



## 7 ADVERSE REACTIONS TO TRANSFUSION

[Blood Bank Labsite](#)

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Any adverse reaction to the transfusion of blood or blood components should be reported to Blood Bank personnel as soon as possible.

Speed is essential in such situations because of the possible life-threatening nature of acute transfusion reactions. The evaluation of all adverse reactions to transfusion is the responsibility of the medical staff of the Blood Bank and the notification of such a reaction by the patient unit serves as a request for Blood Bank physician consultation.

The Blood Bank is required to report any death resulting from transfusion to the Food and Drug Administration.

Reactions may be separated into reactions that present in proximity to the transfusion and those that present at some time subsequent to the transfusion. Suspected post-transfusion disease, which may present at a considerable time following transfusion, must also be reported to the Blood Bank. Investigation of these reports may result in identification of "carrier" donors who are removed from the donor pool

A Blood Bank physician should be consulted regarding the evaluation of patients with reactions, as well as selection of appropriate blood components for future transfusion.

In the case of a mild urticarial and febrile reactions, with no other signs or symptoms attributable to blood transfusion, it may be possible to reinitiate the blood transfusion. Such a decision must be arrived at through consultation between the physician reporting the reaction and a Blood Bank physician

### **Premedication for Recipients of Granulocytes**

It is suggested that patients receiving granulocytes who have a history of febrile reactions to blood components be pretreated with antipyretic agents if there are no contraindications to the use of these drugs. See Febrile Transfusion Reactions. In general, transfusion of Granulocytes should be terminated only for such complications as severe flank pain, chest pain, hemoglobinemia and hemoglobinuria, hypotension, laryngospasm, or acute pulmonary injury.

Reaction Type	Symptoms	Cause	Frequency	Prevention
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[Component & Compatibility, Flow Rates](#)

<p><b>Acute Hemolytic Reaction</b></p>	<p>Fever, chills and fever, the feeling of heat along the vein in which the blood is being transfused, pain in the lumbar region, constricting pain in the chest, tachycardia, hypo-tension, and hemoglobinemia with subsequent hemoglo-binuria and hyperbilirubin-emia.</p> <p>A "feeling of impending doom" is frequently reported by the patient as an early sign of this reaction.</p> <p>In an unconscious or anes-the-tized patient: Uncontrollable bleeding due to disseminated intravascular coagulation may be the only sign of a hemolytic transfusion reaction</p>	<p>Human error such as mislabeled pretransfusion specimen; the transfusion of properly labeled blood to the wrong person, or clerical errors occurring within the Blood Bank</p> <p>transfused red cells react with circulating antibody in the recipient with resultant intravascular hemolysis</p> <p>Most likely to occur when a group O patient is mistakenly transfused with group A, B, or AB blood. Patients receiving a major ABO- incompatible marrow or stem cell transplant with sufficient red cell content will likely develop an acute hemolytic reaction</p>	<p>Rare</p>	<p>proper identification of patients, pretransfusion blood samples and blood components at the time of transfusion</p>
<p><b>DELAYED HEMOLYTIC REACTION</b> <b>Delayed Hemolytic Reaction</b></p> <p><b>Notify the Blood Bank at the time the reaction</b></p>	<p>the most common signs are a falling hematocrit (due to extravascular destruction of the transfused red blood cells) and a positive direct antiglobulin (Coombs) test (DAT).</p> <p>"delayed" hemolytic reactions commonly occurs about 4-8 days after blood transfusion, but may develop up to one month later. There may also be hemoglobinuria and a mild elevation of the serum bilirubin. . Symptomatic patients may manifest fever and leukocytosis thus appearing to have an occult infection.</p>	<p>Many delayed hemolytic reactions will go undetected because the red cell destruction occurs slowly</p> <p>Delayed hemolytic reactions occur in patients who have developed antibodies from previous transfusion or pregnancy but, at the time of pretransfusion testing, the antibody in question is too weak to be detected by standard procedures. Subsequent transfusion with red cells having the</p>	<p>Uncomon</p>	

<p><b>is suspected, to allow prompt investigation. Care must be taken that subsequently transfused red cells lack the antigen corresponding to the patient's antibody.</b></p>		<p>corresponding antigen results in an anamnestic antibody response and hemolysis of transfused red cells.</p>		
<p><b>Febrile</b></p>	<p>fever or chill fever A temperature rise of 1.5 F or 1.0 C from the baseline</p>	<p>Cytokines and antibodies to leukocyte antigens reacting with leukocytes or leukocyte fragments</p>	<p>1 in 8 transfusions</p>	
<p><b>Allergic - urticaria</b></p>	<p>allergic reactions may be associated with laryngeal edema and bronchospasm.</p> <p>If coupled with another sign, such as fever, evaluation for a hemolytic reaction may be indicated.</p>	<p>this reaction is caused by foreign plasma proteins</p>	<p>1% of recipients</p>	
<p><b>Allergic - Anaphylaxis</b></p>	<p>anaphylactic or anaphylactoid Respiratory involvement with dyspnea or stridor may be more pronounced than is usually seen in typical allergic reactions.</p> <p>Reactions manifest cardiovascular instability that includes hypotension, tachycardia, loss of consciousness, cardiac arrhythmia, shock and cardiac arrest.</p>	<p>may be due to anti-IgA</p>	<p>Rare</p>	
<p><b>TRALI</b></p>	<p>abrupt onset of noncardiogenic pulmonary edema Severe cases may require assisted ventilation with high FIO2..</p>	<p>TRALI has been associated with the presence of antibodies in the donor plasma reactive to recipient leukocyte antigens or with the production of inflammatory mediators during storage of cellular blood components</p>	<p>TRALI is a rare though under recognized complication of transfusion</p>	<p>Most cases of TRALI resolve within 72 hours although fatalities may occur in approximately 10 percent of cases.</p>

<b>Volume Overlead</b>		transfusion-related volume overload		Infuse smaller volumes more slowly
<b>Bacterial Contamination</b>	hypotension, shock, fever and chills, nausea and vomiting, and respiratory distress. Diagnosis is established by Gram stain and blood culture of both the blood component and the recipient. distress	Bacterial contamination occurs when a small number of bacteria enter a blood component during collection or processing.. During storage, bacteria may proliferate, resulting in a large number of organisms, and possible endotoxin, being given with the transfusion	rare but difficult to detect prior to transfusion Autologous blood may be contaminated with bacteria, particularly if the patient had an active infection at the time of donation.	
<b>Hypotension</b>	<p>A drop of at least 10 mm Hg in systolic or diastolic arterial blood pressure in the absence of signs or symptoms of other transfusion reactions</p> <p>if the immediate pretransfusion blood pressure is elevated from the patient's typical blood pressure, and the arterial pressure does not fall below the patient's usual blood pressure, it should not be considered a hypotensive reaction. The onset of hypotension is during the transfusion, and resolves quickly with discontinuation of the transfusion.</p> <p>If hypotension persists beyond 30 minutes after discontinuing the transfusion, another diagnosis should be strongly considered.</p>	<p>Some reactions have been associated with angiotensin converting enzyme (ACE) inhibitor drugs or the use of leukocyte reduction filters.</p> <p>Hypotensive reactions have been associated with red cell and platelet transfusions.</p>		

<p><b>Graft-vs-Host Disease GVHD</b></p>	<p>rash, fever, diarrhea, cytopenia and liver dysfunction 3-4 weeks after transfusion</p>	<p>viable T lymphocytes in blood components are transfused, engraft and react against the recipient's tissues and the recipient is unable to reject the donor lymphocytes because of immunodeficiency, severe immunosuppression, or shared HLA antigens</p> <p>associated with bone marrow transplantation. Transfusion associated GVHD occurs. It typically. Transfusion associated GVHD carries a very poor prognosis.</p>	<p>Rare</p>	<p>Irradiation of cellular components</p> <p>The Blood Bank must be apprised of the immune status, or diagnosis, of the patient so that cellular components intended for transfusion of immunocompromised patients and blood components from directed (designated) donors will be irradiated. Irradiation of blood red cell containing components decreases the red cell survival and increases the potassium of the component. There is no apparent effect on platelet survival. Fresh Frozen Plasma (FFP) and cryoprecipitated AHG (CRYO) need not be irradiated because these components do not contain enough viable lymphocytes to cause GVHD.</p>
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<p><b>Non-immune Hemolysis</b></p>	<p>hemoglobinemia and hemoglobinuria Transient hemodynamic, pulmonary and renal impairment may occur. cardiac arrhythmia due to hyperkalemia may occur, particularly in patients with renal failure.</p>	<p>Lysis of red cells can occur due to improper storage, handling, or transfusion conditions.</p> <p>mishandling or storage of blood components</p> <p>the contents of the blood bags are available for study. The blood bag together with attached tubing and intravenous fluids should be saved for further investigations.</p>	<p>Rare</p>	
<p><b>Post-transfusion purpura (PTP)</b></p>	<p>thrombocytopenia that is frequently profound, purpura, or bleeding</p> <p>Febrile reactions have been reported retrospectively with the implicated transfusion</p> <p>thrombocytopenia typically 7-48 days after transfusion</p> <p>PTP must be differentiated from the far more common alloimmunization to platelet antigens. Consultation with a Blood Bank physician is recommended in evaluating such patients.</p>	<p>the patient makes an alloantibody in response to platelet antigens in the transfused blood that for a period of time causes destruction of autologous antigen negative platelets</p>	<p>Rare</p>	<p>Platelet transfusion is of very little value in PTP; however, therapeutic plasma exchange may be beneficial Since autologous platelets do not survive in circulation, there is no expectation that transfused platelets regardless of antigen matching will do any better.</p> <p>Reserved platelet transfusion for patients with active bleeding.</p>

### IF A TRANSFUSION REACTION IS SUSPECTED

**Stop** the transfusion immediately!

**Disconnect the intravenous line** from the needle. Do not disconnect the unit from the IV set. Attach a new IV set and prime with saline, or flush the line with the normal saline used to initiate the transfusion and reconnect the line. Open the line to a slow drip. In certain cases, such

as a mild urticarial reaction or the presence of repeated chill-fever reactions, it may be possible to restart the blood transfusion after evaluation and treatment of the patient. To reinitiate the transfusion using a new IV tubing set, enter the second port to reduce the chance of bacterial contamination.

**Seek medical attention** immediately. If the patient is suffering cardiopulmonary collapse, and medical attention is not immediately available, press the blue "Code" button **and** telephone the Cardiac Arrest Team (dial 911).

**Check** to ensure that the patient name and registration number on the blood bag label exactly with information on the patient's identification wristband attached to his/her wrist. ***DO NOT BYPASS THIS STEP BY ASSUMING THAT THE PATIENT'S TRUE IDENTITY IS KNOWN.***

**Do not discard the unit of blood** that has been discontinued because it may be necessary for the investigation of the transfusion reaction.

- Notify the Blood Bank that a transfusion reaction has occurred and briefly describe the nature of the reaction.
- Blood Bank personnel will identify the Pathology House officer or staff pathologist who will assume responsibility for investigation of the reaction.
- Delay the transfusion of additional units until the possibility of serological incompatibility has been investigated. Consult a Blood Bank physician if there is an urgent need or transfusion.
- Initiate the Transfusion Reaction Report Form after Blood Bank personnel have been notified of a transfusion reaction. It is essential that this form be filled out completely, including the unit numbers of all blood transfused. The form will serve as a written request for investigation of the reaction by a Blood Bank physician.
- In the case of a **suspected hemolytic transfusion reaction** (not urticaria alone), the following items should be submitted promptly to the Blood Bank:

**completed Transfusion Reaction Form** (white copy)

**posttransfusion blood specimens** (Adults: 10 mL clot and 5 mL EDTA, lesser volumes for pediatric patients), and

**incriminated unit(s) of blood and attached tubing.**

Restarting a Transfusion If the Blood Bank physician, after review of the clinical information, believes the transfusion can be restarted, do not disconnect the **unit**. **This** may apply to patients who might manifest urticarial reactions or repeated chill-fever reactions.

Additional blood specimens may be requested, depending on the serological findings. The venipuncture to obtain these blood specimens must not be traumatic. Small lumen catheters should not be used to collect blood specimens for a transfusion reaction investigation. If red cells are hemolyzed during the venipuncture or collection, the serum will turn pink and it may be erroneously concluded that intravascular hemolysis has occurred.

The IV tubing used to transfuse the blood components should be clamped and sent *without the needle attached*. A urine sample is not required for the routine evaluation of a transfusion reaction, but may be requested by the Blood Bank physician in the course of further assessment.

Patient care personnel will be notified by telephone of significant findings of the reaction evaluation as soon as possible. A written report of the investigation, on the Blood Transfusion Reaction Form, will be returned to the patient care unit at a later date for inclusion in the patient's chart.

### TREATMENT OF TRANSFUSION REACTIONS

The following guidelines should be tailored to suit individual cases.

Reaction Type	Treatment - Adult	Pediatric	Follow-up
<b>Acute Hemolytic Reactions</b>	<b>Diuretic therapy:</b> Initially, give 40-80 mg Furosemide (Lasix) intravenously. This dose can be repeated once. Lack of response to furosemide in 2-3 hours indicates the presence of acute renal failure.	Pediatric dose: 1-2 mg/kg/dose. May repeat once at 2-4 mg/kg.	Treat shock and disseminated intravascular coagulation with appropriate measures if and when they appear.
	<b>Water loading:</b> The patient should be hydrated to maintain urinary output of at least 100 mL/hr until urine is free of hemoglobin.  Infuse a loading dose of 0.9% sodium chloride or 5% dextrose in 0.45% sodium chloride. Chart hourly urine output. Maintain the urine output by administering intravenous fluid at 100 mL/hour until the urine is free of hemoglobin. If the patient's urinary output does not increase, with this hydration any additional fluids should be infused with caution.	Pediatric patients should receive a smaller loading volume of fluid in proportion to their body surface area.	
<b>Delayed Hemolytic Transfusion Reactions</b>	Specific treatment generally is not necessary		Supplemental transfusion of blood lacking the antigen corresponding to the offending antibody may be necessary to compensate for the transfused cells that have been removed from the circulation.



<b>Allergic Transfusion Reactions</b>	<b>Antihistamines</b> (e.g., Benadryl). Give 50-100 mg orally or intravenously. If urticaria develops slowly, antihistamines may be given orally.	Pediatric dose: 1-2 mg/kg intramuscularly or intravenously for 25-50 mg per average dose.	Routine use of Benadryl as premedication for all transfusions, regardless of a history of allergic reactions, is discouraged.
	<b>Aminophylline</b> for wheezing, at a dose of 125-250 mg intravenously slowly over a period of about five minutes	Pediatric dose: 3 mg/kg/dose in intravenous drip over of 20 minutes.	
	<b>Epinephrine</b> for severe, acute reactions including laryngeal edema or bronchospasm Give 0.1-0.5 mg (0.1-0.5 mL of a 1:1000 solution) subcutaneously. Subcutaneous dose may be repeated at 10-15 minute intervals. The total subcutaneous dose in a 24-hour period, with rare exception, should not exceed 5 mg.	Pediatric dose: 0.03 mL/M2 (0.03 mg/M2 of a 1:1000 solution) given subcutaneously. A single pediatric dose should not exceed 0.3 mg.	
<b>Febrile Transfusion Reactions</b>	<b>Premedicate</b> the patient with acetaminophen or other antipyretic agents when previous reactions have been extremely bothersome. Pediatric dose: 10 mg/kg to a maximum of 600 mg.		Aspirin will adversely affect the patient's platelet function, so non-aspirin antipyretic agents are preferable.
<b>Severe shaking chills</b>	(rigors) can be controlled by the sedative effect of Benadryl or Demerol (25-50 mg given intramuscularly or intravenously		Note: Demerol may cause acute respiratory arrest. An opiate antagonist (Narcan) should be immediately available.
<b>Sepsis Due to Bacterial Contamination of Donor Blood</b>	Treatment of septic shock includes: terminating the suspected transfusion immediately, cardio-vascular and respiratory support, blood culture of the patient, and administration of broad spectrum antibiotics including anti-pseudomonas coverage if the blood component involved is Red Blood Cells.		

### POSTTRANSFUSION DISEASES

- **All cases of suspected posttransfusion disease transmission encountered among inpatients or outpatients, in any context, must be reported to the Blood Bank** so that they can be investigated. This allows the Blood Bank to notify the regional blood supplier so that blood donors who are thought to be infectious can be excluded from the list of eligible donors.
- Because of the risk of posttransfusion infection, the benefits associated with blood transfusion must always be weighed against possible risks.

- Units of blood and blood components transfused in the University of Michigan Hospitals are obtained from volunteer donors. Screening tests are performed on all units, including those obtained from designated/directed donors.
- Current testing: syphilis, HBsAg, antibodies to HIV-1/2, Hepatitis C virus, anti-HBc and HTLV-I/II, as well as, nucleic acid testing (PCR) for HIV, hepatitis C virus and West Nile Virus.
- Additional tests for transfusion transmitted disease will be implemented in response to federal or accrediting agency regulations or changes in the standard of care. Unfortunately, no specific screening test is currently available to detect all forms of hepatitis.
- Under extremely rare circumstances it may be necessary to transfuse blood or a blood component to a patient before the above screening tests for disease transmission have been completed. In such situations, the physician treating the patient will be made aware of the available options by Blood Bank medical staff and will be informed of the test results as soon as they are available.
- Units of blood negative for anti-CMV can be provided for selected patients undergoing allogeneic bone marrow homotransplantation. CMV safe components may be provided through the use of leukocyte-reduced cellular blood components.
- Guidelines for treatment of hospital personnel who have accidentally inoculated themselves with blood are available in Employee Health Service and Emergency Services.

### **Look Back Notification**

When donors of previously transfused units are found, at a subsequent donation, to be positive for HIV, hepatitis C, HTLV or other diseases as determined by the public health service, the Blood Bank is required by federal regulation to notify the patient. We usually will notify the patient's physician for assistance in contacting the patient. This process is known as "look back".

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