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Frequency of Blood Components Wastage and Associated Factors in Yazd Healthcare Centers

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ABSTRACT

Background: Excessive ordering of blood components imposes heavy costs to blood transfusion centers and increases the amount of blood product wastage due to lack of their use. In recent years, attempts have been made against unnecessary blood and blood product requests in our country. We aimed to investigate the frequency of blood and blood product wasting in healthcare centers of Yazd city in Iran.

Methods: In this cross-sectional study data were obtained from questionnaires, software system of hospital blood banks and data extracted from medical records. PPS (probability proportional to size) was applied as sampling method. Required samples were collected randomly from each hospital. Data were analyzed using descriptive statistics.

Results: In total, 171, 147, 465 request forms for fresh frozen plasma (FFP), platelets, and RBC were evaluated. Approximately, 11%, 6%, and 21.5% of FFP, platelets and RBC units were discarded in the hospitals, respectively. The highest rate of blood component wastage belonged to burns (23%), ICU (22%), surgery (20%) and Thalassemia (20%) departments. Expiring which caused the products to be discarded was the most common cause of blood wastage (82%). "cross match to transfusion ratio" which is a standard quotient in transfusion medicine was 2.9-8 in these medical centers.

Conclusion: The most common causes of blood wasting were lack of definite indications to transfuse blood products, long term storage of blood products without their consumption or discharging the patients not receiving any transfusion. Therefore, it is possible to reduce blood and blood products wastage through proper management of requests and their rational use.

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Introduction

The main goal of blood transfusion organizations is providing safe and sufficient blood to the patients. To fulfill this aim, great cost and effort is spent.[1] In the past, the main type of requested blood was "whole blood"; whereas its use is limited today due to loss of coagulation factors and reduced survival of red blood cells in whole blood. Currently, clinical conditions determine the kind of blood product which is needed.[2]

The expense of producing each unit of blood is reported to

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be 264-374 dollars.[3,4] In addition to these expenses, there are extra costs for storage and transportation of each component which is supposed to be consumed. To ensure its quality, following the principles of maintenance and transportation for each product is obligatory. Non-compliance with any of the executive directions related to product preparation and maintenance could reduce its quality and efficacy.[1]

One important issue in transfusion medicine is indications for transfusion of either product and the ordering policy in each center for blood and blood products by the practitioners. The physician in charge of a patient makes the decision to transfuse the patient and there are considerable differences between the experts and unprofessional physicians in terms of blood ordering outlines. Failure to comply with request principles and excessive ordering by healthcare centers will cause shortage of blood, storing blood products in healthcare centers for a longer time, increasing blood wastage due to reaching the expiration date and imposing high cost on blood transfusion centers for supplying the required blood products.[5] To compensate for it, blood transfusion centers proceed to recruit new donors and call for regular donors.[6]

In recent years, a number of studies were conducted with the aim of investigating ordering patterns of blood and blood products. The maximum blood reservation should be in accordance with these directions. C/T (cross-match/transfusion) ratio is an efficient criteria used for assessing blood request versus blood usage which the standard figure is 2.5.[1,5-7] However, studies have shown that in most hospitals in Iran, this ratio is often higher than the standard revealing that a great number of requested blood units are not consumed due to various reasons.[1,5-8] In recent years, in order to raise awareness about appropriate blood usage, hospital committees are established and hemovigilance programs are conducted in a large number of hospitals.

Based on the information available in the software of "Yazd Blood Transfusion Center", blood collection in years 2006 and 2012 were reported to be 35,364 and 43,129, respectively. Whereas, the number of "unused blood units" returned from the hospitals was 467 and 1572, respectively, indicating a triple increase in number of returned blood units. It is noteworthy that blood returning is one of the reasons for blood wasting. The aims of this study were primarily to investigate the frequency of blood products wasting in health care centers in Yazd city and secondly to determine the factors that affect blood products wastage in these centers.

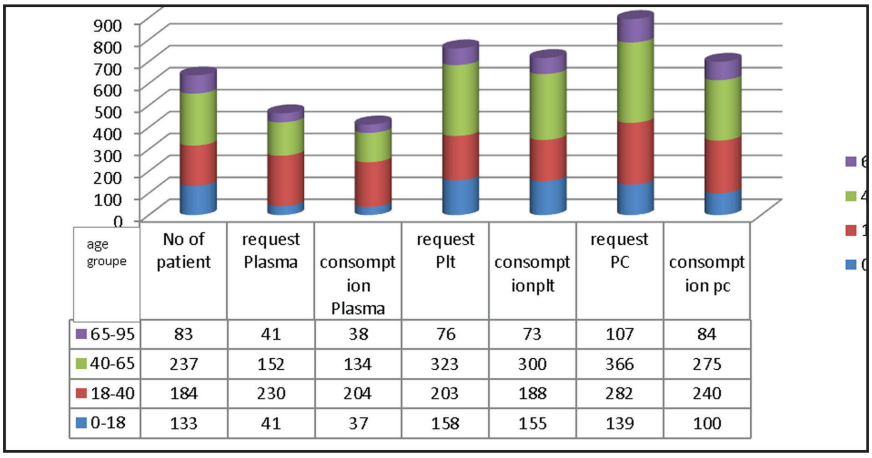
Materials and Methods

In this cross-sectional study, all hospitals of Yazd city were included. The data were obtained during year 2013 through a questionnaire. The questionnaire included information such as age, sex, name of the hospital and the relevant departments, the primary diagnosis, number of blood units requested, number of transfused blood units, number of cross-match tests which were performed and the cause of blood or blood products wasting. In addition, software of blood transfusion center, data of hospital blood banks and data extracted from medical records were assessed for this study. Total number of required questionnaires was calculated by statistical methods ($Z^2p\alpha/D^2$). PPS (probability proportional to size) was used to determine the number of needed questionnaires for each hospital. Numbers of requests for each hospital were determined based on the average number of requests in 2012. Required numbers of samples in each hospital were collected through randomization and using "random numbers table" in 2013. Trained individuals referred daily to the hospitals from beginning of 2013 and filled out the questionnaires. An identification code from 1 to 10 was assigned to each hospital for collecting data and presenting the results of the study. The obtained data were transferred to SPSS software, version 16 and descriptive statistics were applied for analyzing the data. The study was approved by the ethics committee of Shahid Sadughi University of Medical Sciences.

Results

171 request forms for FFP including 476 units was ordered by hospitals during the study period with a mean±SD units of 3±1 per order. A total of 786 units of platelets through 147 platelet request forms with a mean±SD unit of 5±1 per request was ordered. Additionally, 907 units of RBC by means of 465 request forms with a mean±SD unit of 2±1 per request were ordered by the hospitals. 315 (48.5%) request for men and 335 (51.5%) for women were ordered with a mean age of 39.7 years (range: 0-94 years). The age groups of 17-40 years and 40-65 years comprised the highest number of blood products' requests available (figure 1).

425 (89%) out of 476 units of requested FFP, 740 (94%)



age groupe	No of patient	request Plasma	consomption Plasma	request Plt	consomption Plt	request PC	consomption pc
65-95	83	41	38	76	73	107	84
40-65	237	152	134	323	300	366	275
18-40	184	230	204	203	188	282	240
0-18	133	41	37	158	155	139	100

Figure 1: Frequency of blood and blood product requests and consumption according to age groups

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out of 786 requested units of platelet and 712 out of 907 RBC units (78.5%) were consumed, respectively (table 1).

The highest number of blood and blood product requests allocated to the hospital with code 3 with 1083 (34%) requests and the highest mean of blood wasting belonged to the hospital with code 10 (62.5%). The highest C/T ratio was for hospital 10 which showed the figure with amount of 8 (table 2).

Among different departments, Burn (23%), ICU (22%), Surgery (20%) and Thalassemia (20%) departments showed the highest rate of blood product wastage, respectively (table 3).

Expiration of the products was the main cause for discard of all kind of blood products. Overall, in this study 87% of the requested blood products were consumed and 13% had been discarded due to various reasons.

Discussion

Investigating records of "Blood Transfusion Center" in Yazd city in 2012, revealed that the requests for blood products had an increase of 1.4% in comparison to year 2011; whereas, the rate of wasting had an increase of 30%, most of which were allocated to RBC (65%). The major cause of blood and blood products wastage was lack of indication which increased over the years. The other causes included non-compliance with the cold chain and

Table1: Frequency of request, consumption and wastage of blood components according to type of blood component

Blood components	Request Forms	Units of blood components requested	Units of blood components consumption	Consumption (%)	Wastage (%)
FFP	171	476	425	89	11
platelets	147	786	740	94	6
Packed cells	465	907	712	78.5	21.5
Total	783	2169	1877	82.6	12.8

Table 2: Frequency of request and wastage of blood and blood products in Hospitals of Yazd

Code of hospital	FFP request Forms	FFP consumption units	Wastage of FFP (%)	platelets request Forms	platelets consumption units	Wastage of platelets. (%)	RBCs request Forms	RBCs consumption units	Wastage of RBCs (%)	Cross Match/ Transfusion (C/T)
1	26	16	38.5	16	14	12.5	105	70	33.3	6.0
2	6	6	0	19	19	0	65	64	1.5	2.9
3	267	264	1.1	490	476	2.85	317	254	19.9	3.2
4	23	21	8.7	31	31	0	146	90	38.4	4.8
5	5	3	40	90	76	15.5	51	37	27.5	6.5
6	21	21	0	2	2	0	72	64	11.1	4.0
7	1	1	0	107	97	9.35	53	47	11.3	4.4
8	37	37	0	0	0	0	38	36	5.3	4.2
9	19	16	15.8	28	22	21.4	55	47	14.5	5.8
10	71	55	22.5	3	3	0	5	3	40	8.0

Table 3: Frequency of request, consumption and wastage of blood and blood products in different departments

Departments	No of RBC units consumed (%)	No of RBCs units requests (%)	RBCs wastage (%)	No of Platelet units consumed (%)	No of platelet units requests (%)	Platelet wastage (%)	No of plasma units consumed (%)	No of plasma units requests (%)	plasma wastage (%)	Total wastage (%)
Pediatrics	12(1.7)	17(1.9)	5(29)	82(11.1)	85(10.8)	3(3.5)	3(0.7)	3(0.6)	0	8
Emergency	61(8.6)	75(8.3)	14(19)	132(17.8)	144(18.3)	12(8)	45(10.7)	48(10.2)	3(6)	11
Surgery	206 (28.9)	291(32.1)	85(29)	173(23.4)	192(24.4)	19(10)	46(11)	47(10)	1(2)	20
NICU	33(4.6)	36(4)	3(8)	11(1.5)	11(1.4)	0	27(6.4)	27(5.7)	0	4
ICU	63(8.9)	78(8.6)	15(19)	17(2.3)	19(2.4)	2(11)	26(4.3)	39(8.3)	13(33)	22
Internal Medicine	89(12.5)	104(11.5)	15(14)	82(11.1)	85(10.8)	3(4)	87(20.8)	93(19.8)	6(6)	9
Cardiology	37(5.2)	53(5.8)	16(30)	41(5.5)	41(5.2)	0	6(1.4)	6(1.3)	0	16
Gynecology	99(13.9)	120(13.2)	21(18)	25(3.4)	25(3.2)	0	67(16)	74(15.7)	7(9)	13
Thalassemia	18(2.5)	26(2.9)	8(31)	11(1.5)	11(1.4)	0	4(1)	4(0.9)	0	20
Operating Room	35(4.9)	38(4.2)	3(8)	40(5.4)	40(5.1)	0	31(7.4)	36(7.7)	5(14)	7
Oncology	23(3.%)	25(2.8)	2(8)	91(12.3)	98(12.5)	7(7)	1(0.2)	1(0.2)	0	7
Burns	3(0.4)	5(0.6)	2(40)	3(0.4)	3(0.4)	0	55(13.1)	71(15.1)	16(23)	23
Other	33(4.6)	39(4.2)	6(15)	32(4.1)	32(4.4)	0	21(4.4)	21(5.1)	0	7

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termination of blood bag segments for cross matching.

Regarding the high cost for preparing blood and blood products, it is necessary to request and consume all the products logically. According to the results of the current study, range of C/T ratio was 2.9-8 in hospitals of Yazd. In a study by Koshesh et al, this ratio in a hospital specialized for gynecologic patients was 22.8 and in women care unit was 9.8 which were the highest compared to the other centers. The lowest reported C/T was 1.6 in the aforementioned study.[9]

Rafieemehr et al reported C/T ratio of 2.44 in blood banks of Besat Hospital in Hamadan which was satisfactory compared to the standard figures.[8] Nevertheless, this index was 4 in surgery unit. Hospital with code 4 in Yazd had the lowest ratio of 2.9 which was higher than the standard. Generally, High C/T ratio represents non-rational blood ordering and unnecessary blood reservation which led to increased blood wasting.[8] In Rasht, the ratio of C/T was reported 1.9 that was acceptable.[6] Ala aldoulehei et al reported the index of C/T in surgery and heart units of Babol to be 14.7 and 1, respectively.[1] Beizaei et al revealed the ratio of C/T in Surgery Unit as 10.3 from 2001 to 2009.[7] In three university hospitals of Kerman in 2013, C/T was equal to 1.3.[10] In an investigation by Chaudhary and colleagues, the ratio of C/T was 6.7.[11] This diversity reported in C/T ratio may be due to different patterns of blood request on behalf of practitioners.

In this study, 21.5% of requests for RBC were wasted. RBC comprised the most ordered product in one study (73.4%).[5] In a university hospital in Zahedan in 2008, out of 1536 units of requested RBC, 677 (44%) units were discarded.[5] The amount of blood wastage was decreased from 4% to 1% during 10 years in the study by Zoric and colleagues.[12] In the present study, 11% of blood product wastage included plasma and 6% were platelets. Burn (23%), ICU (22%), Surgery (20%), and Thalassemia (20%) departments had the highest rate of wastage for blood products. One study showed that 80% of cross-matched blood in elective surgeries had not been used by the surgeons.[6]

Insufficient education and lack of knowledge about optimal blood usage and logical blood ordering for surgeries seem to be the main factors of inappropriate use and waste of blood in Iran.[13,14] In a study, the Infectious Diseases Department had the highest rate of request for FFP and Surgical Department had the highest requests (14.2%) for RBC. [5] Surgery department had the highest number of blood requests and the highest amount of blood wasting; whereas, cardiology departments had the lowest number of requests and the least amount of wasting in the study by Ala aldoulehei.[1] The main reason for blood and blood products request were anemia with 397 cases and bleeding with 289 cases in this study. The major cause of RBC, plasma and platelets wasting were expiration of the products with 98.8, 81.5, and 100% frequency, respectively. Zoric et al showed that non-standard transportation, lack of consistent system in temperature control in the hospitals and increased orders for products which are not used were the main reasons of blood wasting.[12]

Conclusion

In general, the C/T ratio for transfusion of blood products was high in Yazd hospitals and the main reason for blood and blood products wastage was expiration due to unnecessary requests and longtime storage of blood products for a particular patient who might not need it. Department of surgery contributed to the highest number of blood requests and blood product wasting. Maximum Surgical Blood Ordering Schedule (MSBOS) is suggested as a guide to blood ordering management in these departments. In addition, following the regulations seems necessary to reduce the amount of blood wasting.

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