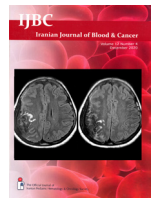
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ORIGINAL ARTICLE

Blood Ordering and Transfusion Pattern: A Retrospective Monitoring of Seven Healthcare Institutions in Southern Kerman Province, Iran

Mohammad Javad Abbaszadeh Afshar[1], Fatemeh Raeesi Nejad[2]*, Ali Behzadi[3]

[1]Department of Medical Parasitology and Mycology, School of Medicine, Jiroft University of Medical Sciences, Jiroft, Iran
[2]Department of Immunology, School of Medicine, Jiroft University of Medical Sciences, Jiroft, Iran
[3]Blood Transfusion Research Center, High Institute for Research and Education in Transfusion Medicine, Tehran, Iran

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*Corresponding author:
Fatemeh Raeesi Nejad, Department of Immunology, School of Medicine, Jiroft University of Medical Sciences, Jiroft, Iran.
Tel: +98-9139484315
Email: Raeesinejad.f324@gmail.com

ABSTRACT

Background: Blood and its products are the most precious resource to any healthcare institution, and the management of these limited resources is necessary to avoid wasting this precious gift. This study, therefore, aimed to assess the efficiency of blood ordering and transfusion practices in healthcare institutions of southern Kerman province, Iran.
Methods: This retrospective survey was conducted between March and September 2019. The information of admitted patients in seven healthcare institutions in southern Kerman province, for whom one or more units of blood were requested, were collected. Cross-match to transfusion (CT) Ratio, Transfusion Index (TI), and Transfusion Probability (T%) were calculated. Values of <2.5, >0.5 and >30% were taken as standards, for CT, TI, and T%, respectively.
Results: On average, 1.35±1.00 blood units are requested for each patient. For 4777 patients, 5647 units cross-matched, and only 4789 units were transfused. The overall CT ratio, TI, and T% were calculated as 1.17, 1.00, and 90.24%, respectively. The highest CT ratio was calculated for ICU and emergency departments, while the thalassemia center had the most desirable ratio.
Conclusion: A desirable blood ordering and utilization pattern was observed in the healthcare institutions of southern Kerman province.

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Introduction

Blood shortages are a growing problem in the world, and the importance of this will become more prominent in health crises when Pan American Health Organization (PAHO) warns of potential blood shortages during the COVID-19 pandemic.[1,2] Blood and its products are the most precious resource to any healthcare institution, and the management of these limited resources is necessary to avoid wasting this precious gift. Over-ordering of blood pre-operatively is a challenging problem in healthcare institutions. The cross-matched blood, when not used, leads to the wastage of valuable supplies and resources both in technician time, effort, and biochemical reagents. Also, it causes a financial burden for each patient undergoing a surgical procedure.[3]

As blood transfusion plays a vital role in resuscitation of the patients who need it, healthcare institutions need to adopt specific criteria for monitoring the blood ordering and utilization system to reduce the blood wastage. Several indices are used to assess the efficiency of blood ordering and utilization systems. i: Cross-match to transfusion (CT) ratio, which indicates the efficiency of the blood ordering practice. A ratio of more than 2.5 indicates excessive cross-matching of blood for a certain procedure. ii: Transfusion index (TI), which indicates the average number of units used per patient cross-matched and signifies the appropriateness of the number of units cross-matched. A value of 0.5 or more is indicative of efficient blood usage. ii: The probability (%T) of a transfusion for a given procedure, which is used

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as an index of blood usage and a value of more than 30% considered significant blood usage.[4, 5]

The increased demands of blood products besides the increasing costs of blood processing have led to the conduction of large-scale surveys and evaluation of blood ordering and transfusion practices in Iran, where the CT ratios reported range from 1.33 to 7.[6-14]

To the best of our knowledge, this is the first study to monitor the blood ordering system in healthcare institutions of southern Kerman province. This study aimed to assess the efficiency of blood ordering and transfusion practices in healthcare institutions of southern Kerman province and attempt to pave the way to reduce unnecessary burden on the blood banking.

Methods

This study, as a retrospective survey, was conducted from March to September 2019. The information of admitted patients at the seven healthcare institutions in southern Kerman province, Iran, for whom one or more units of blood were requested, were collected. All patient's information was recorded, including demographics, the number and type of ordered blood products, hospital departments, number of units cross-matched and transfused, and number of patients cross-matched and transfused. The following indices were calculated in this study: A) Cross-match to transfusion (CT) ratio=No. of units cross-matched/No. of units transfused. A ratio of 2.5 and below was considered indicative of significant blood usage, B) Transfusion index (TI)=No. of units transfused/No. of patients cross-matched. A value of 0.5 or more was considered indicative of significant blood utilization, C) Transfusion probability (%T)=No. of patients transfused×100/No. of patients cross-matched. A value of 30% and above was considered indicative of significant blood usage.

Statistical analysis was done using SPSS version 16.0 (Chicago, Illinois, USA). The frequency was calculated for qualitative and categorical variables, while quantitative variables were represented as mean ± standard deviation.

Results

Over six months of the study period, 7268 units of blood products were requested for 5401 patients in seven healthcare institutions in southern Kerman province. On average, 1.35±1.00 blood units are requested for each patient. Table 1 shows 18.31% of the units were not transfused to the patients and were wasted. Packed cell RBC, fresh frozen plasma, and platelet were the most requested blood products in the healthcare institutions under study (table 1).

In terms of red blood cell (RBC) products, those needing cross-match, 5608 units cross-matched and 4789 units were transfused (table 2). The highest number of requested blood units was for thalassemia center, emergency, and ICU departments, respectively. These departments also

Table 1: The blood product requisitions and transfusion in the healthcare institutions understudy

Blood product	Requested units	Transfused units	Wastage (%)
Packed cell	5652	4770	15.61
Fresh frozen plasma	847	596	29.63
Platelet	724	547	24.45
Whole blood	34	14	58.82
Washed RBC	2	2	0.00
Cryoprecipitate	6	5	16.67
Leukocyte-reduced RBC	3	3	0.00
Total	7268	5937	18.31

Table 2: The number of units cross-matched and transfused in the patients at the healthcare institutions understudy

Department	No. of units		No. of patients	
	Cross-matched	Transfused	Cross-matched	Transfused
Thalassemia center	3176	3057	3152	3038
Emergency	1110	773	694	543
ICU	471	264	322	203
General surgery	193	164	121	113
Obs and Gyn	142	120	92	83
Internal medicine	126	105	96	85
Infectious disease	103	84	84	69
Operating room	51	39	32	25
Neurosurgery	44	34	29	25
Hemodialysis	43	36	41	35
Pediatrics	43	35	40	32
CCU	40	29	28	23
Orthopedics	38	27	26	21
Unknown	28	22	20	16
Total	5608	4789	4777	4311

ICU: Intensive care unit; Obs and Gyn: Obstetrics and Gynecology; CCU: Coronary care unit

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Table 3: Blood ordering and utilization indices in the healthcare institutions under study based on the department

Department	Blood ordering and utilization indices		
	C/T ratio	TI	%T
Thalassemia center	1.04	0.97	96.38
Emergency	1.44	1.11	78.24
ICU	1.78	0.82	63.04
General surgery	1.18	1.36	93.39
Obs and Gyn	1.18	1.30	90.22
Internal medicine	1.20	1.09	88.54
Infectious disease	1.23	1.00	82.14
Operating room	1.31	1.22	78.13
Neurosurgery	1.29	1.17	86.21
Hemodialysis	1.19	0.88	85.37
Pediatrics	1.23	0.88	80.00
CCU	1.38	1.04	82.14
Orthopedics	1.41	1.04	80.77
Unknown	1.27	1.10	80.00
Total	1.17	1.00	90.24

ICU: Intensive care unit; Obs and Gyn: Obstetrics and Gynecology; CCU: Coronary care unit; C/T ratio: cross-match to transfusion ratio; %T: Transfusion probability; TI: Transfusion index

have the highest number of both patients cross-matched (87.25%) and transfused (87.77%). Among the three departments with the highest request and cross-match, the lowest transfusion was found in the ICU department (table 2).

As shown in table 3, the blood ordering and utilization indices, including CT ratio, TI, and %T were calculated 1.17, 1, and 90.24%, respectively. The calculated blood utilization indices showed almost the same value between each department. The highest CT ratios were in ICU and emergency departments, at 1.78 and 1.44, respectively, and the most optimum CT ratio was in thalassemia center (1.04).

Discussion

Human blood is one of the most expensive fluids in the world, and despite the advantages, nowadays, excessive blood wastage is a challenging problem in healthcare institutions.[3] The usage of blood and blood products must be rationalized and saved for a crisis. Hence, several indices are implemented universally to monitoring and optimization of the blood ordering in healthcare institutions.

The current study revealed that only 76.87% of the cross-matched blood products were transfused in the healthcare institution of southern Kerman Province. This finding was comparable to that reported in north of Kerman (75%)[9] and Sistan and Baluchestan (61.7%)[15] provinces. In one study[13] in Mazandaran about 95% of requested blood products were transfused while in another study[10] in South Khorasan only 23.4% of cross-matched blood products were transfused. It seems that the lack of continuous monitoring of blood transfusion committees and the lack of localized guidelines for blood ordering systems have led to a wide range of reports of blood utilization in Iran.

The overall CT ratio of 1.17 that was calculated in the current study was considered to be indicative of efficient blood usage, based on what Boral and Henry recommended.[4] This ratio was comparable with that reported by carried out studies in Kerman (1.33),[9] Gilan (1.9),[8] Mazandaran (2.01),[13] and Bushehr (1.33)[16] provinces but higher than that reported in Razavi Khorasan and South Khorasan with undesirable CT ratio as at 3.71 and 4.2, respectively.[10, 12]

In the current study, the most desirable CT ratio was found in thalassemia center (1.04), and the highest was in ICU (1.78) and emergency (1.44) departments. The CT ratios of the ICU and emergency department are expected to be higher than other departments because of an emergent admission and quick decisions related to treatment in these departments compared to other ones. These situations could contribute to some laxity in the application of established blood ordering and utilization criteria. Overall, a little variance was observed between CT ratios of the studied departments. Although some studies have reported a poor CT ratio in the obstetrics and gynecology department,[13, 16-19] our findings show an optimum CT ratio in this department (1.18).

Regarding the TI, a value of 1 was calculated, which indicates an efficient blood usage in healthcare institutions of southern Kerman. Similarly, a desirable value of the TI in Bushehr (1.94 and 0.5),[16] Mazandaran (1.73),[13] and Kerman (1.81)[9] provinces have been reported. In the current study, the highest TI was estimated in the general surgery department (1.36), and the lowest was in ICU (0.82).

The results of the current study revealed an overall %T of 90.24%, which was indicative of appropriate utilization compared to the unit cross-matched. Several studies have reported an undesirable %T index as 20%, 16.83%, and 14.52% in South Khorasan, Razavi Khorasan, and Fars provinces, respectively.[10, 12, 20]

As a strategy to improve the efficiency of blood ordering practices, the use of a maximum surgical blood order schedule (MSBOS) and "T & S" system for each procedure are suggested. The MSBOS and "T & S" in different parts of the world have been very effective in optimizing blood ordering indicators and preventing blood wastage. Between 1999 and 2001, the CT ratio was

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reduced from 2.25 to 1.71 in London's university hospitals by implementing an MSBOS in the surgical departments, thus preventing the waste of 102 units of blood in 15 months.[21] In Saku central hospital in Japan, the CT ratio was reduced from 3.94 to 2.01 by implementing an MSBOS and "T & S".[22] In Saudi Arabia also the rate of blood wastage was reduced by half by implementing MSBOS and "T & S".[23] Using MSBOS, on the other hand, reduces the transmission risk of potential infections to the patients.[24]

Limitations

In the current study, the requesting department of about 1% of the blood product requisitions were not specified. Also, a considerable portion of the information was not included due to non-negligible defects such as blood product type requested and the uncertain status of cross-matching and transfusion. Since such limitations have been reported in some other studies,[8, 15, 25] it seems necessary to implement an integrated documentation system and continuous monitoring of blood transfusion committees on this process.

Conclusion

Our results revealed a desirable blood ordering and utilization pattern in the seven healthcare institutions of southern Kerman province. This may highlight an efficient blood transfusion committee, knowledgeable doctors and paramedics and also a proper implementation of haemovigilance in the healthcare institutions under study. Holding workshops and retraining courses by blood transfusion organizations for physicians and paramedics can help improve the status of blood ordering systems. Localization and unification of blood ordering and transfusion guidelines seem to be necessary to reduce blood wastage.

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Conflict of Interest: None declared.

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