (2388/4559) of units and more than 12 h in 16.23% (740/4559) of units. An average turn-around time for emergency PRBC issue was within 30 min and was 1 h 35 min for routine issues. Majority of the PRBC issue [54.09% (2466/4559)] occurred between 8 p.m. and 12 a.m. while 27.79% (1267/4559) and 18.12% (826/4559) were between 12.01 a.m. to 4 a.m. and 4.01 a.m. to 8 a.m. respectively. The incidence of transfusion reaction related to PRBC during day and after hour of the study period was 0.28% (35/12248) and 0.37% (17/4559) respectively with *p* value of 0.56 (Table 4).

Table 2 Department wise after hour utilization of PRBC during the study period

Clinical specialty	Number of units utilized	Percentage (%)
General Medicine	928	20.4
General Surgery	700	15.4
Orthopedics	626	13.7
Pediatrics and Neonatology	369	8.06
Obstetrics/Gynaecology	240	5.3
Medical Oncology	395	8.6
Nephrology	285	6.2
Gastroenterology	296	6.5
Cardiothoracic surgery	276	6.1
Neurosurgery	262	5.7
Casualty	131	2.9
Others	51	1.1
Total	4559	100

Table 3 Categorization of transfusion requests into 3E's based on the clinical need

	Number of transfusion		Avoidable transfusions	
	(N)	(%)	(N)	(%)
Evident Clinical need (Group 1)	2593	56.93	Nil	Nil
1. Anemia with symptoms	1911	41.91	–	–
2. Acute blood loss	682	15	–	–
Empirical need (Group 2)	1340	29.34	427	31.86
1. Hematology/Oncology transfusions	560	12.28	–	–
2. Dialysis	368	8.07		
3. Sequence unit transfusion	412	9.03		
Elective need (Group 3)	626	13.71	449	71.72
1. Chronic anemia	367	8.05		
2. Pre-operative/procedural	259	5.68		
Total	4559		876	19.21

Table 4 Transfusion reactions to PRBC during the study period

	Reported at night	Reported in day	<i>P</i> value
Total no. of transfusion reaction	17	35	0.56
Total no. of transfusion	4559	12,248	
Incidence of transfusion reaction	0.37%	0.28%	

Bold indicates *p* value less than 0.05 is considered as significant

Discussion

Primum non nocere—'First do no harm' is the fundamental pre-requisite in health care and so in blood transfusion service as well. Blood transfusion is a complex process with opportunities for transfusion error to occur at various critical points [1, 2, 5–7]. In recent decades, serious hazards of transfusion data have highlighted that errors continue to be the source of 87.0% of transfusion incidents and most of the laboratory errors (40%) take place out of routine hours due to human factors endangering patient safety [5, 8].

In our study, 23.84% of cross matches and 27.15% of PRBC issue were performed during after-hours which was found consistent with other international audits where the proportion of night transfusion varied from 12 to 29% [9–11] and in a study by Tinigate et al., 25.2% of cross-matches was performed during out of hours [12]. The proportion of after hour transfusions for evident clinical need in this study was 56.95% which was comparable with a New Zealand audit (66%) by Donegan et al. [9]. The rationale for transfusion in this group was symptomatic anemia (42.3%) followed by active bleeding (15%). None of the transfusion in this group was found to be

inappropriate. Out of 29.34% of transfusions in empirical need group, most of the transfusions have been performed for transfusion-dependent patients and oncology patients on chemotherapy who were not willing to compromise their day hours for the routine transfusion and we considered those as ethically appropriate. However, few transfusions (5.89%) in this group was reported as sequence unit being transfused for stable patients in the wards which could have been postponed to the subsequent day after weighing the patient's risk to the benefits. In group 3 with elective need, only 28.28% of transfusions were found to be appropriate while 71.72% were identified as avoidable transfusions being performed in asymptomatic chronic anemia patients and in patients posted for elective surgery to reach the target pre-operative hemoglobin level. A significant proportion of single unit transfusion (53.45%) was noted in this group which although complies with the restrictive transfusion strategy could have been performed during day hours. Similarly, in a study by Tracey Stevenson, 67% of transfusions were reported to have been delayed until the next morning without any detrimental effect [11]. However the decision to transfuse is based on the clinical judgement and hence it may influence the level of appropriateness. This is one of the limitations of the study.

Of concern, the time interval between the pre-transfusion hemoglobin report and the transfusion request raised by the clinician was found to be more than 12 h in few transfusions (16.23%), suggesting the transfusion could have been initiated much earlier in the day. The possible reason for this delay could be because the decision to transfuse was made earlier during clinical rounds but the request for the same was raised in the late evening. An audit in UK has highlighted various reasons for overnight transfusion like delay in crossmatch by transfusion laboratory, delay in collection of the unit by clinical staff or delay in administration of the transfusion by nursing staff [10]. Proper communication between transfusion specialist and the clinicians is essential to prevent these undue delays and to have a collaborative effort on improving patient safety.

Interestingly, 54.09% of PRBC issue occurred between 8 p.m. and 12 a.m. during which two technical staffs are on duty in blood bank. Unlike day hours, where each section in blood bank is handled by separate technician, during after hour the blood bank is managed by only two technical staffs. This poses great challenge to after-hour technical staffs as they are involved in multiple tasks like donor phlebotomy, apheresis procedures, component separation, testing for transfusion transmitted infection, pre-transfusion testing, labelling and issue of blood products. Similar kind of challenge is faced by nursing staffs as well in administering and monitoring of transfusion process at the

bedside. In the literature, short staffing, long shifts and multitasking were identified as major risk factors for errors in transfusion process [12–15]. Since the data on transfusion error was not included in our study, the estimation of actual risk associated with after hour transfusions was not possible. However, the risks are evident from various reports which alerts us to be more vigilant towards after hour transfusions in order to improve the patient safety [9–12].

In our study, the incidence of transfusion reaction was 0.37% (17/4559) and 0.28% (35/12248) during after-hour and day hour respectively. This difference, however was not statistically significant ($p = 0.56$). Majority of the transfusion reactions reported during the study period were febrile non-hemolytic transfusion reaction (48.07% [25/52]) followed by allergic reaction (44.23% [23/52]) which are mainly attributed to the product and patient related factors rather than time of the day. This is a single center based study and represents only the tip of the iceberg. More such studies in future would help to perform in depth review of after hour transfusion practice.

Conclusion

This study highlights the current scenario of after hour transfusions and the proportion of avoidable transfusions in our center from transfusion service perspective. It also emphasizes the need for establishing a policy on after hour transfusions through hospital transfusion committee which recommends to avoid non-urgent routine transfusions during after hours, unless it is clinically warranted. Periodic review of blood utilization during night hours and better understanding of human factors related to transfusion process would help in reducing the transfusion errors and improve the patient safety.

Compliance with Ethical Standards

Conflict of interest The authors declare that they have no conflict of interest.

Ethical Approval This article does not contain any studies with human participants or animals performed by any of the authors.

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