



The Critical Role of the Nurse: Recognizing and Responding to Suspected Transfusion Reactions

This learning module is offered by The Massachusetts Department of Public Health and was developed in collaboration with the Transfusion Medicine Programs of Baystate Medical Center and Beth Israel Deaconess Medical Center

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Beth Israel Deaconess
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Disclosures

The planners and presenters have no conflicts of interest to disclose and have received no financial support for any part of the planning of this presentation.

Learning Objectives

- * Describe the steps that should be taken in the first 15 minutes of a transfusion to reduce the likelihood of a reaction.
- * Identify the signs and symptoms that may indicate a transfusion reaction.
- * Review the clinical presentation(s) and cause(s) of several specific types of transfusion reaction.
- * Describe the patient care steps that should be taken when a transfusion reaction is suspected.
- * Explain how to report a suspected transfusion reaction in your facility and why it is important to do so.
- * List available resources to learn more about recognition, response and prevention of transfusion reactions.

The First 15 Minutes

- * Remain **within view** of the patient for the first 15 minutes of the transfusion.

The First 15 Minutes



The majority of severe transfusion reactions occur at the initiation of the transfusion, for that reason:

- ☞ Remain **within view** of the patient for the first 15 minutes of the transfusion.
- ☞ A full set of vital signs should be done at 15 minutes and compared to baseline vital signs.
- ☞ Infusion should begin at a reduced rate for first 15 minutes.
- ☞ **A temperature increase or other change in vital signs or symptoms, may indicate a transfusion reaction.**
- ☞ Monitoring of other vital signs are performed per assessment of the patient's clinical situation.

Other Considerations

- Most Transfusions are considered “uncomplicated” and are associated with very small changes in temperature (less than 1°F), pulse rate (<5 beats/min), and blood pressure (<5 mmHg).
- It is common to see a drop in temperature at the 15 min vital signs check when transfusing a refrigerated blood product.
- Prompt response to a vital sign change may prevent a severe reaction from developing.
- Transfusion reaction determination is completed in the Blood Bank after documents have been reviewed and testing has been performed. It cannot be done at the bedside.

Recognition of Suspected Transfusion Reactions



Image 1

Possible Signs and Symptoms of a Transfusion Reaction

- * Fever, chills, rigors, hypothermia
- * Rashes, urticaria, flushing, pruritis, pallor, angioedema, cyanosis, jaundice
- * Dyspnea, tachycardia, orthopnea, stridor, increased / frothy secretions, wheezing, rales, cough, hoarseness
- * Hypertension, hypotension, bradycardia, tachycardia, dysrhythmias, circulatory collapse
- * Pain (venous access site; other sites: head, chest, lumbar region and abdomen); central, peripheral, or autonomic system dysfunction; anxiety, sense of impending doom, tetany
- * Nausea, vomiting, diarrhea, urinary output changes (oliguria, anuria and hemoglobinuria), flank pain
- * Excessive bleeding or clotting

In the Event of a Suspected Transfusion Reaction



Image 2

- **STOP** the transfusion.
- **MEASURE** and **RECORD** the patient's vital signs and document the time the transfusion is stopped.
- **Keep the IV patent.**
- **Verify Patient and Product Information. RECHECK** for discrepancies.
- **RECORD** the actual volume of the blood product infused.
- **NOTIFY** the ordering provider and seek treatment for the patient.
- **NOTIFY** the Blood Bank.
- **SEND** Blood Bag and administration set back to the Blood Bank with paper transfusion tag. NOTE: The blood unit must be kept sterile so Blood Bank can culture it, if indicated.
- **PROMPTLY Draw and Send** blood specimen tubes (according to facility guidelines).

Do Not Restart the Transfusion

Except for a mild allergic reaction....

- * If the only symptom is **hives** (urticaria) and the patient is stable or improving (with or without medication) the transfusion **may be resumed** if clinically indicated.
- * *If indicated by your institutional guidelines*, the unit should be capped aseptically and returned to the Blood Bank after completion of the transfusion.

Types of Transfusion Reactions

- **Hemolytic**
- **Febrile**
- **Allergic**
- **TACO (Transfusion Associated Circulatory Overload)**
- **Hypotensive**
- **TRALI (Transfusion Related Acute Lung Injury)**

Signs and Symptoms of Hemolytic Transfusion Reactions

- **Back/Flank Pain**
- **Chills and Rigors**
- **Fever**
- **Disseminated Intravascular Coagulation**
- **Hypotension**
- **Epistaxis**
- **Hematuria**
- **Pain and oozing at IV site**
- **Renal Failure**
- **Oliguria or Anuria**
- **Jaundice**

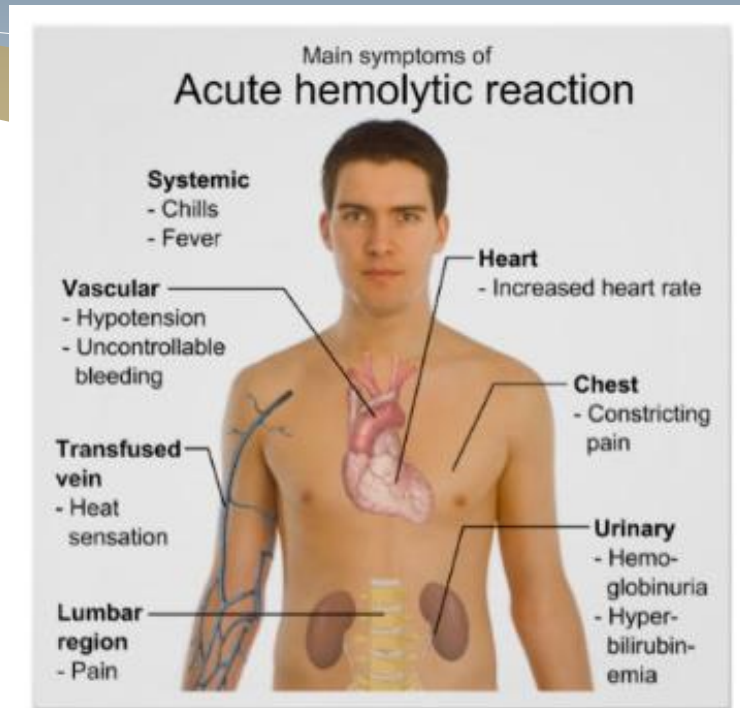


Image 3

Typically occurs during transfusion or up to 6 hours after but can also occur days or weeks later. The most common cause for an acute hemolytic transfusion reaction is a clerical error, such as a mislabeled specimen sent to the Blood Bank, or not properly identifying the patient to whom you are giving the blood.

Hemolytic Transfusion Reaction Pathophysiology

- * Occurs when incompatible blood cells are transfused and the recipient's immune system produces antibodies which destroy (hemolyze) the transfused cells.
- * When administering blood, implement the 5 “rights”. The bedside check is a vital step to ensure the right blood product is given to the right patient to prevent unnecessary reactions. Use a two-person verification process or a one-person verification process accompanied by automated identification technology, such as bar coding.

1. Right Drug/Product
2. Right Patient
3. Right Dose
4. Right Route
5. Right Time

Signs and Symptoms of Febrile Transfusion Reactions

- **Chills**
- **Rigors**
- **Increase in Body Temperature**
- **Increased Respiratory Rate**
- **Headache**

Typically occurs during transfusion or up to 6 hours post-transfusion, and is mitigated by the use of leukoreduced blood products.



Image 4

Febrile Transfusion Reaction

Pathophysiology

- * Fever and chills more commonly are caused when recipient antibodies are directed against donor white blood cells.
- * Fever is also one of the first signs of a hemolytic reaction which is why the transfusion is immediately stopped.



neutrophil eosinophil basophil monocyte lymphocyte

Image 5

Signs and Symptoms of Allergic Transfusion Reactions



Image 6

- **Rash**
- **Urticaria (hives)**
- **Pruritus (itching)**
- **Generalized Flushing**
- **Conjunctival edema**
- **Edema of eyes, lips, tongue and uvula**
- **Angioedema**

Typically occurs during transfusion or up to a few hours post transfusion, and can range from minor sequelae to anaphylaxis. Such reactions may occur in up to 1 in 200 transfusions of RBCs and 1 in 30 transfusions of platelets.

Allergic Transfusion Reaction Pathophysiology

* **Caused by reactions to plasma proteins in the blood product.**

First signs of mild or severe reaction may be hives, in rare cases this may progress to anaphylaxis

Mild allergy *versus* Anaphylactic reaction

Mild

More common ~1/50

Donor plasma protein IgE present on mast cells release histamine.

Symptoms -Hives and Pruritus-self limiting
(INS 2014)

Anaphylaxis

Less common~1/30,000

Recipients Antibody to donor plasma protein IgA, C4, haptoglobin

Signs and Symptoms of TACO Reactions (Transfusion Associated Circulatory Overload)

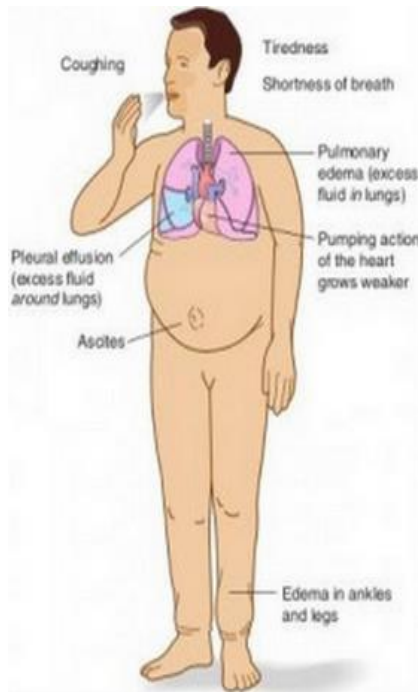


Image 7

- **Coughing**
- **Dyspnea**
- **Orthopnea**
- **Acute Respiratory Distress**
- **Breath sound changes**
- **Drop in oxygen saturation**
- **Crackles or Rales**
- **Chest Tightness**
- **Rapid Blood Pressure elevation**
- **Peripheral Edema**
- **Fever**

Typically occurs within 6-12 hours post transfusion and is recognized as a common yet avoidable complication of transfusion. The risk increases with patients over the age of 60 and patients with cardiac, pulmonary or renal failure, or severe anemia.

TACO Reaction Pathophysiology

- * Due to circulatory overload following transfusion; specifically the inability of the recipient to compensate for the volume of the product transfused and/or the inability of the patient's cardiopulmonary system to handle the transfusion rate.
- * Cardiogenic pulmonary edema may ensue.

Signs and Symptoms of Hypotensive Transfusion Reactions

- **Nausea and vomiting**
- **Early and abrupt drop in blood pressure**



Image 8



Image 9

Though uncommon these reactions happen rapidly either during or within 1 hour of transfusion. The drop in blood pressure typically resolves quickly once the transfusion is stopped.

Hypotensive Transfusion Reaction Pathophysiology

- * Disturbances in the production and metabolism of bradykinin cause the pathophysiology of these reactions.

Signs and Symptoms of TRALI Reactions (Transfusion Related Acute Lung Injury)

- Hypoxemia
- Hypotension
- Dyspnea
- Tachypnea
- Cyanosis
- Fever
- Bilateral Pulmonary Edema

Chest X-ray of a patient before and during an episode of transfusion-related acute lung injury (TRALI)

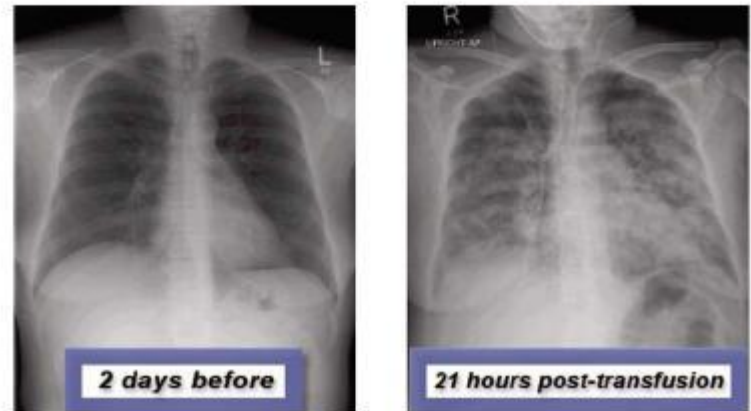


Image 10/11

Typically occurs during transfusion or up to 6 hours after. Symptoms are severe in nature and patient may require supportive care such as oxygen and mechanical ventilation.

TRALI Reaction Pathophysiology

- * The cause of this type of reaction is not fully understood but it is proposed that white blood cell antibodies present in the donor's plasma bind to the white cells of the recipient, which results in activation of complement and neutrophils.

Other Complications of Transfusion

Transfusion Transmitted Infection

- Patient newly diagnosed with infection such as hepatitis or babesiosis following transfusion and there is evidence of the pathogen in the donor.

Transfusion Transmitted Graft vs. Host Disease

- Patient develops Graft vs. Host Disease 2 days to 6 weeks after transfusion. Characterized by rash, diarrhea, fever, hepatomegaly, pancytopenia and liver dysfunction. Irradiation of blood products reduces the risk of transmission.

Post Transfusion Purpura

- Patient produces antibodies to platelets recently transfused leading to platelet destruction and new onset of thrombocytopenia.

A few notes on “Hemovigilance”

- * Hemovigilance is the monitoring (surveillance) of blood product transfusions and potential resulting adverse reactions.
- * By conducting broad-based, systematic hemovigilance, you can detect signals that might indicate a problem with a blood product that might be difficult to detect at the hospital-level.
- * In Massachusetts, the National Healthcare Safety Network is what is used to collect information on transfusion-associated adverse reactions and statewide data is published every year online.
- * By reporting suspected adverse reactions to your Blood Bank, you are participating in hemovigilance.

Case Presentations

Patient 1

A 68 year-old woman with myelodysplastic syndrome has a history of low platelet counts. She presents to clinic for weekly labs. Her current platelet count is 9,000/uL. She receives a platelet transfusion.

Initial:

HR: 76 bpm, T: 97.6°F, BP: 128/73 mmHg, RR: 18/min,
PO₂: 98%



Image 12

10 minutes into the transfusion, she becomes short of breath.

Patient 1

What should you do?



Image 13

STOP TRANSFUSION
Take vital signs.

Initial:

HR: 76 bpm, T: 97.6 °F, BP: 128/73 mmHg, RR: 18/min, PO₂: 98%

Current:

HR: 108 bpm, T: 98.0 °F, BP: 125/76 mmHg, RR: 32/min, PO₂: 88%

Keep the IV patent.

Verify patient and product information.

RECHECK for discrepancies.

Patient 1

Next steps?

Contact her physician.

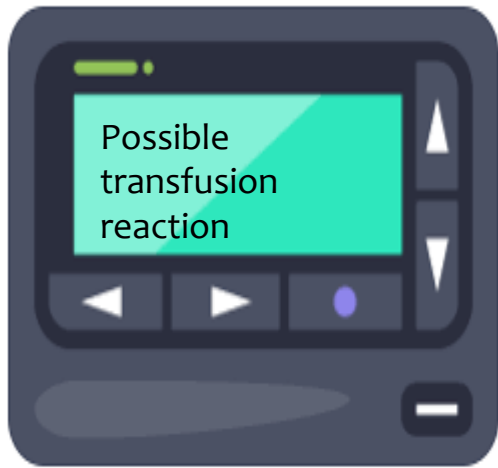


Image 14

Which transfusion reactions could this be?

- Mild Allergic Transfusion Reaction
- Transfusion-Associated Circulatory Overload (TACO)
- Transfusion-Related Acute Lung Injury (TRALI)

Notify the Blood Bank.

Send aseptic product bag and administration set back to the Blood Bank.

Draw and send blood specimen tubes (according to facility guidelines).

Patient 1

Patient symptoms, history, and additional testing help to differentiate:

- No itching or wheezing (*rules out Allergic/Anaphylactic Transfusion Reactions*)
- No history or current symptoms of edema/volume overload (*Transfusion-Associated Circulatory Overload less likely*)

A chest X-ray reveals new acute lung injury (“white-out”).

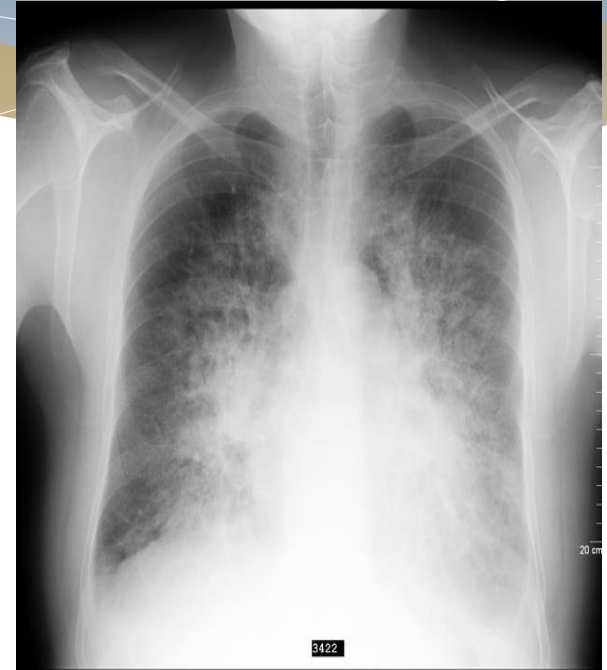


Image 15

Which transfusion reaction is most likely?

Transfusion-Related Acute Lung Injury (TRALI)

Patient 2

A 65 year-old man has a history of heart and liver failure due to alcohol abuse. He presents to the Emergency Department short of breath and fatigued. The patient has anemia (hemoglobin 6.8 g/dL) and severe bilateral lower-extremity edema. He receives a unit of packed red cells.

Initial:

HR: 96 bpm, T: 98.0°F, **BP: 164/93** mmHg, RR: 21/min, PO₂: 96%



Image 16

45 minutes into the transfusion, he becomes increasingly short of breath.

Patient 2

What should you do?



STOP TRANSFUSION
Take vital signs.

Initial:

HR: 96bpm, T: 98.0°F, BP: 164/93mmHg, RR: 21/min, PO₂: 96%

15 minute:

HR: 98bpm, T: 98.1°F, BP: 170/95mmHg, RR: 24/min, PO₂: 95%

Current:

HR: 115bpm, T: 98.6°F, BP: 180/98mmHg, RR: 32/min, PO₂: 91%

Keep the IV patent.

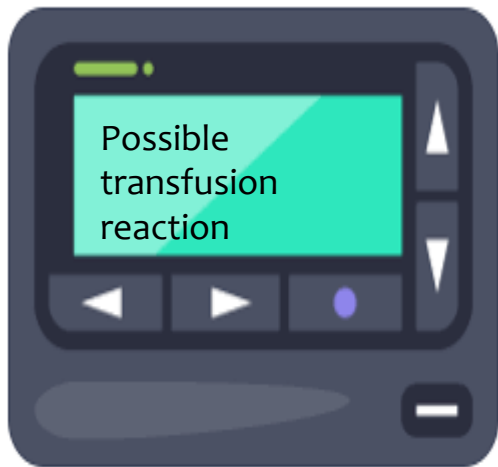
Verify patient and product information.

RECHECK for discrepancies.

Patient 2

Next steps?

Contact his physician.



Which transfusion reactions could this be?

- Mild Allergic Transfusion Reaction
- Transfusion-Associated Circulatory Overload (TACO)
- Transfusion-Related Acute Lung Injury (TRALI)

Notify the Blood Bank.

Send aseptic product bag and administration set back to the Blood Bank.

Draw and send blood specimen tubes (according to facility guidelines).

Patient 2

Patient symptoms, history, and additional testing can help to differentiate:

- No itching or wheezing (*rules out Allergic/Anaphylactic Transfusion Reactions*)
- Blood donor of transfused product was a male with no history of transfusion (*Transfusion-Associated Acute Lung Injury less likely*)

A chest X-ray reveals bilateral hazy infiltrates (*likely volume overload*)

The patient receives diuretics. 4 hours later, his edema and PO₂ sat have substantially improved.

Which transfusion reaction is most likely?

- In future, consider transfusing judiciously and at a slower rate.

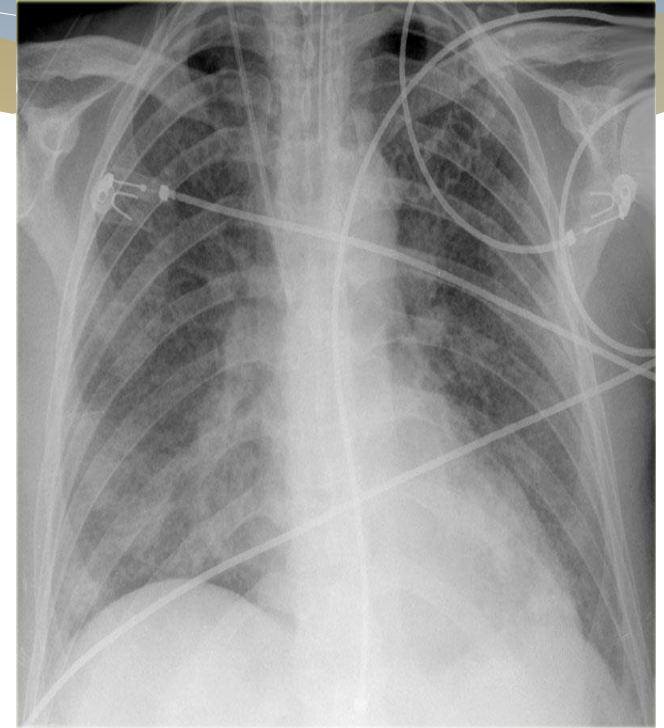


Image 17

Transfusion - Associated
Circulatory Overload (TACO)

Patient 3

A 5 year old girl with leukemia is admitted to the hematology/oncology floor for induction chemotherapy and stem cell transplant, and subsequently requires ongoing blood product support. Her current platelet count is 8,000/uL. She receives an apheresis platelet.

Initial:

HR: 98 bpm, T: 99.0°F, BP: 96/57 mmHg, RR: 21/min, PO₂: 98%

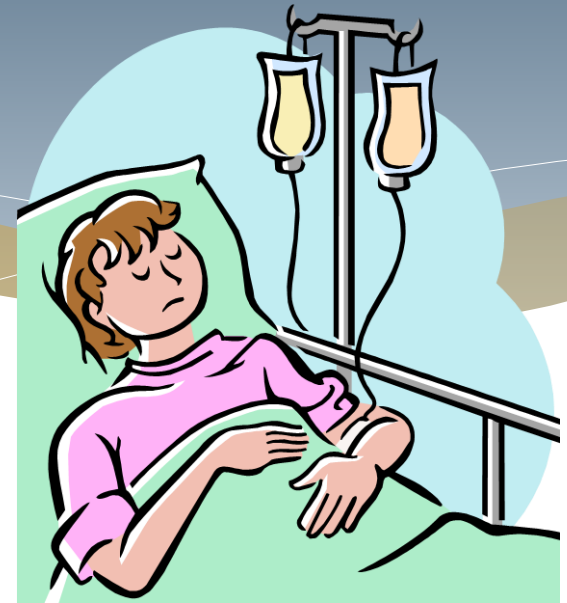


Image 18/19

10 minutes into the transfusion, she complains of itchy bumps on her arms and chest.

Patient 3

What should you do?



STOP TRANSFUSION
Take vital signs.

Initial:

HR: 98 bpm, T: 99.0°F, BP: 96/57 mmHg, RR: 21/min, PO₂: 98%

Current:

HR: 96 bpm, T: 99.0°F, BP: 93/56 mmHg, RR: 22/min, PO₂: 98%

Keep the IV patent.

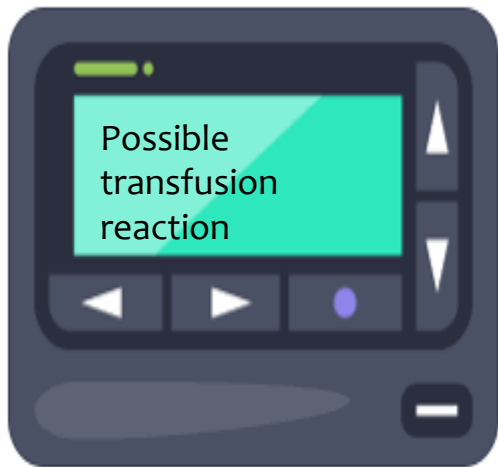
Verify patient and product information.

RECHECK for discrepancies.

Patient 3

Next steps?

Contact her physician.



Which transfusion reactions could this be?

- Mild Allergic Transfusion Reaction

Notify the Blood Bank.

Send aseptic product bag and administration set back to the Blood Bank.

Draw and send blood specimen tubes (according to facility guidelines).

Patient 3

The physician agrees this is likely a Mild Allergic Transfusion Reaction and recommends an antihistamine.

The itchy patches resolve.

If symptoms resolve or do not progress, it may be possible to restart transfusion. **Follow institutional policy.**



Image 20

Patient 3, cont.

You restart the transfusion, as allowed by your institutional policy.

The patient begins to wheeze and clutch her throat.



Image 21

Patient 3

What should you do?



STOP TRANSFUSION
Take vital signs.

Initial:

HR: 98 bpm, T: 99.0°F, BP: 96/57 mmHg, RR: 21/min, PO₂: 98%

Follow Up:

HR: 96 bpm, T: 99.0°F, BP: 93/56 mmHg, RR: 22/min, PO₂: 98%

Current:

HR: 146 bpm, T: 98.6 °F, BP: 69/42 mmHg, RR: 45/min, PO₂: 89%

Keep the IV patent.

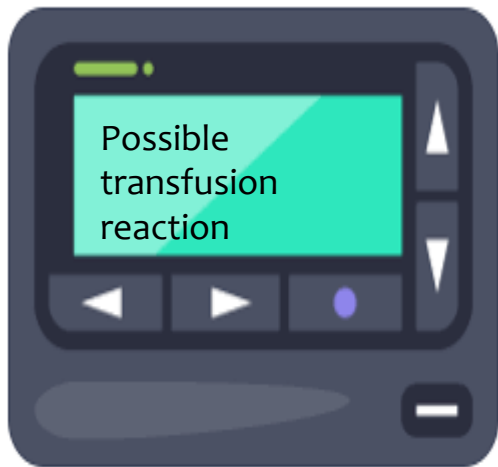
Verify patient and product information.

RECHECK for discrepancies.

Patient 3

Next steps?

Contact her physician.



Which transfusion reactions could this be?

- Anaphylactic Transfusion Reaction

The patient's physician agrees with your suspicions of anaphylaxis and directs administration of epinephrine.

The patient is emergently intubated.

Notify the Blood Bank.

Send aseptic product bag and administration set back to the Blood Bank.

Draw and send blood specimen tubes (according to facility guidelines).

Patient 4

A 78 year-old woman has a chronic gastrointestinal bleed. She presents to her doctor's office complaining of fatigue. A CBC shows anemia, with hemoglobin of 6.5 g/dL. She is admitted to the hospital, where a Foley catheter is placed. She receives a unit of packed red cells.

Initial:

HR: 103 bpm, T: 96.5°F, BP: 94/78 mmHg, RR: 21/min,
PO₂: 95%, and urine in her catheter bag is clear

Post-transfusion:

Stable, Unchanged



Image 22

Three hours after transfusion, she complains of fever and chills. Labs are obtained.
Her hemoglobin remains 6.5 g/dL.

Patient 4

You notice that the urine in the patient's catheter bag is dark brown.

What should you do?

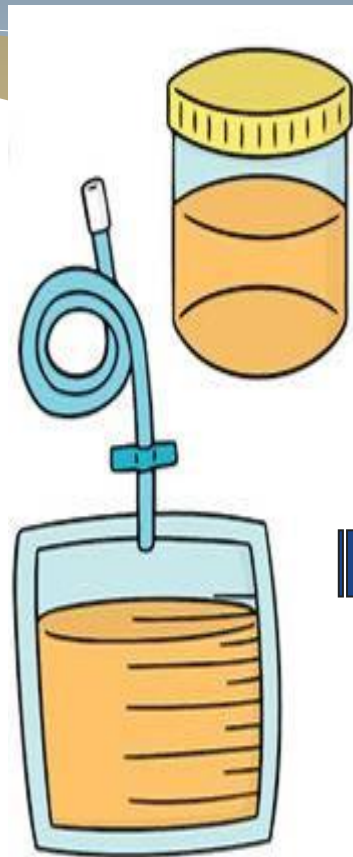


Image 23



Patient 4

What should you do?



Take vital signs.

Initial:

HR: 103bpm, T: 96.5°F, BP: 94/78mmHg, RR: 21/min, PO₂: 95%, and urine in her catheter bag is clear

Post-transfusion:

Stable, Unchanged

Current:

HR: 116bpm, T: 99.5°F, BP: 80/59mmHg, RR: 28/min, PO₂: 91% and dark brown urine in her catheter bag

Keep the IV patent.

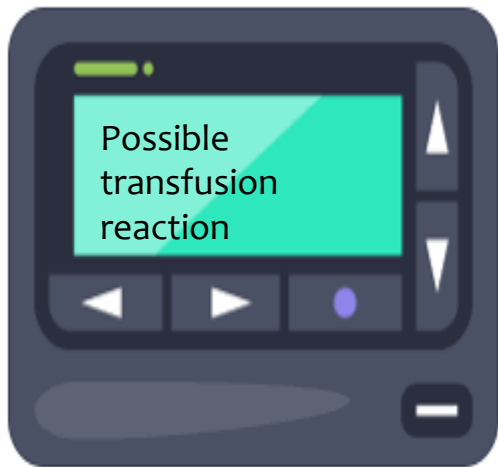
Verify patient and product information.

RECHECK for discrepancies.

Patient 4

Next steps?

Contact her physician.



Which transfusion reactions could this be?

- Acute Hemolytic Transfusion Reaction

Notify the Blood Bank.

Send aseptic product bag and administration set back to the Blood Bank.

Draw and send blood specimen tubes (according to facility guidelines).

Patient 4

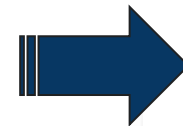
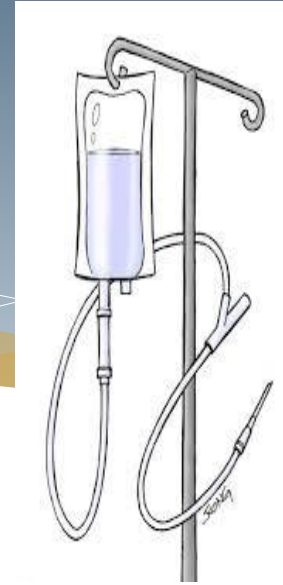
What should you do next?

Keep fluid lines open and running.

Send a transfusion reaction workup to the Blood Bank, including:

- Residual pRBC component
- New patient blood specimen for Direct Antiglobulin Test (DAT) (negative pre-transfusion, now positive)

Which transfusion reaction is most likely?



**BLOOD
BANK**

Image 24

**Acute Hemolytic Transfusion
Reaction**

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