

Scenario Overview

Summary

Mrs. Anderson is a 65-year-old woman undergoing a sentinel lymph node biopsy procedure with lymphatic mapping for carcinoma of the left breast. Her medical history includes hypertension, diabetes mellitus, and hiatal hernia. She is allergic to penicillin (PCN), which produces a systemic rash, nausea, and vomiting. Her current medications include insulin, metoprolol, and ranitidine.

Her preoperative evaluation reveals no history of anesthetic complications. Her past surgical history includes an appendectomy and a cesarean section. There is no evidence of congestive heart failure and her heart sounds are normal. There are no remarkable gastrointestinal or genitourinary findings. Her chest radiograph reveals no acute disease. Her electrocardiogram (EKG) is normal. Her preoperative diagnostic laboratory studies are within normal limits. Vital signs:

- Blood pressure (BP) 120/70
- Heart rate (HR) 70 beats per minute (bpm)
- Respiratory rate (RR) 20
- Peripheral capillary oxygen saturation (SPO₂) 98%
- End-tidal carbon dioxide (ETCO₂) 35
- Temperature 36.5° C (97.7° F)

A prophylactic vancomycin infusion (1 g) was initiated in the preoperative holding area and administered for duration of 1 hour.

The scenario begins 10 minutes after induction of general anesthesia with endotracheal tube (ETT).

Setting

Simulation operating room (OR) or OR not in use.

Time

Pre-brief: 5 minutes
Simulation: 10 minutes
Debrief: 20 minutes

Participants

Multidisciplinary team
Embedded simulation personnel (ESP)
Surgeon or ESP
Anesthesiologist or ESP
Certified registered nurse anesthetist (CRNA)
RN circulator
Scrub person
Nurse assistant or perioperative care technician
Observers

Potential Systems Explored

- Facility policy protocol
- Roles of the perioperative team members during an anaphylaxis crisis
- Supporting technical and developmental skills
- Interprofessional training in communication and professionalism

Learning Objectives

1. The learner will recognize the initial signs and symptoms of anaphylaxis in a surgical patient.
2. The learner will identify the appropriate treatment for a patient having an anaphylactic reaction in the OR.
3. The learner will demonstrate the use of surgical crisis checklists to enhance team dynamics and improve patient outcomes during an anaphylactic reaction.
4. The learner will demonstrate interprofessional communication and professionalism with respectful interactions.

Participant Preparation

Pre-Simulation

- Read the article: Ortiz D, Jurgis A, Riker AI. A case of severe anaphylactic reaction secondary to isosulfan blue dye injection. *Ochsner J.* 2015;15(2):183–186.
- Review the facility policy on anaphylaxis reaction.
- Review the facility OR anesthesia crisis checklist.

Standard Introduction

1. Sign in and obtain participant consents for video or research, if necessary
2. Have participants introduce themselves
 - a. Specialty
 - b. Experience and role
 - c. Something personal
3. Orient participants to simulation process
 - a. Briefing
 - b. Case (simulation)
 - c. Debriefing-Discuss and review what went well and where there are opportunities for improvement
 - d. Feedback and closing
4. Discuss course objectives
5. Describe learning environment
 - a. Simulation is a safe and confidential learning environment
 - b. Acknowledge anxiety
 - c. Assure confidentiality of participants performance and case
 - d. Obtain buy-in for simulation activities. Treat as a real-life situation, given the limitations of working with a mannequin, simulated medications, etc.
 - o Treat this patient as if it was your perioperative patient.
 - o Inject medications as usual
 - e. You will be video recorded for purposes of debriefing. The video will be destroyed/deleted per the simulation lab guidelines.
6. Discuss expectations of participants
 - a. Clinical role (be yourself)
 - b. Assure participants that the embedded simulation people are there to help them and there are no tricks.
 - c. Agree on a code word for a real event (Simulation will end immediately)
7. Identify equipment that is live or partially functional and explain any related safety issues
 - a. Mannequin
 - b. Defibrillators/emergency equipment
 - c. Electrosurgical units
 - d. Cameras
 - e. Vital signs displayed on monitoring devices
 - f. Phone list
 - g. Documentation
8. Orient participants to patient situation and assumed roles; provide role cards if applicable
 - a. "It is 10:00 am on a Thursday and you are taking care of a patient with...."
 - b. "Your table is set up and all items have been counted...."
 - c. "You will start with conducting a time out...."
9. Ask participants if there are any questions before beginning
 - a. Answer any additional questions/clarify shared mental model
 - b. Announce that the simulation is starting

Set-up

Room

- Simulation operating room (OR) or OR not in use
- Post a door sign with preoperative information and the history & physical
- Phone list available for use during simulation

Equipment

- OR table
- Mannequin dressed in a hospital gown and intubated with an ETT
- Identification band for the mannequin
- Allergy band for the mannequin denoting the patient's allergy to PCN
- IV solution infusing in right forearm
- 4 L IV fluid
- Back table basic set up
- Mayo stand basic set up
- Electrosurgical unit
- Sponge pocket bags
- Syringe filled with blue colored water and labeled "isosulfan blue dye"
- Emergency cart (will be requested by the team)
- Anesthesia machine equipped with O₂, suction, bag valve mask, and cardiac monitor
- Compression devices and machine
- Crisis checklists
- Surgical consent

Medications*

- Albuterol inhaler
- Epinephrine 1:10,000 1 mg IV
- Atropine 0.3 mg to 0.5 mg IV
- Vasopressin 1 to 2 units IV
- Diphenhydramine 25 to 50 mg IV
- Ranitidine 50 mg IV
- Cimetidine 300 mg IV
- Hydrocortisone 100 mg IV

*Consider the simulation environment when preparing medications. Be sure that all medications are clearly labeled and identified as simulated if applicable. Simulated medications should not be available in any patient care areas.

Simulator Preparation

- Prepare mannequin rash (See Resources below)
- Drape the patient

Sequence of Events

The patient has been in the OR for 30 minutes

Vital signs

BP 120/70

HR 70 bpm

RR 20

SPO₂ 98%

ETCO₂ 35

Temperature 36.5° C (97.7° F)

The surgeon states, “We are performing the lymphatic mapping with isosulfan blue dye injection on the left side.” The surgeon initiates the lymphatic mapping with isosulfan blue dye injection.

After 3 minutes, the patient’s BP drops to 65/40, the EKG shows her heart rate has increased to 120 bpm, her SPO₂ has decreased to 90%, and her ETCO₂ has decreased to 31. Her temperature remains unchanged.

The anesthesia professional states, “The patient’s SPO₂ is falling; I’m hearing wheezing bilaterally.” At this time, the anesthesia professional notes that the patient’s face and upper extremities are flushed and red. The anesthesia professional pulls back the patient’s gown to show a reddened chest and upper arms.

The anesthesia professional states, “The patient is in ventricular tachycardia and is hypotensive. Her tongue is swelling, she is wheezing, and she may be having an anaphylactic reaction to the isosulfan blue dye.”

- The RN circulator should move to head of bed.
- Call for help and the emergency cart.
- Remove potential causative agents.
- Determine who will be the crisis manager (the crisis manager should reference the crisis checklist for anaphylaxis).
- Ask the surgeon to pause the surgery.
- Administer 100% oxygen (O₂) at high flow (10 L/minute).
- Establish/secure airway.
- Begin IV fluid resuscitation with 1 L normal saline (or administer a fluid bolus of 500 mL) while the patient’s breath and cardiac sounds are auscultated.
- Administer 1:10,000 epinephrine (10 mcg to 100 mcg IV).
- Administer vasopressin (1 to 2 units IV).
- Administer diphenhydramine (25 mg to 50 mg IV).
- Administer ranitidine (50 mg IV) or cimetidine (300 mg IV).
- Administer hydrocortisone (100 mg IV).
- Place the patient in steep Trendelenburg position.
- Obtain additional IV access if required.

Sequence of Events

Skills Assessment - Anaphylaxis

**Continue with the simulation until the following actions/treatments are completed.
Treatment action time points are referenced from time of crisis announcement**

Action/Treatment Checklist	Time	Skill met	Skill not met
Announces crisis			
Calls for help and the emergency cart			
Removes potential causative agents			
Determines crisis manager			
Pauses procedure			
Increases O ₂ to 100% within 3 minutes			
Establishes/secures airway			
Auscultates breath and cardiac sounds			
Begins IV fluid resuscitation with 1 L normal saline (or a fluid bolus of 500 mL) within 3 minutes			
Prepares epinephrine 10 mcg to 100 mcg given within 3 minutes (may be repeated every 1 to 2 minutes as clinically indicated)			
Prepares vasopressin (1 to 2 units IV)			
Prepares diphenhydramine (25 mg to 50 mg IV)			
Prepares ranitidine (50 mg IV) or cimetidine (300 mg IV)			
Prepares hydrocortisone (100 mg IV)			
Places patient in steep Trendelenburg			
Assesses IV access and prepares additional IV			
Open IV fluids / fluid bolus given within 3 minutes			

Debrief

Begin debriefing by soliciting the participant's reactions to the simulation experience. Clarify with the team the patient situation so that everyone is on the same page.

Clarify confidentiality and expectations.

Review the learning objectives.

Discuss what happened in the simulation.

Review what went well.

Consider opportunities for improvement.

Encourage expression of reactions.

Ask participants:

- "How did participating in this simulation make you feel?"
- "Describe your thinking when...?"
- "Were there performance gaps?"
- "What could be changed in the OR?"

Review the participant's roles and team expectations.

Review principles of effective interprofessional teamwork.

Review expectations for effective communication.

Discuss appropriate post-event actions:

- Consider keeping the patient intubated and sedated.
- Monitor the patient for 24 hours post-recovery.

Identify learner issues.

Resources

Anaphylaxis Pre/Post Test

1. Anaphylaxis is a condition where the body produces a severe life-threatening reaction to exposure to an allergen.
 - a. True
 - b. False
2. A key process during the initial response to an anaphylactic crisis includes administration of epinephrine and removal of causative agent.
 - a. True
 - b. False
3. An example of a causative agent which could elicit an allergic reaction in a surgical setting include:
 - a. Latex
 - b. Antibiotics
 - c. Dyes
 - d. All of the above
4. Hypotension, tachycardia and decreased SPO₂ are common initial hemodynamic indicators of anaphylaxis.
 - a. True
 - b. False
5. The first dose of epinephrine should be administered within _____ of the identification of the anaphylaxis crisis.
 - a. 1 minute
 - b. 3 minutes
 - c. 5 minutes
 - d. 10 minutes
6. Establishing and securing the airway is a priority during anaphylaxis management due to the inflammatory effects of acute allergic angioedema.
 - a. True
 - b. False
7. Hydrocortisone is administered during an anaphylaxis crisis to block the immune response causing the allergic reaction.
 - a. True
 - b. False
8. If left untreated, anaphylaxis could progress to circulatory collapse and death.
 - a. True
 - b. False
9. Fluid resuscitation should begin within 3 minutes of the identification of the anaphylaxis crisis.
 - a. True
 - b. False
10. A patient who sustains an anaphylactic crisis in the operating room does not need to have follow-up testing since the allergic reaction will never recur.
 - a. True
 - b. False

Resources

Anaphylaxis Test Answers

1. A
2. A
3. D
4. A
5. B
6. A
7. A
8. A
9. A
10. B

Resources

Mannequin Rash

Equipment needed:

- Two transparent dressings per area
- Face paint: red and pink

1. Remove the top packaging from the first transparent dressing.
2. Paint the top of the transparent dressing with red/pink face paint until it is the appropriate color (Note: Using a blotting motion with a sponge works better than a wiping motion).
3. Let the paint dry for a few minutes.
4. Remove the bottom packaging from the second transparent dressing so that the sticky side is exposed.
5. Place it on top of the painted side of the first transparent dressing. Allow for bubbles and creases to occur when putting it on top so that it looks like blisters.



Photo courtesy of Christina Valle CST, Massachusetts General Hospital Learning Laboratory

References

- Ariadne Labs: A Joint Center for Health Systems Innovation. *Operating Room Crisis Checklists*. 2013. http://www.projectcheck.org/uploads/1/0/9/0/1090835/or_crisis_checklists_package_10-11-13.pdf. Accessed November 7, 2016.
- Arriaga AF, Bader AM, Wong JM, et al. Simulation based trial of surgical-crisis checklists. *N Engl J Med*. 2013;368(3):246-253. doi: 10.1056/NEJMsa1204720
- Core Stanford Anesthesia Cognitive Aid Group. *Emergency Manual: Cognitive Aids for Perioperative Critical Events*. Vol 3.0. August 2016. <http://emergencymanual.stanford.edu/>. Accessed November 7, 2016.

Resources

Acknowledgments

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