Blood and blood product transfusion reaction management

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Introduction

A transfusion reaction is any unfavorable event that occurs in a patient during or after transfusion of blood or a blood component that may be related to that transfusion.[1] Consider any adverse change in the patient's condition to be a possible sign or symptom of a transfusion reaction, and ensure prompt evaluation to prevent further complications.[1]

◆ ***Hospital-acquired condition alert:*** Keep in mind that the Centers for Medicare and Medicaid Services considers a blood incompatibility error a hospital-acquired condition *because it can be reasonably prevented using a variety of best practices.* Make sure to follow evidence-based prevention practices, such as carefully identifying the patient and blood sample for compatibility testing and participating in a two-person verification process before blood or blood product administration, *to reduce the risk of incompatibility errors.*[2][3][4] ◆

Equipment

- Disinfectant pad
- Emergency equipment (code cart with emergency medications, defibrillator, handheld resuscitation bag with mask, intubation equipment)
- Facility-approved disinfectant
- Gloves
- IV administration set
- Laboratory biohazard transport bags
- Laboratory specimen labels
- Normal saline solution
- Output monitoring equipment
- Pulse oximeter and probe
- Sterile end cap
- Stethoscope
- Supplies for blood collection (see the "Venipuncture" procedure)
- Transfusion reaction report form
- Vital signs monitoring equipment
- Optional: indwelling urinary catheter and insertion kit, other personal protective equipment, prescribed treatment for symptomatic relief

Preparation of Equipment

Inspect all IV equipment and supplies. If a product is expired, is defective, or has compromised integrity, remove it from patient use, label it as expired or defective, and report the expiration or defect as directed by your facility.[5]

Make sure emergency equipment is functioning properly and readily available.

Implementation

- Gather and prepare the necessary equipment and supplies.
- Perform hand hygiene.[6][7][8][9][10][11][12][13]
- Confirm the patient's identity using at least two patient identifiers.[14]
- Provide privacy.[15][16][17][18]
- Explain the procedure (as time allows) to the patient and family (if appropriate) according to their individual communication and learning needs *to increase their understanding, allay their fears, and enhance cooperation*.[19]
- Raise the bed to waist level before providing care *to prevent caregiver back strain*.[20]
- Perform hand hygiene.[6][7][8][9][10][11][12][13]
- Put on gloves and, as needed, other personal protective equipment *to comply with standard precautions*.[21][22][23][24][25]
- If you suspect a transfusion reaction, stop the transfusion immediately. Don't allow the blood remaining in the filter and tubing to infuse.[1][26] (See *Guide to transfusion reactions*.)
- Trace the blood administration tubing from the patient to its point of origin *to make sure that you're accessing the correct tubing*, disconnect it from the IV catheter, and cover the hub with a sterile end cap. Don't discard the administration set or the blood product.[1][27]
- Prime a new IV administration set with normal saline solution, attach the administration set to the IV catheter, and infuse normal saline solution at a keep-vein-open rate.[1] Trace the tubing from the patient to its point of origin *to make sure that you've connected the tubing to the correct port*.[27]
- Remain with the patient and notify the patient's practitioner and transfusion services immediately.[1]
- Verify that the patient received the correct blood by comparing the patient's identifying information on the blood bag, attached tag, and patient's wristband. If the information doesn't match, notify the blood bank *to help prevent further mismatching*.[1]
- Monitor the patient's vital signs closely for signs of shock.[1] Monitor oxygen saturation level using pulse oximetry, and assess cardiac and respiratory status frequently, as indicated by the patient's condition and the type of reaction.
- Administer treatment, as prescribed, *to provide symptomatic relief*.[1][26]
- Place the blood bag (even if it's empty), attached IV fluids, and administration set with the related forms and labels in a laboratory biohazard transport bag.[21] Return them to transfusion services, *because transfusion services will test these materials to further evaluate the reaction*.[1]
- Perform a venipuncture in a different vein and obtain a blood sample for laboratory testing *to inspect for hemolysis.* Obtain a blood sample for repeat ABO group determination and direct antiglobulin test, as ordered.[1] The practitioner may order additional laboratory testing such as blood cultures *if bacterial contamination is suspected.* The practitioner may also order blood urea nitrogen and creatinine levels *to monitor kidney function* as well as coagulation studies, such as prothrombin time, partial thromboplastin time, fibrinogen level, and D-dimer, *to identify red blood cell destruction and monitor for disseminated intravascular coagulation.* Notify the practitioner of critical test results within your facility's established time frame, *so the patient can be treated promptly*.

◆ ***Clinical alert:*** Limit phlebotomy and blood loss from laboratory testing *to reduce the risk of iatrogenic anemia*.[28] ◆

- Label all samples in the presence of the patient *to prevent mislabeling.*[14]
- Complete and send the appropriate documentation—usually a transfusion reaction report form—to the laboratory along with the samples in a laboratory biohazard transport bag.[21]
- Discard used supplies in appropriate receptacles.[21][22][29]
- Return the bed to the lowest position *to prevent falls and maintain the patient's safety.*[30]
- Remove and discard your gloves and, if worn, other personal protective equipment.[21][22][29]
- Perform hand hygiene.[6][7][9][10][11][12][13]
- Monitor intake and output closely. Insert an indwelling urinary catheter, if ordered, *to monitor urine output in a critically ill patient.* (See the "Indwelling urinary catheter [Foley] insertion, assigned female at birth" or "Indwelling urinary catheter [Foley] insertion, assigned male at birth" procedure.)[1][31] Note evidence of oliguria or anuria, *because hemoglobin deposits in the renal tubes can cause kidney damage.*
- Make sure that the patient is comfortable.
- Reassure the patient and family, as necessary.
- Clean and disinfect your stethoscope with a disinfectant pad.[32][33]
- Perform hand hygiene.[6][7][9][10][11][12][13]
- Put on gloves and, as needed, other personal protective equipment *to comply with standard precautions.*[21][22][23][24]
- Clean and disinfect other reusable equipment according to the manufacturer's instructions *to prevent the spread of infection.*[32][33]
- Remove and discard your gloves and, if worn, other personal protective equipment.[21][29]
- Perform hand hygiene.[6][7][9][10][11][12][13]
- Document the procedure.[34][35][36][37][38]

COMPLICATIONS

GUIDE TO TRANSFUSION REACTIONS

Any patient who receives a transfusion of blood or blood products is at risk for a transfusion reaction. A transfusion reaction may occur immediately during the transfusion or within several hours of transfusion completion, or it may be delayed. The chart below describes immediate and delayed reactions.[1]

Reaction and causes	Signs and symptoms	Nursing interventions
Immediate reactions		
Acute hemolytic reaction resulting from administration of incompatible blood	• Chills • Shaking • Fever (temperature increase of 2° F [1° C] or more) • Increased pulse rate • Pain at the IV insertion site • Nausea • Vomiting • Chest tightness • Reddish urine[39] • Headache • Flank pain • Hypotension	• Label all blood samples properly in the presence of the patient. • Positively identify the patient and donor blood types and groups before the transfusion.[1] • Use a two-person verification process *to verify the patient and blood component.*[26] • Transfuse the blood slowly for the first 15

	• Kidney failure or shock (if allowed to progress)	minutes and remain with the patient.[26] • Save the donor blood to reattempt crossmatching with the patient's blood.[1] • If an acute hemolytic reaction occurs, stop the transfusion immediately and notify the practitioner and transfusion services.[26] • Maintain patent IV access. • Monitor vital signs for signs of shock. • Insert an indwelling urinary catheter if ordered *to monitor urine output*.[1] • Send a blood sample *to check for intravascular hemolysis.* • Assess for signs of disseminated intravascular coagulation.[1] • Provide supportive medical therapies, as ordered, *to reverse shock*.[1]
Bacterial sepsis resulting from blood product contamination	• Rigors • Chills • High fever (temperature increase of 3.5° F [2° C] or more) • Shock • Tachycardia • Rise or fall in systolic blood pressure greater than 30 mm Hg[40]	• Use sterile technique when collecting and administering blood products. • Ensure that the transfusion is started within the facility's designated time after removal from transfusion services (for example, 30 minutes).[41] • Complete the transfusion in 4 hours or less.[1] [42] • If signs or symptoms of bacterial sepsis occur, stop the transfusion immediately and notify the practitioner and transfusion services.[1]

		• Treat the patient's fever, as prescribed.[1] • Send blood samples from the patient and blood component for culture and sensitivity testing.[1] • Administer antibiotics, as prescribed.[1]
Febrile nonhemolytic reactions resulting from leukocyte or platelet antibodies, plasma protein antibodies, or cytokines from donor leukocytes	• Fever (temperature increase of 2° F [1° C] or more occurring during or shortly after a transfusion in the absence of any other stimulus for fever) • Chills	• Administer acetaminophen or an antihistamine before the transfusion, as prescribed.[1] • Administer leukocyte-reduced red blood cells (RBCs), as prescribed, *because they're less likely to cause a reaction.* • If signs or symptoms occur, stop the transfusion immediately and notify the practitioner and transfusion services.[1]
Transfusion-related acute lung injury (TRALI) resulting from complement and histamine release caused by granulocyte antibodies in the donor or recipient	• Cyanosis[43] • Dyspnea[1] • Fever[43] • Hypoxemia[43] • Hypotension[43] • Pulmonary edema[1] • Normal pulmonary capillary wedge pressure[1] • Pulmonary infiltrates[43] • Tachypnea[43] • Tachycardia[43] • In intubated patients, elevated peak and plateau airway pressures[43] or pink, frothy airway secretions[43]	• If the patient develops signs and symptoms of TRALI, stop the transfusion immediately.[43] • Administer treatment to support blood pressure, as prescribed. • Administer supplemental oxygen, as prescribed. • Prepare for endotracheal intubation and mechanical ventilation if necessary.

Allergic reaction resulting from an allergen in the donor's plasma	• Urticaria[1][44] • Flushing[1] • Wheezing[1] • Laryngeal edema[1] • Localized angioedema[44] • Hypotension[44]	• If the patient tends to experience allergic reactions, administer antihistamines before the transfusion, as prescribed.[1] • If the patient develops mild itching, reduce the transfusion rate.[1] • If signs and symptoms are more severe than mild itching, stop the transfusion immediately and notify the practitioner and transfusion services.[1] • Administer EPINEPHrine, as prescribed, for wheezing and anaphylactic reactions.[1] • If no other cause is found or signs and symptoms occur or if an antihistamine provides relief from itching, restart the transfusion, as ordered.[1] • Don't restart the transfusion if the patient has a fever, pulmonary or airway signs or symptoms, or anaphylaxis.[1]
Transfusion-associated circulatory overload (TACO) resulting from rapid infusion or excessive blood volume	• Precordial pain • Dyspnea[45] • Orthopnea[45] • Hypoxia[45] • Crackles • Wheezing[45] • Cyanosis • Dry cough • Jugular vein distention[45] • Hypertension[45] • Headache[45] • Tachycardia[45] • Wide pulse pressure[45]	• Administer blood products slowly.[1] • Use volume-reduced platelets *to prevent fluid overload*.[1] • Administer the blood product using an electronic infusion device *to maintain flow rate.* • Position the patient in a semi-Fowler or upright position *to increase venous resistance*.[1] • If the patient develops signs and symptoms of TACO, stop the

		transfusion immediately and notify the practitioner and transfusion services.[1]
Delayed reactions		
Delayed hemolytic reaction resulting from production of antibodies by RBCs to antigens on transfused cells	Occurring 5 to 10 days after transfusion: • Fever • RBC destruction	• Monitor laboratory test results for anemia and reduced benefit from successive transfusions.[1] • If the patient develops signs and symptoms of delayed hemolytic reaction, notify the practitioner and transfusion services.[1]
Alloimmunization resulting from an unpredictable development of antibodies to RBCs, white blood cells, platelets, or plasma proteins	• Possible development of signs and symptoms of a hemolytic, febrile, or allergic reaction	• Know that a patient who receives multiple transfusions is at risk.[1] • If signs or symptoms of a reaction occur, notify the practitioner and transfusion services.[1]
Posttransfusion purpura resulting from sensitization caused by pregnancy or a previous transfusion	Occurring 7 to 10 days after transfusion: • Sudden, dramatic thrombocytopenia	• Administer high-dose immune globulin IV, as prescribed. • Monitor the patient's platelet count.
Transfusion-associated graft-versus-host disease resulting from engrafting of the T lymphocytes from the donor's component in the recipient, which then react against the recipient's tissue antigens	Typically developing 10 to 12 days after a transfusion: • Fever • Rash • Diarrhea • Nausea[46] • Vomiting[46] • Anorexia[46] • Liver dysfunction[46] • Decreased white blood cell count[46]	• Provide supportive care, as ordered.

Special Considerations

- The Joint Commission considers a blood incompatibility error a sentinel event. A sentinel event is an unexpected occurrence involving death or serious physical or psychological injury or the

risk thereof. Sentinel events require immediate investigation and response. Follow your facility's process for reporting a suspected blood incompatibility error.[47]
- Be aware that transfusion-related acute lung injury (TRALI) is a leading cause of transfusion-related mortality. Monitor the patient closely for signs and symptoms of TRALI.[1]
- Be alert for signs and symptoms of shock or cardiovascular collapse. Be prepared to intervene with emergency medications and rapid fluid administration. Follow advanced cardiac life support protocols if respiratory or cardiac arrest occurs.
- Be aware that the compatibility testing facility must report recipient fatalities from transfusion of blood or a blood product to the U.S. Food and Drug Administration (FDA) as soon as possible after the event by phone (240-402-9160), email (fatalities2@fda.hhs.gov), or fax (301-837-6256). The reporting facility must also send a written report within 7 days after the fatality addressed to the FDA Center for Biologics Evaluation and Research Document Control Center, 10903 New Hampshire Avenue, WO71, G112, Silver Spring, MD 20993-0002.[48]
- The Joint Commission issued a sentinel event alert related to managing risk during transition to new International Organization for Standardization tubing standards that were designed to prevent dangerous tubing misconnections, which can lead to serious patient injury and death. During the transition, make sure to trace each tubing and catheter from the patient to the point of origin before connecting or reconnecting any device or infusion, at any care transition (such as a new setting or service), and as part of the handoff process; route tubes and catheters having different purposes in different standardized directions; when there are different access sites or several bags hanging, label tubing at both the distal and proximal ends; use tubing and equipment only as intended; and store medications for different delivery routes in separate locations.[49]

Patient Teaching

Because blood transfusion reactions can occur after the completion of a transfusion, teach the patient and family (if appropriate) the signs and symptoms of transfusion reactions. Tell the patient to be alert to the possibility of a delayed reaction and to report signs and symptoms promptly.

Documentation

Documentation associated with blood and blood product transfusion reaction management includes:

- time and date the transfusion was started
- type of blood component transfused
- unit identification number
- patient's condition at the start of the transfusion
- patient's vital signs
- other assessment findings
- time the transfusion was stopped
- volume infused
- patient's condition
- identity of the person who stopped the transfusion and observed the patient
- date and time the practitioner was notified
- prescribed interventions
  - patient's response to those interventions
- samples sent to the laboratory for analysis
- nursing interventions performed
  - patient's response to those interventions
- completed transfusion reaction report form (if required by your facility)
- teaching provided to the patient and family (if applicable)
  - understanding of that teaching
  - follow-up teaching needed.

This procedure has been reviewed by the Academy of Medical-Surgical Nurses.

AMSN Academy of Medical-Surgical Nurses

Related Procedures

- Blood and blood product transfusion reaction management, pediatric

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(Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions)

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Rating System for the Hierarchy of Evidence for Intervention/Treatment Questions

The following leveling system is adapted from *Evidence-Based practice in nursing & healthcare: A guide to best practice,* Fifth edition, by Bernadette Mazurek Melnyk and Ellen Fineout-Overholt (2023).

Level I	Evidence from a systematic review or meta-analysis of all relevant randomized controlled trials (RCTs)

Level II	Evidence from well-designed single RCTs (experimental)
Level III	Evidence from well-designed nonrandomized controlled trials (quasi-experimental), systematic reviews of a complete body of evidence, and intervention studies using mixed methods
Level IV	Evidence from well-designed case-control and cohort studies (observational)
Level V	Evidence from systematic reviews of qualitative and descriptive studies
Level VI	Evidence from single descriptive and qualitative studies, evidence-based practice implementation, and quality improvement projects
Level VII	Evidence from expert opinion, expert committee reports, and literature reviews

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