

# A Prospective Study of Blood Transfusion Practice in Elective Orthopaedic Surgeries

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## Research Article

**Abstract: Aims and Objectives:** To assess the practice and trends of blood transfusion services at our institute in elective orthopaedic surgeries, and to work out Surgical Blood Order Schedule at our institute by means of Cross Match Transfusion Ratio (C/T ratio), Transfusion Index (TI), Transfusion Probability (%T) and Mead's criteria and to develop suggestions to improve the efficiency of blood utilisation and reduce the unnecessary cross matching as well as wastage of blood bank resources. **Materials and Methods:** Patients (male and female) of the age group of 20- 80 years under elective orthopaedic surgery were enrolled in the study. Patients, who received blood transfusion during intraoperative period and within 24 hours postoperatively, during one year duration, were included in the study and frequency of utilization of blood in different elective orthopaedic surgeries was noted. **Results and Conclusion:** A total of 159 patients with an age group of 20-80 years were evaluated in one year duration. Two hundred forty two units of blood were cross matched and only seventy eight units were transfused to seventy one patients. Sixty eight percent of the units cross-matched were not transfused. Five out of six elective procedures had a C/T ratio higher than 2.5 and all of the procedures under study had a low Transfusion Index (TI<0.5).

**Keywords:** Blood Transfusion, Elective, Orthopaedic Surgeries.

## Introduction

Blood transfusion is an essential part of modern health care. The appropriate use of blood and blood products means the transfusion of safe blood products only to treat a condition leading to significant morbidity and mortality that cannot be prevented or managed effectively by other means<sup>[1]</sup>. Many elective orthopaedic surgeries most often, inevitably lead to excess blood loss during the procedure, requiring transfusion. The preoperative assessment of blood requirements is often an over assumption as shown by blood bank records. The consequences of such misuse include outdated of blood, overburdening of blood bank personnel, depletion of blood bank resources, and wastage of time<sup>[2,3,4]</sup>. Hence it is quite necessary to streamline the blood usage by incorporating a blood ordering schedule for such procedures. The maximum surgical blood ordering schedule (MSBOS) is a list of common elective surgical procedures for which the maximum numbers of units of

blood are cross-matched preoperatively for each procedure<sup>[5,6,7]</sup>. The ratio of the number of units cross-matched to the number of units actually transfused, that is, C: T ratio should not exceed 2:1<sup>[8]</sup>. The surgical blood order schedule is an attempt to more closely synchronize the amount of blood cross-matched with the amount which actually will be transfused. Employing on surgical blood order schedules allows all of the following to be reduced: total blood inventory, outdated of blood, expense to patients, cross matching procedures, and laboratory expenses, clerical and technical errors. The objectives of this study were to assess the practice and trends of blood transfusion services at our institute in elective orthopaedic surgeries, work out Surgical Blood Order Schedule at our institute by means of cross-match Transfusion ratio (C/T ratio), Transfusion Index (TI), Transfusion probability (%T) and Mead's criteria and to develop suggestions to improve the efficiency of blood utilization and reduce unnecessary cross-matching as well as wastage of blood bank resources.

## Materials and Methods

After approval from ethical committee of Govt. Medical College and Associated Group of Hospitals, Kota, and after written informed consent was taken from the patient and/ or attendant, this prospective study was conducted in the Department of Anaesthesiology at our institute. Data were included in the study along with cooperation of blood bank and department of orthopaedics. We have studied the use of blood in elective orthopaedic surgeries at our institute to know and develop guidelines for preoperative cross-match ordering schedule. These guidelines could provide knowledge of how much blood has been used for particular operative procedures in the past, and therefore, how much blood should be cross-matched preoperatively for uncomplicated cases that are schedule for similar elective surgery.

In this prospective study, the following things of all the patients were observed and were noted in Proforma<sup>[1]</sup> -

- Frequency of utilization of blood in different elective orthopaedic surgeries was noted.
- It was noted that blood transfusion done in intraoperative / or postoperative period.
- Number of units of blood / patient / operation used was noted.

By these observations, Cross- Match to Transfusion ratio (C/T ratio), Transfusion Probability(%T), and Transfusion Index(TI) for various surgical procedures were calculated.

1. C: T ratio = No of units cross-matched ÷ No of units transfused.
2. Transfusion probability (%T) = (No of patients Transfused ÷ No of patients cross-matched) ×100.
3. Transfusion Index (TI) = No of units transfused ÷ No of units cross-matched.

The cross match transfusion ratio (C/ T ratio) was used as an index of efficacy of blood ordering practice, and C/ T ratio of > 2.5 was an indication of excess cross match<sup>[9]</sup>. The transfusion index (TI), was defined as

average no. of unit transfused for a given procedure. A TI > 0.5 was an indication that preoperative cross matching of blood was necessary for that procedure<sup>[9]</sup>. Using Mead's criterion (average units of blood used for a procedure x 1.5) a transfusion tariff was worked to determine the number of units that need to be cross-matched for a procedure.<sup>[9]</sup> On calculating C/T ratio, Transfusion index (TI), Transfusion probability (%T) and mead's criteria surgical blood ordering schedule of department of orthopaedic of our institute was worked out.

## Results

A total of 159 patients were included in our study. These patients underwent 6 different elective procedures in orthopaedic operation theatre. There were 100 males (63%) and 59 females (37%). The mean age was 52 ± 24 (mean ± standard deviation). Out of the total 242 units cross-matched, only 78 units (32%) were transfused to 71 patients. Sixty eight percent of the total cross-matched units were not transfused. The number of patients and units, blood cross matched and transfused is tabulated in Table 1

**Table 1:** Blood cross-match and transfusion patterns for different elective orthopaedic surgeries

S. No.	Type of surgery	Cross matched		Transfused	
		Patients (n)	B. Units (n)	Patients (n)	B. Units (n)
1	H.A with Bipolar Prosthesis	33	62	15	16
2	ORIF with DHS	37	55	16	19
3	ORIF with CC screw	10	13	04	04
4	ORIF with PFLP	06	15	04	05
5	Total Hip Replacement	12	27	10	12
6	CRIF with IM Nail	61	70	22	22

The C/T ratio, transfusion probability as well as transfusion index were formulated for each of the elective procedures and is shown in Table 2.

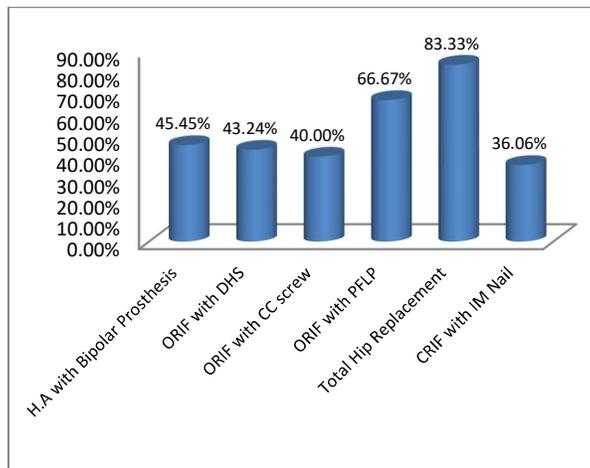
**Table 2:** Blood utilization for different elective orthopaedic procedures

S. No.	Type of surgery	Transfusion Parameters		
		C: T Ratio	% T	TI
1	H.A with Bipolar Prosthesis	3.87	45.45	0.25
2	ORIF with DHS	2.89	43.24	0.34
3	ORIF with CC screw	3.25	40.00	0.31
4	ORIF with PFLP	3.00	66.67	0.33
5	Total Hip Replacement	2.25	83.33	0.44
6	CRIF with IM Nail	3.18	36.06	0.31

Five out of six elective procedures had a C/T ratio higher than 2.5 and all of the procedure under study had a low transfusion index (TI<0.5)

**Table 3:** Shows Operative procedures and blood transfusion pattern in Orthopaedic OT (n=159)

S. No.	Type of Surgery	Total Number of Patients	Number of Patients given BT	Percentage of Patients given BT for operative Procedure
1	H.A with Bipolar Prosthesis	33	15	45.45%
2	ORIF with DHS	37	16	43.24%
3	ORIF with CC screw	10	04	40.00%
4	ORIF with PFLP	06	04	66.67%
5	Total Hip Replacement	12	10	83.33%
6	CRIF with IM Nail	61	22	36.06%
7	Grand Total	159	71	44.65%



Total number of patients operated in Orthopaedic OT under study was 159. Out of them 71 (44.45%) were given blood transfusion during intraoperative period and postoperatively within 24 hours. 45.45% of patients operated for HA with bipolar prosthesis were given blood transfusion, 43.24% of patients operated for ORIF with DHS were given blood transfusion, 40% of patients operated for ORIF with CC screw were given blood transfusion, 66.67% of patients operated for ORIF with PFLP were given blood transfusion, 83.33% of patients operated for THR were given blood transfusion and 36.06% of patients operated for IM nailing were given blood transfusion.

**Discussion**

Blood Transfusion has meritorious benefits for the patients. Simultaneously, it also carries transfusion associated hazards such as AIDS and hepatitis. This has led to a reappraisal of blood transfusion practice and also to the recognition that appropriate use of blood and blood products is important [1]. All patients who were operated and received blood transfusion during intraoperative and immediate postoperative period within 24 hours were included in this study. The Study conducted by B.A Friedman et al in 1976 used the entire hospital stay of the patients [3]. The Study conducted by Paul D Mintz in 1978 used only those blood transfusions which were given in the intraoperative period or within 24 hours postoperatively [10]. The Study conducted by Sharma DP in 1980 used blood transfusion in the operating room or within 24 hours postoperatively [11].

**Blood ordering schedule for surgical procedures**

Juma T et al in (1990)[9] stated cross match transfusion ratio (C/ T ratio) was used as an index of efficacy of blood ordering practice, and C/ T ratio of > 2.5 was an indication of excessive cross match. We have used following criteria for C/ T ratio. C/ T ratio > 2.5 was indication of excessive cross match. Transfusion Index

(TI) – was defined as the average number of units transfused for a given procedure. A TI> 0.5 was an indication that preoperative cross matching was necessary for that procedure[9]. In the Orthopaedic OT preoperative cross matching was not necessary for H.A with Bipolar prosthesis as TI was 0.25, ORIF with DHS as TI was 0.34, ORIF with CC screw as TI was 0.31, ORIF with PFLP as TI was 0.33, THR as TI was 0.44 and CRIF with IM nail as TI was 0.31.

**Mead’s Criteria**

Mead’s criterion (average units of blood used for a procedure × 1.5) and a transfusion tariff were worked out to determine the number of units that need to be cross-matched for a procedure. In our study in the orthopaedic OT, the number of units that need to be cross-matched for various procedures should be 0.375 for H.A with bipolar prosthesis, 0.51 for the ORIF with DHS, 0.465 for ORIF with CC screw, 0.495 for ORIF with PFLP, 0.66 for THR and 0.465 for IM nailing. On calculating the cross-match transfusion ratio (C/ T ratio), transfusion index (TI) and Mead’s criteria, the surgical blood ordering schedule of our institute can be worked out as:

S. No.	Operative Procedure	Action
1.	H.A with bipolar prosthesis	G & S
2.	ORIF with DHS	X-M 1
3.	ORIF with CC screw	X-M 0-1
4.	ORIF with PFLP	X-M 1
5.	THR	X-M 1
6.	IM Nailing	X-M 0-1

X-M = Cross-match G & S = ABO/ Rh group and antibody screen

**Conclusion**

A total of 159 patients with an age group of 20-80 years were evaluated. Two hundred forty two units of blood were cross matched and only seventy eight units

were transfused to seventy one patients. Sixty eight percent of the units cross matched were not transfused. Five out of the six elective procedures had a C/T ratio higher than 2.5 and all of the procedures under study had a low transfusion index (TI<0.5). In order to reduce unnecessary cross matching, blood ordering schedule catering to surgeon and patient requirements is the need of the hour. It is essential for every institutional blood bank to formulate a blood ordering schedule in conjunction with the clinicians for appropriate blood usage. Regular auditing and periodic feedbacks are also essential to improve the blood utilisation practices.

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