Transfusion Triggers and Requirements in Adult Critically Ill Patients

Essay
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By
Hythem Mohammed Mamdouh Abdel Meguid Barakat
M.B.B.Ch
Ain Shams University

Supervised by

Prof. Dr. Nahed Effat Youssef
Professor of Anesthesiology and Intensive Care Medicine
Faculty of Medicine, Ain Shams University

Assist. Prof. Dr. Hanan Mahmoud Farag
Assistant Professor of Anesthesiology and Intensive Care Medicine
Faculty of Medicine, Ain Shams University

Dr. Hany Ahmed Abdel Kader
Lecturer of Anesthesiology and Intensive Care Medicine
Faculty of Medicine, Ain Shams University

Faculty of Medicine
Ain Shams University
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LIST OF ABBREVIATIONS

Abbrev.	Full term

- AABB : American association of blood banks
- ACA : Anti-cardiolipin antibody
- ADP : Adenosine diphosphate
- ALI : Acute lung injury
- AML: Acute myeloid leukemia
- Anti-ApoH: Anti-Apolipoprotein H
- APACHE : Acute physiology and chronic health evaluation
- aPL: Anti-phospholipid antibody
- APS : Antiphospholipid syndrome
- aPTT/aPtt : Activated partial thromboplastin time
- ARDS : Acute respiratory distress syndrome
- AT : Anti-thrombin
- Bl : Blood
- CAPS : Catastrophic antiphospholipid syndrome
- CBC : Complete blood count
- CCI : Corrected count increment
- CHF : Congestive heart failure
- CHR : Reticulocyte hemoglobin concentration
- CI : Confidence interval
- CIT : Chemotherapy-induced thrombocytopenia
- CJD : Creutzdieldt-Jacob disease
- CMV: Cytomegalo virus
- CPB : Cardiopulmonary bypass
- DIC : Disseminated intravascular coagulopathy
- DNA : deoxyribonucleic acid
- DO_2 : Systemic oxygen delivery

LIST OF ABBREVIATIONS

Abbrev.	Full term

- DPG : Diphosphoglycerate
- DRVVT : Dilute Russel's viper venom time
- EACA : Epsilon-aminocaproic acid
- EBV : Epestein-Barr virus
- ELISA : Enzyme linked immunosorbent assay
- EPO : Erythropoeitin
- FDA : Food and drug administration
- FDP : Fibrinogen degradation product
- FFP : Fresh frozen plasma
- GI : Gastrointestinal
- HAV: Hepatitis A virus
- Hb/HB : Hemoglobin
- HBV : Hepatitis B virus
- HCV : Hepatitis C virus
- HELLP : Hemolysis, elevated liver enzymes, low platelets
- HIT : Heparin-induced thrombocytopenia
- HIV : Human Immunodeficiency virus
- HLA : Human leukocytic antigen
- HLH : Hemophagocytic lymphohistiocytosis
- HMWK: High molecular weight kininogen
- HTLV : Human T-lymphotropic virus
- HUS : Hemolytic uremic syndrome
- GPLU: IgG anti-IgG phospholipid units
- ICH : Intracranial hemorrhage
- ICU : Intensive care unit
- Ig : Imuunoglobulin
- IL : Interleukin

LIST OF ABBREVIATIONS

Abbrev.	Full term

- INR : International normalization rate
- KCT : Kaolin clotting time
- LAC : Lupus anti-coagulant
- LMWH : Low molecular weight heparin
- MACE : Major adverse cardiac event
- MCV : Mean corpuscular volume
- MPLU: IgM anti-Igm phospholipid units
- NAT : Nucleic acid amplification testing
- NO : Nitric oxide
- nuCJD: New variant Creutzdieldt-Jacob disease
- PAI: Plasminogen activator inhibitor
- Pcc/PCC : Prothrombin complex concentrate
- PF : Platelet factor
- PFA: Platelet function analyzer
- Pt/PT: Prothrombin time
- PTP : Post-transfusion purpura
- PPR : Percent of platelet recovery
- PVO_2 : Mixed venous oxygen partial pressure
- RBC : Red blood cell
- rFVIIa : Recombinant factor VIIa
- RT : Reptilase time
- SCD : Sickle cell disease
- SD : Standard deviation
- SIRS : Systemic inflammatory response syndrome
- sTFR : Soluble transferrin receptor
- SVO_2 : Mixed venous oxygen saturation
- T-PA/TPA : Tissue plasminogen activator

LIST OF ABBREVIATIONS

Abbrev.	Full term

- TDT/DTT : Dilute thromboplastin time
- TF : Tissue factor
- TFPI : Tissue factor pathway inhibitor
- TM : Thrombotic microangiopathy
- TNF : Tumor necrosis factor
- TRALI : Transfusion related acute lung injury
- TT : Thrombin time
- TTP : Thrombotic thrombocytopenic purpura
- VO_2 : Oxygen consumption
- vWF : von Willibrand Factor
- WBC : White blood cell
- WHO : World health organization

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INTRODUCTION

Triggers for transfusion of blood and blood products have always been a controversy in medicine especially critically ill patients with their different comorbidities. Multiple trials have been made in order to come up with guidelines or triggers for this common practice and many have been published and used ***(Ansari and Szallasi, 2011)***.

Anemia, thrombocytopenia and coagulation problems are common hematological abnormalities encountered regularly in intensive care units (ICUs). The causes of all are multifactorial, making diagnosis of the problem difficult. The causes of anemia range from blood loss to myelosuppression. Various studies have shown that lower hemoglobin (Hb) threshold levels (7 g/dl) for transfusion are appropriate and even safer than higher levels in hemodynamically stable patients. However, the transfusion trigger should be decided in individual patients depending on their comorbidities ***(Drews, 2003)***.

Every effort should be made to find and treat the cause of thrombocytopenia, which may be life-threatening and is, in itself, a poor prognostic feature in ICU patients. Sepsis and drugs are the most frequently encountered causes of thrombocytopenia. Management should include treatment of the

underlying cause, together with platelet transfusion, which may be life-saving but also contraindicated in some causes of significant thrombocytopenia ***(Chaari et al., 2011)***.

Coagulation defects range from simple abnormal clotting tests to frank disseminated intravascular coagulation (DIC). Prothrombin time (Pt) and activated partial thromboplastin time (aPtt) are the most commonly performed tests to screen for causes of bleeding. However, they are not wholly predictive of the bleeding diathesis. Management of coagulation abnormalities is to treat the underlying cause and in the bleeding patient to consider the use of blood products such as fresh frozen plasma (FFP) or a prothrombin complex concentrate (Pcc) ***(Girish et al., 2009)***.

Surveys have consistently shown that anemia is common on admission to the intensive care unit (nearly 75% of patients) and is almost universal by the end of the first week after admission. About half of intensive care unit patients with anemia are given one or more transfusions of concentrated erythrocytes (packed red blood cells) to correct the problem. Few intensive care units employ practice guidelines to standardize transfusion therapy, and in most cases blood transfusions are given without documented evidence of need or benefit ***(Thomas et al., 2010)***.

Blood transfusion in certain patient populations has

certain and different considerations, an example would be cardiac patients. Although there is evidence that anemia in the presence of cardiovascular disease is associated with cardiac morbidity, there is also growing evidence to suggest that red blood cell transfusions not only may not be helpful but in fact may be harmful to at least some patients ***(Willis and Voeltz, 2009)***.

The incidence of clinically significant thrombocytopenia (<100,000/μL) is 13 to 35% in medical and surgical ICUs (Strauss et al., 2002). However, thrombocytopenia is not the only cause of platelet dysfunction. Platelet adhesion defects are an important factor in platelet dysfunction and must be considered during the decision of platelet transfusion ***(Chaari et al., 2011)***.

In 2007, **Lauzier and his coworkers** found that only 32.4% of the fresh frozen plasma (FFP) orders were consistent with guidelines, and 67.6% were inconsistent with the transfusion guidelines ***(Lauzier et al., 2007)***.

Blood and blood product transfusions have it's drawbacks and complications such as hemolysis, febrile non-hemolytic reactions, anaphylaxis, circulatory overload, transfusion related lung injury, graft versus host reactions, and infection transmission. Blood transfusion complications incidence range from as low 0.00003% up to 38% per

transfusion ***(Kuriyan and Carson, 2004)***.

The importance of early detection of a transfusion reaction, particularly in a critically ill patient, cannot be over-emphasized. Knowledge of the type of symptoms associated with these reactions, and the awareness that any symptom that occurs in the patient during a transfusion is suspected until proven otherwise, this is essential for patient safety. Use of appropriate blood use criteria and strict adherence to standard policies and procedures for patient, sample, and product identification will minimize risks ***(Kuriyan and Carson, 2004)***.

AIM OF THE WORK

The aim of this review is to explore the different triggers that could be implemented when transfusing blood and it's products and try to unify a standard set of triggers for transfusion within the population of adult critically ill patients, as well as discuss the complications of such a practice, and the possible methods that may be used in order to minimize blood and blood product transfusion.