Massive Transfusion Protocol for Family Physicians Practicing Obstetrics

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Abstract: Exsanguinating hemorrhage requiring massive transfusion of blood products is a rare but devastating complication in obstetrics. Mortality is reduced with transfusion of packed red blood cells, plasma, and pheresed platelets in a ratio approaching six to six to one. Implementation of massive transfusion protocols in the hospital obstetrical setting will allow hospital blood banks to provide blood products in a more expeditious manner. These protocols would be intended for use only in those patients with exsanguinating traumatic, surgical, and obstetrical medical conditions requiring massive transfusion.

Introduction

Transfusion may become necessary in the obstetrical setting when blood losses become significant and vital signs become unstable. Blood products including packed red blood cells and clotting factors, as well as volume resuscitation, become critical to ensuring adequate oxygenation of tissues and perfusion of vital organs.

Postpartum hemorrhage within twenty four hours of delivery[1] remains a significant cause of maternal morbidity and mortality worldwide. Uterine atony, retained products, lacerations, and uterine rupture[1], as well as complications from disseminated intravascular coagulation (DIC) remain as major causes for the use of blood products on labor and delivery.

Trauma in pregnancy[3] is also one of the leading causes of morbidity and mortality in pregnancy. Motor vehicle crashes and the associated physical trauma complicates one in twelve pregnancies. Two thirds of all trauma in pregnancy results from motor vehicle crashes. Placental abruption is found in forty to fifty percent of pregnant women who have sustained trauma. Likewise fifty percent of fetal losses from maternal trauma are the result of placental abruptions. Pelvic fractures resulting from maternal trauma may result in significant retroperitoneal bleeding which is frequently associated with hypovolemic shock.

Experience from the Iraqi war and other recent war time missions have suggested that expeditiously treating massive blood loss with packed red blood cells and fresh frozen plasma in a one to one ratio[3 & 4], along with transfusion of pheresed platelets with every sixth unit of packed red blood cells results in a three - fold reduction in mortality of wounded troops[5]. Knowledge gained from battlefield medical units has resulted in red cell, plasma and pletelet replacement for massive hemorrhage. These changes have been have been quickly adopted by hospitals in the United States.

Methods

Between 2008 and 2010, a regional trauma center in West Central Alabama saw eighteen patients per year (1.5 patients per month) who required a massive blood transfusion. Massive transfusion is defined

as the transfusion of ten units of packed red blood cells in twenty four hours [5], or replacement of fifty percent or more of the patient's total blood volume within two hours [6].

Eighty five percent of surgeons and trauma center directors responding to a survey in *Transfusion* (July, 2010)[7] reported the use of a massive transfusion protocol. However there was quite a bit of variation in the protocols across hospitals. The authors believe the implementation of a massive transfusion protocol would allow hospital blood banks to provide blood products in a more expeditious manner. The protocol would lower morbidity and mortality in those patients requiring massive transfusion of blood products.

A literature search was conducted relating to massive transfusion protocols and research done in the last two decades. Hospital protocols, commentaries, clinical trials, and guidelines were reviewed. The hospital also utilized its experiences over the last two years.

Results

Eligible patients benefit from the timely implementation of massive transfusion protocols. Eighty five percent of surgical trauma centers in the United States have massive transfusion protocols. Massive transfusion protocols are intended for use only in those patients with exsanguinating traumatic, surgical, obstetrical or other medical conditions that require massive transfusions of blood products. This protocol should not be implemented in any other situation. The protocol should be initiated timely by the responsible emergency room physician, attending surgeon, obstetrician/gynecologist, or responsible attending physician, or at the request of the blood bank. The protocol deals with the procurement of blood products and the appropriate initial and follow up lab evaluations that will be needed during the resuscitation and immediately thereafter.

In addition to the following guidelines, re-warming the patient has also been shown to improve survival. Hypothermia may contribute to complicating coagulopathies [8]. A one degree Celsius decrease in body temperature results in a ten percent decrease in clotting factor activity. Re-warming techniques include warm blankets, blood and fluid warmers, and increasing the patient's room temperature where the resuscitation is taking place.

Pre - transfusion labs should include hemoglobin and hematocrit (CBC), prothrombin time (PT), partial thrombin time (PTT), International Normalized ratio (INR), fibrinogen, ionized calcium and other routine labs as indicated. Red blood cells and fresh frozen plasma should be transfused in a one to one ratio. Furthermore, one unit of pheresed platelets should be transfused after the first six red blood cell and fresh frozen plasma units.

Laboratory studies should be repeated and subsequent transfusion decisions should be guided by lab results, maintaining a six to six to one ratio of packed red blood cells to fresh frozen plasma and pheresed platelets[4 & 9]. If clinical evidence of a coagulaopathy is present, consideration should be given to cryoprecipitate transfusion. Physicians must be aware that massive transfusion with packed red blood cells and saline may dilute coagulation factors and worsen a coagulopathy [10 & 11].

The following is the massive transfusion protocol developed by one of the authors at DCH Regional Medical Center in Tuscaloosa, Alabama (VRW):

Massive Transfusion Guidelines

Draw CBC, PT, PTT, INR, Fibrinogen, Type and screen, ionized calcium, and standard trauma labs, if indicated

Establish adequate IV access

Implement procedures to maintain patient normothermia (warming blankets, blood and fluid warmers, increased room temperature).

The Blood Bank will immediately emergency release up to six units of O negative blood for patients of unknown sex or females under age fifty. O positive units will be released for all other patients, if the blood type is unknown. Type specific blood will be released if the blood type is known.

Red blood cells should be transfused through a blood warmer; consideration should be given to the use of a rapid transfusor.

Blood Bank will immediately begin thawing up to six units of fresh frozen plasma (approximate wait time thirty minutes). These will be sent along with one unit of pheresed platelets as soon as they are available.

CBC, fibrinogen, PT, PTT INR should be repeated following transfusion.

An additional four units of group type specific red blood cells should be prepared. Only immediate spin cross match will be performed. Up to six units may be requested.

Blood Bank will contact patient care area and ask if these are needed prior to release. Blood bank will also inquire about the need for additional units of fresh frozen plasma. If needed, four additional units of fresh frozen plasma will be thawed. Up to six units may be requested.

Red blood cells will be sent emergency release if pre-transfusion testing has not been completed. Paperwork may be completed by ordering/responsible physician or his designee once the crisis has passed.

If clinical or laboratory evidence of a coagulopathy is evident, consideration should be given to cryoprecipitate transfusion after the second round of RBC/FFP/platelet transfusion i.e. (ten to twelve RBC's, ten to twelve units FFP and two units of platelets).

In summary, massive transfusion protocols have been shown to prevent exsanguinating hemorrhage in many situations including massive obstetrical hemorrhage, trauma and surgery. Recent developments in battlefield and civilian trauma experience have shown that mortality is reduced with transfusion of packed red blood cells, plasma, and pheresed platelets in a ratio approaching six to six to one [13].

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