

Scenario Overview

Summary

Mr F is a 52-year-old white man who presents with cervical lymphadenopathy (LAD) for present for the past 2.5 months. A computerized tomography (CT) scan of his neck demonstrates significant LAD with necrotic centers at level III on the right. The nodes are painful. The pain is sharp and worse with pressure. He has no history of excessive bleeding, but he is taking aspirin.

PLAN: The patient would like the mass to be excised for full pathology workup. The surgeon discusses the risks and benefits of the procedure with the patient, as well as the potential for possible damage to critical structures in the neck. All the patient's questions are answered to his satisfaction. The procedure to remove the mass will be performed under monitored anesthesia care. The right neck is marked with the surgeon's initials.

Setting

Operating room/Simulation center

Time

Pre-brief: 5 minutes (orient to room, provide patient history)

Simulation: 10 minutes

Debrief: 20 minutes

Participants

Simulation facilitator

Mannequin with voice capabilities

Multidisciplinary OR team:

- Anesthesia provider (MD and/or CRNA)
- Surgeon (could be a confederate)
- Surgical assistant
- Surgical technologist or RN in the scrub role
- RN circulator

Progressive Complexity

Preparatory steps:

- Place a glove filled with red fluid (to simulate blood) under the skin of the right neck.
- Apply a burn moulage to the right chest area (see Resources).
- Apply tinted prep solution to the clear plastic wrap covering the right neck.
- Secure the smoke tubing in place.

- The mannequin should be prepped and draped when the participants enter the OR.
- Notify the participants that an alcohol-based prep solution was used.

Scenario:

- A time out and fire risk assessment are conducted.
- The surgeon injects the local anesthetic.
- The surgeon makes an incision at the marked site, and there is bleeding at the incision site.
- The surgeon asks the scrub person for the electro-surgical pencil.
- A fire starts under the drapes, and the patient begins to complain of pain in his right shoulder.
- The team begins the fire assessment process and sees the smoke. (Dry ice pumped through tubing – see Resources).
- Drapes should be pulled down and away from the patient, and the patient should be evaluated for burns.
- The simulation facilitator pauses the scenario and explains that the patient will not get any better or any worse.
- The team is called outside the OR (team members may keep gowns and gloves on to reduce supply costs).
- A debriefing session is held outside the OR while the simulation team resets the OR to either the beginning of the procedure or just after use of the electro-surgical unit (ESU).
- The facilitator discusses the RACE (rescue-alarm-contain-extinguish) and PASS (pull-aim-squeeze-sweep) mnemonics and how they pertain to this scenario.
- The facilitator explains deliberate practice to the team.
- The team is escorted back to the OR.
- As the team members take their positions, they should discuss individual responsibilities and tasks required to perform as a high functioning team.
- The scenario is repeated, beginning with the incision and bleeding.
- When the drapes are removed from the patient, the simulation facilitator stops the procedure again.
- The team stays in the OR and a second debriefing centered on the functioning of the team occurs.
- After the debriefing discussion, the team should be instructed to continue the scenario from that point and decide how to care for the patient.
- As the team is caring for the patient, the drapes in the trash basket with the alcohol-based prep solution catch on fire, igniting the wall.
- The team should evacuate the OR with the patient on the

Scenario Overview

- OR bed.
- Based on the situation, the team should determine whether there is sufficient time to obtain portable monitors and oxygen (O₂) or whether the patient can be safely transported on the OR bed without monitoring equipment or O₂.
- Once outside the OR, the simulation facilitator again stops the scenario and participants may remove gowns and gloves.
- The facilitator discusses evacuation of a patient from a burning OR, including RACE in an uncontained fire, gas shutoff valves, horizontal egress, teamwork, patient care in a tenuous position, and fire principles with the team.

Potential Systems Explored

Facility policy protocol

Roles of the perioperative team members during a fire crisis

Supporting technical and developmental skills

Interprofessional training in communication and professionalism

Learning Objectives

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- 1) The learner will demonstrate closed-loop communication and the need for speaking up with members of the perioperative team during a fire crisis.
- 2) The learner will demonstrate effective management of a fire crisis in the OR.
- 3) The learner will demonstrate effective use of escalating resources during an OR crisis.

Participant Preparation

Pre-simulation

Review facility protocols related to fire management in the OR.
Read the following information:

1. Guideline for a safe environment of care, part 1. In: *Guidelines for Perioperative Practice*. Denver, CO: AORN, Inc; 2015:239-263.
2. Guglielmi CL, Flowers J, Forcht Dagi T, et al. Empowering providers to eliminate surgical fires. *AORN J*. 2014;100(4):412-428.
3. Norton E, Gorgone P, Belanger B. Surgical fire risk reduction strategies. *AORN J*. 2014;99(1):C5-C6.

Pre-Brief:

The team is provided with the patient's information and history.

The team is told:

- Please treat this scenario as if it is happening in your OR.
- Inject medications per usual.
- The cardiac monitor displays real-time vital signs.

Set-up

Room

Operating room or simulation-equipped operating room

Equipment

Operating room table
Mannequin dressed in a hospital gown and draped for a right neck procedure
Third-degree burn moulage on right shoulder hidden under drapes
Plastic wrap on right neck tinted with alcohol prep solution
IV inserted in left arm
1 L lactated Ringer's solution
IV tubing
Identification band
Nasal cannula connected to oxygen source on anesthesia machine
EKG pads/pulse oximetry probe connected to monitors on anesthesia machine
Anesthesia machine equipped with oxygen source, suction, and cardiac monitor
Bottle of sterile water filled with water or confetti (to simulate water) on anesthesia cart
Intubation equipment
Drapes for right lateral neck procedure
Instrument table (basic setup)
Basin/ring stand – graduate/basin/bowl filled with water or confetti
Mayo stand basic setup
Folded surgical towels
ESU, pencil, holster
Hypodermic syringe with needle labeled 1% lidocaine with 1:100,000 epinephrine
Physician initials on incision site
Glove or balloon filled with red fluid
Dry ice
Gowns, gloves, hats, masks

Medications

Syringe of succinylcholine
Syringe of rocuronium
Propofol 100 mL vial
Sodium bicarbonate (manufacturer prefilled syringe)
Calcium gluconate (manufacturer prefilled syringe)
1% lidocaine with 1:100,000 epinephrine vial

Simulator Preparation

Mannequin prepped and right lateral neck draped (mannequin's neck can be covered with plastic wrap to protect from damage)
1 L lactated Ringer's IV solution running into left arm
Nasal cannula in place on patient
Mock OR documentation for RN circulator

Documentation

Medical records
Perioperative records
Universal Protocol form

Sequence of Events

Sequence of Events

- When participants enter the OR, the patient is prepped and draped.
- The patient is speaking with the anesthesia provider. The confederate surgeon performs the Hard Stop Time Out/Universal Protocol/Fire Risk Assessment.
- The patient is considered to be at high risk for fire.
- The patient's vital signs when the fire starts: BP 140/90; HR 115; O₂ sat 92
- The procedure starts with an injection of local anesthesia and an incision to the operative site.
- Directly underneath the "skin incision" is a balloon filled with "blood."
- After incision, the blood starts flowing and the surgeon should request the ESU.
- As the electrosurgical pencil is activated, smoke appears from under the right side of the drapes.
- When the drapes are removed, a large third-degree burn is seen on the right shoulder.

Continue with the simulation until the following action/treatments are completed:

Skill met	Action/Treatment Checklist
	Announcement/alert "Code Red" or "Fire" to the team in the room
	Overhead declaration of Code Red
	Drapes are removed
	Saline or water is provided and/or fire is smothered using the sheet-sweep method
	Oxygen is shut off
	The nasal cannula is removed while the patient's airway is maintained
	The fire extinguisher is located
	The fire department is notified or a determination is made not to do so
	The patient is assessed
	The team members are safe
	Patients in adjoining ORs are safe
	The OR door is closed after evacuation of the room
	Equipment/devices/drapes etc. are left in the OR for risk management assessment

Debrief

Standardized debrief questions:

- How did the simulation experience of caring for this patient make you feel?
- Did you have the knowledge and skills to meet the objectives of this simulation experience?
- What gaps did you identify in your own knowledge?
- If you performed the scenario again, how would you handle the situation differently?
- In what ways did you perform well?
- How well did the team work together?

Debrief questions for observers:

- What did the team do well?
- What did the team not do well?
- Is there anything else you would like to discuss?

Fire-specific debrief questions:

- Have you experienced a perioperative fire crisis in your facility? (There are 600 surgical fires per year in the United States).¹
- During the fire scenario, what communication strategies did you use to validate the accuracy of your information or decisions with your team members?
- Were you satisfied with your ability to work through the fire crisis?
- What were the heat source, fuel, and oxidizer in this scenario?
- How could this fire have been prevented?
- Were the drapes assessed after removal for burning material?
- Should the fire department have been notified?
- What other departments or facility areas should be notified after a fire occurs?
- What should the fraction of inspired oxygen (FiO₂) be for a patient undergoing a neck procedure with an open oxygen source?
- Whose job is it to assess the patient?
- What should be done with the burned drapes?
- What procedures could place a patient at risk for fires?
 - Patients undergoing head and neck procedures
 - Laser procedures
 - Laparoscopy procedures

Review the learning objectives.

Review the participant's roles and team expectations.

Review communication expectations.

Reference

1. ECRI. *New clinical guide to surgical fire prevention*. Health Devices. 2009;38(10):314-332.

Resources

Creating Smoke in the OR

Equipment:

- Suction canister
- 5 cm bi-directional flow valve
- ¼ inch tubing (suction tubing)
- Large bore tubing (10 ft of tubing that is similar to respirator tubing)
- Flow regulator (Large stopcock)
- Dry ice
- 1 L warm saline
- Hole in mannequin

1. Modify a suction canister by installing a 7.5 to 10 cm water bi-directional flow valve on the lid as a safety mechanism to prevent excess pressure from building up in the canister. Hook up a 2-ft section of ¼-inch tubing to one of the suction canister inlets.
2. Attach a 10-ft section of respirator tubing to the canister lid and route to the mannequin through a port in the lower back of the mannequin. This travels through the mannequin's abdomen and chest cavity, up to a 14-mm hole near the left clavicle.
3. Clamp this tubing from the IV bag of normal saline with the roller clamp near the canister.
4. Place 1 cup of dry ice in a dry suction canister and place the lid on the canister, being careful not to allow any fluid to contact the dry ice.
5. Attach a warm 1-L bag of saline to the clamped ¼-inch tubing and hold it 2 ft above the canister.
6. Initiate the smoke by unclamping the ¼-inch line, allowing the warm saline to mix with the dry ice. After about 15 seconds, the smoke (CO₂) pressure will build enough to pop off the bi-directional flow valve.
7. Open the smoke outlet tube to allow the smoke to travel through the tubing and out the hole in the mannequin's chest. With the smoke outlet open, smoke velocity can be safely increased by blocking the bi-directional flowtrans valve outlet by hand. After two to three minutes, the amount of smoke generated will rapidly decrease.



Example: Smoke carrier

Resources

Mannequin Burn

Equipment Needed:

- Two transparent dressings per burn
- 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.



Example: Mannequin burn

Resources

Fire Safety Pre/Post Test

1. Define R A C E.

2. Define P A S S.

3. What is the most common location for a patient fire in the operating room?
 - a. Head, neck, and upper chest
 - b. Airway
 - c. Other locations in the body
 - d. All of the above
4. List the three components of the fire triangle.

5. What are common sources of heat in the operating room?
 - a. ESU pencils
 - b. Laser fibers
 - c. Headlights
 - d. Endoscope lights
 - e. All the above
 - f. c and d only
6. What are common sources of fuel in the operating room?
 - a. Alcohol-based prepping solution
 - b. Gauze sponges
 - c. Drapes
 - d. All electrical equipment
 - e. Hair
 - f. All the above
 - g. b, d, and e
7. What are best practices for the use of oxygen and/or nitrous oxide?
 - a. Use minimal oxygen concentration
 - b. Use medical air whenever possible because it has < 30% oxygen
 - c. Avoid air leaks from the anesthesia circuit
 - d. Do not allow oxygen to collect beneath the drapes
 - e. Know O2 shut off valve locations
 - f. All the above
 - g. a, c, and e
8. What do you need on your sterile field if the surgical procedure is a HIGH RISK for fire?
 - a. Hemostats
 - b. Hemostatic agents
 - c. Saline/water
 - d. Extra laparotomy sponges
9. You are circulating for a laparoscopic appendectomy. You observe that the surgical drapes are smoking. The drapes begin to burn from the hot fiberoptic light cord that was not connected to the endoscope camera. What should you do?
 - a. Call for help
 - b. Use the RACE steps
 - c. Run out of the OR in search of help
 - d. All of the above
 - e. a and b only
 - f. b and c only
10. Continuing with question 9; the burning drapes are removed from the patient. As the drapes are falling to the floor, your scrub pants come in contact with the burning drape and begin to flame. What should you do?
_____, _____, and _____

Resources

11. Ideally, in which direction do you initially evacuate the patient and perioperative team members if advised to do so by the charge fire person?
 - a. Horizontally
 - b. Vertically
 - c. To the PACU
 - d. To Preop and Holding
 - e. a and b only
 - f. All of the above

12. A chemical fire extinguisher can be used on an open wound.
 - a. True
 - b. False

13. What should happen once the fire is extinguished and the patient and perioperative team members are safe?
 - a. Risk Management should be contacted
 - b. Burned linen and drapes should be discarded
 - c. Facility post fire procedures should be followed
 - d. All sharps should be removed from the sterile field
 - e. a and b only
 - f. a and c only

14. What is a Fire Risk Assessment?
 - a. A component of the Universal Protocol
 - b. A tool that identifies the risk status of a fire for an individual patient
 - c. A tool that identifies ignition sources
 - d. All of the above
 - e. None of the above

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Fire Safety Test: Answers

1. Rescue Alarm Confine Extinguish/Evacuate
2. Pull Aim Squeeze Sweep a fire extinguisher
3. Head, neck and upper chest. Forty-four percent of fires occurring on the patient involve the head, neck, and upper chest, and 26% occur elsewhere on the patient. Twenty-one percent of fires are located in the airway, and 8% occur at other locations in the body. The majority of fatal fires are airway fires.

Reference

ECRI. New clinical guide to surgical fire prevention. Health Devices. 2009;38(10):314-332.

4. Fuel Ignition source Oxidizer
5. All of the above (Place ESU pencils in holsters when they are not in use; Never lay the light cord on the drapes unless it is connected to the endoscopic camera)
6. All of the above
 - Allow alcohol-based prep solution to dry for at least three minutes before draping.
 - Check the manufacturer's instructions for use; some alcohol-based solutions may require up to 60 minutes to fully dry.
 - A fire on the paper drapes may not be visible. When the room lights are off the drapes have a blue haze when they are burning. Saline and water may not be effective because the drapes may have repellent surfaces. In the event of a non-airway fire, the fuel source should be removed from the patient and the fire extinguished.
 - Simultaneously, the anesthesia professional should discontinue administering airway gases.

Reference

Guideline for a safe environment of care, part 1. Guidelines for Perioperative Practice. Denver, CO: AORN, Inc; 2015.

7. All of the above
8. Saline/water
9. a and b only
10. Stop, Drop, and Roll
11. Horizontally - into an adjoining building
12. False - the chemicals are toxic
13. a and c only
14. All of the above

Acknowledgments

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