Original Article

A Study of Blood Requisition and Transfusion Practice in Surgery at Bir Hospital

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ABSTRACT

AIMS: Ordering of blood and its products is a common practice in medical field. Demanding large quantities of blood, of which little is ultimately used commits exhaustion of valuable supplies and resources both in technician time and reagents as well as adds to financial burden on the patients and costs valuable time in preparing for emergency surgery. This can be decreased by simple means of changing the blood cross matching and ordering schedule depending upon the type of surgery performed. The aim of this study was to improve the efficacy of ordering of blood for its maximum utilization for commonly performed procedures.

MATERIAL AND METHODS: We evaluated blood ordering and transfusion practices in emergency and elective general surgical procedures at our institute and calculated different indices such as cross-match to transfusion ratio (C/T ratio), transfusion probability (% T) and transfusion index (TI). Next Maximal Surgical Blood Ordering System (MSBOS) was estimated for each procedure.

RESULTS: The blood utilization was only 13.6% at our institute, consisting of 17.24% in the elective operations and 13.5% in the emergency operations. Significant blood utilization was nil in most of the routine elective cases suggesting crossmatching of blood to be a culture than necessity.

CONCLUSIONS: Blood ordering pattern needs to be revised and over ordering of blood should be minimized. This can be possible by the estimation of MSBOS for each procedure and requisition as calculated.

Key Words: Blood requisition, Blood Transfusion, Transfusion Indices

INTRODUCTION

The first historical attempt at blood transfusion was in 1492, when blood of three ten year old boys was transfused into Pope Innocent VIII. However, not only did the pope die, but so did the three children. Beginning with Harvey's experiments with circulation of the blood, more sophisticated research into blood transfusion began in the 17th century, with successful experiments in transfusion between animals. However, successive attempts on humans continued to have fatal results[1]. The first fully documented human blood transfusion was administered by Dr. Jean-Baptiste Denys on June 15, 1667. He transfused the blood of a sheep into a 15-year old boy, who survived the transfusion. In 1818, Dr. James Blundell, a British obstetrician, performed the first successful blood transfusion of human blood, for the treatment of postpartum hemorrhage[2]. After this attempt, many blood transfusions were done across the world and surgeries were also performed using direct blood transfusion. Many patients had died and it was not until 1901, when the Austrian Karl Landsteiner discovered human blood groups, that blood transfusions became safer[1].

The ready availability of blood and blood components has resulted in liberal use of blood transfusions. The increasing demand for blood and blood products together with rising costs and transfusion associated morbidity led to a number of studies in late 1970s reviewing blood ordering and transfusion practices. These studies showed gross over ordering of blood much in excess of actual or anticipated needs[3]. Many units of blood routinely ordered by surgeons are not utilized but are held in reserve and thus are unavailable

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for other needy patients. This can impose inventory problems for blood bank, loss of shelf life and wastage of blood[4]. On the other hand, with the increased awareness of immunodeficiency virus infection and other blood – borne infections, blood transfusion has become an issue of increasing concern to both the general public and health practitioners[5].

Developing a blood ordering schedule, which is a guide to expected normal blood usage for surgical procedures can decrease over ordering of blood thereby reducing unnecessary compatibility testing, returning of unused blood and wastage due to outdating. It also allows for a more efficient management of blood inventory [6]. A number of indices are used to determine the efficiency of blood ordering system. The use of crossmatch to transfusion ratio (C/T ratio) was first suggested by Boral Henry in 1975 [3]. Ideally, this ratio should be 1.0 but a ratio of 2.5 and below was suggested to be indicative of efficient blood usage. The probability of a transfusion for a given procedure is denoted by %T and was suggested by Mead et al in 1980 [8]. A value of 30% and above has been suggested as appropriate. The average number of units used per patient crossmatched is indicated by the transfusion index (TI) and signifies the appropriateness of numbers of units crossmatched. A value of 0.5 or more is indicative of efficient blood usage [3]. Maximal Surgical Blood Order Schedule (MSBOS) estimates the amount of blood that will be needed for the individual procedures.

We therefore conducted a study in our hospital to analyze the pattern of blood requests and utilization in the general surgery department. The aim of this study was to improve the efficacy of ordering of blood for maximum utilization for commonly performed procedures.

MATERIALS & METHODS

We conducted a prospective observational study in the patients undergoing operation in general surgical department of National Academy of Medical Sciences, Bir Hospital in between April 1, 2009 and May 31, 2009 for whom intraoperative and/or postoperative transfusion was anticipated and preoperative blood requisition was made.

The preoperative data included haemoglobin, packed cell volume, blood group and number of units cross-matched. The intraoperative data included duration of surgery, blood loss and blood units replaced. The patients were followed up until discharge and any additional blood transfusion were recorded.

These patients were grouped under separate procedures. Under each procedure the number of patients, units of blood cross-matched and number of units transfused were recorded and the following indices were calculated for each procedure.

a) Cross-match to Transfusion ratio(C/T ratio) = No. of units cross-matched / No. of units transfused

A ratio of < 2.5 is considered indicative of significant blood usage.

b) Transfusion Probability (%T) = No. of patients transfused x 100/No. of patients cross-matched

A value of > 30 was considered indicative of significant blood usage.

c) Transfusion Index (TI) = No. of units transfused/ No. of patients cross-matched

A value of > 0.5 was considered indicative of significant blood utilization.

d) Maximal Surgical Blood Order Schedule (MSBOS) = MSBOS = 1.5 x TI

RESULTS

During the two months of study period, blood requisition were made to 79 patients undergoing surgery in the general surgical department, out of which 42 were emergency and 37 were elective operations. 198 units of blood were made available, out of which 27 (13.6%) units of blood were transfused to 18 (22.8%) of the patients.

Of the 42 patients who underwent emergency surgery, 116 units of blood were crossmatched, out of which only 13 (30.95%) patients received 20 units (17.24%) transfusion. Eighteen units of blood were transfused intraoperatively and only 2 units were transfused postoperatively. A summary of the procedures for which crossmatching was done and the outcome is presented in Table 1. On calculation of the transfusion indices, only splenectomy showed significant blood utilization in all the three indices while transfusion index was significant in penetrating trauma of the bowel and lower limb amputation also (Table 2). Transfusion index was nil in creation of ileostomy, Hartmann's procedure and derotation of volvulus.

Table 1. Comparison of blood crossmatched and transfused in Emergency Surgery

Final Diagnosis (Operation)	Crossmatched		Transfused			
	Patients	Units	Patients	Intraop	Postop	Total
Appendicular Perforation (Explo lap and appendectomy)	3	6	1	1	0	1
Duodenal Ulcer Perforation (Graham's Omentopexy)	8	16	1	2	0	2
Enteric perforation (Primary repair)	4	14	2	2	0	2
Enteric Perforation (Ileostomy)	2	8	0	0	0	0
Penetrating trauma bowel (Primary Repair)	4	12	2	2	1	3
Intestinal Obstruction (Volvulus Derotation)	4	12	0	0	0	0
Intestinal Obstruction (Band excision / Adhesiolysis)	4	8	1	2	0	2
Intestinal Obstruction (External hernia repair)	6	12	1	1	0	1
Large Bowel Mass (Hartmann's procedure)	1	4	0	0	0	0
Splenic Rupture (Splenectomy)	1	4	1	2	0	2
Lower Limb Amputation	5	20	4	6	1	7

Table 2. Transfusion indices in Emergency Group

Final Diagnosis (Operation)	CT	%T	TI	MSBOS
Appendicular Perforation (Explo lap and appendectomy)	6	33.33	0.33	0.495
Duodenal Ulcer Perforation (Graham's Omentopexy)	8	12.5	0.25	0.375
Enteric perforation (Primary repair)	7	50	0.5	0.75
Enteric Perforation (Ileostomy)	∞	0	0	0
Penetrating trauma bowel (Primary Repair)	4	50	0.75	1.125
Intestinal Obstruction (Volvulus Derotation)	∞	0	0	0
Intestinal Obstruction (Band excision / Adhesiolysis)	4	25	0.5	0.75
Intestinal Obstruction (External hernia repair)	12	16.67	0.17	0.255
Large Bowel Mass (Hartmann's procedure)	∞	0	0	0
Splenic Rupture (Splenectomy)	2	100	2	3
Lower Limb Amputation	2.86	80	1.4	2.1

Similarly in the elective category, 37 patients were crossmatched 82 units of blood, out of which only 5 (13.5%) patients received 7 (8.5%) units of blood. 6 units were transfused intraoperatively while only 1 unit was transfused during the postoperative period. A summary of the procedures for which crossmatching was done and the outcome is presented in Table 3.

On calculation of the transfusion indices, abdominal rectopexy for prolapse of rectum and gastrojejunostomy for pyloric stenosis showed significant blood utilization while transfusion index was significant in amputation for Buerger's disease also (Table 4). Transfusion index was nil in most of the routine surgeries performed in elective basis.

Table 3. Comparison of blood crossmatched and transfused in Elective Surgery

Final Diagnosis (Operation)	Crossmatched		Transfused			
	Patients	Units	Patients	Intraop	Postop	Total
Cholelithiasis (Open Cholecystectomy)	8	16	0	0	0	0
Goitre (Thyroidectomy)	2	6	0	0	0	0
Parotid adenoma (Parotidectomy)	2	5	0	0	0	0
Ca Breast (Modified Radical Mastectomy)	4	8	1	1	0	1
Breast Lump (Lumpectomy)	2	4	0	0	0	0
Pyloric stenosis (Gastrojejunostomy)	1	4	1	2	0	2
Ileostomy in situ (Reversal)	2	5	0	0	0	0
Ca caecum (Rt. Hemicolectomy)	1	4	0	0	0	0
Rectal Prolapse (Abdominal Rectopexy)	1	4	1	1	1	2
Hemorrhoids (Hemorrhoidectomy)	2	4	0	0	0	0
Non functioning kidney (Nephrectomy)	2	2	0	0	0	0
Nephrolithiasis (Pyelolithotomy)	4	8	1	1	0	1
Ureterlithiasis (Ureterolithotomy)	4	8	0	0	0	0
Buerger's Disease (Amputation)	2	4	1	1	0	1

Table 4. Transfusion indices in Elective Group

Final Diagnosis (Operation)	CT	%T	TI	MSBOS
Cholelithiasis (Open Cholecystectomy)	∞	0	0	0
Goitre (Thyroidectomy)	∞	0	0	0
Parotid adenoma (Parotidectomy)	∞	0	0	0
Ca Breast (Modified Radical Mastectomy)	8	25	0.25	0.375
Breast Lump (Lumpectomy)	∞	0	0	0
Pyloric stenosis (Gastrojejunostomy)	2	100	2	3
Ileostomy in situ (Reversal)	∞	0	0	0
Ca caecum (Rt. Hemicolectomy)	∞	0	0	0
Rectal Prolapse (Abdominal Rectopexy)	2	100	2	3
Hemorrhoids (Hemorrhoidectomy)	∞	0	0	0
Non functioning kidney (Nephrectomy)	∞	0	0	0
Nephrolithiasis (Pyelolithotomy)	8	25	0.25	0.375
Ureterlithiasis (Ureterolithotomy)	∞	0	0	0
Buerger's Disease (Amputation)	4	50	0.5	0.75

DISCUSSION

Blood transfusion no doubt plays a major role in the resuscitation and management of surgical patients, but surgeons most of the time overestimate the anticipated blood loss thereby over ordering blood[6]. Recently there has been a growing demand for blood and blood products. This demand has often exceeded the resources of local blood banks and thereby disrupted both the planning and nature of surgical lists. Demanding large quantities of blood, of which little is ultimately used causes exhaustion of valuable supplies and resources both in technician time and biochemical reagents[4]. It also adds to financial burden on the patients and costs valuable time while preparing for emergency surgeries.

Preoperative over ordering of blood has been documented since 1976, when Friedman et al[3] published their findings. Subsequently, a number of studies have also showed over ordering of blood by surgeons in most of the countries. The percentage of cross-matched patients receiving transfusion for general surgical procedures ranged from 5-40%[4] as compared to 13.6% of utilization in our hospital.

In our study significant blood utilization using all three indices was obtained in splenectomy, gastrojejunostomy and abdominal rectopexy. Similar studies conducted elsewhere have shown similar findings[4,6]. The study has also shown that in most of the elective surgical patients, none of the blood that was crossmatched was utilized, therefore indicating that the routine crossmatching of blood in elective surgery is a culture rather than a necessity.

In a study done by Vibhute et al[4], 500 patients were taken consecutively for a similar study. In their study, only 23.14 % of blood was utilized. Next, MSBOS was estimated for each procedure and for the next 150 consecutive patients, blood requisition was done according to MSBOS. This produced almost two-third reduction of the blood issued from the blood bank and the percentage of blood utilized also increased from 23.14 to 74.74%.

CONCLUSION

Blood ordering pattern needs to be revised and over ordering of blood should be minimized. This can be possible by the estimation of MSBOS for each procedure and requisition as calculated. In the surgeries which have insignificant blood loss, only blood grouping of the patient should be done and cross matching can be avoided which can not only be rational and cost effective, but also hasten the time lost in waiting for surgery. However, one must confirm the availability of blood for emergency situation before starting the surgery.

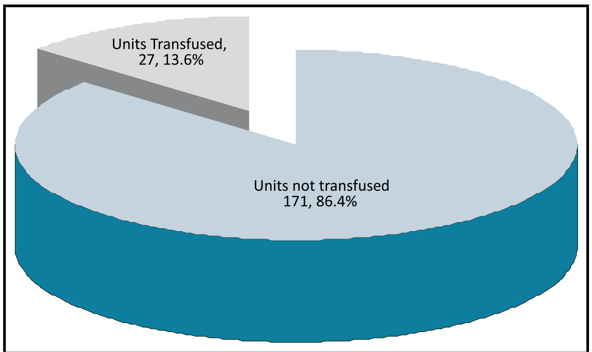

Figure 1. Comparison of total units of blood ordered and transfused

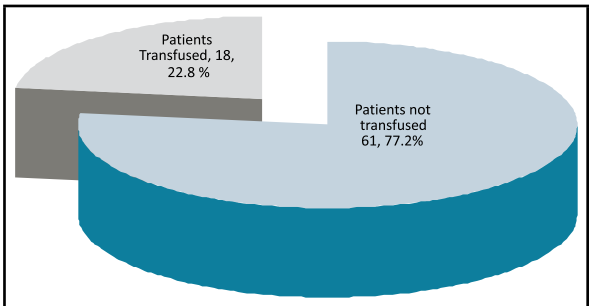

Figure 2. Comparison of total patients crossmatched and transfused

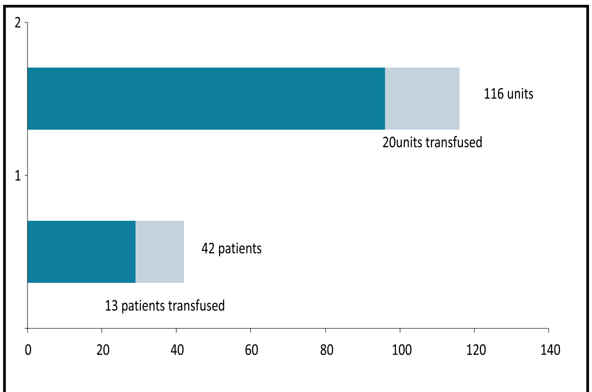

Figure 3. Transfusion comparison in emergency cases

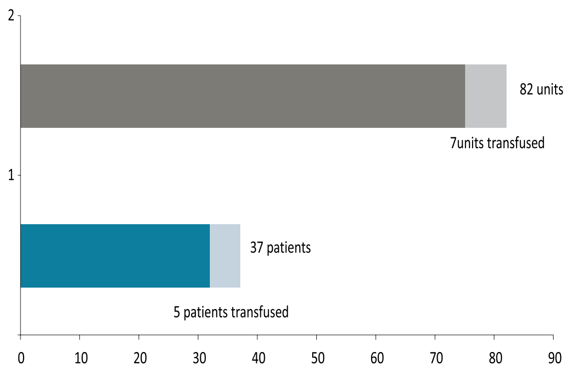

Figure 4. Transfusion comparison in elective cases

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