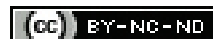


Analysis of Blood and Blood Component Wastage and its Reasons among Various Departments in a Tertiary Care Teaching Hospital in Southern India

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ABSTRACT

Introduction: The main aim of many blood centers are to supply sufficient amount of safe blood and blood components whenever required. Shortage of blood may be due to low donation rate, inadequate storage, improper transportation and wastage at ward side. Wastage of blood can have a negative impact on blood transfusion services.

Aim: To determine the rates of wastage of blood and blood components units at the ward side and identify the various reasons for wastage and explain the strategies to reduce the wastage rate.

Materials and Methods: This retrospective study was conducted in the Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India from January 2018 to December 2020. The data was collected from the blood centre record. All blood and blood components issued during the study period were included in the study. The number, type and blood group of blood and blood components issued, the number of blood units wasted after issue, and the reason for wastage was collected. The collected data were entered in Microsoft excel and analysed using Statistical Package for the Social Science (SPSS) version 21.0. Descriptive statistics were performed as necessary.

Results: During the study period, a total of 69198 units of blood and blood components were issued to different wards and operation theatres in the hospital. Among the total issues, 26863 (38.82%) were in the form of Packed Red Blood Cells (PRBC), 3968 (5.73%) in the form of Whole Blood (WB), 26069 (37.67%) in the form of Fresh Frozen Plasma (FFP), 11272 (16.29%) in the form of Random Donor Platelets (RDP), 933 (1.35%) in the form of Cryoprecipitate (CP) and 93 (0.13%) in the form of Single Donor Platelets (SDP). Among issued, 115 (0.17%) of blood and blood components were wasted with packed red cells accounting for 51 (44.35%). Among the various reasons, 43 (37.39%) was due to demise of patients before transfusion was initiated, followed by non requirement by the patients due to no loss/minimal loss blood during surgery 24 (20.87%). Majority of blood and blood components were wasted by the Department of Emergency Medicine (EMD) 36 (31.3%) followed by the Department of Neurology 20 (17.39%) and Orthopaedics 12 (10.43%).

Conclusion: Implementation of proper blood transfusion policies and continuous educational programs in coordination with clinicians and staff nurses at ward side and operation theatres will help to decrease the blood wastage at ward side.

Keywords: Blood loss, Blood usage, Education, Transfusion, Transfusion reaction

INTRODUCTION

Blood is a valuable resource and blood transfusion plays a vital role in patient management in modern medicine. The major challenge faced by the blood centre is to supply a sufficient amount of safe blood and blood components whenever required. World Health Organisation (WHO) data indicated that 87.5% of developing countries collect less than half of the blood needed to meet the transfusion requirements of their populations [1]. Shortage of blood may be due to low donation rate, inadequate storage, improper transportation and wastage at department side.

Wastage of blood can have a negative impact on blood transfusion services. Wastage of blood needs to be addressed with easy and inexpensive interventions. Through there are many reports regarding blood wastage in blood centres [2-4], but there are only very limited data on blood wastages at department side in India. Few studies from Iran and India showed the wastage of blood at department side were 16.4% and 3.2%, respectively [5,6]. With this background present study was conducted to determine rates of wastage of blood and blood components units at the department side and identify the various reasons for wastage and explain the strategies to reduce the wastage rate.

MATERIALS AND METHODS

This retrospective study was conducted in the Department of Transfusion Medicine, Sri Venkateswara Institute of Medical Sciences, Tirupati, Andhra Pradesh, India. The required data was collected from January 2018 to December 2020 and was analysed from January 2021 to February 2021.

Inclusion criteria: All blood and blood components issued during the study period were included in the study.

Exclusion criteria: All blood and blood components discarded due to reactivity of transfusion transmitted infections, outdated, leakage/broken were excluded in the study.

The data was collected from the blood centre record. The number, type and blood group of WB and blood components such as PRBC, FFP, RDP, SDP and CP issued, the number of blood units wasted after issue, and the reason for wastage were collected.

STATISTICAL ANALYSIS

The collected data was entered in Microsoft excel and analysed using SPSS version 21.0. Descriptive statistics were performed as necessary.

RESULTS

During the study period from January 2018 to December 2020, a total of 69198 units of blood and blood components were issued to

various departments and operation theatres in the hospital. There was an increase in issue of blood and blood components from 2018 to 2019 from 26287 (37.99%) to 27689 (40.01%), respectively and it drastically fell down in 2020 to 15222 (22%) due to COVID-19 pandemic [Table/Fig-1]. Among the total issues, 26,863 (38.82%) were in the form of PRBC, 3968 (5.73%) in the form of WB, 26069 (37.67%) in the form of FFP, 11,272 (16.29%) in the form of RDP, 933 (1.35%) in the form of CP and 93 (0.13%) in the form of SDP [Table/Fig-2]. Among issued, a total of 115 units (0.17%) were wasted [Table/Fig-1], out of which, 51 (44.35%) were in the form of PRBC, 42 (36.52%) in the form of FFP, 19 (16.52%) in the form of RDP, and 3 (2.61%) in the form of WB [Table/Fig-2].

S. No.	Year	Issues n (%)	Wastages n (%)
1.	2018	26287 (37.99)	43 (0.16)
2.	2019	27689 (40.01)	32 (0.12)
3.	2020	15222 (22.00)	40 (0.26)
Total		69198	115 (0.17)

[Table/Fig-1]: Year wise distribution of issues and wastage of blood and blood components.

S. No.	Component	Issues n (%)	Wastages n (%)
1.	WB	3968 (5.73)	3 (2.61)
2.	PRBC	26863 (38.82)	51 (44.35)
3.	FFP	26069 (37.67)	42 (36.52)
4.	RDP	11272 (16.29)	19 (16.52)
5.	SDP	93 (0.13)	0
6.	CP	933 (1.35)	0
Total		69198	115

[Table/Fig-2]: Component wise distribution of total issues and wastages during the study period.

WB: Whole blood; PRBC: Packed red blood cells; FFP: Fresh frozen plasma; RDP: Random donor platelets; SDP: Single donor platelets; CP: Cryoprecipitate

There were no wastage of SDP and CP. Among the various reasons for wastage recorded, 43 (37.39%) were due to demise of patients before transfusion was initiated, followed by non requirements by the patients due to no loss/minimal loss blood during surgery 24 (20.87%) [Table/Fig-3]. Among the wastage of PRBC, majority 24 (47.06%) were not utilised due to minimal blood loss during surgery. Among the FFP and RDP issues, majority were wasted due to demise of the patients after issuing the blood components [Table/Fig-3]. Majority of blood and blood components wasted belong to

S. No.	Component	Demise of patient before start of Tx (%)	No blood loss during surgery (%)	Transfusion reaction (%)	Left against medical advice (%)	Patient sick before transfusion (%)	Transfusion filter not available for TPE (%)	Vein not accessed (%)	Total (%)
1.	WB	1 (33.33)	-	-	1 (33.3)	1 (33.3)	-	-	3 (2.61)
2.	PRBC	13 (25.49)	24 (47.06)	-	4(7.84)	9 (17.65)	-	1(1.96)	51 (44.35)
3.	FFP	18 (42.86)	-	17 (40.48)	1 (2.38)	-	6 (14.29)	-	42 (36.52)
4.	RDP	11 (57.89)	-	2 (10.53)	6(31.58)	-	-	-	19 (16.52)
Total		43 (37.39)	24 (20.87)	19 (16.52)	12 (10.43)	10 (8.70)	6 (5.22)	1 (0.87)	115

[Table/Fig-3]: Reasons for wastage of blood and blood components at ward side.

WB: Whole blood; PRBC: Packed red blood cells; FFP: Fresh frozen plasma; RDP: Random donor platelets

S. No.	Component	Blood group								Total
		O		A		B		AB		
		Positive	Negative	Positive	Negative	Positive	Negative	Positive	Negative	
1.	WB	1	1	0	0	0	0	0	1	3
2.	PRBC	24	2	1	2	17	0	5	0	51
3.	FFP	9	1	6	0	17	6	3	0	42
4.	RDP	9	0	6	0	4	0	0	0	19
Total n (%)		43 (37.39)	4 (3.48)	13 (11.3)	2 (1.74)	38 (33.04)	6 (5.22)	8 (6.96)	1 (0.87)	115

[Table/Fig-4]: Group wise distribution of blood and blood component wastages.

WB: Whole blood; PRBC: Packed red blood cells; FFP: Fresh frozen plasma; RDP: Random donor platelets

O positive 43 (37.39%) followed by B positive 38 (33.04%) [Table/Fig-4], Majority of blood and blood components were wasted by the Department of EMD 36 (31.3%) followed by the Department of Neurology 20 (17.39%) and Orthopaedics 12 (10.43%) [Table/Fig-5].

DISCUSSION

During the study period a total of 69198 blood components were issued to different departments in the hospital, among these PRBC 26863 (38.82%) and FFP 26069 (37.67%) were most commonly demanded by the departments followed by RDP 11272 (16.29%), and WB 3968 (5.73%). This is similar to the study done by Kurup R et al., where PRBC and FFP were the most demanded by the departments of their hospital [7]. In another study done by Mohebbi Far R et al., in a Qazvin, packed cells (58.6%) was the most commonly requested component followed by platelets, FFP and CP [8]. In one Indian study, of the total 17634 units of blood components issued, 58.1% were packed cells, 29.4% FFP, 12.2% platelet concentrates, and 0.18% CP [6].

During the study period a total of 115 (0.17%) units were wasted out of 69198 issues by the departments present within the hospital. This is in contrast to the study done by Tahmasebi A et al., where in 16.4% units were wasted, which is very high compared to our study [5]. In a report from Iran, blood wastage was found to be 9.8% [8]. In a study by Javadzadeh SH et al., blood wastage was reported to be 12.8% [9]. Blood component wastage in study from India was recorded as 3.2% [6].

Overall, it was found from the present study that majority of wastage of blood and blood components were associated with demise of patients before initiation of transfusion (37.39%) after issue of blood followed by lack of need (20.87%) and wastage due to transfusion reaction (16.52%) of previous unit. A study from Western India reported 0.05% of blood units being discarded due to non utilisation after issue [3]. Out of 26863 units of PRBC issued, 51 (44.35%) were wasted in the present study. Among these, 24 (47.06%) were not utilised for the patients due to minimal loss of blood during surgery especially by the Department of Orthopaedics. Sudden demise of the patients was the major cause for wastages of FFP (42.86%) and RDP (57.89%) in the present study. Second most common cause for wastage of FFP was due to transfusion reaction of the previous first unit (40.48%) and hence the subsequent units were not transfused and discarded and that of PRBC was due to patients getting discharged against medical advice (31.58%) after the issue of PRBC. In the present study, there was minimal wastage of WB (2.61%). This may be due to less number of WB units being issued during the study period. In the present study there were no

Department	Component				Total (%)
	WB	PRBC	FFP	RDP	
EMD	1	13	11	11	36 (31.30)
Medicine	2	4	1	2	9 (7.83)
GS	0	4	2	4	10 (8.70)
Urology	0	0	0	2	2 (1.74)
SGE	0	3	6	0	9 (7.83)
Neurology	0	1	19	0	20 (17.39)
MO	0	1	1	0	2 (1.74)
CTVS	0	1	2	0	3 (2.61)
SO	0	2	0	0	2 (1.74)
Nephrology	0	3	0	0	3 (2.61)
OBG	0	2	0	0	2 (1.74)
Orthopaedics	0	12	0	0	12 (10.43)
RT	0	1	0	0	1 (0.87)
Cardiology	0	1	0	0	1 (0.87)
ENT	0	1	0	0	1 (0.87)
NS	0	2	0	0	2 (1.74)
Total	3 (2.61)	51 (44.35)	42 (36.52)	19 (16.52)	115

[Table/Fig-5]: Department wise distribution of blood and blood component wastages.

EMD: Emergency medicine; GS: General surgery; SGE: Surgical gastroenterology; MO: Medical oncology, CTVS: Cardiothoracic vascular surgery, SO: Surgical oncology, OBG: Obstetrics and gynecology, RT: Radio therapy; ENT: Ear neck throat; NS: Neuro surgery; WB: Whole blood; PRBC: Packed red blood cells; FFP: Fresh frozen plasma; RDP: Random donor platelets

wastages of SDP and CP during the study period. This could be attributed to the preparation and issue of these units whenever requested by the wards.

In the present study, majority of the blood and blood components were wasted by the Department of EMD (31.3%) followed by the Department of Neurology (17.39%) and Orthopaedics (10.43%). The major wastage in EMD can be attributed due to the arrival of patients in a critical stage and patients succumbing to the disease before the start of transfusion. In a study done by Tahmasebi A et al., most of the blood components (55%) were wasted by the Department of Surgery followed by the Department of Orthopaedics and EMD [5]. In another study done by Javadzadeh SH et al., maximum blood and blood components were wasted by burns (40%), cardiology (30%) and surgery (29%) wards [9].

Blood transfusion is an essential component of healthcare. In a study done by Roberts N et al., estimated that India is in need of 52.5 million units of blood components with deficiency of 40.9 million [10]. An insufficient or unsafe blood supply for transfusion has a negative impact on the effectiveness of key health services. Despite maintaining the sufficient stock at blood bank, careful management of inventories to minimise wastage is crucial.

Most of the reasons of wastage in the present study were preventable one. So, Sensitisation of doctors and residents regarding indication and ordering of blood and its components would decrease the wastage. Issue of limited units particularly in case of FFP rather than

as a bulk of six or more units would decrease the wastage of FFP due to transfusion reaction of the earlier units, so that remaining units can be utilised properly without wastage. Multiple approaches can be followed to reduce blood and blood component wastage including education on blood component usage, maintenance of cold chain of blood components by placing a blood bank refrigerator at operation theatres and emergency departments would decrease the wastages drastically as it can be received back and issued to another patient. Continued follow-up, including monthly meetings with clinical staff, distribution of blood wastage audits, and retraining of hospital staff can be helpful in reducing waste. Developing once own institution-based blood ordering policy will limit excessive blood ordering and further will reduce the wastage of blood components.

Limitation(s)

Some broad specialities like Obstetrics and Gynaecology and Paediatrics were established recently in the institute. Hence the wastage reported for those departments cannot be generalised for other institutes.

CONCLUSION(S)

Blood transfusion is an essential part of patient care. Most of the common causes of blood wastage like minimal blood loss during surgery were mostly preventable. Implementation of proper blood transfusion policies in coordination with clinicians and staff nurse at ward side and operation theatres will help to minimise the preventable wastages at department side. Continuous educational programs to improve the performance of staff will help to reduce the wastage rate and solve the shortage of these elements.

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