J Arch Mil Med. 2016 May; 4(2):e39341. doi: 10.5812/jamm.39341.

Published online 2016 May 28. **Editorial**

Endless Improvement of Transfusion Medicine in Military Medical Organizations

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Received 2016 May 20; **Accepted** 2016 May 20.

Keywords: Transfusion Medicine, Military Medical, Blood Transfusion

The third international congress of transfusion medicine held in Tehran during 15 - 17 December 2015 focused on the theme of evidence-based use of blood and blood components. More than 600 participants from 16 different countries attended the event.

After holding two successful international congresses of transfusion medicine in 2007 and 2011,the third congress was jointly organized by high institute for research and education in transfusion medicine, Iranian blood transfusion organization, international society of blood transfusion (ISBT), Asian association of transfusion medicine (AATM), French blood service, European school of transfusion medicine (ESTM), school of military medicine (Aja University of medical sciences) and world health organization (WHO) collaborating center for research and training on blood safety.

Around 108 million units of donated blood are collected globally every year. This shows an increase of almost 25% from 80 million donations collected in 2004. Nearly 50% of these blood donations are collected in high-income countries, home to less than 20% of the world's population. In other words, approximately half of these are collected in high-income countries, home to 15% of the world's population (1) (Figure 1).

In low-income countries, up to 65% of blood transfusions are given to children under five years of age; whereas in high-income countries, the most frequently transfused patient group is over 65 years of age, accounting for up to 76% of all transfusions.

Blood donation rate in high-income countries is 39.2 donations per 1000 individuals; 12.6 donations in middle-income and 4.0 donations in low-income countries. Statistics indicate a high rate and significant increase in blood donation in Iran, where 100% of the donations is voluntary (95% non-related and 5% family relatives) (2, 3).

The congress was opened by Dr. Ali Akbar Pourfathollah, managing director of the Iranian blood transfusion organization (IBTO). Dr. Pourfathollah remarked that 41 years since the establishment, IBTO has achieved considerable improvements in different fields such as reaching a rate of 27 blood donations in 1000 individuals (even better, 30/1000 in Central provinces) and 52% regular blood donations (4).

The history of blood transfusion could be tracked back to the Great War and the first blood bank innovated by Colonel Oswald Hope Robertson from US army in 1915, though the first official blood bank was established in Chicago in 1937. Likewise, the first blood bank in Iran was established in the military hospital of Tehran by general brigadier professor M.A. Shams in 1952, followed by another center in the Iranian Red Crescent by Dr A.Azhir. After several years, IBTO was established in 1974, as a non-profit organization by Dr. Fereydoon Ala. Currently, the IBTO has 30 official regional centers and more that 280 donation sites across the country. The blood donation rate in Iran has substantially increased by about 60% from 1998 to 2007 (3, 5-7).

During the opening ceremony, Dr. Fereydoon Ala, founder of IBTO was honored for his lifelong excellence and perfection.

The congress covered a wide range of topics ranging from recruitment of voluntary blood donors, blood safety and quality control, thrombosis & homeostasis, blood transfusion in pediatric and obstetrics, blood transfusion in disasters, cell therapy, plasma-derived medicines, hemovigilance to patient blood management.

The main theme of the congress was evidence-based use of blood components and plasma-derived medicines. The evidences showed that the irrational use of blood and blood components is one of the main concerns of blood providers. The WHO strategy for blood safety emphasizes the need to reduce unnecessary transfusions through the appropriate clinical use of blood and using blood alternatives. The congress offered an exciting scientific program

that covers a wide range of topics to meet the needs of everyone working in this area of medicine such as nurses, surgeons, hematologists and the staff of blood services and laboratories.

The main topics of the congress were: patient blood management, blood safety and quality control, thrombosis and homeostasis, pediatric hematology, cell therapy, donor and donation, immunohematology and anesthesiology and blood transfusion in war and disasters.

The congress included a scientific session about blood transfusion and blood banking during war and disasters. Given the long history of blood transfusion and blood banking in military medicine, in this session, important challenges and opportunities about the panel subject was discussed. The following are the abstracts of the presentations in this session. JAMM international welcomes comments by the respected readers and future submissions about this issue.

Management of Blood Transfusion and its Components During War

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Trauma to the army personnel is common at battlefields. Uncontrolled major hemorrhage occurs from both blunt and penetrating trauma, which may lead to hypovolemic shock and death. Controlling the source of bleeding is a priority. In these victims damage control resuscitation is a systematic approach to major trauma. The aim of damage control resuscitation is to aggressively minimize hypovolemic shock and limit the development of coagulopathy, hypothermia and acidosis known as lethal triad.

This new therapeutic paradigm differs considerably in many important respects from previous management strategies for catastrophic blood loss. The main elements of damage control resuscitation are immediate correction of specific coagulopathies, induced by hemorrhage and management of several extreme homeostatic imbalances that may appear after resuscitation. Clotting factor declines in the bleeding patient but this decline is often out of proportion compared to the reduction that is due to dilution alone. Trauma-associated coagulopathy is attributed to one of four basic mechanisms including: qualitative platelet defect, diffuse endothelial cell injury, depletion of coagulation factors and platelet or secondary to disseminated intravascular coagulation (DIC).

Following initial stabilization, the aim is to prevent or reverse complications that worsen outcomes such as hypothermia, electrolyte disturbances, metabolic acidosis and coagulopathy. This can be achieved through close monitoring of the patient.

Keywords: War; Blood Management; Trauma

Alternatives of Blood Components During War

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Background: In a battle or war zone, blood is a precious commodity that must be supplied quickly and safely. Blood transfusions have been shown to be lifesaving in combat casualties since World War I. Development of the first blood substitutes, dates back to the early 1600s, and the search for the ideal blood substitute continues. A number of driving forces have led to the development of artificial blood substitutes. One major force is the military, which requires a large volume of blood products that can be easily stored and readily shipped to the site of casualties. Frozen blood products have been used on deployed military operations since the Vietnam War. Since World War II, the search for a suitable alternative for blood has been intensified, to enable coping with war-like situations and large-scale civilian disasters. The purpose of this study was to review the potential clinical uses of erythrocyte substitutes and frozen blood products in treating military battlefield casualties, with specific emphasis on combat injury rates and wounding patterns, resuscitation doctrine and logistic requirements.

Methods: Review of published military medical literature and unclassified documents from the armed forces blood program.

Results: Hemorrhage is the leading cause of death on the battlefield. Early intervention, with definitive treatment, could save up to 30% of soldiers who are killed in action or who die of wounds. The role for oxygen-carrying fluids in the initial management of military injuries is undefined; however, erythrocyte substitutes have many benefits compared to donated blood and could reduce the logistic requirements for blood in field hospitals.

Conclusions: Safety, long storage life, light unit weight, availability, low cost, universal compatibility, and tolerance to environmental extremes are all characteristics that are necessary for blood substitutes to extend or replace the use of stored blood in treating battlefield casualties.

Keywords: War, transfusion, artificial blood, frozen blood

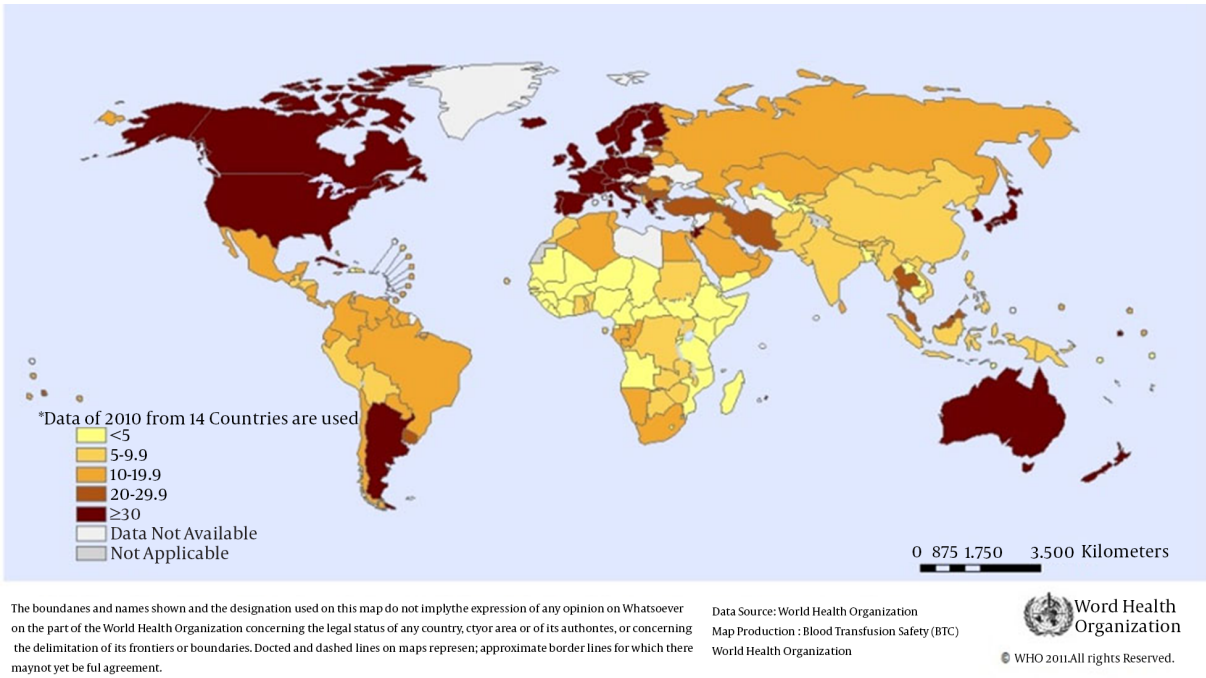

Figure 1. Global Whole Blood Donation per 1000 Individuals, 2011, World Health Organization

Blood Transfusion During War: History and Considerations

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Providing blood for the recipient is not an easy task at all. During war much more effort is required.

The most important medical advancement of World War I was blood transfusion. About a century later, along the multiple wars around the world, the development continued and resulted in a thoughtful flexible emergency plan, standardized blood bank program, blood loss management, blood storage and its products, bloodless surgery and donor recruitment strategies. Local blood supply is considered a critical factor in conquering such emergencies during war.

Usage of war garment goes back to fifth century B.C by the Chinese. Invention of Kevlar fiber by Stephanie kwolek in 1964 revolutionized the bullet-proof vest industry. Nanotechnology was utilized in 2005. During year 2008, usage of synthetic silk, which is twenty folds stronger than steel, has been the latest innovation. Dog tags are invaluable sources of information in the battlefield. They are two copies of personal information, blood type, inoculation history and even special medical conditions. This idea was used for the first time in 19th century.

Adolf Lorenz started bloodless surgery at the beginning of the 20th century. Volume expander, autologous transfusion and blood substitute are utilized. Special surgical instruments such as gamma knife, electrocautery, Aragon beam and hypotensive anesthesia are needed. Intra-operative blood salvage and acute normovolemic hemodilution are also useful. The defense minister of the US focused on empowering the army doctor by training bloodless surgery.

Pre-transfusion screening include routine ABO and Rh type, Ab screening and Ab identification in some circumstances. Management of blood transfusion during war is an interdisciplinary task. Army national blood organization media are the cornerstone of an appropriate blood bank program.

Keywords: War; Blood Transfusion; History

Figure 2. Scientific Session of the Blood Bank and Blood Transfusion During War and Disaster at the 3rd International Congress of Transfusion Medicine, Tehran, Iran, December 2015

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