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Evaluation of Cross Match to Transfusion Ratio in Pre-Operative Blood Ordering for Elective Surgery

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Abstract

Objective: The preoperative cross match to transfusion ratio for common elective general surgical procedures were evaluated in our university hospital to assess the efficacy of ordering of blood and also to compare it with the Maximum Surgical Blood Order Schedule (MSBOS).

Materials and Methods: Data was collected retrospectively during a 6-month period in Ain Shams University Hospital. Patients were identified through the transfusion services electronic database and our operating theatre database. Data collected included type of surgery, number of units cross-matched and number of units transfused. This data was used to calculate the C:T ratio and transfusion index. Also we compared the ordering of the blood with the MSBOS to assess the compliance to the international guidelines.

Results: A total of 85 patients who underwent elective procedures in general surgery department of Ain Shams University, were included in the study. Out of the 186 units of blood cross-matched, only 72 (38.7%) were transfused. 61.3% of the total cross-matched units were not transfused. The overall C:T ratio was therefore 3.5:1, with the average transfusion index was 0.5.

Conclusion: We concluded that the cross match transfusion index was relatively high in the surgical department of Ain Shams University Hospital which clarifies high percentage of blood wastage. The implementation of the MSBOS with the Type and Screen policy may aid in reducing the wastage.

Keywords: Cross-match/Transfusion ratio; Transfusion; Surgery; MSBOS

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Introduction

Ordering of blood is a common practice in elective surgical procedures. The preoperative request for blood units is often based on worst case assumptions, with potential for exhaustion of the blood bank resources. The time and effort consumed in cross-matching for each patient undergoing a surgical procedure is substantial, most of which is actually not utilized for transfusion. Also, the need for blood in hospitals continues to exceed the volume collected by the transfusion services [1].

American College of Critical Care Medicine has emphasized the need to reduce both unnecessary pre-operative blood testing and ordering of Red Blood Cell (RBC) units. Implementing a Hospital Based Patient Management (PBM) program can help identify ways of achieving these goals [2].

Gross over ordering is evidently seen in a distinctly high blood cross-matched to transfused ratio. The ratio of the number of units' cross-matched red cells for a given surgical procedure to the number of units actually transfused should not exceed 2:1 [3].

Any blood bag, which is extracted from the blood bank inventory for cross-matching, becomes unavailable for other patients. Once cross-matched the blood bag is held in reserve, ensuing inventory problems for blood banks, loss of shelf life and wastage of blood unit [4].

On the other hand the Maximum Surgical Blood Ordering Schedule (MSBOS) was created to ensure the completion of necessary pre-transfusion testing prior to a surgical procedure in order to prevent delays. It was also intended to eliminate unnecessary preoperative testing, hence effecting a cost savings, and to reduce the number of RBC units that are cross-matched for specific patients thereby improving the efficiency of managing the blood bank's inventory. Prior to the development of the MSBOS, the preoperative ordering of blood products was based on the surgeon's estimation of the patient's need for intraoperative transfusion. First described in 1976, the MSBOS was created in order to provide guidelines and recommendations for preoperative pre-transfusion testing and RBC

Table 1: Transfusion data as per surgery type.

Operation	Cross matched units	Transfused units	C/T ratio	Transfusion index
Anterior resection	6	1	6	0.25
Abdomino-perineal resection	6	3	2	0.5
Closure colostomy	6	2	3	0.3
Hemicolectomy	13	1	13	0.2
Liver resection/ Hepatofocal lesion	13	6	2.2	0.6
Reversal Hartman	2	1	2	0.5
Sigmoid colectomy	12	7	1.7	0.6
Whipple's operation	13	4	3.3	0.25
Abdominal Exploration	23	2	11.5	0.2
Amputaion	2	1	2	0.5
CBD exploration	10	2	5	0.4
Esophygectomy	8	5	1.6	0.75
Radical gastrectomy	10	8	1.3	1
Retro peritoneal sarcoma	4	3	1.3	0.75
Splenectomy	4	2	2	0.5
Redo sleeve gastrectomy	3	1	3	0.5
Block neck desection	12	4	3	0.4
aortic aneurysm	12	7	1.7	0.6
Total colectomy	2	4	0.5	2
Rectal prolapse	4	1	4	0.25
Redo gastric bypass	3	1	3	0.3
Cholecystectomy	9	4	2.3	0.2
Pseudo-pancreatic cyst	5	1	5	0.3
Gastric outlet obstruction	4	1	4	0.25

ordering [5]. MSBOS is a list of common elective surgical procedures performed, along with the maximum number of blood units being cross-matched preoperatively for each procedure.

There are 2 basic tests performed to type blood, namely the Type and screening (T and S) and the cross-match tests. The T and S test is a method to identify the blood by the ABO group system. The serum is screened for the presence of alloantibodies by antibody screening test. It is easier and faster to perform than a cross-match test and does not remove blood from the common pool. Cross-matched means to type a sample and a unit of red cells to look for cross-reactivity. Blood is ready to use, but it is removed from the common pool [6].

In the MSBOS, the number of blood bags per each type of surgery is defined also whether to perform the T and S or the cross match.

The aim of this study was to measure the cross match/transfusion ration and to audit compliance with national guidelines.

Material and Methods

Data was collected retrospectively during a 6-month period in Ain Shams University Hospital. Patients were identified through the transfusion services electronic database and our operating theatre database. Consecutive elective general surgical procedures were included. Data collected included type of surgery, number of units cross-matched and number of units transfused. This data was used to calculate the C:T ratio, which was defined as the number of cross-matched units used (perioperative)/number of cross-matched units requested [4].

Cross matched/transfused ratio (c/T ratio) = No. of units Cross-matched/No. of units transfused.

Transfusion Index (TI) signifies the appropriateness of numbers of unit's cross-matched. A value of 0.5 or more is indicative of efficient blood usage [3,5].

Transfusion index (TT) = No. of units transfused/No. of units cross matched.

Also, the MSBOS was included to compare the actual cross matched units with the international guidelines.

Results

A total of 85 patients who underwent elective procedures in general surgery department of Ain Shams University, were included in the study. Out of the 186 units of blood cross-matched, only 72 (38.7%) were transfused. 61.3% of the total cross-matched units were not transfused. The overall C:T ratio was therefore 3.5:1, with the average transfusion index was 0.5. The abdominal exploration and the cholecystectomy showed the higher C:T ratio reaching to 6:1.

Although it is recommended in the MSBOS to use the type and screen in specific surgeries such as cholecystectomy, closure colostomy, reversal hartman, amputation, rectal prolapse and redo of gastric sleeve, the type and screen method was not requested for any patient, which indicates that this method is not applied in the

Table 2: Comparing the average cross matched units/patient and the MSBOS.

Operation	Average of the cross matched blood/patient	MSBOS
Anterior resection	1.5	2
Abdomino-perineal resection	3	2
Closure colostomy	3	T&S
Hemicolectomy	1.9	2
Liver resection/ Hepatofocal lesion	1.9	4
Reversal Hartman	1	T&S
Sigmoid colectomy	6	2
Whipple's operation	4.3	6
Abdominal Exploration	1.6	2
Amputaion	2	T&S
CBD exploration	2.5	2
Esophygectomy	2.7	4
Radical gastrectomy	2.5	4
Retro peritoneal sarcoma	2	4
Splenectomy	4	2
Redo sleeve gastrectomy	1	T&S
Block neck desection	2	2
aortic aneurysm	6	6
Total colectomy	2	4
Rectal prolapse	2	T&S
Redo gastric bypass	1.5	T&S
Cholecystectomy	1.8	T&S
Pseudo-pancreatic cyst	1.3	2
Gastric outlet obstruction	2	2

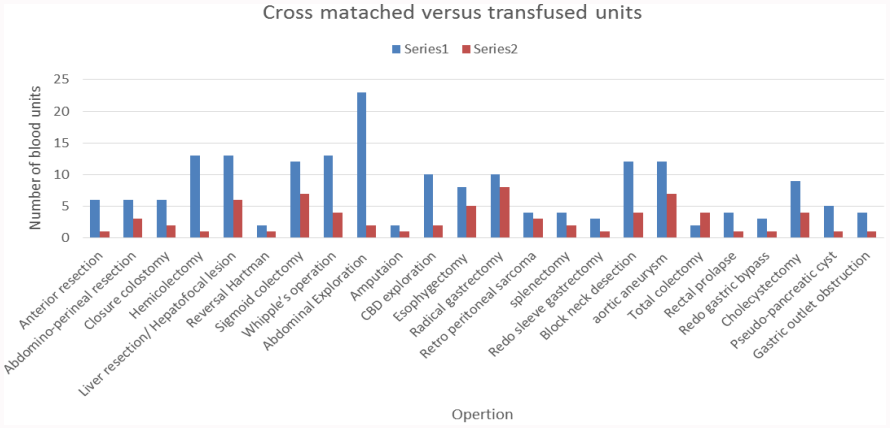

Figure 1: Column chart comparing cross matched units with the transfused units.

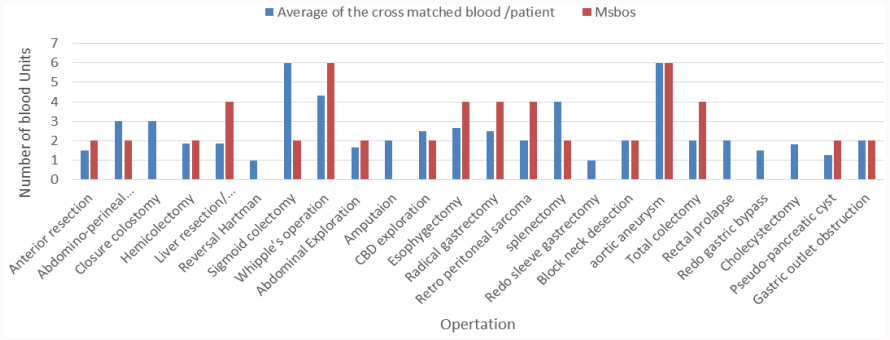

Figure 2: Column chart comparing the average of cross matched units/patient with the MSBOS.

pre-operative blood requesting protocol. The number of patients and blood units cross matched and transfused is tabulated below (Table 1 and 2) (Figure 1 and 2).

Discussion

Over-ordering of blood is a common practice in surgeries. Elective surgery is a major part of this demand for blood as the preoperative blood order goes beyond the real need. Unless international guidelines were followed, the preoperative assessment of blood requirements is often an over assumption which results in important problems as regarding the wastage of blood supplies, unnecessary laboratory work and extra-costs [7].

Our results showed that the overall C:T ratio was 3.5:1 (compared to 2:1 in the international guidelines) which suggests that there is grossly over-ordering of blood. Although that upon comparing our ordering of blood with the MSBOS we found that in most surgeries we ordered less than the recommended schedule, but the C/T ratio was more than the expected due to neglecting the usage of the type and screen method which saves a lot of time and money and also does not remove the blood from the storage pool. Thomas et al. [1] stated that the C/T were 2.1:1, while with Subramanian et al. [4] the ratio was 2.5:1 in elective surgery. Although MSBOS has succeeded in propelling the efficiency of blood ordering system, it is ineffectual in accounting for individual differences in transfusion requirements between different patients undergoing the same surgical procedure. Also, MSBOS is not capable of identifying over transfusion, nor does it impact on institutional variation in transfusion practices [8]. Surgical Blood Ordering Schedule (SBOS) is a comprehensive MSBOS, which includes patient and surgery specific variables such as preoperative and postoperative hemoglobin levels of the patient and amount of surgical blood loss during each surgical procedure. It also enables the identification of procedures that can be accommodated by the group and save policy, reducing superfluous compatibility testing and wastage due to outdating. Such an SBOS allows the surgical teams, to develop unique local transfusion system, and to set its own minimum transfusion levels for fit and unfit patients. Also, another formulation of MSBOS was done using Mead's criterion [9,10]. According to this criterion, the number of RBCs calculated was one and half times the transfusion index for each surgical procedure. Mead's criterion was used by Vibhute et al. [10] to establish a MSBOS for elective surgical procedures.

Mead's criteria: MSBOS = 1.5× transfusion index. They evaluated the blood ordering and transfusion practices in 500 elective general surgical procedures. The wastage of blood was minimal after the usage of the Mead's criteria.

Conclusion

We concluded that there was a wastage in ordering of blood in the pre-operative elective surgery reflected by the high C:T ratio (3.5:1) compared to international guidelines (2:1). The main contributing factor to this wastage is the non-implementation of the Type and screen method which is a main corner stone in the MSBOS.

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