Blood Transfusion Therapy:
A Guide to Blood Component Administration

Blood Transfusion Therapy Work Group

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Note: The information contained in this flipchart pertains to adult patients.
**PRETRANSFUSION**
- Verify physician’s order
- Verify that consent was obtained
- Verify patient and blood unit identification

**FILTERS**
- Filter all blood components through a standard (150 to 280 micron) blood filter.
- Albumin, plasma protein fraction (PPF), and intravenous immunoglobulin do not need to be filtered.
- **CAUTION!** Do not use leukocyte reduction filters for granulocytes or hematopoietic progenitor cells.
- Refer to transplantation or nursing protocol for infusion of HPCs

**TIME OF INFUSION**
- If the component cannot be started promptly (i.e., within 30 minutes of issue), return it to the blood bank for appropriate storage.
- Generally, all blood components should be infused within 4 hours.
- If longer infusion times are needed, the component may be divided by the blood bank.

**MEDICATION**
- **CAUTION!** Do not add medication to blood.

**WARMING**
- If warming is needed, a monitored system must be used to ensure that the blood is not warmed to a temperature at which red cell hemolysis occurs. (Usually do not warm above 42 C)

**PUMPS**
- Electromechanical infusion devices may be used for transfusion.
- **CAUTION!** Hemolysis of red cells may occur with some models—check with manufacturer before use.

**COMPATIBLE INTRAVENOUS SOLUTIONS**
- 0.9% NaCl injection, USP is acceptable.
- **DO NOT** use 5% Dextrose solutions (may induce hemolysis).
- **DO NOT** use Lactated Ringer’s (contains Ca++, which may induce clot formation in the blood bag and/or administration set).
**DOCUMENTATION AND MONITORING**
- Monitor patient during and after transfusion for signs of a reaction
- Document vital signs before, during, and after transfusion
- Record volume administered and transfusion reaction per nursing protocol

**COMPATIBILITY TESTING**
- Crossmatching must be performed for all whole blood and red cell components.
- Type and Screen should be ordered if transfusion is possible but unlikely.
- Type and Crossmatch should be ordered if transfusion is likely.

**TYPES OF COMPONENTS**

<table>
<thead>
<tr>
<th>Component</th>
<th>Volume Per Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Whole Blood</td>
<td>450-550 mL</td>
</tr>
<tr>
<td>Red Blood Cells</td>
<td>200-250 mL</td>
</tr>
<tr>
<td>Red Blood Cells in additive solutions</td>
<td>300-400 mL</td>
</tr>
<tr>
<td>Leukocyte-Reduced Red Blood Cells in additive solutions</td>
<td>240-280 mL</td>
</tr>
<tr>
<td>Frozen Daglycerolized Red Blood Cells</td>
<td>180-250 mL</td>
</tr>
<tr>
<td>Washed Red Blood Cells</td>
<td>180-250 mL</td>
</tr>
</tbody>
</table>

**STORAGE TEMPERATURE**
- Red cell components MUST be stored in a blood bank monitored (1-6 C) refrigerator.
- If the component cannot be infused immediately, return it to the blood bank within 30 minutes for appropriate storage.
**COMPATIBILITY**

**WHOLE BLOOD**
- ABO—Whole Blood **MUST** be group-specific.

**RED CELL COMPONENTS**
- ABO—For red cell components, compatibility is as follows:

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Compatible Donor Group</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A, O</td>
</tr>
<tr>
<td>B</td>
<td>B, O</td>
</tr>
<tr>
<td>AB</td>
<td>A, B, AB, O</td>
</tr>
<tr>
<td>O</td>
<td>O</td>
</tr>
</tbody>
</table>

**Rh**
- All transfusions should be Rh compatible.
- Rh-negative red cells can be given to Rh-positive patients.
- NOTE: In certain circumstances, such as bleeding emergencies, Rh-positive red cells can be given to Rh-negative patients.

**NOTES**

**FILTERS**
- ALL red cell components must be administered through a standard (170 micron) or leukocyte reduction filter.
- Leukocyte reduction filters designed to be used for platelets must NOT be used for red cells.

**TIME OF INFUSION**
- Components should be infused within 4 hours.

**MEDICATION**
- DO NOT add medication to whole blood or red cell components.

**PUMPS**
- Acceptable for use. (See CAUTION in General Transfusion Practices.)

**COMPATIBLE INTRAVENOUS SOLUTIONS**
- 0.9% NaCl injection, USP may be added to Red Blood Cells if indicated to reduce viscosity. (See General Transfusion Practices.)
**TYPE OF PLATELETS**

<table>
<thead>
<tr>
<th>Volume</th>
<th>Usual Dose</th>
</tr>
</thead>
<tbody>
<tr>
<td>Collected by apheresis</td>
<td>150-300 mL 1 bag equals 4-6 units WB-derived platelets 1 unit/10 kg body weight (usual adult dose 4-6 units)</td>
</tr>
<tr>
<td>Whole-blood-derived</td>
<td>50-70 mL</td>
</tr>
</tbody>
</table>

- Multiple WB-derived units of the same blood type may be pooled together.

**COMPATIBILITY**

**ABO**
- For platelets ABO donor-recipient compatibility is preferable but not required.

**Rh**
- Rh-negative platelet concentrates can be given to Rh-positive patients.
- If Rh-positive platelet concentrates are given to Rh-negative patients, the use of Rh Immune Globulin should be considered.

**COMPATIBILITY TESTING**

- Testing (crossmatching) for ABO compatibility not required.

**Storage Temperature**

- 20-24°C (room temperature). DO NOT REFRIGERATE PLATELETS.

**NOTES**

**FILTERS**
- ALL platelets must be administered through a standard (170 micron) filter or a leukocyte reduction filter.
- Leukocyte reduction filters designed to be used for red cells must NOT be used for platelets.

**Time of Infusion**

- Should be infused within 4 hours.

**Medication**

- DO NOT add medication to platelet concentrates.

**Pumps**

- Acceptable for use with platelets.
### Types of Components

<table>
<thead>
<tr>
<th>Component</th>
<th>Volume/Unit</th>
</tr>
</thead>
<tbody>
<tr>
<td>Plasma (FFP)</td>
<td>180-250 mL</td>
</tr>
<tr>
<td>Plasma Cryoprecipitate</td>
<td>180-250 mL</td>
</tr>
<tr>
<td>Reduced</td>
<td></td>
</tr>
<tr>
<td>Cryoprecipitate</td>
<td>10-20 mL</td>
</tr>
</tbody>
</table>

### Compatibility Testing
- Testing (crossmatching) not required.

### Storage Temperature
- Plasma and cryoprecipitate are stored frozen at \( \leq -18 \, ^\circ \text{C} \).
- Requires about 30-60 minutes to prepare for use.
- Multiple units of cryoprecipitate may be mixed together (pooled).
- Transfuse as soon as possible after thawing.

### Compatibility

#### ABO
- Plasma components should be ABO compatible.

<table>
<thead>
<tr>
<th>Patient Group</th>
<th>Compatible Donor Groups for Plasma*</th>
</tr>
</thead>
<tbody>
<tr>
<td>A</td>
<td>A, AB</td>
</tr>
<tr>
<td>B</td>
<td>B, AB</td>
</tr>
<tr>
<td>AB</td>
<td>AB</td>
</tr>
<tr>
<td>O</td>
<td>A, B, AB, O</td>
</tr>
</tbody>
</table>

*Cryoprecipitate may be given without regard to ABO type in adults.

#### Rh
- Plasma and cryoprecipitate may be transfused without regard to Rh type.

### Notes

#### Filters
- Plasma and cryoprecipitate must be administered through a blood filter.

#### Time of Infusion
- Should be infused within 4 hours.

#### Medication
- DO NOT add medication to plasma or cryoprecipitate.

#### Pumps
- Acceptable for use.

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**Plasma and Cryoprecipitate**
**COMPONENT CONTENTS**
- Volume = 200-300 mL
- Hct approximately 12%
- Granulocytes (>1.0 \times 10^{10} PMN)
  >3-5 \times 10^{10} PMN if donor treated with G-CSF
- Platelets >2.0 \times 10^{11} (approximately 4 units of platelets)

**COMPATIBILITY**
- Granulocytes must be ABO and Rh compatible.
- HLA matching may be required in alloimmunized patients.

**COMPATIBILITY TESTING**
- Testing (crossmatching) for ABO compatibility MUST be performed.
- Matching for HLA may be required.

**STORAGE TEMPERATURE**
- Store at 20-24°C.
- Should be infused as soon as possible, but no later than 24 hours after collection.

**NOTES**

**FILTERS**
- ONLY A STANDARD (170 micron) FILTER CAN BE USED (do not use microaggregate or leukocyte-reduction filters)

**TIME OF INFUSION**
- Should be infused within 4 hours.
- CAUTION! Febrile reactions are common and often dose- and rate-related.

**MEDICATION**
- Premedication is frequently administered to prevent fever and other reactions.
- DO NOT add medication to granulocyte concentrates.
- Amphotericin B should not be administered concurrently with granulocytes.

**PUMPS**
- Acceptable for use.

**ORDERING**
- Granulocytes are not stocked in the blood bank but must be ordered for each use.
- It usually requires 24-48 hours to obtain the first granulocyte component.
- Donor treatment with G-CSF (and/or steroids) increases the yield of granulocytes by three- to fivefold.
**Types of Derivatives**

- Albumin (5%, 25%)
- Plasma Protein Fraction
- Factor VIII Concentrates (some are recombinant)
- Factor IX Concentrates (some are recombinant)
- Factor VIIa Concentrate (recombinant)
- Anti-Inhibitor Coagulation Complex (indicated for patients with high-titer Factor VIII inhibitors)
- Rh Immune Globulin (for IM and IV use)
- Immune Serum Globulin (IM and IV preparations available)
- Hyperimmune globulin preparations

**Compatibility Testing**

- Crossmatching not required.

**Notes**

**Filters**

- For coagulation factor concentrates, filtration using a standard blood filter or the filter needle supplied with concentrates is required.
- Coagulation concentrates should be transfused as soon as possible after reconstitution.
- Albumin, plasma protein fraction, and serum globulins do not require filtration.

**Time of Infusion**

- Should be infused within 4 hours.

**Medication**

- DO NOT add medication to blood derivatives.
- Dilute albumin with 0.9% saline or D5W. DO NOT use sterile water.

**Pumps**

- Acceptable for use.
<table>
<thead>
<tr>
<th>REACTION TYPE</th>
<th>SIGNS AND SYMPTOMS</th>
<th>CLINICAL ACTION*</th>
</tr>
</thead>
</table>
| Mild allergic  | Localized urticaria (hives), pruritis, rash | **Stop transfusion** (steps 1-5 above)  
  • Antihistamines may be administered (PO, IM or IV)  
  • If reaction subsides, transfusion may be completed |
| Severe allergic | Rushing, wheezing, hypotension, anaphylaxis | **Stop transfusion** (steps 1-6 above)  
  • Epinephrine and/or steroids may be indicated  
  • **CAUTION:** may become medical emergency; support blood pressure and maintain open airway |
| Febrile        | Chills and unexpected fever [>100.4°F (38°C) or >1.8°F (1°C) rise] | **Stop transfusion** (steps 1-6 above)  
  • Febrile reactions usually respond to antipyretics—avoid aspirin in thrombocytopenic patients  
  • Rule out a hemolytic reaction, septic reaction, and TRALI |
| Acute hemolytic| Rigors, fever, flank pain, tachycardia, dyspnea, hypotension, unexplained bleeding, oliguria, hemoglobinuria, hemoglobinemia | **Stop transfusion** (steps 1-6 above)  
  • Induce diuresis with fluids and diuretics  
  • **CAUTION:** may become medical emergency; support blood pressure and maintain open airway  
  • Do not administer additional units until cleared by the blood bank |
| Transfusion-related acute lung injury (TRALI) | Chills, fever, dyspnea, respiratory failure, noncardiogenic pulmonary edema | **Stop Transfusion** (steps 1-6 above)  
  • Administer supplemental oxygen and employ mechanical ventilation as necessary  
  • **CAUTION:** may become medical emergency; support respiratory function and blood pressure  
  • Notify blood bank to ensure removal of any related components from the same donor  
  **Stop Transfusion** (steps 1-6 above)  
  • Administer broad spectrum antibiotic coverage after obtaining blood cultures  
  • **CAUTION:** may become medical emergency; support blood pressure  
  • Notify blood bank to ensure removal of any related components from the same donor  
  • Send bag to blood bank for culture and Gram’s stain |
| Septic reaction| Fever, chills, rigors, nausea, vomiting, hypotension | **Stop transfusion** (steps 1-6 above)  
  • Induce diuresis with fluids and diuretics  
  • **CAUTION:** may become medical emergency; support blood pressure  
  • Notify blood bank to ensure removal of any related components from the same donor  
  • Send bag to blood bank for culture and Gram’s stain |

*Consult attending physician and follow hospital protocol
MANAGEMENT OF ACUTE TRANSFUSION REACTIONS

Immediate Steps for All Transfusion Reactions:

1. Stop the transfusion
2. Keep IV open with 0.9% NaCl
3. Verify that the correct unit has been given to the correct patient
4. Check vital signs
5. Notify the responsible physician and blood bank

After the transfusion is terminated (except for mild allergic reactions, see below)

6. Send freshly collected blood and urine samples with blood unit and administration set to the blood bank.