Maximum Surgical Blood Ordering Schedule Saves money and Resources

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MAXIMUM SURGICAL BLOOD ORDERING SCHEDULE SAVES MONEY AND RESOURCES

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ABSTRACT

Objective: By documenting the ordering of blood and examining its utilization at King Abdulaziz University Hospital in Jeddah, Saudi Arabia, this study aimed to determining the cost and blood usage over a one-year period and showing the need for implementing a maximum surgical blood ordering schedule.

Method: This is a prospective study involving the collection of data from all cross-match and transfusion requests for elective surgery from October 1998 to October 1999. Blood transfusion data for individual patients were collected and grouped according to the surgical department divisions and obstetric and gynecology department. The total number of cross-matched and transfused units were recorded and the ratio (number of units cross -matched / transfused) was determined. The number of unnecessary cross-matched units and their cost including the technicians' time were calculated.

King Abdulaziz University granted this research.

Results: There were 7450 units cross-matched at King Abdulaziz University Hospital from October 1998 - October 1999. The cross-matched units for elective surgery and obstetric and gynecology were 3049 and the transfused units were 318. The ratio of cross-matched / transfused blood units was calculated and it showed a very high and unacceptable value for each surgical procedure. The highest ratio was observed in plastic surgery (12.9:1), followed by general surgery (9:1) and obstetric and gynecology; almost the same, (8.9:1) was recorded. The cost of cross matching one unit was estimated to be 40 SR (Saudi Riyals) (1 US $=3.75 SR). The number of unused cross-matched blood units was 2731 with the unnecessary cost of approximately 2731 x 40 = 109240 SR.

Conclusion: Although not currently practiced, it is highly desirable for this hospital to implement MSBOS. The expected annual saving will be enormous and this money can be reallocated somewhere else for better efficiency at blood bank operations.

Key words: Transfusion, Blood ordering, Cost, Maximum surgical blood ordering schedule (MSBOS)

INTRODUCTION

Blood transfusion, a major development in medicine, is a life-saving measure in the management of a variety of medical and surgical conditions. Since the first successful human-to-human blood transfusion in 1918 [1], the use of blood expanded to the point that the demand for blood transfusions exceeded the available resources.

About two thirds of all red blood cell transfusions are given in the peri-operative period [2] and most of the improper use of blood occurs also in that period [3].

There is a trend to over-order and over-utilize whole blood (WB), fresh frozen plasma (FFP) and packed red cells (PC) which not only depletes available resources but is also associated with complications for the recipients.

The need for blood should be determined by both clinical evaluation and laboratory investigations.

Dodsworth and Dudley [5] reported that only 30% of the blood cross-matched for routine surgery was used and many operations were canceled due to unavailability of blood. The international standard for blood utilization is usually 30% or more [5]. Unavailability of blood was the third most common cause of surgical operative cancellations in Saudi Arabia [6].

The purpose of this study was to determine the efficiency of blood utilization with particular reference to common operations for which blood is routinely ordered and not utilized and to estimate its cost. We intended to find out areas of maximum utilization of blood and its products, cross-match to transfusion ratio and prevalence of discarded blood. We also intended to use this information as a basis for revising our policies of blood ordering for surgical procedures.

METHODS

Data of blood ordered for various surgical procedures

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over a one-year period were collected. Data for each operative procedure were collected and these included the number of patients for whom blood was requested that is, number of units cross-matched and number of units utilized. Patient data were grouped according to the departments and divisions that consumed most banked blood.

Standard blood banking terms were used. C:T ratio refers to units cross-matched (C) divided by units transfused (T). Transfusion index (T_i) is the average number of units transfused for a given procedure. Whereas C:T ratio is an index of blood ordering efficiency, the T_i is a measure of blood requirements for a given procedure. A C:T ratio of 3:1 has been recommended as the target, although the ideal ratio is 1:1. The ideal Ti would be 0.5.

Providing transfusion guidelines and monitoring cross match-to-transfusion (C:T) ratios can be helpful. A C:T ratio greater than 3 usually indicates excessive cross-match requests. Analysis was made of common surgical procedures with their respect to their C:T ratio. Costs included in the production stage for allogeneic transfusion were quality control, component processing, testing for transmissible diseases (HIV-1, HIV-2 hepatitis C virus, Treponema pallidum and hepatitis B surface antigen), blood banking and serologic testing of RBC cross-matching and technicians' time. Costs were allocated on the basis of the time spent by the laboratory staff to prepare RBC units and the volume of units subscript prepared. Blood collected into $CPDA_1$ may be stored for 35 days. Red cells suspended in optimal additive solutions have an extended shelf-life up to 42 days. Usage of blood additives that increase red cell shelf-life to 42 days adds flexibility to donor drive scheduling and helps decrease the outdate rate as a result of repeated unnecessary cross-matching,

RESULTS

A total of 7950 units were cross-matched during October 1998 - October 1999 from all departments at King Abdulaziz University Hospital (KAUH). Of this total, 3049 were for elective surgery & OB/Gyn, and 318 units were transfused. The number of cross-matched units in different departments are shown in Table I. The general surgical department ranked the highest followed by obstetrics and orthopedics; 1570, 886 and 399, respectively. Table I shows the C/T ratios and the % utilization, which ranged from 8.9:1 (11%) in OB/Gyn to 14:1 (7%) in Urology. The most common surgical procedures ranked according to requested blood units are shown in Table II. In general surgery, laparoscopic cholecystectomy was the procedure for which blood was requested but had a very low transfusion index. Similarly in orthopedics, total knee replacement had a high rate of cross-matched but low transfusion index. The most common cause of discarded blood was expired shelf life as shown in Table III. The estimated cost of each cross- matching was approximately SR 40.

DISCUSSION

Elective surgery is the major route for wasting hospital blood resources. Surgeons' blood ordering habits are such that supplies, reagents, and technicians' time are committed and can be wasted. It has been shown from the United Kingdom [7], the United States of America [8], Australia [9], Kuwait [10], and Saudi Arabia [11-12] that if surgeons' habits of blood ordering are rationed, savings would occur without patients being harmed. The Maximum Surgical Blood Order Schedule (MSBOS) is a table of elective surgical procedures, which lists the number of units of blood routinely cross-matched pre-operatively. The MSBOS [13] is the maximum number of blood units, which are transfused in 90% of cases during surgical procedures and within 72 hours post-operatively.

A 'type and screen' (T&S) order is recommended in MSBOS for procedures with a low transfusion index that require less than 0.5 units of blood per patient. Surgeons or anesthesiologists may individualize specific requests and over-ride the system to accommodate special needs. There is adequate evidence that pre-operative antibody screening (type and screen) combined with selective ordering with an abbreviated cross-match is serologically, as well as clinically safe and effective compatibility testing is cost-effective. The transfusion service must pay special attention to patients with a positive antibody screen. The antibody should be identified and, if it is clinically significant, an appropriate number of antigen-negative units should be provided. Boral [14] and his group have presented convincing data indicating that even on the rare occasion where blood is needed for an emergency procrdure without cross-matching, the chance of missing a significant antibody is less than one in a thousand. Although 'type and screen' (T&S) is a safe procedure it may fail to detect an unexpected antibody, which might be clinically significant and can cause a hemolytic transfusion reaction. Of 13,950 patients transfused after negative antibody screen, Oberman [15] *et al* found only eight antibodies, a risk of 1/1744 per patient. Mintz [16] *et al* identified 21 antibodies in 87,033 samples tested with a probable risk of 1/4144 per patient. Taswell [17] *et al* found 22 antibodies in 88,000 patients studied, a risk of 1/4000 per patient. In our experience in about 16,000 prospective patient recipients, only one antibody (Anti wra) has been found by the cross-matching procedure and was not detected by antibody screen.

In this study, the expiry rate of blood units was 10% compared to 36% in Hussain's study [18]. This acceptable rate was mainly due to the increase in demand for blood from the pediatric and medical departments. Ordering and cross matching blood for transfusion and not using it later exerts a heavy load on the blood bank in terms of excessive expenditure involving reagents and excessive working hours. Unnecessary cross matching of blood also makes it unavailable to patients who need transfusion urgently. Hence in this hospital according to

the policy, if the reserved blood is not utilized within 48 hours the request will be automatically canceled. However, such repeated cross-matching leads to unnecessary discarding of blood. General surgery and obstetrics ranked the highest among departments requesting blood but with very low transfusion index. The most common operation in general surgery with amazing high C/T ratio (72:1) was laparoscopic cholecystectomy.

If 'type and screen' is implemented, then the following advantages are predicted: (i) Saving the time and workload of blood bank personnel by nearly 30 %, (ii) Reducing the total number of outdated blood units, (iii) Saving reagents by about 39% and total budget saving of 40%, (iv) Reducing unnecessary wastage of blood bank inventory. The success of any blood transfusion policy will depend heavily on clinicians' cooperation. The policy can list operations for which blood shall or shall not be routinely cross-matched. 'Type and screen' will be quite safe for many surgical procedures like laparoscopic cholecystectomy, hernia repair, total knee replacement, open reduction with internal fixation and in many other procedures in urology, plastic surgery and obstetrics. A consensus can be reached in a hospital-wide blood utilization committee and its implementation can be monitored by the blood bank. There is a lot of wasted blood due to expiry date, to repeated cross- matching and not utilizing the blood which will waste blood beside reagents and technicians' time. Al-Momen [11] *et al* estimated that an annual saving of 312,000 Saudi Riyals (approximately US $83,000) would occur in one hospital only if its blood transfusion services were appropriately used. The mean overall cost of one transfusion performed on an inpatient basis was $210 per unit of red blood cells for an allogeneic transfusion. The mean cost of an allogenic transfusion performed on an outpatient basis was $280 per unit of red blood cells [19]. Several studies have assessed the cost of allogeneic RBC and autologous whole-blood transfusion. Forbes [20] and associates calculated the mean hospital cost of allogeneic RBC used in transfusions to be $155 (US) per unit in 1988, and Lubarsky [21] and collaborators determined the mean to be $151 (US) per unit in 1991. These studies considered hospital costs only, whereas Sheingold [22] and colleagues, with the use of a costing system developed for Chedoke-McMaster hospital, Hamilton, Ont., calculated the mean cost of all aspects of allogeneic RBC transfusion in Chedoke-McMaster Hospitals and CRCS centers to be $210 per unit.

Etchason [23] and co-workers estimated the cost of collection and production of allogeneic RBC to be $150 (US) per unit in 1992 and of autologous blood to be $198 (US) per unit.

We conclude that our blood bank facilities are not efficiently utilized. The reasons and benefits of remedial actions are discussed. An institution's guidelines must reflect local patterns of surgical practice and patient population. Establishing appropriate transfusion guidelines and a maximum surgical blood order schedule (MSBOS) can improve blood ordering practices and give hospitals better control of inventory levels and outdating blood units. Good communication reduces misunderstandings and increases both surgeons' and hematologists' satisfaction. Ordering guidelines should be periodically reviewed to keep up with changing methods and practices.

Table I. Cross matched / transfused ratio for blood units in different departments, KAUH

Department	UX	UT	C/T	% UT
General surgery	1570	171	9:1	11
Obs & Gyn	886	100	8.9:1	11
Orthopedics	399	33	12:1	8
Plastic surgery	51	4	12.8:1	8
Urology	143	10	14:1	7
Total	3,049	318	9.6:1	10

UX: Units Cross-matched, UT: Units Transfused, C/T: Cross-matched / Transfused Ratio.

Table II. Commonest surgical procedures, KAUH

Department	Procedure	UX	UT	C:T	% UT
Urology	Bladder surgery	22	0		
	Lithotripsy	15	0		
	Nephrectomy	12	0		
	TURP	11	0		
Pediatric Surgery	Porta cath	28	3	9.3:1	0.11
	Ambiguous genitalia repair	8	0		
	V P shunt	8	0		
	Hypospadias repair	6	0		
Plastic Surgery	Abdominal reduction	9	0		
	Soft palate repair	8	2	4:1	0.25
	Skin graft	6	2	3:1	0.33
	Breast reduction	6	0		
Orthopedics	Total knee replacement	63	7	9:1	0.11
	Open reduction + internal fixation	54	4	13.5:1	0.07
	Osteotomy	38	2	19:1	0.05
	Knee amputation	28	4	7:1	0.14
General Surgery	Laparoscopic cholecystectomy	432	6	72:1	0.01
	Hernia repair	148	6	24.7:1	0.04
	Thyroidectomy	119	10	11.9:1	0.08
	Breast surgery	67	6	11.2:1	0.09

UX: Units Cross matched, UT: Units Transfuse, C/T: Cross-matched / Transfused Ratio.

Table III. Discarded blood, KAUH Oct 98 – Oct 99

Reason	No. of Blood Units
Expired shelf-life	308
HbsAg positive	90
Anti-HCV positive	73
VDRL positive	5
HIV positive	1
Total	477

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