

Fire in the Procedural Area 2024

Objectives

Upon Completion of this Module, the participant will be able to:

1. At the end of the Module, Participants should be able to:
2. List the components of the fire triangle.
3. Identify measures to prevent procedural fires.
4. Describe the steps to take in the event of a fire in the procedural setting.
5. Identify evacuation routes.
6. Discuss the fire risk assessment tool.
7. Identify the types of fire extinguishers recommended for use to extinguish a fire that occurs in the perioperative area.
8. Identify Dry Time start and ending times.
9. Describe "PASS" and "RACE" Acronyms.

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Surgical Fire Facts

Estimated Frequency

- 200-240 per year in the U.S.
 - 44% on head, neck or upper chest
 - 26% elsewhere on the patient
 - 21% in the airway
 - 8% elsewhere in the patient
- 20 to 30 are serious & result in disfiguring/disabling injuries
- 1 to 2 are fatal

Components of the Fire Triangle

- Three elements combine to cause a reaction
 - ◊ Fuel
 - ◊ Ignition/energy/heat
 - ◊ Oxidizer
- One element being removed reduces fire hazard significantly

Controlling Fuels Sources: Interventions

There are many fuels sources in the operating room. Controlling the fuel source can prevent fires in the OR.

- Use moist towels around the surgical site when using a laser
- During throat surgery, use moist sponges as packing in the throat
- Use water-based ointment and not oil-based ointments in facial hair and other hair near the surgical site
- Avoid pooling of prepping solutions
- Remove prep-soaked linen and disposable prepping drapes
- Allow skin-prep agents to dry and fumes to dissipate before draping according to Manufacturer Recommendations
- Allow chemicals (e.g., alcohol, collodion, tinctures) to dry according to Manufacturer Recommendations
- Conduct a skin prep “time out” Monitor, identify, and report safety hazards

CMS Regulations: Alcohol-Based Skin Preps

- Follow policies and procedures to reduce risk of fire
- Personnel must be aware of these policies
- Products are packaged for controlled delivery with clear directions that must be followed
- Documentation of implementation of fire prevention practices must be present in the patient’s medical record
- Personnel must demonstrate practice of the policies and procedures

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SOURCES OF IGNITION IN THE PERIOPERATIVE SET-

- Electrosurgical unit (ESU)
- Laser
- Fiber-optic cable/light
- Argon beam coagulator
- Power tools (e.g. drills, burrs)
- Electrical equipment
- Defibrillator



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Controlling Ignition Sources: Interventions

- Place the patient return electrode on a large muscle mass close to the surgical site
- Keep active electrode cords from coiling
- Store the Electrical surgical unit (ESU) pencil in a safety holster when not in use
- Keep surgical drapes or linens away from activated ESU
- Moisten drapes or place absorbent towels and sponges in close proximity to the ESU active electrode
- Do not use ignition source to enter the bowel when it is distended with gas
- Keep ESU active electrode away from oxygen or nitrous oxide
- Use active electrodes or return electrodes that are manufacturer approved for the ESU being used
- Use approved protective covers as insulators on the active electrode tip, NOT red rubber catheter or packing material
- Activate active electrode only in close proximity to target tissue and away from other metal objects
- Inspect minimally invasive electrosurgical electrodes impaired insulation; remove electrode from service if not intact
- Use “cut” or “blend” settings instead of coagulation
- Use the lowest power setting for the ESU
- Only the person controlling the active electrode activates the ESU
- Remove active electrode from electrosurgical or electrocautery unit before discarding
- Use a laser-resistant endotracheal tube when using laser during upper airway procedures
- Place wet sponges around the ET tube cuff if operating in close proximity to the endotracheal tube
- Use wet sponges or towels around the surgical site
- Only the person controlling the laser beam activates the laser
- Have water or saline and the appropriate type fire extinguisher available
- Place the light source in “standby” mode or turned off when not in use
- Inspect light cables before use and remove from service if broken light bundles are visible
- Select defibrillator paddles that are correct size for the patient
- Use only manufacturer recommended defibrillator paddle lubricant
- Place defibrillator paddles appropriately
- Inspect electrical cords and plugs for integrity and remove from service if broken
- Check biomedical inspection stickers on equipment for a current inspection date and remove from service if not current
- Do not bypass or disable equipment safety features
- Follow manufacturer’s recommendations for use
- Keep fluids off electrical equipment

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Oxidizers

- Oxygen
- Oxygen-enriched environment
- Nitrous oxide

Controlling Oxidizers: Intervention

- Tent drapes to allow for free airflow
- Keep the oxygen percentage as low as possible
- Use an adhesive incise drape
- Inflate endotracheal tube cuff with tinted saline
- Evacuate surgical smoke from small or enclosed spaces
- Pack wet sponges around the back of the patient's throat
- If O₂ is being used, suction the oropharynx deeply before using ignition source
- Inform the surgeon that an open O₂ source is being used
- Stop supplemental O₂ or nitrous before & during the use of the ignition source
- Check the anesthesia circuits for possible leaks
- Turn off the O₂ at end of each procedure

(AORN, 2019)

Oxygen delivery during head, face, neck, and upper chest surgery:

- Do **not** use open delivery of 100% oxygen
- Intubate or use a laryngeal mask airway if supplemental oxygen needed
- If O₂ is greater than 30% via open delivery, use 5-10L of air/minute under the drapes

Exceptions:

- Patient verbal response required during the surgery (e.g. carotid artery surgery, neurosurgery, pacemaker insertion)
- Open oxygen delivery required to keep the patient safe

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Fire Risk Assessment

- Perform before start of procedure
- All members of team participate
- Communicate this assessment during the "time out"
- Document this assessment in the patient record

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Fire Risk Assessment (continued)

- A fire risk assessment should be completed during the time out for every patient. The RN circulator should complete the Fire Risk Assessment Tool to determine the risk-level designation.
- The risk-level designation of **A, B, C, D, or E** is determined by the code assigned to each of the critical questions that has an affirmative response. A procedure may have one or more fire risk-level designations.
- The RN circulator should report the fire risk-level designations to the surgical team during the “time out” as “A, B, C, D, E” or any combinations of these letters.
- Each fire risk-level designation has corresponding interventions that should be implemented by the perioperative team before and/or during the procedure to decrease the risk for fire.

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Fire Risk Assessment Tool

- A. Is an alcohol-based prep agent or other volatile chemical being used preoperatively? Y or N
- B. Is the surgical procedure being performed above the xiphoid process? Y or N
- C. Is an open oxygen or nitrous oxide being administered? Y or N
- D. Is an ESU, laser, or fiber-optic light cord being used? Y or N
- E. Are there other possible contributors? Y or N

The fire risk assessment score will be charted in the electronic surgical record. It will also be documented on the white communication board in each operating room.

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Fire Risk Assessment

A: Is an alcohol-based skin antiseptic or other flammable solution being used preoperatively?

Actions:

- Use reusable or disposable sterile towels to absorb drips and excess solution during application.
- Remove materials that are saturated with the skin antiseptic agent before draping the patient.
- Wick excess solution with a sterile towel to help dry the surgical prep area completely.
- Allow flammable skin antiseptics to dry completely and fumes to dissipate before surgical drapes are applied and before using a potential ignition source (e.g., electro-surgical unit [ESU], laser).
- Conduct a “Skin Prep Time Out.” Verbalize to the entire Surgical Team that prep was completed at _____ time. State the manufacturer dry time to start clock to ensure that draping does not start until recommended dry time is completed.

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Fire Risk Assessment (continued)

B: Is the operative or other invasive procedure being performed above the xiphoid process or in the oropharynx?

Actions:

- Cover the head and facial hair near the surgical site with water-soluble gel.
- Use an adhesive incise drape between the surgical site and the oxygen source.
- Use a laryngeal mask airway or an endotracheal tube when the patient requires supplementary oxygen greater than 30%, unless using the tube is contraindicated by the procedure.
- Inflate the endotracheal tube cuff with tinted solutions (eg, methylene blue).
- Pack wet sponges around the back of the patient's throat during surgical procedures involving the airway.
- Evacuate accumulated anesthetic gas using a metal suction cannula before an ignition source is used in or near an oxygen-enriched environment.
- Evacuate surgical smoke in small or enclosed spaces (eg, back of the throat) when using electrosurgery or a laser near the endotracheal tube.
- Suction the oropharynx deeply before using an ignition source if oxygen is used.
- Check the anesthesia circuits for possible leaks.

C: Is open oxygen or nitrous oxide being administered?

Actions:

- Place drapes, including warming blankets with attached head drapes, over the patient's head in a manner that allows the oxygen to flow freely and not accumulate under the drapes.
- Deliver 5 to 10 L/minute of medical air under the drapes to flush out excess oxygen via a second delivery system.
- Use the lowest possible concentration of oxygen that provides adequate patient oxygen saturation.
- Stop supplemental oxygen or nitrous oxide for 1 minute before using electrosurgery; battery-powered, hand-held cautery units; or lasers for head, neck, or upper chest procedures.
- Turn off the flow of oxygen at the end of each procedure.

D: Is an ESU, laser, or fiber-optic light being used?

Actions—ESU use:

- Place the ESU in a location that does not put stress on the electrical cord.
- Keep the electrical cord dry and free of kinks, knots, and bends.
- Inspect the ESU cord before use, and do not use it if there is any evidence of breaks, nicks, or cracks in the outer insulation coating.
- Keep the active electrode cord free of kinks and coils during use.
- Only the person controlling the active electrode should activate the ESU.
- Use the lowest possible power setting for the ESU.
- Store the active electrode in a clean, dry, non-conductive safety holster when it is not in use.
- Keep surgical drapes or linens away from the activated ESU.
- Moisten drapes (if absorbent), towels, and sponges used near the active electrode tip.
- Do not use an ignition source to enter the bowel or the trachea.
- Keep the ESU active electrode away from oxygen, nitrous oxide, or combustible anesthetic gas sources if possible.

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Fire Risk Assessment (continued)

D: Is an ESU, laser, or fiber-optic light being used?

Actions— Fiber-Optic use:

Place the light source in standby mode or turn it off when the cable is not in use.

Inspect light cables before use and remove them from service if broken light bundles are visible.

Connect all fiber-optic light cables before activating the light source.

Place the light source on standby when disconnecting fiber-optic light cables.

Secure the working end (i.e., the end that is inserted into the body) of the endoscope or cord on a moist towel or away from any drapes, sponges, or other flammable materials.

E: Are there other possible contributors?

Actions:

- Select defibrillator paddles that are the appropriate size for the patient.
- Use only manufacturer-recommended lubricants for defibrillator paddles and pads.
- Use appropriate defibrillator paddle placement to allow optimal skin contact.
- Slowly drip saline on a moving drill, burr, or saw blade.
- Place drills or saws on the Mayo stand or back table when they are not in use.

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Fire Extinguishers

MOST FIRE EXTINGUISHERS ARE MARKED WITH A, B, OR C OR ALL THREE TO INDICATE WHAT TYPE OF FIRE THEY ARE USED FOR

FIRE CLASSIFICATIONS

- **Class A:** paper, cloth, wood, rubber and some plastics (e.g. combustible materials)
 - **EXTINGUISH CLASS A FIRES WITH WATER**
- **Class B:** Vapor present in flammable liquids, petroleum products, many oils, alcohol, & other combustible liquids or solvents
 - **EXTINGUISH CLASS B FIRES WITH FOAM OR CARBON DIOXIDE**
- **Class C:** Energized electrical equipment
 - **EXTINGUISH CLASS C FIRES WITH CARBON DIOXIDE**

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Types of Fires

- On the patient
- In the patient
- Includes airway fires
- On or In a piece of equipment

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Fighting Fires on a Patient

- Announce the Fire- R*A*C*E
- Remove any burning materials from the patient
- Extinguish on floor
- If the fire continues on the patient, put flames out with any material within reach, then remove charred material from the patient
- If only Class A materials are involved (no electrical equipment involved), a basin of water can be used to extinguish flames
- Turn off oxygen source. Shut off any gases in the room.
- Obtain a fire extinguisher as the last response
- Save all materials and equipment for investigation

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Fighting Fires Involving an Endotracheal Tube

- Announce the fire - R*A*C*E
- Collaborate and assist the anesthesia professional with:
 - Disconnecting and removing the breathing circuit
 - Turning off the flow of oxygen
 - Pouring saline or water into the airway
- Removing the endotracheal tube and any segments of the burned tube
- Examining the airway
- Re-establishing the airway

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Fighting Fires On or In a Patient

- Assess the surgical field for a secondary fire on the underlying drapes or towels
- Assess the patient for injury
- Report injuries to the physician
- Document assessment
- Notify the appropriate chain of command

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Fighting Fires on or in Equipment

- Communicate the presence of the fire to team members
- R*A*C*E
- Disconnect equipment from electrical source
- Shut off electricity to the piece of equipment at the electrical panel
- Shut off gases to equipment, if applicable
- Assess fire size and determine if equipment can be removed safely or if evacuation is needed
- Extinguish fire with extinguisher, if appropriate
- Notify the appropriate personnel

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Responsibilities—All Fires

- Alert team members to presence of a fire- R*A*C*E
- Remove burning material from patient
- Stop the flow of breathing gases to the patient
- Extinguish the fire by smothering or using water or saline
- Push the back table away from the sterile field
- Assess for secondary fire
- Assess patient for injuries
- Notify appropriate personnel
- Assign liaison to the families
- Act as a liaison to the families
- Complete an Event Report
- Gather involved materials and supplies

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Responsibilities—Large Fires

- Perform responsibilities for All Fires
- R*A*C*E
- Extinguish any burning material off the patient
- Turn off oxygen shut-off valve outside of room
- Communicate with personnel in the surrounding areas about the presence of fire
- Delegate responsibilities for non-direct care givers
- Assign a traffic director
- Assist fire response team or fire department personnel to location
- Assist with decision to evacuate
- Compile a list of all people in the perioperative areas in case of evacuation
- Order evacuation of perioperative areas
- Activate the disaster plan

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Responsibilities—Airway or Endotracheal Tube Fire

- Perform responsibilities for All Fires
- R*A*C*E
- Disconnect and remove the breathing circuit
- Discontinue the flow of breathing gases to the patient
- Remove the ET tube and any segments of the burned tube that remain in the airway
- Pour water or saline into the airway as directed
- Examine the airway
- Re-establish the airway

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Responsibilities—Equipment Fire

- Perform responsibilities for All Fires
- R*A*C*E
- Disconnect the equipment from the electrical outlet
- Remove the working end of the equipment from the sterile field
- Shut off the electricity to the equipment if you are unable to remove plug from the outlet
- Shut off gases to equipment
- Assess the size of fire and determine if equipment can be safely removed from room or to evacuate
- Extinguish fire using extinguisher, if appropriate

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How to Extinguish a Fire Using a Solution

- Use a nonflammable liquid such as saline or water
- Aim at base of fire
- Remember: drapes may be impermeable

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Types of Fire Extinguishers at Baptist

- Baptist Main and Gulf Breeze OR are equipped with the latest requirements.
- All Extinguisher types are Water Mist Extinguishers.
- ABC type Extinguishers are found outside of the operating room in the OR hallways.

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How to Smother a Fire

- Hold towel between fire and patient airway
- Drop one end of towel toward head
- Drop other end of towel over the fire
- Sweep hand over towel
- Raise the towel
- Keep your body away from the fire
- **DO NOT PAT**

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How to Handle a Fire in Other Parts of the Building

- Charge nurse should notify team members where procedures are in progress
- Do NOT start elective cases
- All personnel should prepare to evacuate

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R.A.C.E.

- **R** = Rescue the patient
- **A** = Activate the Alarm
 - Dial “333” to announce a “Code RED”
- **C** = Contain the fire
- **E** = Extinguish the fire or Evacuate

P.A.S.S

- **P** = Pull the pin at the top of the extinguisher
- **A** = Aim the nozzle at the base of the flames
- **S** = Squeeze the handle
- **S** = Sweep from side to side at the base of the fire until the fire is extinguished

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When to Fight a Fire

- If the fire is small
- If the fire is confined to immediate area
- If you are trained to use an extinguisher and can operate one effectively
- Use the correct extinguisher for the fire type
- DO NOT place yourself in danger
- Have your back to a safe escape route
- Protect yourself at all times-Stay low & avoid breathing heated smoke and fumes, or extinguishing agent
- If fire spreads or threatens escape, LEAVE IMMEDIATELY

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Shutting Off Gases

- Find the valve location
- Be familiar with valve operation
- Determine when to shut off gases
- ADON, Charge Nurse and Plant Operations can shut off gases

Fire Blankets: Not for Patient Fires!

Blankets used for fire suppression are NOT recommended

- Fire may be sustained by O₂ delivered to the blanket
- Placing a blanket
 - May trap fire next to or under the patient
 - May displace instruments
 - May burn in oxygen-enriched atmospheres

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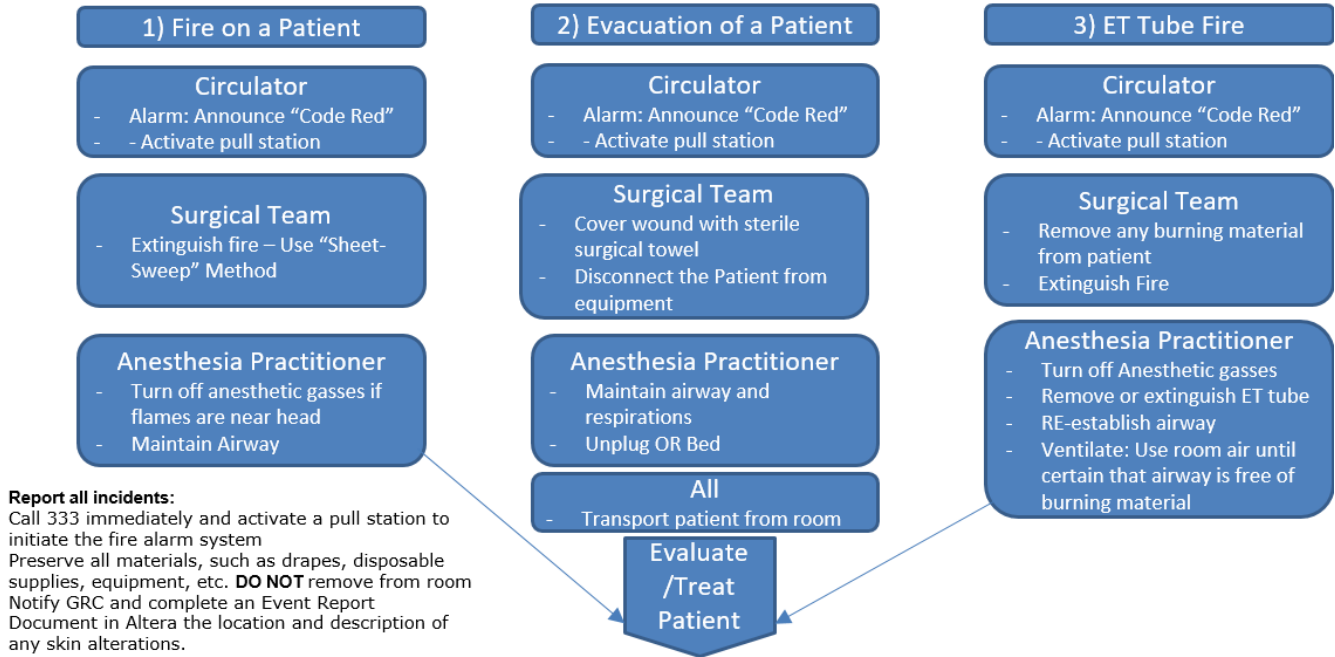
Evacuation: Types and Areas

- Determine when to evacuate
- Determine lateral, horizontal or vertical evacuation
- Know which doors are fire doors
- Know where smoke compartments are
- Know where evacuation floor plan maps are located

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Fire Response in the Operating Room



Fire Drills

- Regular fire drills
- Practice:
 - Peeling drapes off patient
 - Deactivating ignition source
 - Smothering fires
 - Disconnecting O2 tubing from patient and using ambu bag
 - Reporting fires
 - Using fire extinguishers
 - Evacuating patients from the OR

In accordance with the DNV requirements, Practitioners should participate in Fire Drills.

Please sign the rosters at Fire Drills to get credit for attendance.

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REFERENCES

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