Journal of Rawalpindi Medical College (JRMC); 2016;20(3):222-224

Original Article

Blood Cross-Match Ordering Practices

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Abstract

Background: To assess blood utilization practices by evaluating the cross-match ordering and transfusion ratio in surgical and nonsurgical patients to avoid unnecessary transfusion and wastage of blood.

Methods: In this prospective study patients belonging to age of 1 year to 60 years, which were admitted in Pediatric, Medicine, Surgery, Gynae/OBS / Orthopaeds/ wards were included. Cross-matched to transfusion ratio (C/T ratio), Transfusion probability (%) and Transfusion Index (Ti) for each of these patients was performed during the study period. C/T ratio is used as a measure of the efficiency of blood ordering practice. It should ideally be between 2 and 2.5. We compared our results with the ideal.

Results: Requests from 2800 patients were sent to prepare 3547 cross matched units. Of these, 2723 units were transfused. Overall C/T was 1.3, %T 76.7%,Ti 0.9. Of the total cross match requested 44.4% were requested by surgical department including Gynae/OBS, Urology, Neurosurgery, Orthopeads and General surgeries. Out of all surgical departments C/T of Gynae/OBS was 2.5% & of all other surgical departments was 1.7% &Ti o.4. C/T ratio of nonsurgical patients was 1.09.

Conclusion: Overall blood utilization was encouraging, but excessive cross-matching with minimal transfusion practice was observed in Gynae/OBS patients which can be minimized by considering transfusion triggers before requesting cross-match.

Keywords: Cross-match/transfusion ratio, Maximum surgical blood ordering schedule.

Introduction

Limited availability and supply necessitates the rational use of blood and blood products. Over-ordering of blood can lead to wastage of time, wastage of reagents, and unnecessary workload on Blood Bank. It also imposes extra expenses on patient's. Preoperative over ordering of blood can burden the physical and human resources of a health care facility and increase the cost of medical care. In the absence of an explicit maximum blood order policy, ordering for blood transfusion is frequently based on subjective anticipation of blood requirement instead of evidence based estimates of average requirement in a particular patient.[1,2] Data from several developing countries have shown gross over ordering of blood in 40%to 70% of patients transfused.[3,4] This may cause exhaustion of valuable supplies and resources both in technician time, effort, and biochemical reagents. It also adds to financial burden for each patient undergoing a surgical procedure.[5] Increasing demand for blood and blood products together with rising cost and transfusion associated morbidity led to a number of studies that review blood ordering and transfusion practice.[6,7]

Patients and Methods

This hospital based prospective study was conducted over a period of one year from August 2014 to August 2015. Total of 3950 patients were included in the study. Blood requisition and transfusion of patients admitted in surgical (Gynae/OBS, Urology, Neurosurgery, Orthopeads and General Surgeries) and non-surgical wards (Obstetrics and Gynea, Medical units (ICU, CCU), Orthopaeds, Pediatric department, Oncology department) were compiled and reviewed. Blood utilization indices were computed with the following equation.[11]

(i)Cross-match to transfusion ratio (C/T ratio) = number of units cross-matched/number of units transfused. A ratio of 2.5 and below is considered indicative of significant blood usage.

(ii)Transfusion probability (%T) = number of patients transfused/number of patients cross-matched × 100. A value of 30% and above was considered indicative of significant blood usage.

(iii)Transfusion index (TI)=number of units transfused/number of patients cross-matched. A value of 0.5 or more was considered indicative of significant blood utilization.

Results

All (n= 2800) patients were advised to arrange blood for cross match (n= 3547).Of these, 2723 units were transfused while 824 units remained unissued. Blood transfusion from the units cross-matched was 76.7%.Overall C/T was 1.3, %T 76.7%, Ti 0.9(Table

1).Of the total cross match requested 44.4 %(1606 units) were requested by surgical department.

Table 1: Total cross- match to transfusion ratio (C/T)

Total Cross match	Transfused units	Untranfused Units	Cross-matched/Transfusion ratio
3547	2723,77%	824,23%	1.3%

Table 2: Cross-match to transfusion ratio (C/T) of surgical departments

Department	Cross match requested	Transfused units	Untransfused units	Crossmatch transfusion ratio %
Surgical (total)	1606	901	707	2.5
Gynae/obs	933	410	523	2.2
Neurosurgery	33	19	16	1.7
Urology	39	26	13	1.5
General surgery	314	196	118	1.6
Orthopaeds	287	250	37	1.14
Total	3212	1802	1414	

Table 3: Cross-match to transfusion ratio (C/T) of non- surgical departments

Department	Cross match requested	Transfused	Untransfused	Crossmatch/ Trnasfusion Ratio
Non-Surgical	1404	1300	97	1.09
General medicine	632	574	58	1.10
Oncology	468	432	32	1.08
Nephrology	183	183	--	1
Pulmunology	101	91	7	1.1
Burn unit	20	20	--	1
Total	2808	2600	194	

Amongst surgical departments, 933 units were cross matched for gynae/obs department. 410 units were transfused while 523 units remained unissued with a C/T of 2.5%. C/T for all other surgical departments was 1.7% &Ti 0.4(Table 2).Total of 1404 units were cross matched for the non-surgical departments, out of which 1338 units were transfused. Maximum request for cross match was received from general medicine and oncology departments(632 units and 464 units were requested respectively). Cross-match requests was placed for patients currently on or post-chemotherapy for hematological and non-hematological malignancies, patients with renal failure and on dialysis and patients labelled as having anemia. Over all C/T ratio of nonsurgical patients was 1.09 and a Ti of 0.95. A C/T ratio of 1 was observed in nephrology and burn unit.(Table 3).Eleven percent of the total Cross match requests placed were from paediatric department. It included patients with inherited or acquired red blood cell disorders and patients on or post chemotherapy. The major bulk was cross matched for thalassaemia major patients. Fauji Foundation hospital caters to 53 registered patients of thalassaemia. A total of 406 units were cross matched with 352 (86.6%) being issued while only 53 units were not utilized after cross match. A low rate of blood utilization was observed in patients admitted in intensive care unit after cross match. A total of 105 cross match requests were received from ICU with blood utility of only 37.1 %. Amongst all the departments, highest C/T ratio of 2.69 was observed in patients admitted in intensive care unit whereas an encouraging 100% cross matched blood unit utility was observed in patients of cardiac care units. Fifty two blood units were cross matched over one year period with all of them were issued.

Discussion

Blood is a scarce clinical resource costing a huge financial burden.[8] Large number of units of blood are cross-matched each day for patients who are most unlikely to require transfusion which could result in wastage of this precious resource.[9] There is a limited supply with increasing demand and underutilization of the requested blood worldwide. Ideally, this ratio should be 1.0, but a ratio of 2.5 and below was suggested to be indicative of efficient blood usage.[5]A study, conducted in Ethiopia, revealed an overall C/T ratio of 2.3 where as a higher C/T ratio was observed in elective surgical patients. Higher C/T ratio in this study was observed due to non-availability of a blood bank within the hospital premises whereby blood requisitions were sent to referral hospitals .[10]In another study conducted in India C/T ratio was found to be 2.4 in patient undergoing cesarean-section which was comparable to our CT ratio; however for other surgeries it was less than 2 which was within MSBOS (Maximum surgical blood ordering practices) criteria.[11]

In a study done to find out the blood ordering practices for Caesarean sections only 13% of blood that was cross-matched was used and the cross-match transfusion ratio was 9.7 which was alarmingly high. [12] Although not comparable but our study also showed a high CT ratio in gynae/obstetric patients which emphasizes the need of routine cross-match practice prior to Caesarean section to be re-looked thoroughly.[12] In another study done on 314 minor and 227 major surgeries the overall CT ratio was 2.1:1. These results are close to results in surgical patients.[13]

In a study conducted in Nigeria done in 986 patients, 94.42% (1608) were cross-matched but only 34.51% (555) were transfused that gave an average CT ratio of 2.90. [14] In Agha Khan Hospital, data was analyzed for 32 elective surgical procedures in 2131 patients. Majority of the patients had CT ratios greaterthan 2.5.[15]

In a study, done in a rural hospital of Melbourne, C:T ratio was 1.59 for emergency requests and 5.96 for elective requests.[16] The emergency requests were predominantly appropriate but a significant proportion of elective requests were inappropriate.

In another study patients scheduled for surgery were allocated four groups: high, medium, low and minimal risk of blood loss and transfusion. The C/T ratios were 6.61 (high risk group), 13.7 (medium risk group) and 35.5 (low and minimal risk groups). The overall C/T ratio was 9.[17] Such high C/T ratio in this study could be due to lack of awareness and transfusion staff doctors regarding blood ordering procedures. A study was done to assess the clinical transfusion practice at Mbarara Regional Referral Hospital , Uganda. There were no guidelines on the appropriate use of blood at MRRH but the C:T ratio found was quite comparable to our study. The cross-match-to-transfusion ratio was 1.3. [18] Another study conducted in Australian and New Zealand intensive care units (ICUs) showed that Transfusion practice of RBCs in Australian and New Zealand ICUs is restrictive and is concordant with guidelines. [19]

At the Johns Hopkins Medical Institutions, they evaluated whether the MSBOS, along with a remote electronic blood release system (EBRS), reduced unnecessary preoperative blood orders and costs .Data for preoperative blood orders were analyzed for 63,916 surgical patients over a period of 34-month .Among patients having surgical procedures deemed not to require a type and screen or cross-match (n = 33,216), the percentage of procedures with preoperative blood orders decreased by 38% to 25%. Among all hospitalized inpatients, the cross-match-to-transfusion ratio decreased by 27% over the same time period. Based on the realized reductions in blood orders, annual costs were reduced by $137,223 ($6.08/patient) for surgical patients, and by $298,966 ($6.20/patient) for all hospitalized patients.[20]

Conclusion

1.Implementation of proper blood ordering schedule can result in a substantial reduction of cost to the patient and will also decrease the opportunity cost of holding blood 'out of circulation' for patients who may not require transfusion and better management of stocks.

2.The hospital with blood transfusion committee should formulate maximum blood ordering policies for selective surgical procedures and conduct regular auditing.

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