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An Analysis of the Unused Blood Components Return at the Teaching Hospital in North Eastern Malaysia

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Abstract

All blood components should be returned to the blood bank immediately if a decision of not to transfuse is made for reissuance or proper disposal. Improper handling of returned blood components lead to blood components wastage and may jeopardized the next recipients' safety. The aim of this study is to determine the frequency and reasons of unused blood components return and its quality indicator for the useful information of blood inventory plan in our centre. This was a cross sectional study done from August 2020 to February 2021 at Transfusion Medicine Unit, Hospital USM. Each of blood components return was examined for the type and number of units, return reasons and the quality indicator (duration of stay outside the blood bank, temperature and physical appearance changes). The totals of 620 (3.1%) units of blood components were returned from 20120 units supplied and 80.8% units of them did not fit for reissuance resulted in 2.5% wastage from the total blood products. The highest rate of returned blood component was packed red cell (4.6%). The reasons of return mostly were inappropriate where majority due to 'standby' purpose (47.4%) followed by patient death (15.6%), adequate haemoglobin level (7.6%) and a few other unacceptable reasons. The reason for unused returned blood component reflects that the indication of a transfusion request is not strongly justified. The overall rate of returned units has exceeded the storage temperature requirement is unacceptable high, resulting in the wastage of blood components. Although the number of returned blood component and wastage is small but it can affect the blood supply

Keywords
Unused blood, blood component, wastage

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Introduction

In the recent medical services, increasing demands are placed on transfusion medicine services to supply adequate blood components. Any unnecessary loss of these precious resources could be minimized and prevented by proper handling of unused blood components for reissuance. Therefore, all blood components shall be returned to the blood bank immediately if a decision is made not to transfuse as to maintain the blood cold chain. Improper handling of blood components after issuance will lead to wastage in which might significantly impact the regional and national blood supply.

The issue of transfusion safety is also one of the main concerns. There is increased risk for bacterial contamination and lead to adverse reaction mainly septic shock if the blood component was stored improperly while outside the blood bank. The standards of the American Association of Blood Bank (AABB) require that the temperature of returned blood for reissue must be maintained continuously between 1°C to 10°C [1, 2]. For this purpose, most transfusion services have set a 30 minute limit on the time that a unit of blood can be out of a monitored refrigerator [2, 3]. Previous study suggest that room temperature exposure for periods of up to 4 hours does not result in accelerated bacterial multiplication [2]. On the basis of this information, it appears that the time period could be extended to 4 hours without increased risk to the recipient provided the temperature was maintained within 1 to 10°C. Poor storage also affects lifespan and quality of the stored blood products which called "storage lesions" [4, 5]. The data showed that the mean FVIII and protein C activities were lower in post 24-hours thawed plasma [6].

Patient safety remains a priority and may present limits to complete elimination of blood components wastage. Wastage may result when: 1) the red cells are not returned before a unit exceeds a temperature of 10°C, 2) thawed or pooled components are not administered to a patient, 3) the death of a patient occurs prior to administration of thawed or pooled components and 4) the breakage of blood and component units occurs [7]. It is the blood bank responsibility to routinely monitor returned blood component as a quality assurance, investigate factors contributing and establish the systems to reduce the number of wastage.

Methods

This was a cross sectional study done from August 2020 to February 2021 at Transfusion Medicine Unit, Hospital Universiti Sains Malaysia. Our blood bank issued thawed fresh frozen plasma (FFP) and cryoprecipitate to the ward for transfusion. Each of the returned blood component was examined for the type and number of units, return reasons, and quality indicator for reissuance (duration of stay outside the blood bank, temperature and the physical changes such as broken seal, colour, haemolysis and clot). The temperature of the packed red cell (PRC), FFP and cryoprecipitate were checked upon receiving the returned units using calibrated digital thermometer.

The return blood component will be discarded if either: 1) it has been issued for more than 4 hours (based on the national guideline that all red cells should be transfused within 4 hours after issuance; 2) the temperature is over +10°C (except for platelet concentrate, PC); 3) the seal is broken; 4) there is any sign that the pack has been opened; and 5) there is any sign of haemolysis, clot or changes in the colour [1, 8, 9]. The Statistical Package for Social Sciences (SPSS) version 20.0 was used for data analysis. The reasons and frequency of returned blood component was described using descriptive statistics.

Results

The totals of 20120 units issued within the study period with 620 units (3.1%) of unused blood components were returned after issuance. The highest and lowest rate of returned blood component was PRC (4.6%) and PC (0.7%) respectively. Majority of returned units (80.8%) did not fulfil standard acceptance criteria of reissuance and need to be discarded and resulted in 2.5% wastage from the total blood products (Table 1).

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Table 1: Summary of blood component issued and returned unused (n=20120)

Blood components	Units issued, n	Units returned to blood bank, n (%)	Units not fit for reissuance, n (%)	Wastage, %
PRC	9443	432 (4.6)	362 (83.8)	3.8
FFP	4729	108 (2.3)	93 (86.1)	2.0
CP	2010	53 (2.6)	37 (69.8)	1.8
PC	3938	27 (0.7)	9 (33.3)	0.2
Total	**20120**	**620 (3.1)**	**501 (80.8)**	**2.5**

PRC=packed red blood cell; FFP=fresh frozen plasma; CP=cryoprecipitate; PC=platelet concentrate

Although the majority of each blood components were returned within acceptable time limits (79.4%, ≤4 hours), but many of them exceeded the temperature limit (77.4%, >10°C) (Table 2). The reasons of return are majority due to 'standby' purpose (47.4%) followed by patient death (15.6%) and adequate haemoglobin level (7.6%). There were a few unacceptable reasons including adequate haemoglobin (Hb) level (7.9%), mild urticarial reaction (6.9%), no venous access (3.9%) and unconsented for transfusion (0.7%) as shown in Table 3.

Table 2: The quality charteristic of unused return blood component for reissuance (n=620)

Blood components	Time frame (H), n (%)		Temperature (°C), n (%)		Physical changes[b], n (%)	
	≤4	>4	≤10	>10	No	Yes
PRC [a]	336 (77.8)	96 (22.2)	108 (25.0)	324 (75.0)	411 (95.1)	21 (4.9) [c]
FFP [a]	91 (84.3)	17 (15.7)	22 (20.4)	86 (79.6)	106 (98.1)	2 (1.9) [c]
CP [a]	37 (69.8)	16 (30.2)	4 (7.5)	49 (92.5)	53 (100.0)	0 (0.0)
PC	18 (66.7)	9 (33.3)	NA		27 (100.0)	0 (0.0)
Total	**492 (79.4)**	**128 (20.6)**	**134 (22.6)**	**459 (77.4)**	**597 (96.3)**	**23 (3.7)** [c]

[a]=1 unit may have more than one discarded criteria; [b]=include haemolysis, clot, changes in the colour or seal opened; [c]=seal opened; H=hour; PRC=packed red blood cell; FFP=fresh frozen plasma; CP=cryoprecipitate; PC=platelet concentrate; NA=not applicable since PC was stored at room temperature

Table 3: The reasons of returned unused blood component after issuance (n=620)

Reasons of returned blood component	Frequency, n	%
'Stand-by' purpose	294	47.4
Patient died	97	15.6
Adequate Hb level	47	7.6
Only required certain unit	45	7.3
Mild ATR - rash/urticaria	43	6.9
Febrile/rigor prior to transfusion	39	6.3
No venous access	24	3.9
Fluid overload	12	1.9
Not consented	4	0.7
Others	8	1.3
Unknown (reason not stated)	7	1.1
Total	620	100

AOR=at own risk; Hb=haemoglobin; ATR=acute transfusion reaction

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Discussion

Monitoring of blood component wastage is one of the quality assurance for the management of blood supply and should be monitored and analysed regularly to improved the transfusion service. Within this 8 months of the audit period, we found about 3.1% of issued blood component was returned unused.. Majority of returned units were unfit for reissuance and lead to wastage (2.5%) which was comparable with other study. Blood product wastage in other hospital was reported to range from 0.1% to 10% in which the PRC unit wastage was 1.0% and combined FFP and PC wastage ranged from 2.0-2.5% [10-14]. The wastage may resulted either from a number of reason, including inappropriate blood collection and processing as they do not meet the required specification, expiration of the usability period, products or return unused products in which not fullfill the specification of acceptance for reissuance [10-13]. Acceptance criteria for reissuance of the returned component included: 1) the primary container has not been entered; 2) temperature of the component has been maintained; 3) the component has been returned within a prescribed time frame issue and 4) visual inspection of the component is satisfied with no haemolysis, clot or changes in colour [1].

The most commonly returned blood component in our institution was PRC in contrast to what was reported by Oh and Kim, 2003 that the most commonly returned blood component was plasma component [15]. This was because the majority of PRC was prescribed as a 'standby' purposed in the operation theater (OT) which then were unused. Majority of them (75.0%) had exceeded the temperature limit of 10°C and was the main cause of the discarded component in our centre. The previous study reported similar finding that the overall rate of non-transfused PRC units returned have exceeded storage temperature requirements is unacceptably high and the temperature chain of blood bag was not well maintained [16, 17]. In contrast to our study, previous study reported that the main reason for unfit for reissue was because the units were returned after the allowable time frame [14Wong KF 2012]. Although our study showed that the most units returned within the allowable time frame, the temperature had exceeded the limit of 10°C which was unfit for reissue. It indicated improper storage of the products when they were outside the blood bank.

Another study reported that physicians and nurse are responsible for most wastage, principally by failing to return unused PRC to the blood bank before the unit exceeded a temperature of 10°C and failed to administer thawed or pooled blood products [7]. The factors involved were the personnel's lack of knowledge, awareness and training, improper shipping and storage temperature management and lack of responsibility [13]. Ensuring compliance to the protocol is logistically difficult when blood is stored or transported outside the transfusion service's supervision and control. Therefore, most importantly raising awareness of safe transfusion practice, blood component wastage and educating staff in proper handling of blood components are able to ensure a safe transfusion as well as minimizing wastage.

We found that the main reason of returned blood components was due to the prescribers order blood in access as 'stand-by' purpose especially in the OT. Same with he reason of returned units due to patient had already adequate Hb level since it indicates that the blood transfusion is not strongly indicated and non-chalance towards this precious resource. The physicians should properly assess the patient and justify first the indication of transfusion before the blood component was taken from the blood bank. These inappropriate reasons reflected a poor understanding of transfusion practice and lack of accountability when ordering blood products. There was no place for 'stand-by' blood because it is often not transfused. Akinola et al reported that even though a large number of units of PRC was made available in the OT at the time of operation, majority were not transfused resulting in a large waste of financial, laboratory and blood bank resources [16, 18]. A study in Iran revealed that the major reason for ordering blood not to be used was incorrect surgical team estimation of needed of transfusion [19]. Bearing in mind this fact, there were a high number of units returned after issuance of those particular blood units but only a small percentage of these units were actually taken for transfusion later. This reflects that the indications for the request were neither clear nor justified [20].

There was also other inappropriate reason for returned blood component which was associated with mild adverse reaction such as allergic reaction (urticaria) and patient developed fever prior to transfusion. In case of mild allergic reaction, if the attended medical practitioner or clinician has good knowledge about transfusion practice, they should continue the transfusion with appropriate treatment (e.g. antihistamin) and direct observation [21]. We also observed that a few returned blood component due to unconsented patient as well as unavailable of venous access for transfusion. This reflect that the patients were not readily prepared for blood transfusion as the informed consent and venous access were not properly checked prior to take the blood components from the blood bank. Based on our local and national guideline even worldwide, informed and valid consent for blood transfusion should be obtained before the transfusion for all patients who will likely or definitely receive a transfusion [8, 22, 23]. The wastage of the blood component can be avoided if this requirement was obtained prior to take the components from the blood bank.

The wastage due to improper handling blood component reflects a poor understanding of transfusion practice including lack of awareness and training of staff particularly in ordering and handling blood component. Our previous local study findings support this issue, as we reported a moderate level of overall knowledge (54.9%) of blood transfusion among nurses and poor knowledge in a particular component, including blood handling after delivery to the ward (24.5%) [24]. It is preventable and to solve this problem, proper local guideline or protocol of proper handling of blood components should be prepared in keeping with the continous education programme and need for accountability when ordering blood products. We found that the individuals responsible for wastage include physicians, nurses and laboratory personnel similar to which had beed reported before [7].

Conclusion

As a conclusion, the reason for unused returned blood component reflects that the indication of a transfusion request is not strongly justified. The overall rate of returned units has exceed the storage temperature requirement is unacceptable high, resulting in the wastage of blood components. Although the number of returned of the unused blood component and wastage is small but it may affect the blood supply since majority of them were not fit for reissuance. Every effort should be made to prevent wastage of this precious resource. Raising awareness of the blood product wastage problem with adequate communication and continues education about proper handling of blood components was the easiest and least expensive intervention and was most likely responsible for the majority of the early reduction in blood wastage. Regular monitoring of returned blood component wastage should be a routine quality assurance function of the Hospital Transfusion Committee for better blood supply plans.

Conflict of interest

The authors disclose no potential conflicts of interest

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