Use of Blood Products in Critically ILL Patients

Essay

*Submitted for Partial Fulfillment of Master Degree **in** **Intensive Care***

Presented By

Mohamed Fakeeh Saker El-Fors
(M.B., B.Ch.)

Under Supervision of

Prof. Dr. Gamal Fouad Saleh Zaki
Professor of Anesthesiology and Intensive Care
Faculty of Medicine - Ain Shams University

Dr. Hazem Mohammed Abd El-Rahman
Assistant Professor of Anesthesiology and Intensive Care
Faculty of Medicine - Ain Shams University

Faculty of Medicine
Ain Shams University
٢٠١٢

قالُوا سُبْحَانَكَ لاَ عِلْمَ لَنَا إِلاَّ مَا عَلَّمْتَنَا إِنَّكَ أَنتَ الْعَلِيمُ الْحَكِيمُ

صدق الله العظيم

سورة البقرة آية (٣٢)

*In the name of **God** the Most Gracious and most Merciful, for bestowing his blessings upon me, granting me the power to proceed and for stretching out his hand with knowledge to help me accomplish this work.*

*There are no words to show my appreciation for **Prof. Dr. Gamal Fouad Saleh Zaki,** Anesthesiology and Intensive Care Faculty of Medicine-Ain Shams University, for his enormous help, for the enduring wisdom that this work retains from his invaluable years of expertise and input. His constructive criticism, meticulous revision, his guidance, and tremendous support that enabled me to accomplish this work.*

*My Sincere and deepest gratitude to **Prof. Dr. Hazem Mohamed Abdel Rahman Fawzy,** Anesthesiology and Intensive Care Faculty of Medicine - Ain Shams University for his genuine help and providing his time and effort, for his continuous encouragement, valuable support and generous recommendations.*

Mohamed Fakeeh Saker El-Fors

Contents

List of Abbreviations

٢،٣ DPG	٢،٣ diphosphoglycerate
AABB	American Association of Blood Bank
AHTR	Acute hemolytic transfusion reaction
AIDS	Acquired immunodeficiency disorders
Amp	Adenosine mono phosphate
AmpK	Adenosine mono phosphate kinase
APACHE	Acute physiology and chronic health evaluation
ARDS	Adult respiratory distress syndrome
ATIII	Antithrombin-III
ATP	Adenosine triphosphate
ATPase	Adenosine triphosphatase
BT	Blood transfusion
Ca^{++}	Magnesium
CGMP	Cyclic guinedine mono phosphate
CoHb	Carboxyhemoglobin
CPD-A	Citrate - p - phosphate d-dextrose a - adenine
Cr	Chromium
DDAVP	Desamino-٨-D arginine vasopressin
DHTR	Delayed hemolytic transfusion reaction
DIC	Disseminated intravascular coagulopathy
EPO	Erythropoietin
FATR	Febrile associated transfusion

List of Abbreviations (Cont.)

FDPs	Fibrin degradation products
FFP	Fresh frozen plasma
G٦PD	Glucose ٦-phosphate deficiency
GMP	Guanidine monphosphate
GP	Glyco protein
GTP	Guineden triphosphate
GVHD	Graft versus host disease
HAV	Hepatitis A virus
Hb	Hemoglobin
HBcAg	Hepatitis B core antigen
HBOCs	Hemoglobin-based oxygen carriers
HBsAg	Hepatitis B surface antigen
HBV	Hepatitis B virus
HCT	Hematocrite
HCV	Hepatitis C virus
HEV	Hepatitis E virus
HIT	Heparin induced thrombocytopenia
HLA	Human leucoytic antigen
HR	Heart rate
HTLV	Human T-cell leukemia – lymphoma virus
HUS	Hemolytic uremic syndrome
INR	International normalization ratio

List of Abbreviations (Cont.)

K^+	Potassium
MetHb	Methemoglobin
Na^+	Sodium
NADH	Nicotinamide adenine dinucleotide
NTBI	Non transfusion buounded iron
PPF	Plasma protein fraction
PRBCs	Packed red blood cells
PRP	Platelet rich plasma
PTH	Post-transfusion hepatitis
RBC	Red blood corpuscle
RES	Retriculoendothelial system
TACO	Transfusion associated circulatory overload
TA-GVHD	Transfusion acquired graft versus host disease
TRALI	Transfusion related acute lung injury
TRICC	Transfusion requirement in critical care
TTP	Thrombocytopenic purpura
vCJD	Variant creutz feldt-jakob disease (mad cow disease)
VWF	Vonwillberand's factor

List of Tables

List of Tables (Cont.)

Tab. No	Title	Page

List of Figures

Introduction

The art of fluid administration and hemodynamic support is one of the most challenging aspects of treating critically ill patients. Transfusions of blood products continue to be an important technique for resuscitating patients in the intensive care settings ***(Markoo et al., ٢٠٠٩).***

Much before William Harvey gave the theory of blood circulation in ١٦٢٨, the idea of blood transfusion from young and healthy individuals to the old for restoration of good health had appeared in the mind of man, then blood transfusion process had been developed over the last centuries and decades until ١٩٨١ after discovery of Acquired Immunodeficiency Syndrome (AIDS) virus, blood transfusion services gained special attention and a separate specially name "Transfusion Medicine" ***(Madhusudanan et al., ٢٠٠٣).***

Blood is transfused either as whole blood or in the form of one of its components like: red cell concentrate, red cell suspension, leucocytes, depleted red cells (buffy coat), leucocyte depleted red cells, plasma, platelets concentrates and plasma fractionation ***(Madhusudanan et al., ٢٠٠٣).***

Anemia (with or without associated blood loss) is common among patients admitted to intensive care units (ICUs). It affects ٩٥ percent of patients who stay in the ICU longer than three days and greater than ٤٠ percent of patients receive red blood cell transfusions while in ICU.

In addition, patients may also receive other blood products to manage coagulopathy or active bleeding. The

appropriate use of blood products requires an understanding of the potential risks and benefits ***(Corwin et al., ٢٠٠٤).***

Allogenic blood transfusion has long been associated with both infectious and non infectious risks, although today's blood supply is safer than ever from various pathogens, infectious risks have not been completely eliminated because of limitations in current detection methods and the potential risks of transfusion are often under-recognized compared with infectious risks, but they are far more common, exceeding infectious risks but many. Considering the numerous complications associated with blood transfusion, it is important to develop various strategies to minimize unnecessary transfusions and to ensure the safe and appropriate use of blood and blood products when necessary ***(Lawrence et al., ٢٠٠٨).***

For many decades, the decision to transfuse red blood cells was based upon the "١٠/٣٠ rule": transfusion was indicated in all patients in order to maintain a blood hemoglobin concentration above ١٠ g/dL (١٠٠ g/L) and a hematocrit above ٣٠ percent ***(Wang et al., ٢٠١٠).***

However, concern regarding transmission of blood-borne pathogens and efforts at cost containment caused a re-examination of transfusion practices in the ١٩٨٠s. The ١٩٨٨ National Institutes of Health Consensus Conference on Perioperative Red Blood Cell Transfusions suggested that no single criterion should be used as an indication for red cell component therapy and that multiple factors related to the patient's clinical status and oxygen delivery needs should be considered.

Accordingly, the decision to transfuse erythrocytes must be based upon an assessment of the risks of anemia versus the risks of transfusion ***(Walsh et al., ٢٠٠٤).***

Transfusion of red blood cells or another blood product is common in the intensive care unit (ICU).as mention before It has been estimated that greater than ٤٠ percent of patients receive one or more red blood cell transfusions while in the ICU, of which approximately ٩٠ percent are provided in the context of stable anemia. The appropriate use of blood products requires that the potential benefits and risks be carefully weighed for each patient. Indications and complications of blood product transfusion in the ICU are reviewed here, as well as the various types of blood products. Other issues related to transfusion of blood products are discussed separately ***(Walsh et al., ٢٠٠٤).***

Aim of the Work

The aim of this work is to review the current literature for the modern guidelines and strategies governing the use of blood product in critically ill patients.