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Research Paper

Monitoring the frequency of request and transfusion of blood products in Razi Hospital, the North of Iran

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ABSTRACT

Efficient management of blood inventory, coupled with understanding request and transfusion patterns, is crucial for healthcare institutions to optimize their resources and provide timely and effective patient care. Surgical procedures often lead to significant wastage of blood products. This study aimed to identify the ratio of blood product requests and transfusion, focusing on implementing the maximum surgical blood ordering schedule (MSBOS). This cross-sectional study from 2020 to 2021 conducted at Razi Hospital, Rasht, Iran. Demographical data, clinical characteristics, type and numbers of requested and transfused blood products of the patients were recorded, and the cross-matched to transfusion (C/T) ratio was calculated for all requests. According to our results, about 54.7% of the patients were males, and out of 34873 requests for blood products (14334 in 2020 and 20539 in 2021), 28729 were transfused (11262 in 2020 and 17467 in 2021). Oncology unit (C/T=3.4) in 2020 and the kidney transplantation unit in 2021 (C/T=3.14) had the most higher C/T among different hospital units, and the packed cells were the most frequent request and transfused blood products. To address the blood wastage physicians must be educated on the proper request for blood products according to the MSBOS table.

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1. Introduction

In modern healthcare systems, blood products are vital in saving lives, providing critical care, and supporting medical interventions [1]. The availability and appropriate blood products for transfusion are essential for ensuring the well-being of patients, particularly those in need of transfusions due to surgical procedures, trauma, or medical conditions [2]. Efficient management of blood inventory, coupled with understanding request and transfusion patterns, is crucial for healthcare institutions to optimize their resources and provide timely and effective patient care [3]. The excessive demand for blood is one of the common problems in hospitals, which causes issues such as the lack of proper distribution of blood products among different centers, rising costs, and increasing workload of the blood bank [4]. Blood transfusion is a complex process that involves multiple stages, including blood collection, testing, storage, and administration. Each stage carries inherent risks and costs, making it crucial to balance ensuring an adequate blood supply and minimizing wastage [5, 6]. The transfusion pattern of blood products usually evaluate via the implementation of the Maximum Surgical Blood Ordering Schedule (MSBOS) table in hospitals [7, 8] and aids healthcare facilities in estimating the blood requirements for various surgical procedures based on their complexity, patient's clinical condition, and associated blood loss [9]. Over the years, many hospitals have implemented the MSBOS table as a proactive strategy to estimate blood requirements accurately. [9, 10]. By adhering to this schedule, healthcare professionals can streamline the procurement process, reduce unnecessary blood orders, and improve inventory management [11]. Despite the potential benefits of implementing the MSBOS table, its utilization and effectiveness may vary across healthcare institutions. Surgical practices, patient demographical characteristics and clinical history, hospital protocols, and clinician awareness can influence its successful implementation [12]. Therefore, it is crucial to assess the transfusion patterns of blood products in hospitals based on the MSBOS table to determine whether it aligns with the anticipated estimates and leads to optimal resource utilization [13]. This study aimed to investigate the request and transfusion frequency of blood products at Razi Hospital, Rasht, Iran.

2. Materials and Methods

In this cross-sectional study, in order to evaluate the frequency of request and transfusion of blood products with an emphasis on the MSBOS table, the Razi Hospital, Rasht, Iran, in 2020 and 2021, the demographical and clinical data of the 15405 patients were recorded from the patient's archive in hospital. The data included the gender and age of the patients, hospital units, types and numbers of requested and transfused blood products (cryo-poor plasma (CPP), cryo, fresh frozen plasma (FFP), packed cell, platelet, platelet apheresis, washed cells). The ratio of cross-matched blood products to transfusion blood products (C/T) was in all cases. Also, in the case of elective surgeries, according to the type of surgery, the number of blood products requested and cross-matched products was evaluated based on the MSBOS pattern. All patients gave their consent to participate in the study, which was approved by the ethical committee of the Guilan University of Medical Sciences (IR.GUMS.REC.1400.225). Statistical tables were used to describe the data, and numbers and percentages were used to describe qualitative variables. All data were analyzed using SPSS version 22.

3. Results

According to our results, out of 15405 studied patients, 6971 were female. Of 34873 requests (14334 in 2020 and 20539 in 2021), 28729 blood products were transfused (11262 in 2020 and 17467 in 2021). The frequency of the requests and transfusion for patients in Razi Hospital, Rasht, Iran, were demonstrated in Table 1, which showed that the most frequent request and transfused blood products were packed cells with a request frequency of 50.65% and 50.66% in 2020 and 2021, respectively.

Table 1: Frequency of requests and transfused blood products for patients in Razi Hospital, Rasht, Iran, in 2020 and 2021.

Year	2020						2021					
Blood products	Request			Transfusion			Request			Transfusion		
	Male n	Female n	Total n (%)	Male n	Female n	Total n (%)	Male n	Female n	Total n (%)	Male n	Female n	Total n (%)
CPP	34	50	554 (3.86)	26	409	435 (3.86)	173	382	555 (2.71)	147	325	472 (2.70)
Cryo	679	414	1093 (7.63)	534	325	859 (7.64)	1283	799	2082 (10.14)	1091	680	1771 (10.14)
FFP	908	1014	1922 (13.42)	712	797	1509 (13.39)	1447	1753	3200 (15.58)	1230	1491	2721 (15.58)
Packed cell	3872	3388	7260 (50.65)	3042	2663	5705 (50.66)	4965	4079	9044 (44.02)	4222	3468	7690 (44.03)
Platelet	1748	1531	3279 (22.87)	1377	1199	2576 (22.87)	2815	2364	5179 (25.22)	2394	2011	4405 (25.22)
Platelet apheresis	51	48	99 (0.69)	39	39	78 (0.69)	109	82	191 (0.93)	93	90	163 (0.93)
Washed cells	58	69	127 (0.88)	46	54	100 (0.89)	113	175	288 (1.40)	93	152	245 (1.40)

Cryo-poor plasma (CPP); Fresh frozen plasma (FFP)

Moreover, the frequency of transfused packed cells in 2020 and 2021 was 44.02% and 44.03%, respectively. On the other hand, platelet apheresis in both years was transfused less than other blood products (<1%). Table 2 represents the frequency of requests and transfused blood products according to the MSBOS in different units of the hospital, in which in 2020, oncology (3.4), kidney transplantation (2.86), and surgery (2.15) units, respectively, had higher C/T compare to other units, while in 2021 kidney transplantation (3.14), surgery (1.56), and nephrology (1.53) wards, respectively were. The results demonstrated a decrease in C/T from 1.27 to 1.18 in 2020 compared to 2021. The C/T with emphasis on the MSBOS according to the months of request or transfuse demonstrated a 0.11 decrease from 2020 (1.34) compared to 2021 (1.23) (Table 3).

Table 2: The ratio of requests and transfused blood products (C/T) for 15405 patients according to the MSBOS table in different units of Razi Hospital, Rasht, Iran, in 2020 and 2021.

Year	2020			2021		
Hospital Units	Request n (%)	Transfusion n (%)	C/T	Request n (%)	Transfusion n (%)	C/T
Internal ICU	320 (2.23)	267 (2.37)	1.19	915 (4.45)	807 (4.62)	1.13
ICU	1019 (7.11)	792 (7.03)	1.29	1456 (7.09)	1265 (7.24)	1.15
CCU	114 (0.79)	99 (0.88)	1.15	152 (0.74)	115 (0.66)	1.32
Hematology (Outpatient)	400 (2.79)	372 (3.30)	1.07	576 (2.80)	578 (3.31)	1
Hematology	1374 (9.58)	1167 (1.36)	1.18	3167 (15.42)	2846 (16.29)	1.11
Nephrology	170 (1.18)	146 (1.29)	1.16	331 (1.61)	216 (1.24)	1.53
Nephrology (Outpatient)	-	-	-	2 (0.01)	2 (0.01)	1
Toxicology (Outpatient)	100 (0.69)	82 (0.73)	1.22	55 (0.27)	46 (0.26)	1.20
Toxicology	208 (1.45)	203 (1.80)	1.02	288 (1.40)	230 (1.32)	1.25
Gastrointestinal disease	244 (1.70)	208 (1.85)	1.17	586 (2.85)	525 (3.01)	1.12
Gastrointestinal diseases (Outpatient)	2 (0.01)	1 (0.01)	2	4 (0.02)	4 (0.02)	1
Endocrinology and rheumatology	176 (1.23)	155 (1.38)	1.14	463 (2.25)	411 (2.35)	1.13
Endocrinology and rheumatology Outpatient)(	3 (0.02)	2 (0.02)	1.5	5 (0.02)	5 (0.03)	1
Infectious diseases	262 (1.83)	172 (1.53)	1.52	374 (1.82)	343 (1.96)	1.09
Infectious diseases (Outpatient)	23 (0.16)	20 (0.18)	1.15	23 (0.11)	24 (0.14)	0.96
Pulmonary diseases	966 (6.76)	691 (6.13)	1.39	692 (3.37)	560 (3.21)	1.24
Pulmonary diseases (Outpatient)	92 (0.64)	83 (0.74)	1.11	40 (0.19)	38 (0.22)	1.05
Hemodialysis (Outpatient)	56 (0.39)	55 (0.49)	1.02	70 (0.34)	64 (0.37)	1.09
Internal diseases 2	94 (0.67)	91 (0.81)	1.03	816 (3.97)	735 (4.21)	1.11
Internal diseases 2 (Outpatient)	-	-	-	6 (0.03)	7 (0.04_	0.86
Internal diseases 1	83 (0.58)	81 (0.72)	1.02	190 (0.93)	177 (1.01)	1.07
Surgery	1001 (6.98)	466 (4.14)	2.15	1419 (6.91)	907 (5.15)	1.56
Surgery (Outpatient)	-	-	-	3 (0.01)	3 (0.02)	1
Thalassemia (Outpatient)	3137 (21.88)	3120 (27.70)	1.01	3778 (18.39)	3755 (21.50)	1.01
Kidney transplantation	275 (1.92)	96 (0.85)	2.86	480 (2.34)	153 (0.88)	3.14
Dermatology (Outpatient)	176 (1.23)	155 (1.38)	1.13	112 (0.55)	108 (0.62)	1.04
Dermatology	308 (2.15)	238 (2.11)	1.29	495 (2.41)	421 (2.41)	1.018
Respiratory isolation 1	510 (3.55)	376 (3.34)	1.35	684 (3.33)	497 (2.85)	1.38
Inpatient emergency	1514 (10.59)	959 (8.52)	1.58	1660 (8.08)	1354 (7.75)	1.23
Outpatient emergency	487 (3.39)	324 (2.88)	1.50	503 (2.45)	374(2.14)	1.34
Acute emergency 1	23 (0.16)	19 (0.17)	1.21	-	-	-
Urology	930 (6.49)	582 (5.17)	1.59	1004 (4.89)	709 (4.06)	1.42
Urology (Outpatient)	19 (0.13)	15 (0.13)	1.27	153 (0.74)	153 (0.88)	1
Oncology	17 (0.12)	5 (0.04)	3.4	13 (0.06)	11 (0.06)	1.18
Oncology (Outpatient)	224 (1.56)	217 (1.93)	1.03	20 (0.10)	20 (0.11)	1
Operation room	5 (0.03)	0 (0.0)	-	4 (0.02)	4 (0.02)	1
Echocardiography	2 (001)	2 (0.02)	1	-	-	-

The ratio of cross-matched to transfusion (C/T); Intensive care unit (ICU); Cardiac care unit (CCU)

Table 3: The ratio of requests and transfused blood products (C/T) for 15405 patients according to the MSBOS table in Razi Hospital, Rasht, Iran, in different months in 2020 and 2021.

	C/T	
Month	2020	2021
January	1.2	1.3
February	1.2	1.3
March	1.2	1.2
April	2.2	1.2
May	1.5	1.2
Jun	1.4	1.3
July	1.2	1.3
August	1.3	1.1
October	1.2	1.2
November	1.3	1.2
December	1.1	1.3
September	1.3	1.2

4. Discussion

Razi Educational and Medical Center, Rasht, Iran, is the largest and most equipped center for internal diseases in Guilan province, including internal groups (oncology, nephrology, gastroenterology, endocrinology, and rheumatology), vascular surgery, organ transplantation (kidney and liver), and urology departments. It is also the most important center for blood transfusion in Guilan province, Iran. In this regard, the results of this study can provide valuable information on clinical management strategies. Since the Guilan province is one of the most common provinces of diseases related to hemoglobin, and on the other hand, as a province with a more elderly population compared to other provinces, the frequency of blood donors is low. On the other hand, considering the costs related to the preparation and maintenance of blood products, any wastage causes an increase in costs and a shortage of the product. According to the current study, most patients were males (54.7%), and the most frequent request and transfused blood products were packed cells. The frequency of requests and transfused blood products was higher in 2020 compared to 2021. Surgery and kidney transplantation wards had the highest C/T among the hospital units.

In a study by Rezaei et al., the frequency of transfused blood products in nine Semnan province, Iran hospitals were evaluated. The results showed that out of 32133 requests of packed cells, 7423 requests of platelets, and 12176 requests of FFP, 2911 (90.91%), 7205 (97.06%), and 11979 (98.38%) were transfused, respectively [14], which was higher than our reported frequency. The main reason for not transfusing the requested blood products was the patient's condition and the product's expiration date. A similar study by Kochak et al. investigated the frequency of requests and transfused blood products in 654 hospitalized patients in ICU, in which 327 patients received packed cells. On the other hand, the clinical outcomes of blood transfusion in patients with different hemoglobin levels were not significantly different. Also, it seems that in Iran, blood products are not transfused according to the standard protocol and international blood transfusion strategy. Considering the importance of blood transfusion, especially in the ICU, it is necessary to make arrangements to comply with standard strategies [15].

The reported C/T, according to the hospital's different units, was 1.27 and 1.18 during 2020 and 2021, respectively, and according to the months of the year, was 1.34 and 1.23 during 2020 and 2021, respectively, with the majority of transfused packed cells. Similar to our findings, a study by Najafizadeh et al. reported that the overall C/T of Vali-e-Asr Hospital, Birjand, Iran, was 1.35. The C/T of the cardiovascular surgery unit was 2.13%, which was higher than other units, and the packed cells were the most frequently transfused blood products [16]. The result of a retrospective study on transfused and wastage of blood products during 2012–2014 in Guyana illustrated that the most frequently requested blood component was packed cells. About 25 % of blood products were wasted for various reasons, which required more medical staff awareness and training to reduce blood wastage [6].

In another study conducted by Dunbar et al. in Lebanon, the amount of blood transfusion and blood wastage in three trauma centers was investigated, and the results stated that an enormous volume of blood products requested under the massive transfusion protocol was not transfused. Part of the requested blood products was wasted due to the need for careful storage and limited expired date. They suggested that it is better to schedule better policies regarding the need and requests to minimize the wastage of blood and blood products [17]. It seems that the use of the MSBOS table resulted in more reasonable requests and reduced the workload of the blood bank. To promote blood product safety and reduce the risk of infection transmission, the blood transfusion organization conducted the proper selection of donors, high-sensitivity screening tests, and affected blood sufficiency. Therefore, a proper request should be made to provide enough blood products for emergency cases [18].

The current study's findings indicated a high rate of blood wastage, which required better clinical management and training for blood requests based on the MSBOS guidelines for the proper request of blood products.

Authors' contributions

Conceived and designed the analysis: CG, BN; Collected the data: HA; Contributed data or analysis: HI; Wrote and revision the paper: CG, BN, HI, HA. All authors read and approved the final version of manuscript.

Conflict of interest

No potential conflict of interest was reported by the authors.

Ethical declarations

All patients gave their consent to participate in the study, and study design was approved by the ethical committee of the Guilan University of Medical Sciences, Rasht, Iran (IR.GUMS.REC.1400.225).

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