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Patterns of Blood Products Utilization at a Tertiary Care Center in the Southern Region of Saudi Arabia

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Abstract:

OBJECTIVES: The present study was designed to assess the pattern of blood products utilization during a 3-month period in a tertiary care center in Southern Saudi Arabia to determine the pattern of blood products use, assess any wastage and if so, to suggest improvement.

MATERIALS AND METHODS: A total of 457 blood transfusion requests for 244 patients were received over a 3-month period. Registered demographic characteristics (age, sex, and nationality), ward, type of blood, and hemoglobin concentration before transfusion for all the patients were collected.

RESULTS: A total of 1328 blood products were requested, while 780 (59%) units were transfused. The cross-matched packed red cells/transfusion ratio was 1.8, while request/transfusion was 1.7 for the fresh frozen plasma and 1.23 for platelets. Packed red blood cells were the main blood product used in blood transfusion (BT). General surgery/orthopedics and intensive care unit were reported with a greater number of requests. The main indications noted for blood requisition were surgery and anemia.

CONCLUSIONS: Current guidelines appear to be respected within services regarding BT decision criteria. However, about half of the requested blood is not transfused which suggest further improvement. Adherence to established guidelines seems variables among different departments. Elective transfusion medicine rotations for all trainees and specialized dedicated sessions for doctors may help in further betterment of utilization of blood bank services.

Keywords:

Blood transfusion, crossmatched, surgery, transfusion ratio, wastage

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Introduction

Blood transfusion (BT) is indicated to restore hemodynamic balance, assure appropriate tissue oxygenation, and avoid further complications such as any adverse cardiac events and postoperative anemia.^[1]

In Saudi Arabia, blood products are invaluable resources that come from healthy unpaid volunteers, so the health-care professionals must consider cost/benefit balance when they come to decide whether

to perform this procedure. BT is one of the most common medical procedures during hospitalization with high cost associated that burden the health-care system.^[2]

Nonetheless, there are potential complications related to BT such as allergic, infectious, and immunomodulating adverse events that can even lead to death. Moreover, BT is often an overused therapeutic resource. Hence, the process of BT should ensure patient care both in treating the potential life-threatening blood loss and reducing the hazards directly associated to BT.^[3]

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The medical societies are directing their efforts to reduce risks and associated costs related to BT. Different medical societies have also promoted actions to avoid unnecessary BT. For the indication of anemia, most recent transfusion guidelines by the American Association of Blood Banks recommends that packed red blood cell (PRBC) transfusions in most hospitalized patients should be performed when hemoglobin (Hb) concentration is below 7 g/dl if the patient is stable and below 8 g/dl if cardiac disease is present or the patient is undergoing cardiac or orthopedic surgery.^[4]

Furthermore, after red blood cell single-unit transfusion, the society recommends to reevaluate the patient if not actively bleeding and stable. These guidelines have been based on evidence from clinical trials performed to develop BT programs and improve quality care, and the research studies have proven the same or even better outcomes as compared to other strategies that indicate BT when the patient's Hb is below 9–10 g/dl.^[5]

Despite the availability of societies endorsed guidelines that govern indications of blood requisition and transfusion, adherence to these guidelines is variable. Clinicians do not always agree on what criteria should be established, and BT policies are not always standardized. This heterogeneity within medical services can lead to overuse and over-request of blood units that hinder blood bank working, overloading the staff, and wasting a valuable limited blood unit. It has been also reported that 20% of all transfused blood in a hospital is requested by surgical cases.^[6] However, previous studies explained that blood transfusion requests (BTRs), particularly in elective surgery, are often based in pessimist expectations of potential risks with, sometimes, very low probability of taking place, which leads to over-request of blood units.^[7]

Current practice regarding blood unit requests supports a maximum of 2:1 blood ordering, meaning that if a service orders 2 blood units and administers only one; a good significant use of blood is being held.^[8]

This study was designed to assess the BTRs during a 3-month period in a tertiary care center from Southern Saudi Arabia to determine if significant blood waste is taking place and if so, to understand which hospital services tend to request unnecessary blood units.

Materials and Methods

This cross-sectional study, approved by Research Ethical Committee of Aseer Central Hospital (REC#2018-05-20) in October 2018, was conducted during January and March 2019 by analyzing the record of blood bank for all in house received BTRs. We registered demographic

data (sex, age, and nationality) from the patients who received transfusion requests during the period and the transfusion request data (type of transfusion, indication, crossmatch, and blood type). Patients were followed until discharge from inpatient hospitalization to assure no other transfusions were missed. Cross-matched to transfusion ratio (C/T ratio) or request to transfusion ratio in the case of PRBCs was used to measure the efficiency of blood ordering practice. BTRs from outside the hospital were excluded.

Statistical analysis

Qualitative data were expressed as percentage, and quantitative data were reported as mean \pm standard deviation. Statistical analysis was performed using GraphPad Prism version 7.0 Software.

Results

A total of 1328 (458 requests) blood products were ordered for crossmatching for 244 patients during the 3-month study period. The patient's demographics are depicted in Table 1. The major blood component used for transfusion was PRBCs (74.1%) and the major causes for BT indication were surgery (43.0%) and anemia (17.2%). General surgery service requested more blood products, 27.3% (total of 125 BTR), followed

Table 1: Biodemographic data for patients with the blood transfusion requests in Aseer Central Hospital

Biodemographic data	n (%)
Age (years)	
13-50	269 (58.7)
50+	189 (41.3)
Sex	
Male	317 (69.2)
Female	141 (30.8)
Blood available	
Yes	452 (98.7)
No	6 (1.3)
Type of request	
RBC-only	338 (74.1)
FFP-only	30 (6.6)
PLT-only	37 (8.1)
RBC/FFP	27 (5.9)
RBC/PLT	7 (1.5)
FFP/PLT	3 (0.7)
RBC/FFP/PLT	14 (3.1)
Indication	
RTA/trauma	63 (13.8)
Bleeding	61 (13.3)
Surgery	197 (43.0)
SCD/thalassemia	14 (3.1)
Anemia	79 (17.2)
Cancer, dialysis, others	44 (9.6)

RBC=Red blood cell; FFP=Fresh frozen plasma; PLT=Platelets; RTA=Road traffic accident; SCD=Sickle cell disease

by orthopedic surgery, 26.2% (total of 120 BTR), and medical services, 18.7% (total of 86 BTR). Most of the received requests came from intensive care unit (ICU) wards (32%), followed by the general wards (30%).

Overall, 780 units (59%) were transfused, giving an overall request to transfusion ratio of 1.7. The overall crossmatch transfusion ratio of packed red blood was 1.8 [Table 2]. However, analysis per request shows a variable C: T ratio reaching of up to 6 [Table 3].

Discussion

This study was carried out to assess the BTRs in Aseer Central Hospital, Southern region of Saudi Arabia. Findings of this study show that PRBC was the major blood component requested for transfusion. As shown in Table 1, surgery and anemia were the most frequent indications of BT in this study. This finding correlates well with other studies conducted locally and in developing countries.^[9] Moreover, surgical departments including general surgery, orthopedics, trauma, and plastic surgery (burns) requested more blood units than medical departments. Analysis of the distribution of BTRs showed that requested blood for patients in ICU was mainly due to trauma and anemia (60%). While in the coronary care unit, the main cause of blood request was only related to anemia (100%).

Current transfusion practices suggest that the ratio of 2:1 is appropriate, i.e., for every two units arranged one has been used. While the ratio of 1.0 is considered ideal, indicating the usage of every single unit that has been crossmatched.^[10] Finding of the current results indicates a good utilization of blood in Aseer Central Hospital. Overall, the C/T ratio of 1.84 was observed which indicates that more than half of the cross-matched blood components' utilization. In the general surgery and orthopedics departments, the C/T ratio was lower (1.4) than medical services (1.7). Lower ratio of C/T in general surgery and orthopedics cases below 2 signifies no significant wastage of blood components in these two departments. It has been reported in a local study that the C/T ratio in the cardiac surgery department was 1:1.^[9] which is better than the current study. The possible explanation could be the utilization of all blood components arranged during cardiac bypass surgeries, while in the current study, it was not limited to cardiac

surgeries. In a study by Abdel Gader *et al.*, 2015, the ratio of C/T of 10:1 was observed in obstetrics and gynecology department, indicating only 10% utilization of cross-matched blood.^[9] This explains the standby arrangement of blood products with a fear of bleeding in gynecological issues. Hence, it is clear that the C/T ratio could be partly correlated with the department of the hospital and clinical situation.

In literature, a wide range of C/T ratios have been reported ranging from 1.0 to sometimes 3.0–6.0. Using C/T ratio as a parameter, studies across the world show inappropriate blood usage (C/T ratio >2.5) in many countries such as Tanzania, Ethiopia, Malaysia, Egypt, and Zambia with C/T ratios 3.7, 2.3, 5.0, 3.9, and 2.8, respectively.^[11–15]

In addition to the crossmatch and utilization of blood products, the correlation of Hb and indication of BT were also explored in this study. It was observed that, when the level of Hb was <7 g/dL, approximately 95% of the patients received BT, which correlates well with the current transfusion guidelines.^[16] It has been reported that low Hb is the major trigger for BTRs and intraoperative measurement of Hb increases the appropriate use of blood.^[17]

The Maximum blood ordering schedule (MBOS) maximizes the usage of blood, minimizes wastage, and promotes appropriate blood usage in elective surgery by reducing the workload of unnecessary crossmatching and issuing of blood and optimize stock management.^[18] Another approach that could be developed is the “type and screen only.” Type indicates the ABO and Rh blood typing while screen means testing the of patient's plasma/serum for clinically significant irregular antibodies. This approach has shown promising results.^[19]

Conclusions

Appropriate management of BTRs can help reduce overall blood wastage and blood bank overload, allowing a more efficient system. Furthermore, patient outcome benefits from efficiency in BT, which means, only giving blood when needed and not “just in case.” The blood bank started to contact ordering physicians and

Table 2: Number of units requested and use of blood components for transfusion

	Number of BTR	Number of requested blood units for crossmatching (or preparation)	Number of transfused blood units (%)
Red blood cells package	385	858	466 (54.3)
Fresh frozen plasma	68	299	176 (59)
Platelets	62	171	138 (80)

The resulting overall calculated crossmatch/transfusion ratio for red blood cells package was 1.84, for fresh frozen plasma was 1.76, and for platelets was 1.23. BTR=Blood transfusion requests

Table 3: Request to transfusion ratio, per request, among different specialties

Specialty	RBCs crossmatch transfusion ratio				
	Mean	SD	Median	Minimum	Maximum
Medical	1.4	0.8	1.0	1.0	6.0
GS	1.7	1.0	2.0	1.0	6.0
Ortho	1.7	0.8	2.0	1.0	4.0
Others	1.4	0.8	1.0	1.0	6.0

SD=Standard deviation; RBC=Red blood cell; GS= general surgery

surgeons to minimize crossmatching for standby unless the need for blood is highly anticipated. Medical staff preparation and awareness of current guidelines along with their collaboration for well functioning of blood bank department is critical. Blood banking education is underrepresented in both undergraduate and postgraduate education. Saudi commission for health specialties might consider implementing a mandatory rotation for both medical and surgical trainees in the blood bank, to foster the understanding of basic blood bank principles.

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Conflicts of interest

There are no conflicts of interest.

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