ORIGINAL ARTICLE

Outcome of Uncrossmatched Red Blood Cells Transfusion: A Retrospective Study at the University Hospital, Kelantan, Malaysia

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ABSTRACT

Introduction: The practice of uncrossmatched red blood cells (URBC) transfusion has been accepted as part of resuscitation efforts in Emergency Departments (ED), especially in the case of hypovolemic shock secondary to blood loss. This study aimed to evaluate the outcome of patients who received URBC during the resuscitation process. **Methods:** This was a retrospective cross-sectional study among patients who received at least one unit of URBC in the ED at Hospital Universiti Sains Malaysia between March 1, 2016 and December 31, 2017. The outcome of patients who received URBC were analysed descriptively and presented as numbers and percentages. Simple log regression was used to analyse the association between the number of URBC given and the outcome of the patients. **Results:** A total of 106 patients were involved in this study, with 63 (59.4%) of them were male and 43 (40.6%) were female. The mean age of these patients was 41.58 years old. For the outcome, 25 patients (23.6%) had an activation of massive transfusion protocol (MTP), 37 patients (34.9%) received emergency surgical procedure, and 28 patients (26.4%) died during hospitalisation. The mean length of hospital stay was 10.65 days (SD: 17.4). Numbers of URBC received have a statistically significant association with mortality status (p = 0.015) and activation of MTP (p = 0.02), but no significant association with the need for emergency procedure (p = 0.469). **Conclusion:** The numbers of URBC transfused can be associated with mortality and the activation of MTP.

Keywords: URBC, MTP, Emergency Department, Trauma

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INTRODUCTION

Hospital Universiti Sains Malaysia (HUSM) is one of the teaching hospitals under the Ministry of Education, located at Kubang Kerian in the district of Kota Bharu, Kelantan. Emergency Department (ED) HUSM is one division under HUSM that provides a high level of medical science, dentistry, and general health services to the public, as well as learning and research facilities. ED HUSM is categorised as a Level III Trauma Centre. It was transferred to a new building block in 2016, which is located at a significant distance (600 m) from the Transfusion Medicine Unit (TMU) HUSM. It receives and manages both trauma and non-trauma cases.

In Malaysia, blood group O RhD positive packed red blood cell (PRBC) is considered as safe O, which is used for URBC transfusion during resuscitation

process. This decision is made based on the fact that RhD negative phenotype is rare in Malaysia (1). The usage of RhD negative blood as URBC should only be reserved for women in childbearing age whose RhD type is unknown, patients aged below 18 years old, or patients who have difficult to determine Rh type, during intrauterine transfusion, transfusion among new-borns, and transfusion in patients with preformed antibodies (2, 3).

The current practice in ED HUSM dictates that the decision to transfuse URBC is decided by a senior medical officer or registrar in charge during that particular shift. Currently, eight units of URBC and eight units of fresh frozen plasma (FFP) of blood group AB are placed at the ED HUSM to be used during resuscitation process. This decision was made after clinical evaluation and bedside ultrasound of the volume status of the patient. For the time being, there is no specific protocol for URBC transfusion in ED. URBC is supplied when the patient is in critical need of blood transfusion, and that any delay would end up in mortality or severe morbidity. Judicious use of blood is highly recommended, despite the availability of URBC in ED HUSM. This is because

blood is considered a scarce resource and transfusion of URBC is not without risk. Moreover, transfusion of URBC is a strong predictive factor for mortality, which requires a massive transfusion protocol (MTP) activation (4). Hence, this study aimed to evaluate the outcome of patients who received URBC transfusion during resuscitation in the ED, as well as to determine the association between the number of URBC used and the outcome of the patients.

MATERIALS AND METHODS

This was a retrospective cross sectional study that involved the records of all patients who received URBC in the Emergency Department HUSM for any indication as part of the resuscitation procedure from March 1, 2016 until December 31, 2017. The inclusion criteria for this study were patients who received at least one unit of URBC at ED HUSM, patients who were older than 18 years old, and that the information needed for this study were completely documented in the patient's medical record. Patients with incomplete documentation or untraceable medical record during the study period, and those who already received blood transfusion from the referring centre, were excluded from this study. Out of 156 patients who received URBC at ED HUSM, only 106 patients were included in this study based on the inclusion and exclusion criteria. These patients were further divided into two groups: trauma and non-trauma patients. From the total of 106 patients, 58 were trauma patients, while the remaining 48 were non-trauma patients. The trauma group included motor vehicle accidents (MVA), intra-abdominal injuries, polytrauma due to alleged fall, either from a tree or a multi-storey building, and assaults. Non-trauma cases would include per vaginal (PV) bleed and gastrointestinal (GI) bleed.

Ethical approval for this study was obtained from Jawatankuasa Etika Penyelidikan Manusia (JePEM) or the Human Research Ethics Committee, Universiti Sains Malaysia. Data were entered and the statistical analysis was conducted using the Statistical Package for Social Sciences (SPSS) software, version 22. Data were calculated using the 95% confidence interval. The demographic and outcome of patients who received URBC were analysed using descriptive analysis. Results for the descriptive analysis are presented as numbers, percentage, median, and mean. Simple logistic regression was used to determine the association between the number of URBC given and the outcome of the patients. The analysed outcomes were mortality, the need for MTP activation, the need to proceed to emergency procedure, and length of hospital stay.

RESULTS

Characteristics of Patients

Table I summarises the demographic characteristics of patients who received URBC in the ED HUSM. From

Table I : Characteristics of patients who received URBC (n = 106)

Variables	n (%)	Mean (SD)	Median (IQR)	Range
Age		41.48 (18.89)*	35.0 (31)	18– 85
Gender				
Male	63 (59.4)			
Female	43 (40.6)			
Number of URBC used		1.34 (0.65)	1.0 (1.0)**	1 – 5
1	76 (71.7)			
>1	30 (28.3)			
Type of causes				
Trauma	58 (54.7)			
Non- trauma	48 (45.3)			

the total of 106 patients, 63 (59.4%) were male and 43 (40.6%) were female. The age of patients who received URBC ranged between 18 and 85 years old, with a mean age of 41.58 years old. The maximum number of URBC used was five units for one patient. Most of the patients received only one unit of URBC during resuscitation. There were 58 trauma patients, while the remaining 48 were non-trauma patients.

Outcomes

Out of 106 subjects, 25 patients (23.6%) had an activation of MTP, 37 patients (34.9%) proceeded to receive emergency surgical procedure, and 28 patients (26.4%) died during hospitalisation. The mean length of hospital stay was 10.65 days (SD: 17.4) (Table II) ranging from 0 to 102 days.

Table II : Outcome of patients who received URBC in ED HUSM (n=106)

Variables	n (%)	Mean (SD)
Activation of MTP		
No	81 (76.4)	-
Yes	25 (23.6)	-
Mortality		
No	78 (73.6)	-
Yes	28 (26.4)	-
Proceed to emergency procedure		
No	69 (65.1)	-
Yes	37 (34.9)	-
Length of hospital stay (day)		10.65 (17.4)

Association Between of Number of URBC and Outcomes

The number of URBC received has a statistically significant association with mortality status (p = 0.015) (Table III) and activation of MTP (p = 0.02) (Table IV), but no significant association with the need for emergency procedure (p = 0.469) (Table V). Each additional unit of URBC given had increased the chance of mortality by 4.1 times and increased the chance of MTP activation by 2.36 times when other confounders were not adjusted.

DISCUSSION

Blood group O RhD negative PRBC units are often used in emergency transfusions as they are considered safe

Table III: Association between number of URBC and mortality status among trauma patients by simple logistic regression (n = 58)

Variables	Regression coefficient (b)	Crude Odds ratio (95% CI)	Wald statistics	p value
Number of URBC	1.409	4.092 (1.318, 12.706)	5.942	0.015

Table IV: Association between number of URBC used and the activation of MTP among trauma patient (n = 58)

Variables	Regression coefficient (b)	Crude Odds ratio (95% CI)	Wald statistics	p value
Number of URBC	0.858	2.358 (1.144, 4.861)	5.470	0.020

Table V: Association between number of URBC and the need for emergency procedure among trauma patients by simple logistic regression (n = 58)

Variables	Regression coefficient (b)	Crude Odds ratio (95% CI)	Wald statistics	p value
Number of URBC	0.286	1.332 (0.613, 2.891)	0.524	0.469

to be transfused to patients with non-O blood groups. It is a known fact that blood group O RhD negative red blood cells have neither A nor B antigen. They are sometimes called the universal blood donors. Therefore, they are compatible with all other ABO and RhD blood groups, making them the most suitable blood product for emergency uncrossmatched transfusions. By principle, blood group O RhD negative PRBC should be used in all emergency transfusions for safety reasons. However, due to the larger demands for blood group O RhD negative PRBC compared to the supply, there will be problems in supplying these blood products to patients. In Malaysia, blood group O RhD-positive PRBC units are used as URBC during resuscitation process. This decision is made based on the fact that RhD negative phenotype is rare in Malaysia (1). Based on a study by Musa R. H. *et al.* (2012) at the National Blood Centre Malaysia, the percentage of RhD positive subjects were more than 97.5% among all races, which were 99.5% among Malays, 98.5% among Chinese, and 91.7% among Indians (1).

In this study, more than half of the subjects were male. However, previous studies showed percentages of more than 70% (5, 6) of male patients receiving URBC compared to the result found in this study. Another study showed similar findings with the results in this study (40.6% of female subjects), and they included non-trauma cases in the usage of URBC, mainly bleeding gynaecological cases (7).

The mean age among recipients of URBC in the ED HUSM was 41.5 years old, which was quite close to the result obtained by Ball *et al.* (2011) that showed a mean age of 45.2 years old. The most common reason for uncrossmatched RBC transfusion among younger patients was due to gynaecological bleeding. However, another study recorded a lower mean age of 38 years

old (4). There was a wide range of ages among the recipients of URBC in the ED HUSM, from 18 years old to 85 years old. Most of the elderly patients who required transfusion of URBC were experiencing GI bleed and intra-abdominal bleeding, including ruptured abdominal aortic aneurysm (AAA).

The overall mortality rate of patients requiring URBC transfusion in this study was 26.4%. This was similar to the finding by a study from Marburg, Germany, which showed 26% of mortality rate among patients who received URBC transfusion (8). The author reported that each additional unit of URBC given had increased the chance of mortality activation of 4.1 times, which was supported by other studies (4, 9). A higher mortality rate was seen in the group of patients who received more packed red cells during resuscitation. In general, the use of URBC and the activation of MTP are in close association in many situations. Based on the findings in this study, the increment of one unit of URBC could lead to 2.36 times the odds of activating MTP, and that the clinician must re-assess the dynamic status of the patient following the initiation of URBC. The decision to initiate MTP depends on the clinical features and bedside ultrasound of the managing team. This situation may explain why only 23.6% of patients who were initially transfused with URBC ended with MTP activation later. The group of patients who did not received MTP might have been assigned to a good responder, and they showed positive improvements during the assessment following the transfusion of URBC. As the dynamic and physiological aspects of patients would vary from one patient to another, repeated assessment and evaluation of patients following the initiation of URBC transfusion is important to prevent unnecessary MTP activation that can lead to wastage of blood and blood products (10).

Mean length of hospital stay among patients who received URBC in the ED HUSM was 10.4 days, ranging from 0 to 102 days, which was consistent with most studies. Day 0 of admission indicated the mortality cases that occurred in the ED. The longest hospital stay was 102 days, which involved a case of motor vehicle accident with complicated multiple trauma, and prolonged intubation and ventilation. Ball *et al.* (2011) reported that the mean length of hospital stay was 9.1 days, with a range of 1 to 105 days, which was similar to the findings in this study. Malone *et al.* (2003) concluded that hospital length of stay will be increased if patients receive blood transfusion within the first 24 hours after trauma. They observed that the length of stay among patients who received blood transfusion within the first 24 hours was 14 days, with SD of ±16 days. Meanwhile, a group of patients who did not receive blood transfusion within the first 24 hours stayed at the hospital for only 3 days, with SD of ±6 days (11). Inaba *et al.* (2008), in their study at the Los Angeles County and the University of Southern California Medical Center, recorded the mean length of hospital stay among who received

URBC during resuscitation in ED as 18.9 days, with SD of ±22.7 days. In comparison, the group of patients who did not receive URBC transfusion in ED had a shorter length of hospital stay of 17.5 days, with SD of ±19.4 days (4).

In this study, 23.6% of patients eventually needed MTP activation. Findings from this study also showed that there was a significant association between the numbers of URBC transfused with the activation of MTP. Each additional unit of URBC given increased the chance of MTP activation by 2.36 times. Sisak *et al.* (2013) showed that 43% out of 91 patients who received early transfusion in ED would eventually activate MTP during resuscitation (12). Nunez *et al.* (2010) found that patients who received URBC at their Level I trauma centre at the Vanderbilt University Medical Centre in southeastern USA were three times more likely to receive massive transfusion. They concluded that transfusion of URBC should be considered as a potential trigger for the activation of MTP (13). A study in Texas reported that the transfusion of URBC was associated with the activation of MTP. Most of the patients presented to the ED requiring transfusion of URBC had sustained severe injuries, and they required a massive transfusion (9).

An emergency procedure is defined as when a patient needs a prompt procedure for lifesaving purpose in the ED. In this study, only 36 patients (35%) who received URBC in the ED proceeded to receive an emergency procedure. The most common emergency procedures among patients who received URBC in ED HUSM were exploratory laparotomy, uterine suction and curettage, uterine dilatation and curettage (D&C), oesophagogastro-duodenoscopy (OGDS), wound washout, wound debridement, and external fixation. A study by Unkle *et al.* (1991) noted that 56% of patients who received URBC during resuscitation in ED proceeded to have various emergency procedures. The most common procedures found in their study were laparotomy, thoracotomy, exploration of multiple cavities, and basic orthopaedic surgery. Their study was conducted at the Level I trauma centre involving 135 trauma patients, which differed from the setting of this current study (14). Similarly, Ball *et al.* (2011) found that 64% of patients who received URBC in ED proceeded to emergency procedure. The most common procedures in their study were laparotomy, thoracotomy, limb and neck exploration, and exploration of multiple cavities or anatomic areas (5).

CONCLUSION

The numbers of URBC transfused were associated with mortality and could lead to the activation of MTP. However, the number of URBC received was not a predictive factor for the need to proceed to an emergency procedure.

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