

Blood utilization in orthopedic and trauma practice

Bader Kamal Tayara, Moaad Hatim Al-Faraidy, Faisal Abdullah Al-Sayel, Abdallah S Al-Omran, Mir Sadat-Ali

Department of Orthopaedic Surgery, College of Medicine, King Fahd Hospital of the University, Al Khobar, Saudi Arabia

ABSTRACT

Objectives: Very little is known about blood utilization in orthopedic and trauma surgery and there is no definite policy in this regard. Our objective is to perform an audit on our practice of blood utilization in the orthopedic department. **Methods:** We have retrospectively analyzed the data of patients who were admitted between January 2011 and December 2012 to the orthopedic male, female and pediatric wards for which blood products were requested. **Results:** Three hundred and eight patients were admitted for surgery during the study period. The average age was 35.12 ± 20.4 years and postsurgery they stayed in the hospital for 25.60 ± 10.5 days. Blood products were requested for 223 trauma surgeries. In elective orthopedic procedures, only 42.78% of the blood requested was utilized while in trauma patients it was 55.25%. **Conclusions:** A substantial amount of blood and its product was used in trauma and elective orthopedic surgeries. There was a major discrepancy between the blood requested and utilized and secondly in the majority single unit transfusion was utilized, which is not within the fundamentals of blood transfusion.

Key words: Blood transfusion, orthopedic surgery, trauma, utilization

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INTRODUCTION

Blood transfusion is an important part in the management of the sick and the injured. In US yearly 24 million blood and its products are used.^[1] The use of blood is quite common in orthopedic and trauma surgery; in the former situation of elective surgery of total joint arthroplasty and scoliosis the use of blood components is quite high. Chiavetta *et al.*^[2] reported that in over 31% of blood is utilized by cardiac and orthopedic surgeons, but still there is very little literature on utilization of blood in orthopedic and trauma surgery.^[3]

During the resuscitation of trauma patients most of the surgeons if not all overestimate the anticipated blood

requirement and order cross-matching of blood, which may never be used. Even for elective surgery over-ordering is not uncommon.^[4,5] Subramanian *et al.*^[6] reported that only 40% of ordered blood was utilized in elective general surgery and 22% in neurosurgery practice. Elective orthopedic surgery is also not free from such wastage of blood. Rogers and Johnstone^[7] reported that by proper guidelines they could reduce transfusion ordering by 50%. Recently, Hall *et al.*^[8] found that over ordering was still quite common in their practice in United Kingdom.

In our institution, we still lack the policy of maximum surgical blood ordering schedules (MSBOS) and no national guidelines and in the absence of such instruments it is possible that there is every chance of over ordering of the blood products. Just to get the proper answers of our practice of ordering and utilization, this retrospective analysis was undertaken.

METHODS

We have retrospectively analyzed the data of patients who were admitted between January 2011 and December 2012 to the orthopedic male, female and pediatric wards for which blood products were requested. Patients were subdivided into four groups: Patients admitted as emergency due to trauma, patients admitted for elective surgery, patients operated-upon

Address for correspondence: Prof. Mir Sadat-Ali,
P.O. BOX 40071, King Fahd Hospital of the University,
Al Khobar 31952, Saudi Arabia.
E-mail: drsadat@hotmail.com

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as emergency, and trauma patients put on elective list due to any cause.

Demographics included, age, sex, type of injury, admitted for trauma or cold orthopedic surgery, surgery done elective or emergency, presurgery hemoglobin, total amount of blood and its components requested, X-matched and used. Blood utilization was compared for between variables of trauma and orthopedic surgery, elective versus emergency surgery. Different components of blood was also separated depending the usage; packed red blood cells (PRBCs), fresh frozen plasma (FFP), cryoprecipitate (CRYO), and platelets (PLTs). The following calculations were made to achieve the cross-match: Transfused ratio = Number of units cross-matched divided by number of units transfused and transfusion index (TI) = Number of units transfused divided by number of units cross-matched.

Data was analyzed by computing Student's t-test by using SPSS version 14.0 (Chicago, Illinois, USA). $P < 0.05$ was considered significant.

RESULTS

Three hundred and eight patients were admitted for surgery during the study period. The average age was 35.12 ± 20.4 years and postsurgery they stayed in the hospital for 25.60 ± 10.5 days. A total of 628 units were utilized, PRBC 351 units, FFP 182, PLTs concentrate 74, 16 Fibrinogen and 5 CRYO units. Table 1 gives the details of limb fractures and majority of the injuries were sustained due to road traffic accidents (66.8%). Eighty-five patients who underwent elective orthopedic surgery, blood products were requested (arthroplasty hip and knee 51, Spine scoliosis and degenerative spine 21, developmental hip dysplasia 9 and corrective osteotomy 4). Table 2 shows the units requested, and units utilized in the three most common elective procedures. Out of 223 trauma cases 169 were operated as emergency and 54 as elective [Table 3]. The figure for elective versus emergency surgery was 52.25% and 55.11%. A single unit transfusion was done in 71.91% in orthopedic and 75.46% in trauma procedures while 70.4% single unit transfusion in emergency and 75.5% during elective procedures [Table 4]. In 3.71% patients had massive transfusions. A total of 628 units were utilized, PRBC 351 units, FFP 187, PLTs 74 and fibrinogen in 16 units.

DISCUSSION

Our study shows significant difference between the requested blood products, cross-matched and its utilization in elective orthopedic procedures only 42.78% of the blood requested

Table 1: Site of trauma requiring blood transfusion

Site of fractures	Percentage of patients (total patients 223)
Femur shaft+distal	58
Tibia and fibula	34
Spine	31
Pelvis+acetabulum	27
Humerus	27
Proximal femur	21
Radius and ulna	12
Mangled extremity	13
Multiple fractures	41
Fractures with vascular injury	17

Table 2: Preoperative hemoglobin level and units transfused in major orthopedic surgery

Procedures	Preoperative hemoglobin (g/dl)	Units requested	Units utilized
TKR	11.89±1.68	2.42±0.83	1.36±0.68
THR	10.2±2.31	3.57±0.78	2.39±0.71
Scoliosis correction	10.9±1.87	4.1±1.89	3.9±1.1

TKR: Total knee replacement; THR: Total hip arthroplasty

Table 3: Data of patients with trauma surgeries

Variable	Trauma
Number of patients	223
Age years	34.53±19.36
Preoperative hemoglobin (g/dl)	12.15±2.36
Blood components requested	3.54±3.12 (766)
Blood components transfused	1.85±2.19 (400)
Single unit transfused	163

Table 4: Data of patients with emergency and elective surgeries

Variable	Emergency	Elective	P (95% CI)
Number of patients	169	139	
Age years	32.48±21.27	34.53±19.36	0.1
Preoperative hemoglobin (g/dl)	12.2±2.77	12.15±2.36	0.1
Blood components requested	3.81±3.33	3.54±3.12	0.2
X-match and hold	1.52±1.05	1.59±1.22	0.2
Blood components transfused	2.1±2.66	1.85±2.19	0.1 (<0.5802)
Single unit transfused	119	105	0.01 (<25.63)

CI: Confidence interval

was utilized while in trauma patients it was 55.25% and secondly in 71.91% in orthopedic and 75.46% in trauma procedures the utilization was too low.

Subramanian *et al.*^[6] reported a nonutilization of 76.86% of ordered blood in their study, which is not too far from our findings. In this study, a total of 1625 blood components were requested, and only 478 were utilized. The cross-match to TI was much lower 0.83:1, indicating that we are using more blood than cross-match which may not be in the interest of patient care as in real emergency the delay in transfusion could be life and death situation for the patient. Jayaraneet *et al.*^[9]

found that the overall computed tomography (CT) ratio was 5.0 and many procedures were found to have a high CT ratio and a low TI. Arulselvi *et al.*^[10] reported that in their review of general surgery, neurosurgery, orthopedics and emergency medicine departments and 4320 patients found that none of the departments had an index of over cross-match to transfusion ratio of 2.5:1.

Blood transfusion, which could be massive at times, is the fundamental facet in the management of trauma patients and is a life-saving exercise. It is believed that in trauma patients the request for blood components and utilization is high but in our study we found that our utilization was 55.25%, whereas Arulselvi *et al.*^[10] reported a high transfusion rate (94%) among trauma patients. The British Committee for Standards in Haematology Blood Transfusion Task Force indicated that CT ratio >2.5 is indicative of poor blood utilization.^[11]

In the absence of the MSBOS in our institution as yet which could improve the efficiency of blood utilization, we believe the ideal CT ratio of 1–2:1 and TI of 1 for our settings, even though a CT ratio >2.5 and TI >0.5 was described as significant blood utilization.^[12] In this study, we were able to analyze three most common elective procedures and the CT ratio for scoliosis correction was 4.1–3.9 units [Table 2].

McWilliams *et al.*^[13] found that failure to follow MSBOS leads to surgical delays and in our institution we found that cancellations of surgical procedures due to disagreements between the anesthetists regarding the quantity and timing of availability of blood. Frank *et al.*^[14] found that there is a wide variation among surgeons and their procedures, and individual anesthesiologists and these factors need to be incorporated in the blood management program.

There are few limitations of our study. One of them being the retrospective nature of this study in which we could not gather all the information for accurate analysis. The strength of this audit is that this is the first study undertaken in the institution and the country regarding blood utilization in orthopedic and trauma practice. In conclusion our study highlights that there is a discrepancy between the blood requested, cross-match and transfused. The gaps need to be filled up by formulating and practicing institution-based

MSBOS or any other similar protocol for proper optimizing the use of blood components.

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