

Transfusion Services

ADVERSE REACTIONS TO TRANSFUSION

Any adverse reaction to the transfusion of blood or blood components should be reported to the Transfusion Service 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 Pathology Department and the notification of such a reaction by the nursing unit serves as a request for physician consultation. The Transfusion Service is required to report any death resulting from transfusion to the Food and Drug Administration. These reactions may be separated into those that present in proximity to the transfusion and those that present at some time subsequent to the transfusion.

The most common adverse sequelae to transfusion of blood and blood components are fever, chills, and urticaria. The most potentially significant reactions include acute and delayed hemolytic transfusion reactions. Less common severe reactions, such as anaphylaxis due to anti-IgA, transfusion-related volume overload, acute lung injury, shock due to bacterially contaminated blood (rare) or post-transfusion purpura, will be diagnosed and managed in consultation with the Transfusion Service.

Suspected post-transfusion disease, which may present at a considerable time following transfusion, must also be reported to the Transfusion Service. Investigation of these reports may result in identification of "carrier" donors who are removed from the donor pool.

FEBRILE REACTIONS

Febrile, or chill-fever, reactions to blood transfusion are common and are thought to be caused, in some cases, by recipient antibodies to leukocyte antigens reacting with leukocytes or leukocyte fragments contained by the transfused blood. Such reactions are most commonly encountered in patients with a history of leukocyte antibodies. Approximately one out of eight patients who have such reactions will have similar reactions to subsequent transfusions.

Febrile reactions usually present during transfusion or in the immediate post-transfusion period (within 1 hour) and must be distinguished from fever related to the underlying disease or infection. Thus, documentation of a pretransfusion baseline temperature is extremely important. A temperature rise of 1.5°F or 1.0°C from the baseline is considered a fever. In some patients these reactions present as severe rigor.

Fever is the most frequent manifestation of acute hemolytic transfusion reactions. Therefore, it is important to rule out this potentially life-threatening reaction through proper evaluation. Febrile nonhemolytic reactions have been associated with alloantibodies to donor leukocyte antigens and with pyrogens produced in cellular blood components during storage. Notification of the Transfusion Service of all adverse reactions is necessary to provide the patient with the most appropriate blood component.

ALLERGIC (URTICARIAL) REACTIONS

The appearance of urticaria during and immediately after the transfusion of blood components is seen in approximately 1% of recipients. Foreign plasma proteins cause this reaction. On rare occasions, such allergic reactions may be associated with laryngeal edema and bronchospasm. A mild urticarial reaction is generally innocuous. If coupled with another sign, such as fever, evaluation for a hemolytic reaction may be indicated.

-- If the allergic symptoms, such as urticaria, are bothersome, an antihistamine may be administered before the blood transfusion is restarted.

-- If the case of a mild urticarial reaction with no other signs or symptoms attributable to blood transfusion, it is not necessary to submit post-transfusion blood specimens. It may also be possible to reinstate the blood transfusion. Such a decision must be arrived at through consultation between the physician reporting the reaction and the Transfusion Service.

ACUTE HEMOLYTIC REACTIONS

The most dreaded complication of blood transfusion is the acute hemolytic reaction in which transfused red cells react with circulating antibody in the recipient with resultant intravascular hemolysis. Such a reaction is most likely to occur when a group O patient is mistakenly transfused with group A, B, or AB blood.

Most hemolytic reactions are the result of human error, such as the transfusion of properly labeled blood to the wrong person, improper identification of pretransfusion blood samples, or clerical errors occurring within the Transfusion Service.

-- Symptoms of an acute hemolytic reaction may include 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, hypotension, and hemoglobinemia with subsequent hemoglobinuria and hyperbilirubinemia. The patient, as an early sign of this reaction, frequently reports a "feeling of impending doom".

-- Uncontrollable bleeding due to disseminated intravascular coagulation may be the only sign of a hemolytic transfusion reaction in an unconscious patient. Such a reaction may not be accompanied by hypotension.

DELAYED HEMOLYTIC REACTION

Not all hemolytic reactions occur during or shortly after blood transfusion. The so-called "delayed" hemolytic reaction commonly occurs 4 - 8 days after blood transfusion, but may develop up to 2 weeks later. The most common signs of such a reaction are a falling hematocrit (a manifestation of extravascular destruction of the transfused red blood cells) and a positive direct antiglobulin test (DAT or Coombs test). There may also be hemoglobinuria and a mild elevation of the serum bilirubin. Many delayed hemolytic reactions will go undetected because the red cell destruction occurs slowly.

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 corresponding antigen results in an anamnestic antibody response and hemolysis of transfused red cells.

Notify the Transfusion Service at the time a reaction is suspected, to allow for prompt investigation. Care must be taken that subsequently transfused red cells lack the antigen corresponding to the patient's antibody.

GRAFT Vs HOST DISEASE

GVHD is associated with bone marrow transplantation. Transfusion-associated GVHD occurs when 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. Irradiation is the recommended method of preventing this

complication. Blood components from directed (designated) donors and cellular components for the transfusion of immunocompromised patients are routinely 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) need not be irradiated because it does not contain enough viable lymphocytes to cause GVHD.

TRANSFUSION RELATED ACUTE LUNG INJURY (TRALI)

TRALI is a rare complication of transfusion manifested by abrupt onset of noncardiogenic pulmonary edema. Severe cases may require assisted ventilation with High FIO₂. TRALI usually resolves within 72 hours and rarely progresses to Adult Respiratory Distress Syndrome (ARDS). 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. Prompt notification of the Transfusion Service when TRALI is suspected will assist in evaluation and selection of appropriate blood component selection for future transfusions.

IF A TRANSFUSION REACTION IS SUSPECTED

-- **Stop** the transfusion immediately.

-- **Disconnect** the intravenous line from the needle. 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 reinstate 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, initiate a "Doctor Blue" code.

-- Check to ensure that the patient name and registration number on the blood bag unit tag corresponds 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.**

-- **Notify Transfusion Service** personnel (Minneapolis: 612-813-6824/St. Paul: 651-220-6558) that a transfusion reaction has occurred and briefly describe the nature of the reaction. Delay the transfusion of additional units until the possibility of serological incompatibility has been investigated.

-- **Initiate the Transfusion Reaction Report Form** after Transfusion Service 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 Pathologist.

In the case of a suspected transfusion (not urticaria alone), the following items should be submitted promptly to the Transfusion Service:

1. Completed Transfusion Reaction Form
2. Post-transfusion blood specimens (contact the Transfusion Service)
3. The incriminated unit(s) of blood and attached tubing should be sent to the Transfusion Service unless the physician after review of the clinical information believes it can be restarted. The latter 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.

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 Transfusion Reaction Form, will be returned to the patient care unit at a later date for inclusion in the patient's chart.

POST-TRANSFUSION DISEASES

All cases of suspected post-transfusion disease transmission encountered among inpatients or outpatients, in any context, must be reported to the Transfusion Service so they can be investigated. This allows the Transfusion Service to notify the regional blood supplier so those blood donors who are thought to be infectious can be excluded from the list of eligible donors. Because of the risk of post-transfusion infection, the benefits associated with blood transfusion must always be weighed against possible risks. In addition, as noted previously, patients must be informed of the risks of transfusion and of alternative strategies.

Units of blood and blood components transfused at Children's Hospitals and Clinics are obtained from volunteer donors. Screening tests are performed on all units, including those obtained from designated donors. Currently testing for Syphilis, Hepatitis B, Hepatitis C, non-A/non-B Hepatitis, Human Immunodeficiency Virus (HIV) and Human T-cell Lymphotropic Virus (HTLV-I/II) are performed using methodologies approved by the Federal Drug Administration (FDA). 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 blood components 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 Transfusion Service staff and will be informed of test results as soon as they are available.

Guidelines for treatment of hospital personnel who have accidentally inoculated themselves with blood are available in Employee Health Service and Emergency Services.