TITLE
TRANSFUSION OF BLOOD COMPONENTS AND PRODUCTS

OBJECTIVES

- To provide Emergency Medical Services (EMS) direction to ensure the safe handling and transfusion of blood components and blood products, that supports and aligns with the parent document, Alberta Health Services (AHS) Transfusion and Administration of Blood Components and Products Policy.

- To assist EMS health care professionals to know how and when to discontinue the transfusion, to recognize the signs and symptoms of a reaction, to administer the treatment for the reaction, and to properly document.

APPLICABILITY

Compliance with this document is required by all Alberta Health Services employees, members of the medical and midwifery staffs, students, volunteers, and other persons acting on behalf of Alberta Health Services (including contracted service providers as necessary).

ELEMENTS

1. Scope of Practice

1.1 All pre-hospital considerations to initiate blood components and products by Paramedics for adult patients are made in consultation with Online Medical Consultation (OLMC) physician or, when assigned, the Transport Physician (TP). Blood Components and Products Appendix A and Blood Group Compatibility Appendix B.
1.2 All AHS EMS Paramedics can contact an OLMC or the TP for any reason associated with changes in the patients condition.

   **Note:** Air Ambulance events shall have an assigned and available TP. In *order* to maintain continuity of patient care, whenever possible, the TP shall be consulted instead of the OLMC.

1.3 If a sending physician ordered the blood components and products, initiation of blood components and products took place in an AHS medical facility, and there is no change in the patients condition, then there is no requirement for any added orders of blood components and products by OLMC or the TP.

1.4 Paramedics shall not initiate a transfusion in pediatric patients.

1.5 Paramedics shall monitor transfusion of blood components and products in pediatric patients.

1.6 Emergency Medical Technicians (EMTs) and Emergency Medical Responders (EMRs) may not initiate, monitor or maintain blood components and products.

1.7 When blood components and products have been discontinued, EMTs and EMRs may monitor patients for signs and symptoms of **adverse reactions**.

2. **Competency**

2.1 Competency with the transfusion of blood components and products is directed by the AHS *Transfusion of Blood Components and Products* Policy.

3. **Patient Informed Consent**

3.1 Paramedics shall confirm that patient **informed consent** has been obtained before initiating or continuing a transfusion.

3.2 It is the responsibility of the **most responsible health practitioner** to have obtained express written consent prior to the transfusion of blood components and products and shall document this on the **patient care record (PCR)**. Please refer to AHS *Consent to Treatment/Procedure(s)* Policy Suite.

3.3 In the context of emergency health care, please refer to AHS Consent Health Services *Consent to Treatment/Procedure(s)* Policy suite.

4. **Laboratory**

4.1 Laboratory Services of the sending AHS medical facility shall fill out the section “Completed by Sending Laboratory” of the AHS *Final Disposition of Transported Blood Components Record* prior to EMS receiving the blood transport container.

4.2 The AHS *Final Disposition of Transported Blood Components Record* is used for all patients to track units of blood that are transfused outside of a sending AHS medical facility. AHS Laboratory Services attach the record to the blood transport
container from the sending AHS medical facility. If a record has not been placed on the blood transport container, an AHS Final Disposition of Transported Blood Components Record still needs to be completed.

4.3 EMS attending Paramedic will:

a) Record each transfusion on an AHS Final Disposition of Transported Blood Components Record Form.

b) If a blood transport container has been prepared for transport, the transport container should only be opened at the time that a transfusion will be initiated.

c) Fill out the section “Completed by EMS/Patient Transporter”.

d) Should an adverse reaction occur while providing care, fill out the section “Time of Transfusion Reaction”.

e) Transfer patient care to a receiving AHS medical facility health care professional.

f) Document details of the transfusion and occurrences the PCR.


5.1 Blood components and products are listed in Appendix A Blood Components and Products.

5.2 Patient informed consent has been completed and documented.

5.3 In preparation to initiate administration of blood components and products, the Paramedic shall:

a) Confirm physician order for blood components and products;

b) Confirm Transfusion Service Identification Number (TSIN); on the patient wristband matches the TSIN on the blood unit assigned to the recipient. The TSIN will not be present if the blood units are not cross-matched.

c) Perform hand hygiene;

d) Apply body substance isolation / personal protective equipment (PPE)

e) Perform patient assessment;

f) Obtain history and measure baseline vital signs;

g) Document on PCR and time stamp all information gathered from the assessment, history and baseline vital signs (continue to documenting changes in the patient condition);
h) Determine treatment plan; and

5.4 Verify the patient identity.

a) Accurate identification of the intended recipient is a crucial step in ensuring transfusion safety. Most fatal hemolytic transfusion reactions occur due to incompatibility between the donor and recipient blood types. The most common cause of the incompatibility is the patient misidentification.

Note: If a discrepancy is found, stop the process until the discrepancy is resolved and/or Transfusion Medicine/Laboratory is contacted.

b) Confirm patient identity as per the AHS Patient Identity Verification Policy

c) Confirm the following information by two (2) health care professionals:

(i) Patient’s first name, last name;

(ii) Patient’s personal health number (PHN) and hospital record number;

(iii) blood component and product types; and

(iv) Blood component and product unique identifiers, pooled unit numbers or lot numbers.

d) In an emergency, the requirements in (a) above do not apply.

(i) EMS health care professionals shall not refuse or delay a health service to a patient based on the inability to verify their identity.

(ii) The patient shall be assigned to a temporary unique identity number for use until the patient’s identity can be verified.

(iii) The safest Blood Type to administer is recipient blood group O.

6. Blood Components and Products Patient Administration Preparation

6.1 Inspect the blood components and products, assessing for the absence of clotting or clumps, cloudiness, leaks or other abnormalities. If any abnormalities are noted, do not transfuse.

6.2 If no problems are noted, start flow:

a) Ensure the roller clamps on both lines of the blood administration tubing are closed.

b) Attach the blood components and products and the bag of normal saline.
c) Open the roller clamp on the normal saline and charge the blood administration tubing with saline to the predetermined level.

d) Then close the roller clamp on the normal saline.

7. **Vascular Access**

7.1 A single patent, healthy intravenous access site is required for blood components and products administration. Other medications or intravenous (IV) or intraosseus (IO) fluids should be administered through a separate site.

7.2 Intravenous or Intraosseous lines should be labelled appropriately.

7.3 Infuse Normal Saline or solutions compatible with blood components and products.

7.4 Venipuncture: Cannulate a large vein, using aseptic techniques, with a minimum 20 gauge (G) angiocath in adults, and attach the blood administration tubing to the IV.

7.5 Intraosseous: Blood components and products can be administered through an intraosseous line if necessary.

8. **Blood Components and Products Transfusion**

8.1 Begin infusion slowly – rate should be no faster than two (2) millilitres (mL) per minute for the first 15 minutes, while monitoring the patient for any signs of an adverse reaction. Supporting information is found at Transfusion Medicine.

8.2 In the absence of any adverse reactions, set the administration rate as ordered by the OLMC physician or the TP (generally two to four [2 – 4] millilitres per kilogram per hour (mL/kg/hr), unless indicated for significant blood loss).

8.3 Continue monitoring patient according to the AHS EMS Medical Control Protocol (MCP) or Critical Care Medical Control Protocol (CCMCP) Standard Approach and Ongoing Assessment.

9. **Blood Components and Products Adverse Reaction**

9.1 When symptoms of blood components and products adverse reaction presents, stop the transfusion and take the following steps to treat the patient:

   a) Ensure emergency medications and equipment is accessible.

   b) Replace the blood components and products and administration set with a normal saline line.

   c) Administer a normal saline infusion using a “to keep vein open” (TKVO) rate.
d) If patient is presenting with signs and symptoms of an adverse reaction, treat according to the appropriate AHS EMS MCP or CCMCP

e) Treat shock and be sure to monitor urine input and output.

f) Place patient on high flow oxygen, monitor electrocardiogram (ECG) and peripheral oxygen perfusion (SpO2).

g) Consult OLMC or the TP for support and recommendations for patient stabilization.

9.2 Process for blood container and administration set:

a) Properly contain by storing in a plastic biohazard bag.

b) Provide direction to the receiving AHS medical facility health care professional to return to the laboratory.

c) Document the signs and symptoms, blood container unit/lot number that elicited the reaction, on the:

   (i) PCR document;

   (ii) AHS Final Disposition of Transported Blood Components Record.

10. Blood Components and Products Completion of Transfusion

10.1 When the blood components and products administration is complete, remove the empty unit bag, and administer additional units (when required) or clamp the tubing if finished.

10.2 Repeat the administration process for each additional unit that is to be administered.

a) Blood administration sets may have to be changed every two (2) units, as the filter will gradually become clogged.

b) A new administration set must be used when changing the type of blood products and components being transfused.

c) Document on each copy of the patient care record and the AHS Final Disposition of Transported Blood Components Record:

   (i) TSIN number

   (ii) Blood components and products (may use blood unit stickers);

   (iii) Date and time of initiation and completion of each unit;

   (iv) Signs and symptoms of adverse reactions and unit which elicited the reaction;
Any blood components not administered (should be documented as “not administered” on the AHS Final Disposition of Transported Blood Components Record and PCR.

Record on the PCR where the blood products were left and with whom at receiving site.

10.3 Discard emptied blood containers into a yellow biohazard container.

10.4 Any blood components and products that are left over and have not been administered should be documented as “not administered” on the Final Disposition of Transported Blood Components Record.

a) Leave any unused units in the blood transport container with accompanying paperwork.

11. Prothrombin Complex Concentrate (PCC) – Octaplex and Beriplex Administration

11.1 Consult OLMC or the TP to confirm indications for blood components and products administration.

11.2 Obtain and document informed consent.

11.3 Reconstitute the PCC according to the manufacturer’s monograph.

11.4 Administer PCC 1000 units IV/IO (40 mL) (initial rate one [1] mL/minute for five to 10 minutes, then two to three (2 – 3 mL/minute).

11.5 Administer Vitamin K 10 milligrams (mg) IV over 30 minutes.

11.6 In case of continued bleeding 15 – 20 minutes after the completion of the infusion, and following collection of proper blood specimens for the laboratory tests, a second dose of Vitamin K might be given if clinically indicated.

11.7 Repeat dosing of Vitamin K is not required for second or third doses.

DEFINITIONS

**Adverse reactions** means the signs and symptoms of minor or major life-threatening reactions are similar and, at the time of onset, impossible to differentiate. It is critical to obtain a detailed history and perform a thorough assessment prior to initiating blood components / products administration as many of these signs and symptoms may already exist due to the patient’s chronic or acute health problems. Adverse reactions are considered a transfusion reaction.

**Blood components** means the therapeutic parts of blood used for transfusion, namely, packed red blood cells, plasma, platelets and cryoprecipitate (Canadian Society for Transfusion Medicine, Standards for Hospital Transfusion Services).

**Blood products** means the therapeutic parts of blood derived from plasma by manufacturing companies. Examples include albumin, intravenous immune globulin, and prothrombin complex
concentrates (Canadian Society for Transfusion Medicine, Standards for Hospital Transfusion Services).

**Health care professional** means an individual who is a member of a regulated health discipline, as defined by the *Health Disciplines Act* [Alberta] or the *Health Professions Act* [Alberta], and who practises within scope and role.

**Informed consent** means the agreement of a patient to undergo a treatment/procedure after being provided with the relevant information about the treatment/procedure(s), its risks and alternatives, and the consequences of refusal.

**Most responsible health practitioner** means a health practitioner who has responsibility and accountability for the specific treatment/procedure provided to a patient who is authorized by Alberta Health Services to perform the duties required to fulfill the delivery of such a treatment/procedure(s), within the scope of his/her practice.

**Online Medical Consultation (OLMC)** means a physician providing consultation and medical control over a radio, by phone or through some other form of instant communication to Emergency Medical Services.

**Order** means a direction given by a regulated health care professional to carry out specific activity (-ies) as part of the diagnostic and/or therapeutic care and treatment, to the benefit of a patient. An order may be written (including handwritten and or electronic), verbal, by telephone or facsimile.

**Patient care record (PCR)** means the document created to record patient care, demographic and billing information. This document may be stored electronically or on paper.

**Patient(s)** means an adult or child who receives or has requested health care or services from Alberta Health Services and its health care providers or individuals authorized to act on behalf of Alberta Health Services. This term is inclusive of residents, clients and outpatients.

**Personal health number (PHN)** means the patient’s health care insurance number assigned to the patient by the provincial/territorial/federal government. (Health Information Act [Alberta])

**Personal protective equipment (PPE)** means any specialized clothing or safety items worn by individuals prior to contact with potential or identified hazards, such as from a direct exposure to blood, tissue, and/or body fluids.

**Transfusion Service Identification Number (TSIN)** means a tag or label attached to a blood components or blood products that has been designated for a specific recipient, specifying information that identifies the blood components or blood products for that recipient.

**Transport Physician (TP)** means the physician who supports red/critical patient processes and all medical consultation needs for Air Ambulance.
REFERENCES

• Appendix A - Blood Components and Products
• Appendix B - Blood Group Compatibility
• Alberta Health Services Governance Documents:
  o Consent to Treatment/Procedure(s) Policy suite
  o Services Patient Identity Verification Policy
• Alberta Health Services Resource Documents:
  o Alberta Health Services Laboratory Services/Transfusion Medicine Blood Components
    and Products Information
  o Alberta Health Services Laboratory Services Transfusion Medicine Acute Transfusion
    Reaction Algorithm Table http://www.albertahealthservices.ca/3318.asp
APPENDIX A

BLOOD COMPONENTS AND PRODUCTS

Cryoprecipitate

a) Derived from plasma, contains fibrinogen and other factors

b) Indicated in Haemophilia A, Von Willebrand’s Disease, or as replacement therapy for factor VIII and fibrinogen in cases of uncontrolled bleeding and coagulopathy (i.e. part of a massive transfusion protocol)

c) A typical dose is 6-10 units

d) Each unit of cryoprecipitate is between 10-20 ml

e) Stored frozen and must be thawed in a special warmer prior to administration

Frozen Plasma (FP)

a) Contains all of the coagulation factors normally present in plasma, including factors V and VIII (required for the conversion of prothrombin to thrombin)

b) Restoration of coagulation factors needs to be considered on all cases of blood loss

c) Generally, one unit of FP should be administered for every 4 to 6 units of RBC’s that are transfused

d) Each unit of FP is between 200-250 ml

Red Blood Cells (RBC’S)

a) RBC is made from a unit of whole blood where 80% of the plasma is removed and a preservative solution is added; erythrocytes make up 40-65% of the remaining volume

b) Improves oxygen carrying capacity and minimizes volume expansion

c) Each unit of RBC is approximately 300 mL

d) Warmed normal saline is administered concurrently

Platelets

a) Indicated in cases of massive blood transfusion, severe thrombocytopenia, or abnormal platelet function

b) Each dose of platelets is either:
   - A pool of 4 donor units suspended in plasma, or
   - Apheresis: an equal volume from 1 donor suspended in plasma
Whole Blood

a) All components of Blood

b) One unit of whole blood is approximately 450 mL

c) Not available as a transfusion products in Alberta

Prothrombin Complex Concentrate (PCC) – Octaplex

a) Lyophilized plasma concentrate that is composed of the Vitamin K dependent coagulation factors II, VII, IX, X, Protein C and Protein S

b) Indicated for the reversal of coagulopathy for warfarin related bleeding

c) Reconstituted solution contains approximately 25 units of prothrombin complex per ml

d) Standard dosing is based on factor IX units; each vial of PCC will be assumed to contain 500 units of factor
## Manufactured Blood Products

<table>
<thead>
<tr>
<th>Class</th>
<th>Manufactured Blood Products</th>
<th>EMS Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td></td>
<td>Major, life-threatening bleeding in patients with an INR greater than 1.5 on warfarin therapy of Vitamin K deficiency</td>
</tr>
</tbody>
</table>

| Dosage | Repeat | 1000 units (40 ml) SIVP | Every 15 minutes to a total maximum of 3000 units (120 ml) |

| EMS Contraindications | History of Heparin induced thrombocytopenia |

<table>
<thead>
<tr>
<th>Notes</th>
<th>Not recommended for:</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Disseminated Intravascular Coagulation</td>
</tr>
<tr>
<td></td>
<td>Coagulopathy associated with liver dysfunction / disease</td>
</tr>
<tr>
<td></td>
<td>Massive transfusions</td>
</tr>
<tr>
<td></td>
<td>Reversal of anticoagulants other than Vitamin K antagonists</td>
</tr>
<tr>
<td></td>
<td>Treatment of elevated INR’s without bleeding or need for surgical intervention</td>
</tr>
<tr>
<td></td>
<td>Follow up INR/PT, PTT and Fibrinogen should be performed 10-15 minutes after infusion and prior to repeat doses.</td>
</tr>
<tr>
<td></td>
<td>Observe closely for signs of any unwanted or untoward reactions.</td>
</tr>
<tr>
<td></td>
<td>No other drugs / solutions can be co-administered in the same line while PCC is being infused.</td>
</tr>
<tr>
<td></td>
<td>May be supplied in one of two products: Octaplex ©</td>
</tr>
<tr>
<td></td>
<td>Initial infusion rate of 1 ml/minutes for the first 10 minutes, followed by a maximum rate of 2-3 ml/min.</td>
</tr>
</tbody>
</table>
Vitamin K

**TABLE**

<table>
<thead>
<tr>
<th>Class</th>
<th>EMS Indications</th>
</tr>
</thead>
<tbody>
<tr>
<td>Manufactured Blood Products</td>
<td>Major, life-threatening bleeding in patients with an INR greater than 1.5 on warfarin therapy of Vitamin K deficiency</td>
</tr>
<tr>
<td>Dosage</td>
<td>10 mg IV</td>
</tr>
<tr>
<td>Repeat</td>
<td>Do not repeat dose</td>
</tr>
<tr>
<td>EMS Contraindications</td>
<td>Hypersensitivity to phytonadione or any components of the formulation</td>
</tr>
<tr>
<td>Notes</td>
<td>Rate of infusion should not exceed 1 mg/minute.</td>
</tr>
<tr>
<td></td>
<td>Severe reactions resembling hypersensitivity reactions have occurred rarely during or immediately after IV administration.</td>
</tr>
</tbody>
</table>
APPENDIX B

Blood Group Compatibility

a) Compatibility is required in RBC and plasma administration.

b) Transfused RBC’s must be compatible with antibodies in the recipient’s plasma.

c) Transfused plasma must be compatible with antigens on the recipient’s cells.

d) Compatibility is preferred in platelet and cryoprecipitate administration.

e) is the universal red cell donor and can be transfused to recipients of all other blood types; AB is the universal red cell recipient and can receive from all other groups (Table 1).

TABLE 1: BLOOD GROUP COMPATIBILITY

<table>
<thead>
<tr>
<th>Recipient Blood Group</th>
<th>Antigens on Erythrocyte</th>
<th>Antibodies in Plasma</th>
<th>Compatible Donor Red Cell Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A</td>
<td>Anti- B</td>
<td>A, O</td>
</tr>
<tr>
<td>B</td>
<td>B</td>
<td>Anti-A</td>
<td>B, O</td>
</tr>
<tr>
<td>AB</td>
<td>A,B</td>
<td>None</td>
<td>A, B, AB, O</td>
</tr>
<tr>
<td>O</td>
<td>None</td>
<td>Anti -A, anti-B</td>
<td>O</td>
</tr>
</tbody>
</table>
Rh Factor Compatibility

a) Compatibility is required in RBC administration.

b) Compatibility is preferred in platelet administration.

c) Rh positive patients can receive Rh(+) and Rh(-) red cells; Rh negative patients should receive Rh(-) red cells (Table 2).

d) Rh factor cannot cause a haemolytic reaction on the first exposure because the Rh antibody is not normally present in the plasma of an Rh negative person.

**TABLE 2: Rh Factor Compatibility**

<table>
<thead>
<tr>
<th>Recipient Rh Factor</th>
<th>Antigen on Erythrocyte</th>
<th>Compatible Donor Rh factor</th>
</tr>
</thead>
<tbody>
<tr>
<td>Rh (+)</td>
<td>D</td>
<td>Rh (+), Rh (-)</td>
</tr>
<tr>
<td>Rh (-)</td>
<td>None</td>
<td>Rh(-)</td>
</tr>
</tbody>
</table>

Plasma Groups Compatibility

a) Compatibility is required for FP administration.

b) Transfused plasma must be compatible with antigens on the recipient's red cells.

c) AB is the universal plasma donor and O is the universal plasma recipient (Table 3).

**TABLE 3: Plasma Group Compatibility**

<table>
<thead>
<tr>
<th>Recipient Plasma Group</th>
<th>Antibodies in plasma</th>
<th>Compatible Donor Plasma Groups</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>Anti-B</td>
<td>A, AB</td>
</tr>
<tr>
<td>B</td>
<td>Anti – A</td>
<td>B, AB</td>
</tr>
<tr>
<td>AB</td>
<td>None</td>
<td>AB</td>
</tr>
<tr>
<td>O</td>
<td>Anti-A, anti-B</td>
<td>A,B,AB,O</td>
</tr>
</tbody>
</table>