SIMULATION

Acute Hemolytic Transfusion Reaction

Michael Purcell, MD*, Christopher E San Miguel, MD* and Jennifer Yee, DO*

*The Ohio State University Wexner Medical Center, Department of Emergency Medicine, Columbus, OH

Correspondence should be addressed to Jennifer Yee, DO at jennifer.yee.26@gmail.com

Submitted: February 28, 2018; Accepted: April 23, 2018; Electronically Published: July 15, 2018; https://doi.org/10.21980/J88D2Z

ABSTRACT:

Audience: This scenario was developed to educate emergency medicine residents on the diagnosis and management of acute hemolytic transfusion reactions in the emergency department. The case is appropriate for senior medical students and advanced practice providers. The principles of crisis resource management, teamwork, and communication are also incorporated into the case.

Introduction: Patients who present with suspected acute hemolytic transfusion reactions require rapid diagnosis and management, as well as a thorough evaluation for other differential diagnoses, such as DIC (disseminated intravascular coagulation), TTP (thrombotic thrombocytopenic purpura), and sepsis. The possibility of acute hemolytic transfusion must be entertained early, as it carries significant morbidity including the risk of developing acute hemolytic anemia, acute renal failure, DIC, shock, and/or death.[1] The mortality rate of acute hemolytic transfusion reactions can reach 44%, and it accounts for 20% of all transfusion-related mortalities.[2,3] Given this significant morbidity and mortality, early recognition and management are paramount in the emergency department (ED) to avoid clinical deterioration and death.

Objectives: By the end of this simulation session, the learner will be able to: 1) Recognize the clinical signs and symptoms associated with transfusion reactions. 2) Discuss necessary systems-based management of potential transfusion reactions, such as notifying the blood bank and evaluating to see if another patienta accidentally received a wrong unit of blood. 3) Discuss the management of various transfusion reactions. 4) Appropriately disposition the patient to an intensive care unit (ICU) or stepdown unit. 5) Effectively communicate with team members and nursing staff during the resuscitation of a critically ill patient.

Method: This session is conducted using high-fidelity simulation, followed by a debriefing session and lecture on the diagnosis and management of transfusion reactions. Debriefing methods may be left to the discretion of participants, but the authors have utilized advocacy-inquiry techniques.

Topics: Medical simulation, acute hemolytic transfusion reaction, transfusion reactions, hematology, emergency medicine.

USER GUIDE

List of Resources:

Learner Audience:
Medical students, interns, junior residents, senior residents

Time Required for Implementation:
Instructor Preparation: 30 minutes
Time for case: 20 minutes
Time for debriefing: 40 minutes

Recommended Number of Learners per Instructor:
4

Topics:
Medical simulation, acute hemolytic transfusion reaction, transfusion reactions, hematology, emergency medicine.

Objectives:
By the end of this simulation session, the learner will be able to:

1. Recognize the clinical signs and symptoms associated with transfusion reactions.
2. Discuss necessary systems-based management of potential transfusion reactions, such as notifying the blood bank and evaluating to see if another patient accidentally received a wrong unit of blood.
3. Discuss the management of various transfusion reactions.
4. Appropriately disposition the patient to an ICU or stepdown unit for further management.
5. Effectively communicate with team members and nursing staff during the resuscitation of a critically ill patient.

Linked objectives and methods:
Acute hemolytic transfusion reactions are rare but serious events that account for 20% of transfusion-related fatalities.[1] They most commonly occur as a result of human error and can have mortality rates as high as 44%, making them a clinically important adverse event in emergency medicine.[2] When donor blood is transfused, the recipient's preformed antibodies recognize antigens on the donor red blood cells, resulting in an acute hemolytic transfusion reaction. This most commonly occurs as a result of ABO incompatibility.[3] The reaction causes both intravascular and extravascular red blood cell hemolysis. The initial signs and symptoms of an acute hemolytic transfusion reaction include fever, chills, back pain, rigors, myalgias, and dark urine. If this process progresses, it can lead to acute hemolytic anemia, acute renal failure, DIC, shock, and/or death.[4] Prompt management of acute hemolytic transfusions includes recognition of the reaction, stopping blood transfusion, notifying the blood bank, and starting IV fluid resuscitation. This simulation scenario reinforces the recognition and emergent management of blood transfusion reactions in a psychologically-safe learning environment. This scenario requires learners work through all five objectives during the simulation and to receive formative feedback on their performance.

Recommended pre-reading for instructor:
We recommend that instructors review literature regarding transfusion reaction diagnoses and management. Suggested readings include:

- Carson JL, Guyatt G, Heddle NM, et al. Clinical practice guidelines from the AABB: red blood cell transfusion thresholds and storage. *JAMA*. 2016;316(19):2025-2035. doi: 10.1001/jama.2016.9185
- Carson JL, Triulzi DJ, Ness PM. Indications for and adverse effects of red-cell transfusion. *N Engl J Med*. 2017;377(13):1261-1272. doi: 10.1056/NEJMra1612789
- Fatalities reported to FDA following blood collection and transfusion: annual summary for fiscal year 2016. Report from the US Food and Drug Administration. https://www.fda.gov/downloads/BiologicsBloodVaccines/SafetyAvailability/ReportaProblem/TransfusionDonationFatalities/UCM598243.pdf
- Kluckman M, Stern E, Reeves L. Hematologic Emergencies. In: Stone C, Humphries RL. eds. CURRENT Diagnosis & Treatment: Emergency Medicine. 8th ed. New York, NY: McGraw-Hill; 2011:707-740.
- Additionally, instructors should familiarize themselves with their state-specific legal ramifications of sympathetic statements, apologies, and admittance of guilt.
- Cotton VR. Legal pitfalls of medical apology laws. The Beacon. Reprinted from Inside Medical Liability. https://www.medicalmutual.com/news/article/legal-pitfalls-of-medical-apology-laws/303. Published April 4, 2014. Accessed May 26, 2018.

Results and tips for successful implementation:
The case was written for emergency medicine residents in a freestanding, community-based, or academic emergency department. It is intended as a high-fidelity simulation scenario, but also may be used as a mock oral board case. The scenario was based on an actual patient case. We ran the case over four

days with three sessions per day, with each session containing 3-4 residents on average. Verbal feedback was very positive since this was a low-frequency case with many potential differential diagnoses. Participants also appreciated debriefing discussions on addressing medical errors with patients and how to notify the blood bank or other potentially affected patients. When pre-hospital providers ran the case, we discussed their rules regarding transportation with or without blood products running (which varied), but otherwise, no major changes were made to this case format.

References/suggestions for further reading:

1. Kluckman M, Stern E, Reeves L. Hematologic emergencies. In: Stone C, Humphries RL. eds. *CURRENT Diagnosis & Treatment: Emergency Medicine*. 8th ed. New York, NY: McGraw-Hill; 2011:707-740.
2. Carson JL, Triulzi DJ, Ness PM. Indications for and adverse effects of red-cell transfusion. *N Engl J Med*. 2017;377(13):1261-1272. doi: 10.1056/NEJMra1612789
3. Carson JL, Guyatt G, Heddle NM, Grossman BJ, Cohn CS, Fung MK, et al. Clinical practice guidelines from the AABB: red blood cell transfusion thresholds and storage. *JAMA*. 2016;316(19):2025-2035. doi: 10.1001/jama.2016.9185
4. Fatalities reported to FDA following blood collection and transfusion: annual summary for fiscal year 2016. Report from the US Food and Drug Administration. https://www.fda.gov/downloads/BiologicsBloodVaccines/SafetyAvailability/ReportaProblem/TransfusionDonationFatalities/UCM598243.pdf.

INSTRUCTOR MATERIALS

Case Title: Acute Hemolytic Transfusion Reaction Case Scenario

Case Description & Diagnosis (short synopsis): Instructors can alter the introduction depending on whether they want the simulation to occur in an academic or community emergency department (ED).

- For academic EDs: Patient is a 60-year-old male who presents from an in-house hematology/oncology clinic for fever. He was at the clinic receiving a blood transfusion for acute on chronic anemia. His hemoglobin was noted to be 5.5 on routine bloodwork yesterday. He has anemia of chronic disease with chronic kidney disease, and his baseline hemoglobin is 7.
- For freestanding/community EDs: Patient is a 60-year-old male who presents from home for acute on chronic anemia noted on routine bloodwork yesterday. His hemoglobin was noted to be 5.5, and his baseline hemoglobin is 7. He has a history of anemia of chronic disease with chronic kidney disease. The previous EM physician had started the blood transfusion and has now signed out the case that he can be discharged after the transfusion has been completed. The nurse has notified you of a fever.

Participants should perform a thorough history and exam, as well as immediately stop the blood transfusion. The blood bank should be notified. Learners should also evaluate for sepsis and other causes of hemolytic anemia, perform supportive care, and admit for further management.

Equipment or Props Needed:

High-fidelity simulation mannequin
Angiocaths for peripheral intravenous access = 18g, 20g, 22g
Cardiac monitor
Pulse oximetry
Intravenous (IV) pole
Normal saline (1L x2)
1 unit of AB+ packed red blood cells
    Can be simulated with red food dye and a 250-cc intravenous bag of normal saline. Blood should clearly be marked with an AB+ label. A patient identification sticker may also be added to the unit of blood with a name that is similar to the simulated patient. (e.g. Donald Smith / Donna Smith)
Urine specimen cup with light brown liquid (to simulate hematuria)
Patient identification bracelet with name, birthday, MRN, and including “O negative blood”

INSTRUCTOR MATERIALS

Confederates needed:
Primary Nurse

Stimulus Inventory:
#1 Complete blood count (CBC)
#2 Basic metabolic panel (BMP)
#3 Liver function tests (LFTs)
#4 Prothombin time (PT)/international normalized ratio (INR)
#5 Partial thromboplastin time (PTT)
#6 Haptoglobin
#7 Lactate dehydrogenase (LDH)
#8 Peripheral smear - https://commons.wikimedia.org/wiki/File:Schistocytes.jpg
#9 ECG – sinus tachycardia - https://commons.wikimedia.org/wiki/File:Sinustachy.JPG
#10 Chest Radiograph - https://commons.wikimedia.org/wiki/File:Chest_Xray_PA_3-8-2010.png

Background and brief information: Instructors can alter the introduction depending on whether they want the simulation to occur in an academic or community emergency department (ED).

- For academic EDs: Patient is a 60-year-old male who presents from an in-house hematology/oncology clinic for fever. He was at the clinic receiving a blood transfusion for acute on chronic anemia. His hemoglobin was noted to be 5.5 on routine bloodwork yesterday. He has anemia of chronic disease with chronic kidney disease, and his baseline hemoglobin is 7.
- For freestanding/community EDs: Patient is a 60-year-old male who presents from home for acute on chronic anemia noted on routine bloodwork yesterday. His hemoglobin was noted to be 5.5, and his baseline hemoglobin is 7. He has a history of anemia of chronic disease with chronic kidney disease. The previous EM physician had started the blood transfusion and has now signed out the case that he can be discharged after the transfusion has been completed. The nurse has now notified you of a fever.

The patient denies epistaxis, hemoptysis, hematochezia, melena, and hematemesis. His last transfusion was two months ago, he has had “more transfusions than (he) can count,” and he has never had problems with past transfusions. He had no other symptoms of systemic illness

before the transfusion (myalgias, upper respiratory symptoms, dysuria, nausea, vomiting, or diarrhea).

Initial presentation: The patient is febrile with generalized body aches and tachycardia but is not initially toxic appearing. He is able to provide his own history.

How the scenario unfolds: The learner(s) will enter the room and see a 60-year-old male on a gurney. Learners have already been informed of the patient's fever in the setting of a blood transfusion. The learner should ask for complete vitals and perform a full history and physical. Next, the learner(s) should immediately stop the blood transfusion and contact the blood bank. If the learner does not stop the blood transfusion, the patient will decompensate and become hypotensive. The learner should provide supportive care and admit the patient to the ICU or stepdown unit, depending on their hospital's admission policies.

Critical Actions:

1. Obtain IV access and place the patient on the monitor
2. Perform a thorough history and physical exam
3. Stop the blood transfusion
4. Notify the blood bank of the possible transfusion reaction and attempt to identify if another patient received an incorrect blood product
5. Initiate sepsis and hemolysis work ups
6. Start IV fluids
7. Communicate the medical error to the patient
8. Admit to the intensive care unit versus stepdown, depending on the admitting practices of your institution

INSTRUCTOR MATERIALS

Case title: Acute Hemolytic Transfusion Reaction Case Scenario

Chief Complaint: 60-year-old male presents from hematology clinic with a fever.

Vitals: *Heart Rate (HR)* 120 *Blood Pressure (BP)* 86/60 *Respiratory Rate (RR)* 24
Temperature (T) 102°F *Oxygen Saturation (O_2Sat)* 96% on room air

General Appearance: lying supine in bed

Primary Survey:

- **Airway:** intact
- **Breathing:** symmetric bilaterally
- **Circulation:** tachycardic. 2+ symmetric pulses

History:

- **History of present illness:** For academic EDs: Patient is a 60-year-old male who presents from an in-house hematology/oncology clinic for fever. He was at the clinic receiving a blood transfusion for acute on chronic anemia. His hemoglobin was noted to be 5.5 on routine bloodwork yesterday. He has anemia of chronic disease with chronic kidney disease, and his baseline hemoglobin is 7.

  For freestanding/community EDs: Patient is a 60-year-old male who presents from home for acute on chronic anemia noted on routine bloodwork yesterday. His hemoglobin was noted to be 5.5, and his baseline hemoglobin is 7. He has a history of anemia of chronic disease with chronic kidney disease. The previous EM physician had started the blood transfusion and has now signed out the case that he can be discharged after the transfusion has been completed. The nurse has now notified you of a fever.

  His blood type is O negative. The patient denies epistaxis, hemoptysis, hematochezia, melena, and hematemesis. His last transfusion was two months ago, he has had "more transfusions than (he) can count," and he has never had problems in the past with past transfusions. He had no other symptoms of systemic illness before the transfusion (myalgias, upper respiratory symptoms, dysuria, nausea, vomiting, or diarrhea).
- **Past medical history**: hypertension, chronic kidney disease, anemia
- **Past surgical history:** appendectomy

- **Patient's medications:** lisinopril, amlodipine, clonidine, ferrous sulfate
- **Allergies:** none
- **Social history:** social alcohol use, denies smoking or drugs
- **Family history:** noncontributory

Secondary Survey/Physical Examination:

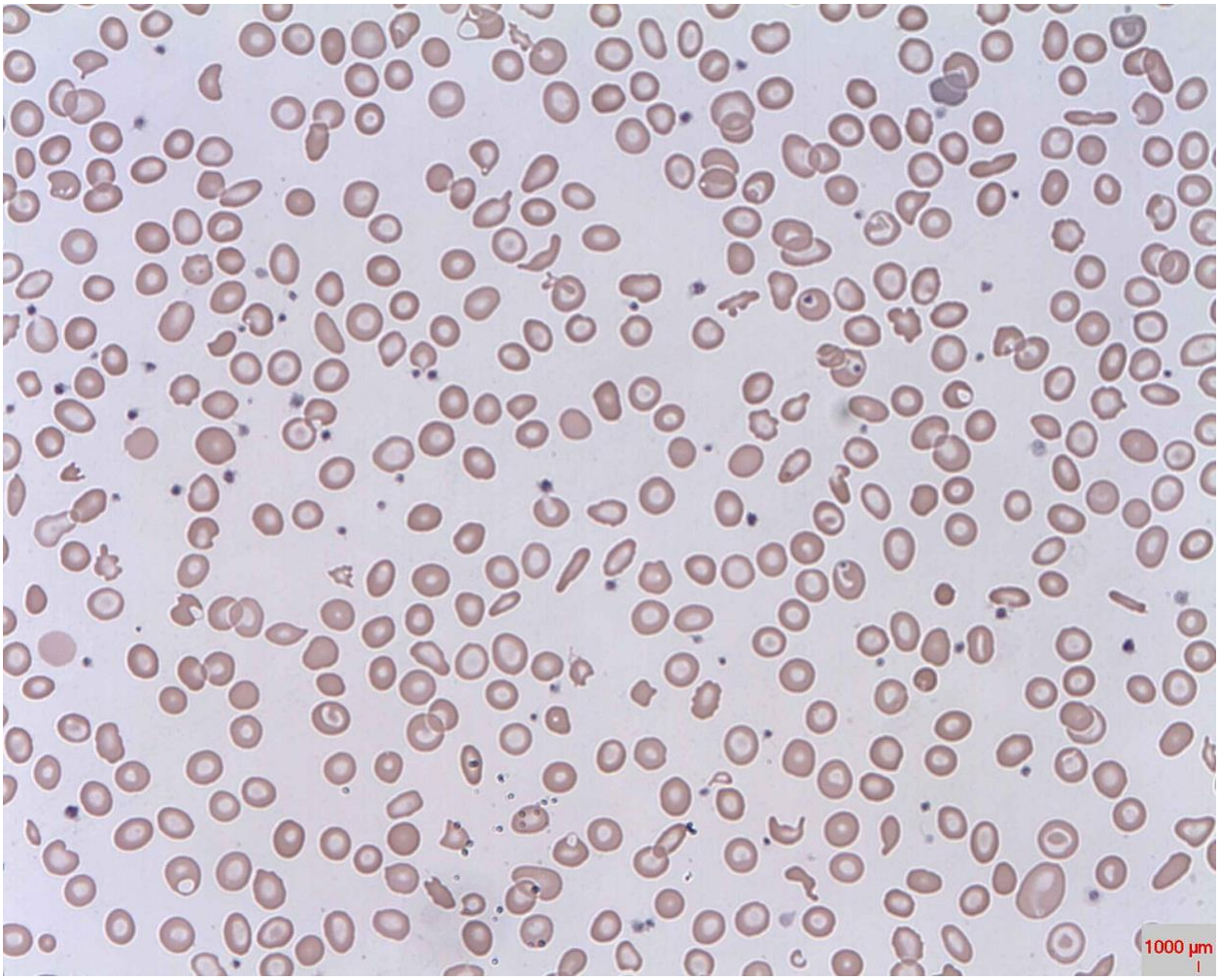
- **General appearance:** lying in bed, alert and oriented
- **HEENT:**
  - **Head:** within normal limits
  - **Eyes:** within normal limits
  - **Ears:** within normal limits
  - **Nose:** within normal limits
  - **Throat:** within normal limits
- **Neck:** within normal limits
- **Heart:** tachycardic, otherwise within normal limits
- **Lungs:** within normal limits
- **Abdominal/GI:** within normal limits
- **Genitourinary:** within normal limits
- **Rectal:** within normal limits
- **Extremities:** within normal limits
- **Back:** generalized diffuse paraspinal tenderness. Bilateral costovertebral angle tenderness. Normal visual inspection other than diaphoresis.
- **Neuro:** within normal limits
- **Skin:** diaphoretic
- **Lymph:** within normal limits
- **Psych:** within normal limits

Results:

Complete blood count (CBC)	
White blood count (WBC)	14.4 x1000/mm^3(H)
Hemoglobin (Hgb)	5.5 g/dL
Hematocrit (HCT)	16%
Platelet (Plt)	190 x1000/mm^3
Basic metabolic panel (BMP)	
Sodium	138 mEq/L
Chloride	99 mEq/L
Potassium	4.5 mEq/L
Bicarbonate (HCO_3)	20 mEq/L
Blood Urea Nitrogen (BUN)	36 mg/dL
Creatine (Cr)	2.6 mg/dL
Glucose	90 mg/dL
Calcium	8.0 mg/dL
Liver function tests (LFTs)	
Aspartate Aminotransferase (AST)	30 u/L
Alanine Aminotransferase (ALT)	40 u/L
Total Bilirubin (T bili)	2.8 mg/dL
Direct Bilirubin (D bili)	0.2 mg/dL
Albumin	3.0 g/dL
Alkaline Phosphate (alk phos)	100 u/L
Prothombin Time (PT)	18 seconds
International Normalized Ratio (INR)	1.5
Partial Thromboplastin Time (PTT)	62 seconds
Haptoglobin	20 mg/dL
Lactate dehydrogenase (LDH)	400 u/L (H)

INSTRUCTOR MATERIALS

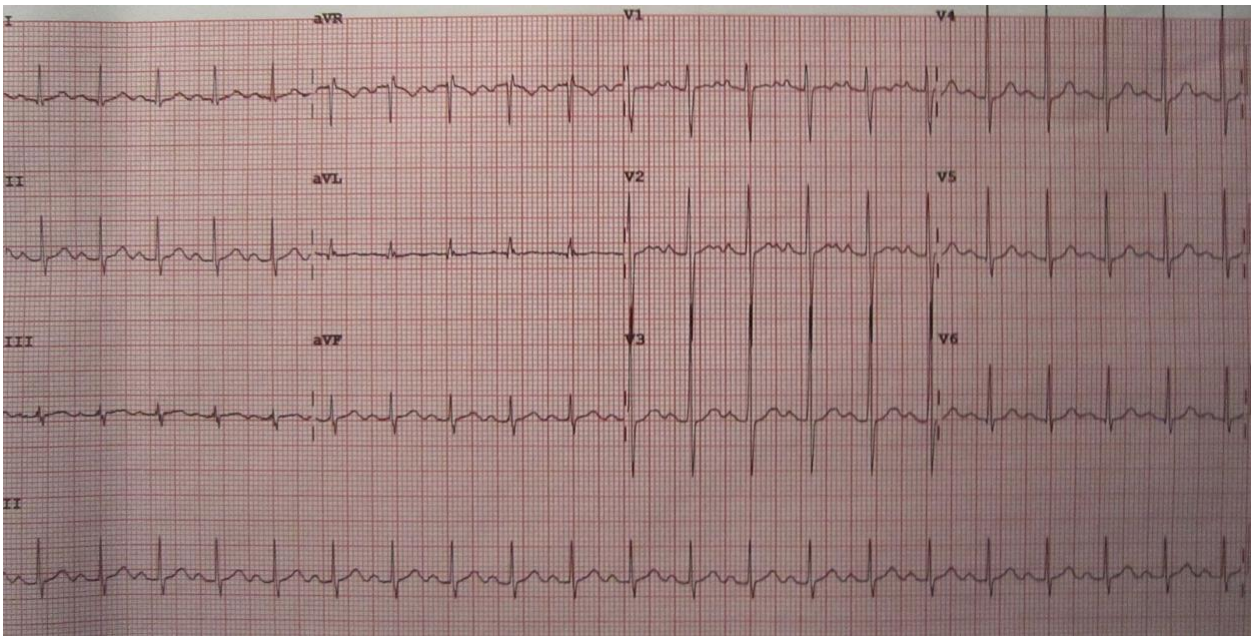
Peripheral smear
Erhabor O. Schistocytes. In: Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Schistocytes.jpg. November 15, 2014. CC0 1.0, Public Domain.



INSTRUCTOR MATERIALS

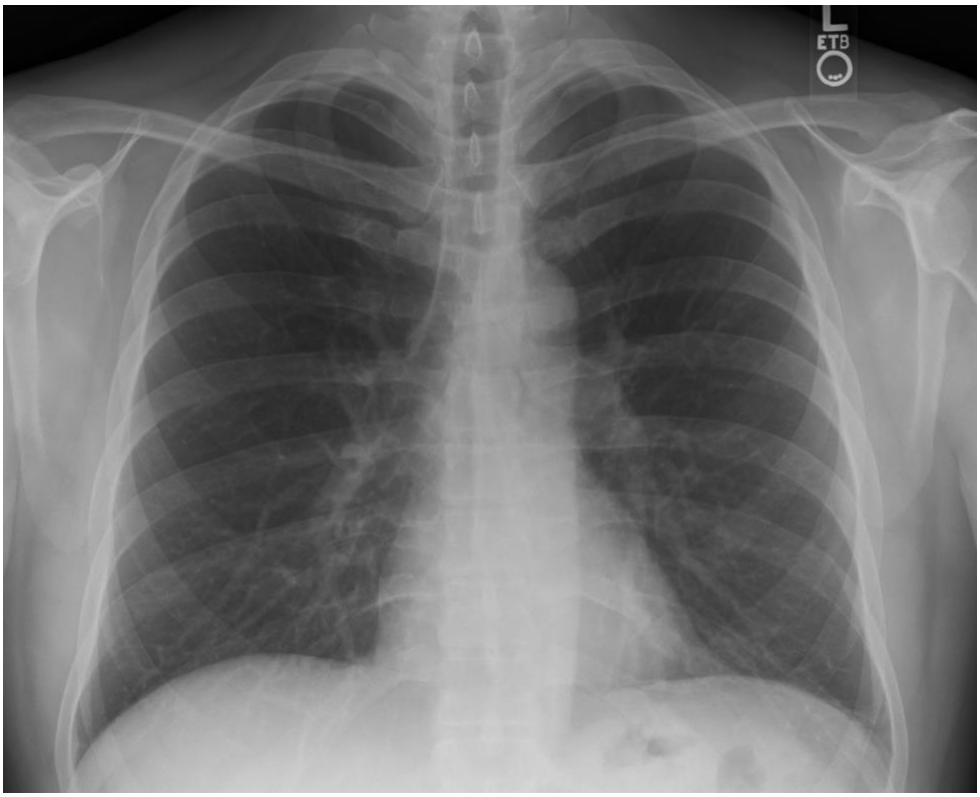
ECG

Heilman, J. Sinus tachycardia as seen on ECG. In: Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Sinustachy.JPG. June 15, 2012. CC BY-SA 3.0.



INSTRUCTOR MATERIALS

Chest Radiograph
Stillwaterising. Chest X-ray PA. In: Wikimedia Commons. https://commons.wikimedia.org/wiki/File:Chest_Xray_PA_3-8-2010.png. March 8, 2010. CC0 1.0, Public Domain.



OPERATOR MATERIALS

SIMULATION EVENTS TABLE:

Minute (state)	Participant action/ trigger	Patient status (simulator response) & operator prompts	Monitor display (vital signs)
0:00 (Baseline)	Patient already in a bed in the emergency department. IV placed, labs drawn. Participant should perform a thorough history and physical exam.	Vitals should already be displayed on a monitor at the start of the case. Patient is awake and able to provide history.	Temp: 102ºF HR: 120 BP: 86/60 RR: 24 O_2sat 96% RA
10:00a	Participant should request that blood transfusion be stopped, that blood bank be notified, and IV fluids started.	If the blood is stopped by ten minutes, the patient's clinical status improves.	Temp: 100ºF HR: 105 BP: 100/70 RR: 20 O_2sat 97% RA
10:00b	Blood transfusion has not been stopped by ten minutes.	If the blood transfusion was not stopped, patient's clinical status will decline and they will become more hypotensive and tachycardic. *If learner has still not requested that blood transfusion be stopped instructor can have the nurse ask "should we keep giving him the blood?" or the patient can ask "what's wrong with my blood? Do I have a bad blood type?", or patient could ask "why is my urine so dark" and hold up the UA container.* If learners stop blood at this point, return to 10:00a If blood not stopped, patient will become unresponsive and become more tachycardic.	Temp: 100ºF HR: 140 BP: 70/50 RR: 24 O_2sat 95% RA

OPERATOR MATERIALS

Minute (state)	Participant action/ trigger	Patient status (simulator response) & operator prompts	Monitor display (vital signs)
12:00	Participant should initiate work-up for hemolysis and sepsis, as well as supportive care.	Once blood transfusion is stopped, patient will become hemodynamically stable, allowing learners time to order further tests for work-up for hemolysis and sepsis.	T: 100ºF HR: 105 BP: 100/70 RR: 20 O_2sat 97% RA
15:00	Participant should communicate concern for a hemolytic transfusion reaction to the blood bank, the inpatient team, and request admission for monitoring and continued supportive care.	Patient remains hemodynamically stable with blood transfusion stopped. When participant calls blood bank, blood bank responses may vary – the authors used a generic "thank you for the call – we will look into this further and get back to you." End of case.	T: 100ºF HR: 105 BP: 100/70 RR: 20 O_2sat 97% RA

Diagnosis:
Acute Hemolytic Transfusion Reaction

Disposition:
Admit to ICU versus Stepdown

DEBRIEFING AND EVALUATION PEARLS

Acute Hemolytic Transfusion Reaction

A hemolytic transfusion reaction develops when host antibodies bind to donor's antigens on the transfused RBCs. The resultant RBC destruction is often both intravascular and extravascular.

Acute hemolytic transfusion reactions can occur immediately or within 24 hours of transfusion. The reaction can also occur after transfusion of FFP (fresh frozen plasma) and platelets, as RBCs or anti-RBC antibodies may be present in these products.

Signs and symptoms of acute hemolytic transfusion reaction include fever, chills, back pain, dark urine, pain along the infusing intravenous line, and hypotension. There is a classic triad of fever, flank pain, and dark urine described, but it is clinically rare to have the full triad.

Treatment:

- Notify the blood bank! Stop the transfusion!
- Give IVF if hypotensive and to induce diuresis
- Specific hemolytic labs: hemolysis labs [(increased) indirect bilirubin, (decreased) haptoglobin, (increased) LDH], peripheral smear
- DIC labs: coagulation factors, fibrinogen, d-dimer
- other labs: CBC, BMP, LFTs, consider septic workup

Other types of transfusion reactions:

- Anaphylactic transfusion reactions - may be found in patients with hereditary IgA deficiency. This reaction typically presents with classic signs and symptoms of allergic reactions, including skin manifestations (urticaria), abdominal pain, nausea, diarrhea, edema, and bronchial spasm. Usually this reaction occurs very early in the transfusion. These reactions should be treated by stopping the transfusion in addition to typical allergic reaction treatments of histamine blockers, steroids, and epinephrine.
- Urticarial transfusion reaction - isolated hives. May continue the transfusion. May be due to donor serum proteins.
- Febrile non-hemolytic transfusion reaction - common (0.1%-1% of all RBC transfusions). Fever, chills. Diagnosis of exclusion. Due to cytokine release from WBCs in a blood product that was not leukoreduced. Seen more in platelet transfusion than RBC transfusion. Should be treated as hemolytic transfusion reaction until proven otherwise.

DEBRIEFING AND EVALUATION PEARLS

- Primary hypotensive reactions - reported most commonly with platelet transfusions. May be associated with ACE inhibitor use. Thought to involve bradykinin. Rapidly reversible.
- Transfusion associated circulatory overload (TACO) - <1% of transfusions. Furosemide may be given with the transfusion in high risk population, such as heart failure and liver failure patients.
- Transfusion-associated sepsis. Transfused product may contain gram negative endotoxin, causing systemic inflammatory response.
- Transfusion-Related Acute Lung Injury (TRALI): < 0.01% of transfusions.

Risk of infections and transmission with transfusions

- Bacterial contamination of blood products – highest in platelets stored at room temp (1/2000 – 1/3000 platelets).
- Hepatitis B. The odds of contracting hepatitis B from donated blood is about 1 in 300,000.
- West Nile Virus. The risk of contracting West Nile Virus from a blood transfusion is approximately 1 in 350,000.
- The risk of contracting hepatitis C is 1 in 1.5 million.
- HIV. All donated blood is thoroughly tested for HIV. There is a 1 in 2 million chance that donated blood will not only carry HIV but will also infect a transfusion recipient.

Other debriefing points:

- Team members: How do you feel?
- Observers: How do you feel after watching the case?
- Facilitators: Was there anything that intrigued you while observing?
  (e.g. the patient made multiple comments about back and flank pain, but the team did not perform a visual inspection of the back or test leg strength or reflexes. I wondered if discitis, epidural abscess, shingles, or other pathologies may have been on the differential. What do you guys think?)

- How do you tell a patient about an iatrogenic mistake or injury?
  - Each state has different apology statutes. There are disclosure laws, sympathy laws and apology laws: https://www.medicalmutual.com/news/article/legal-pitfalls-of-medical-apology-laws/303.
  - State apology laws protect aspects of a provider-patient conversation against use of evidence of liability, while disclosure laws mandate disclosure of unanticipated

outcomes to patients and may protect the communication from being used legally (Mastroianni, Mello, Sommer, Hardy, & Gallagher, 2010).
    - As of 2010, sixteen states do not have any apology law, and sympathetic statements made by providers may be used as evidence of liability. In 2010, only six states had laws protecting physician expressions of both sympathy and fault (Kass & Rose, 2016; Mastroianni *et al*, 2010).
    - Traditionally, physicians have feared apologizing to patients when a medical injury is sustained, often due to fear that it would be interpreted as an admission of guilt and an increased liability risk (Cohen, 1999), as well as damaging their reputation (Gallagher, Studdert, & Levinson, 2007).
    - However, Nazione & Pace (2015) noted that multiple previous studies have shown that poor communication behaviors of physicians named in malpractice suits contributed to the rationale of patients who filed lawsuits (as cited by Beckman, Markaki, Suchman, & Frankel, 1994; Hickson, Wright Clayton, Githens, & Sloan, 1992; Moore, Adler, & Robertson, 2000). As mentioned by Bell *et al* (2012), lack of open communication erodes trust and fuels litigation (as cited in Vincent, Young, & Phillips, 1994).
    - Ho and Liu (2011) demonstrated that apologizing reduces the amount of anger that patients feels toward their physician.
    - Another study suggested that after an apology, patients are more likely to have a positive attitude toward the physician and may be more likely to continue their professional relationship (Wu, Huang, Stokes, & Pronovost, 2009).
    - Nazione and Pace (2015) noted that apologizing after a medical error has been associated with a reduced risk of litigation, as well as acceptance of smaller settlements (as cited by Atwood, 2008; Bornstein, Rung, & Miller, 2002; Robennolt, 2006).
    - Patients deserve to have full disclosure of what happened and you should know your state's laws in terms of the legal ramifications of making sympathetic statements, apologies, and admittance of guilt.
- Did the team call the blood bank? Why or why not? Why is it important to identify other patients that may have potentially been affected? (if patient A accidentally received the blood for patient B, then what happened to patient B?)
- Closed-loop communication amongst team: was it used? Why or why not? Were there any implications of this during case execution?
- What should the patient be told about what happened? Are there legal implications in notifying the patient of a medical error?

DEBRIEFING AND EVALUATION PEARLS

- If the simulated patient received someone else's blood, steps must be taken to ensure that the second patient did not receive the wrong blood as well.

References:

1. Atwood D. Impact of medical apology statutes and policies. *J Nurs Law.* 2008;12(1), 43–53. doi: 10.1891=1073-7472.12.1.43.
2. Beckman HB, Markakis KM, Suchman AL, Frankel RM. The doctor–patient relationship and malpractice. Lessons from plaintiff depositions. *Arch Intern Med.* 1994;154(12), 1365–1370.
3. Bornstein BH, Rung L, Miller MK. The effects of defendant remorse on mock juror decisions in a malpractice case. *Behav Sci Law.* 2002;20(4), 393–409. doi: 10.1002=bsl.496.
4. Cohen JR. Advising clients to apologize. *S Cal L Rev*. 1999;72, 1009–1070.
5. Gallagher TH, Studdert D, Levinson W. Disclosing harmful medical errors to patients. *New Engl J Med.* 2007;356(26), 2713-2719.
6. Hickson GB, Wright Clayton E, Githens PB, Sloan, F. A. Factors that prompted families to file medical malpractice claims following perinatal injuries. *JAMA* .1992;267(10), 1359–1363. doi: 10.1001=jama.1992.03480100065032.
7. Ho B, Liu E. Does sorry work? The impact of apology laws on medical malpractice. *J Risk Uncertain.* 2011;43(2), 141–167. doi: 10.1007=s11166-011-9126-0.
8. Kachalia A, Kaufman SR, Boothman R. Liability Claims and Costs Before and After Implementation of a Medical Error Disclosure Program. *Ann Intern Med.* 2010;153(4), 213-221.
9. Kass J, Rose RV. Medical Malpractice Reform-Historical Approaches, Alternative Models, and Communication and Resolution Programs. *AMA Journal of Ethics.* 2016*;18*(3), 299-310. doi: 10.1001/journalofethics.2016.18.03.pfor6-1603.
10. Mastroianni AC, Mello MM, Sommer S, Hardy M, Gallagher TH. The Flaws in State 'Apology' and 'Disclosure' Laws Dilute Their Intended Impact on Malpractice Suits. *Health Affairs.* 2010;29(9), 1611-1619.
11. Moore PJ, Adler NE, Robertson PA. Medical malpractice: The effect of doctor–patient relations on medical patient perceptions and malpractice intentions. *West J Med.* 2000;173(4), 244–250.
12. Nazione S, Pace K. An Experimental Study of Medical Error Explanations: Do Apology, Empathy, Corrective Action, and Compensation Alter Intentions and Attitudes? *J Health Commun.* 2015;20(4324), 1422-1432.

DEBRIEFING AND EVALUATION PEARLS

13. Robbennolt JK. Apologies and legal settlement: An empirical examination. *Mich L Rev.* 2006;102(3), 460–516.
14. Vincent C, Young M, Phillips A. Why Do People Sue Doctors? A Study of Patients and Relatives Taking Legal Action. *Lancet.* 1994;343(8913):1609–13.
15. Wu AW, Haung I-C, Stokes S, Pronovost PJ. Disclosing medical errors to patients: It's not what you say, it's what they hear. *J Gen Intern Med.* 2009;24(9), 1012–1017. doi: 10.1007=s11606-009-1044-3.

SIMULATION ASSESSMENT

Acute Hemolytic Transfusion Reaction Case Scenario

Learner: _____

Assessment Timeline

This timeline is to help observers assess their learners. It allows observer to make notes on when learners performed various tasks, which can help guide debriefing discussion.

Critical Actions	0:00
1. Obtain IV access and place the patient on the monitor. 2. Perform a thorough history and physical exam. 3. Stop the blood transfusion. 4. Notify the blood bank of the possible transfusion reaction. 5. Attempt to identify if another patient accidentally received an incorrect blood product. 6. Initiate sepsis and hemolysis work ups. 7. Start IV fluids. 8. Communicate the medical error to the patient. 9. Admit to ICU vs stepdown	

SIMULATION ASSESSMENT

Acute Hemolytic Transfusion Reaction Case Scenario

Learner: _____

Critical Actions:

- ☐ Obtain IV access and place the patient on the monitor.
- ☐ Perform a thorough history and physical exam.
- ☐ Stop the blood transfusion.
- ☐ Notify the blood bank of the possible transfusion reaction.
- ☐ Attempt to identify if another patient accidentally received an incorrect blood product.
- ☐ Initiate sepsis and hemolysis work ups.
- ☐ Start IV fluids.
- ☐ Communicate the medical error to the patient.
- ☐ Admit to ICU vs stepdown.

Summative and formative comments:

Milestones assessment:

	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
1	**Emergency Stabilization (PC1)**	☐ Did not achieve Level 1	☐ Recognizes abnormal vital signs	☐ Recognizes an unstable patient, requiring intervention Performs primary assessment Discerns data to formulate a diagnostic impression/plan	☐ Manages and prioritizes critical actions in a critically ill patient Reassesses after implementing a stabilizing intervention

Standardized assessment form for simulation cases. JETem © Developed by: Megan Osborn, MD, MHPE; Shannon Toohey, MD; Alisa Wray, MD
Purcell M, et al. Acute Hemolytic Transfusion Reaction Case Scenario. JETem 2018. 3(3):S1-24.
https://doi.org/10.5072/FK26D5XH73

SIMULATION ASSESSMENT

Acute Hemolytic Transfusion Reaction Case Scenario

Learner: _____

	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
2	**Performance of focused history and physical (PC2)**	☐ Did not achieve Level 1	☐ Performs a reliable, comprehensive history and physical exam	☐ Performs and communicates a focused history and physical exam based on chief complaint and urgent issues	☐ Prioritizes essential components of history and physical exam given dynamic circumstances
3	**Diagnostic studies (PC3)**	☐ Did not achieve Level 1	☐ Determines the necessity of diagnostic studies	☐ Orders appropriate diagnostic studies. Performs appropriate bedside diagnostic studies/procedures	☐ Prioritizes essential testing Interprets results of diagnostic studies Reviews risks, benefits, contraindications, and alternatives to a diagnostic study or procedure
4	**Diagnosis (PC4)**	☐ Did not achieve Level 1	☐ Considers a list of potential diagnoses	☐ Considers an appropriate list of potential diagnosis May or may not make correct diagnosis	☐ Makes the appropriate diagnosis Considers other potential diagnoses, avoiding premature closure
5	**Pharmacotherapy (PC5)**	☐ Did not achieve Level 1	☐ Asks patient for drug allergies	☐ Selects an medication for therapeutic intervention, consider potential adverse effects	☐ Selects the most appropriate medication and understands mechanism of action, effect, and potential side effects Considers and recognizes drug-drug interactions

Standardized assessment form for simulation cases. JETem © Developed by: Megan Osborn, MD, MHPE; Shannon Toohey, MD; Alisa Wray, MD
Purcell M, et al. Acute Hemolytic Transfusion Reaction Case Scenario. JETem 2018. 3(3):S1-24.
https://doi.org/10.5072/FK26D5XH73

SIMULATION ASSESSMENT

Acute Hemolytic Transfusion Reaction Case Scenario

Learner: _____

	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
6	**Observation and reassessment (PC6)**	☐ Did not achieve Level 1	☐ Reevaluates patient at least one time during case	☐ Reevaluates patient after most therapeutic interventions	☐ Consistently evaluates the effectiveness of therapies at appropriate intervals
7	**Disposition (PC7)**	☐ Did not achieve Level 1	☐ Appropriately selects whether to admit or discharge the patient	☐ Appropriately selects whether to admit or discharge Involves the expertise of some of the appropriate specialists	☐ Educates the patient appropriately about their disposition Assigns patient to an appropriate level of care (ICU/Tele/Floor) Involves expertise of all appropriate specialists
9	**General Approach to Procedures (PC9)**	☐ Did not achieve Level 1	☐ Identifies pertinent anatomy and physiology for a procedure Uses appropriate Universal Precautions	☐ Obtains informed consent Knows indications, contraindications, anatomic landmarks, equipment, anesthetic and procedural technique, and potential complications for common ED procedures	☐ Determines a back-up strategy if initial attempts are unsuccessful Correctly interprets results of diagnostic procedure
20	**Professional Values (PROF1)**	☐ Did not achieve Level 1	☐ Demonstrates caring, honest behavior	☐ Exhibits compassion, respect, sensitivity and responsiveness	☐ Develops alternative care plans when patients' personal beliefs and decisions preclude standard care

Standardized assessment form for simulation cases. JETem © Developed by: Megan Osborn, MD, MHPE; Shannon Toohey, MD; Alisa Wray, MD
Purcell M, et al. Acute Hemolytic Transfusion Reaction Case Scenario. JETem 2018. 3(3):S1-24.
https://doi.org/10.5072/FK26D5XH73

SIMULATION ASSESSMENT

Acute Hemolytic Transfusion Reaction Case Scenario

Learner: _____

	Milestone	Did not achieve level 1	Level 1	Level 2	Level 3
22	**Patient centered communication (ICS1)**	☐ Did not achieve level 1	☐ Establishes rapport and demonstrates empathy to patient (and family) Listens effectively	☐ Elicits patient's reason for seeking health care	☐ Manages patient expectations in a manner that minimizes potential for stress, conflict, and misunderstanding. Effectively communicates with vulnerable populations, (at risk patients and families)
23	**Team management (ICS2)**	☐ Did not achieve level 1	☐ Recognizes other members of the patient care team during case (nurse, techs)	☐ Communicates pertinent information to other healthcare colleagues	☐ Communicates a clear, succinct, and appropriate handoff with specialists and other colleagues Communicates effectively with ancillary staff

Standardized assessment form for simulation cases. JETem © Developed by: Megan Osborn, MD, MHPE; Shannon Toohey, MD; Alisa Wray, MD
Purcell M, et al. Acute Hemolytic Transfusion Reaction Case Scenario. JETem 2018. 3(3):S1-24.
https://doi.org/10.5072/FK26D5XH73