Fire Safety In the OR

Review and Prevention of Airway Fires in the Peri-Operative Setting

By Joyce Freeman, B.S., Cer.A.T.

Objectives:

- This education will include:
- 1. Describing the Fire Triad.
- 2. Location of fire extinguishers and exit routes.
- 3. Role of surgeons, anesthesiologists, nurses and technicians
- 4. Discussion on a airway fire scenario.

Fire Safety In the OR

- Fires in the OR setting are recognized more now, with an emphasis to pay closer attention to education.

- Between 50 and 200 fires occur in the operating with 20% resulting in serious injury or death.

ASA Closed Claims Database

- 2% of claims are related to burns
- 1 death reported was related to a laser burn of the airway.
- 2 airway fires resulted in permanent disabling injuries.
- Payment resulted more in burn claims, 72%.
- Airway cases most serve with highest payout and were paid 100% of the time.

Advisory Statement

- “Anesthesiologists and Surgeons should periodically participate in OR fire drills with the entire OR team. This formal rehearsal should take place during dedicated educational time, not during patient care”.

- Upstate performs a yearly OR Fire Drill rotating between 5 East, 3 North , and Upstate Outpatient Center. Future drills will also include Upstate Community Hospital.

Fire In The OR: Anesthesiology

- The following slides will focus on:
  - Preparation, Prevention and Management of an Airway Fire.
  - What to do if an anesthesia airway fire occurs.

Preparation

- Anesthesiologists and surgeons should participate as part of the entire OR team to assess the risks associated with each patient.
- The team members will agree on how an OR fire will be prevented.
- Who should be in charge in the event a fire occurs: surgeon or anesthesiologist?
- Some institutions have a time out to assess the risks involved ensuring that all fire prevention precautions are in place.
- Have at least one bottle of saline or water on the anesthesia cart in case of fire, several is better.

Preparation Continued

- Ensure that the correct ET tube is used for the Correct procedure. Laser tube vs standard tube.

- Laser Surgery: Laser ET tube cuffs should be filled with saline rather than air.
  - Fill laser tube cuff with tinted saline to act as a marker for cuff puncture by laser. Methylene blue is recommended.

Procedures with High Risk for Fires

- **Oropharyngeal Surgery**: Tonsillectomy and Adenotonsillectomy
- **Facial Surgery**: Removal of lesions on head, face, or neck
- **Endoscopic Laser Surgery**: Removal of layrngeal papilliomas
- **Cutaneous/ Transcutaneous Surgery**
- **Tracheostomy and Burr Hole Surgery**

New Considerations for Preventing Surgical Fires

Control the oxygen concentration in the field.

1. For patients sedated for procedures above the xiphoid process, the recommendations are:

   A. Patient should breath room air.

   B. Administering O2 should be limited to 30%, ensuring that hypoxia doesn't set in.

   C. If greater than 30% inspired O2 is needed to prevent hypoxia then expel the oxygen from the surgical field.

New Considerations continued

Other types of patients to keep in mind when greater amounts of O2 are required:

- Pacemaker Insertion in fragile patients
- Patients who are O2 dependent and need to be responsive.
  - ✓Carotid Endarterectomy
  - ✓Awake Craniotomy

Review of Fire Triad

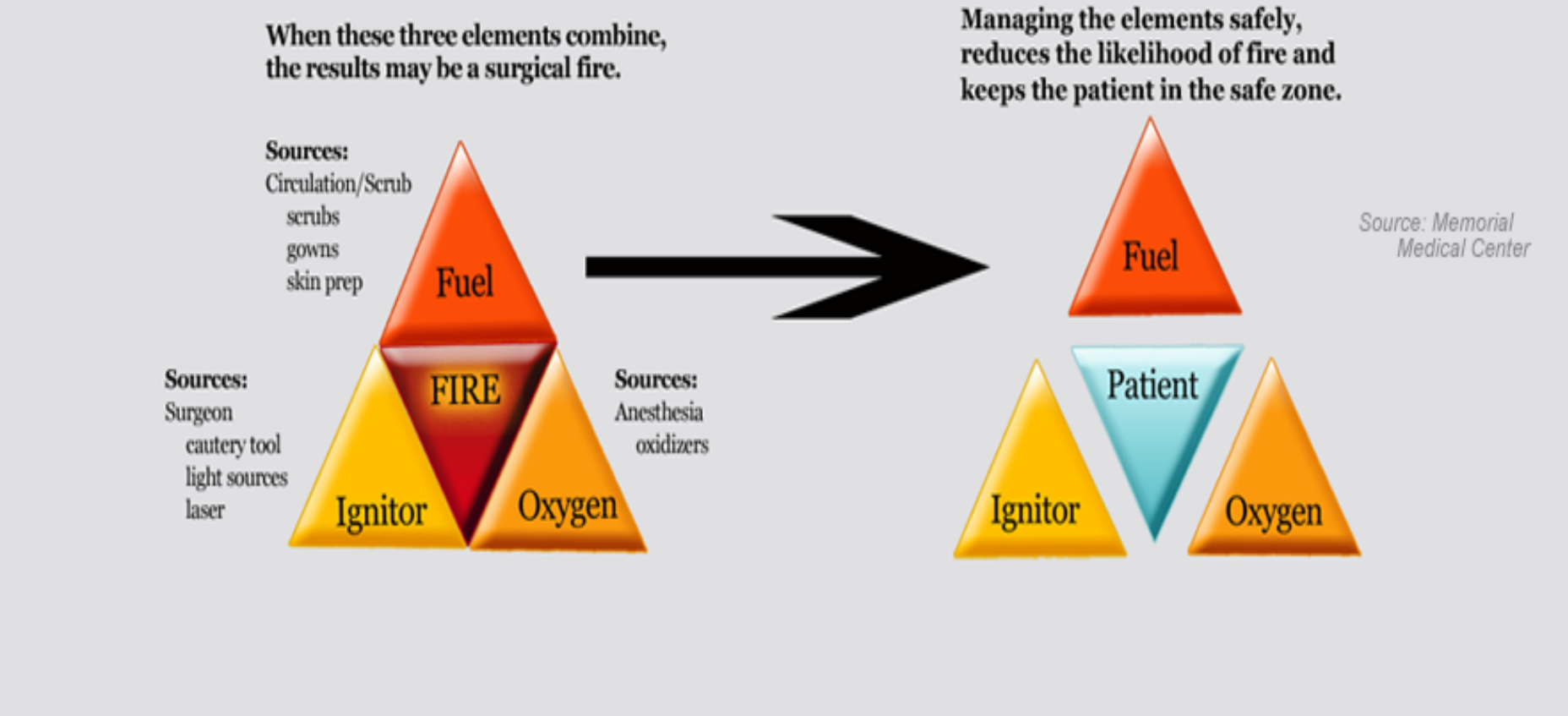
Oxidizer: Oxygen & nitrous oxide. Oxidizer enriched atmosphere exists within a closed or semi-closed breathing system, including patient's airway. Masks, nasal cannulas can promote the pooling of oxygen or mixture of oxygen and nitrous oxide.

Ignition Source: Electrocautery, Lasers, drills, burrs, argon beams, fiberoptic lights to name a few.

Fuel Source: Sponges, drapes, guaze, alcohol containing solutions (prep solutions), chlorhexidine, volatile compounds such as ether or acetone, oxygen masks, nasal cannulae, patient's hair, flexible endoscopes, and gowns can be a fuel source. *Potentially **you** can become a fuel source, the gowns being worn by the surgical team, and or your sleeve*.

Fire Triad

- Keep the patient safe



Ignition Source

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

- Source: AORN

Ignition Source (continued)

- 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
- Use a laser-resistant endotracheal tube when using laser during upper airway procedures
  - Source: AORN

Ignition Source (continued)

- Place wet sponges around the 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 and the appropriate type fire extinguisher available

Source: AORN

Oxidizers

- Oxygen
- Oxygen enriched environment
- Nitrous oxide

- Source: AORN

Oxidizer Safety Tips

- Inflate endotracheal tube cuff with tinted saline
- Evacuate surgical smoke from small or enclosed spaces
- Pack wet sponges around the back of the throat
- If O_2 is being used, suction the oropharynx deeply before using ignition source
- Check anesthesia circuits for possible leaks
- Turn off O_2 at end of each procedure
  - Source: AORN

Oxidizer Safety Tips (continued)

- Arrange drapes to create free air flow, avoid pocketing to avoid O2 pooling.
- Keep oxygen percentage as low as possible
- Deliver 5 L to 10 L/min of air under drapes
- If >30% concentration required, intubate, or use laryngeal mask airway
- Stop supplemental O_2 or nitrous oxide 1 min. before using ignition source
- Use an adhesive incise drape

- Source: AORN

Fuel Source

- Patient
- Personnel
- Drapes
- Gowns
- Towels
- Sponges
- Dressings

- Source: AORN

- Linens
- Head coverings
- Shoe covers
- Collodion
- Alcohol-based skin preparations
- Human hair
- Endotracheal tubes
- Tapes

Fuel Source Safety Tips

- 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 ointment in facial hair and other hair near the surgical site
  - Source: AORN

Fuel Source Tips (continued):

- Allow skin-prep agents to dry and fumes to dissipate before draping.
- Allow chemicals (e.g., alcohol, collodion, tinctures) to dry.
- “ChloraPrep” and “DurapPrep” are alcohol based; both require a drying time of a minimum of 3 minutes on hairless skin.
- Always avoid wetting the hair, drying time increases to a minimum drying time of least 1 hour.
- Always follow the manufactures instruction on fire safety that is located on the package.
- Conduct a skin prep “time out”

Source: AORN

Management of Airway Fire

Responding to Fire: Surgeons

- Immediately initiate a predetermined sequence of responses
- Nurse: Call for assistance
- Each team member should immediately respond without waiting for others to react.
- Surgical team should remove all drapes from patient. Use sterile water or saline to put out any fires associated with patient.

Airway/Circuit Fire: Anesthesiologists

- Call for assistance: Anesthesia technician
- Extinguish the ET tube fire and remove the ET tube.
- Stop the flow of airway gases: Oxygen and Nitrous oxide 1st.
- Remove all flammable and burning materials from the airway.
- Pour saline or water into the patient's airway.

Airway Assessment: Fire is Out

- No need to remove patient from OR suite
- Ventilation should be re-established
- Oxygen and Nitrous oxide should not be used
- ET tube should be examined to assess whether fragments are left in airway
- Rigid bronchoscopy performed to assess thermal injury.
- Flexible scope could possibly restart fire.

Fire is not extinguished after 1st Attempt: Non Airway Fire

- CO2 fire extinguisher should be used; if not successful then…
- Activate fire alarm
- Evacuate the patient following institutional protocols
- Close door to room to contain fire
- Turn off medical gas supply to room
- Do not attempt to re-enter the room.

Conclusion:

- Communication between the surgeon and the anesthesia care providers is vital when high risks procedures are being performed.
- Be prepared in the event a fire does occur.
- Know and understand OR policy at Upstate.
- Know closest evacuation routes in the event that the fire is not manageable.

Fire Extinguishers and Classes

- Class A: Ordinary Combustible Material
- Class B: Flammable liquids or grease
- Class C: Energized Electrical Equipment
- Class D: Combustible Metals
- Class K: Combustible cooking oils and grease

Fire Classes continued

Approved coverage for fire extinguishers for use in fires in the OR:

- Air pressurized water: Class A
- Dry Chemical: Class B and C
- CO2: Class B, C, and limited A
- Multi-Purpose dry chemical: Class A, B, and C

Fire Safety in the OR

- A CO2 fire extinguisher should be used.
- If the CO2 fire extinguisher is not successful both groups agree that the fire station should be pulled.
- Upstate policy mandates that if a fire occurs, a Code Red is initiated.

CO2 Fire Extinguisher

Dry Chemical Fire Extinguisher

Fire Extinguisher

5 East: Location of Pull Stations

Pull Stations are located

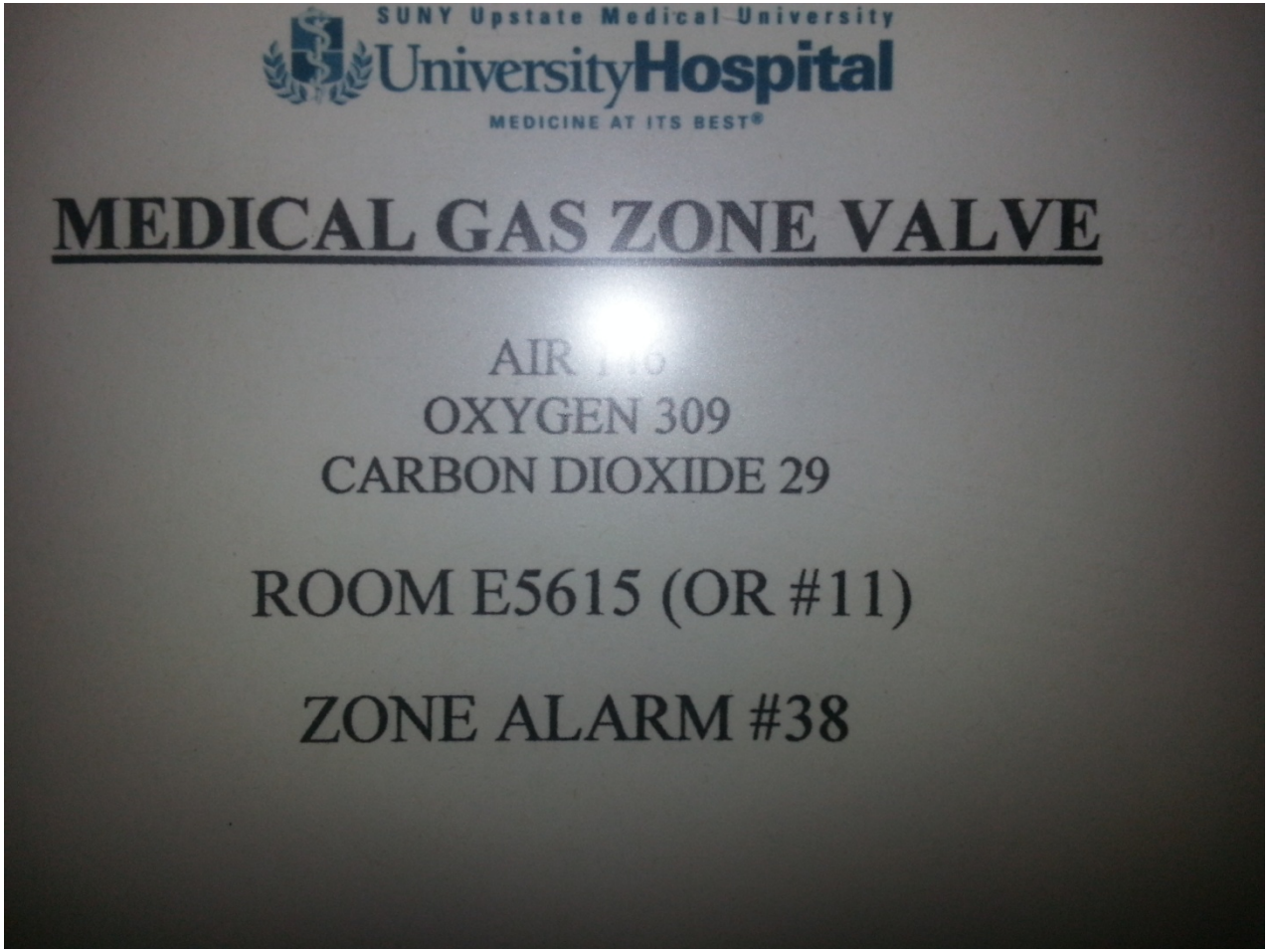
- Across from the 5 East OR desk
- Back hallway by room 12
- Outside the 5 East lounge
- PACU.

3 North: Location of Pull Stations

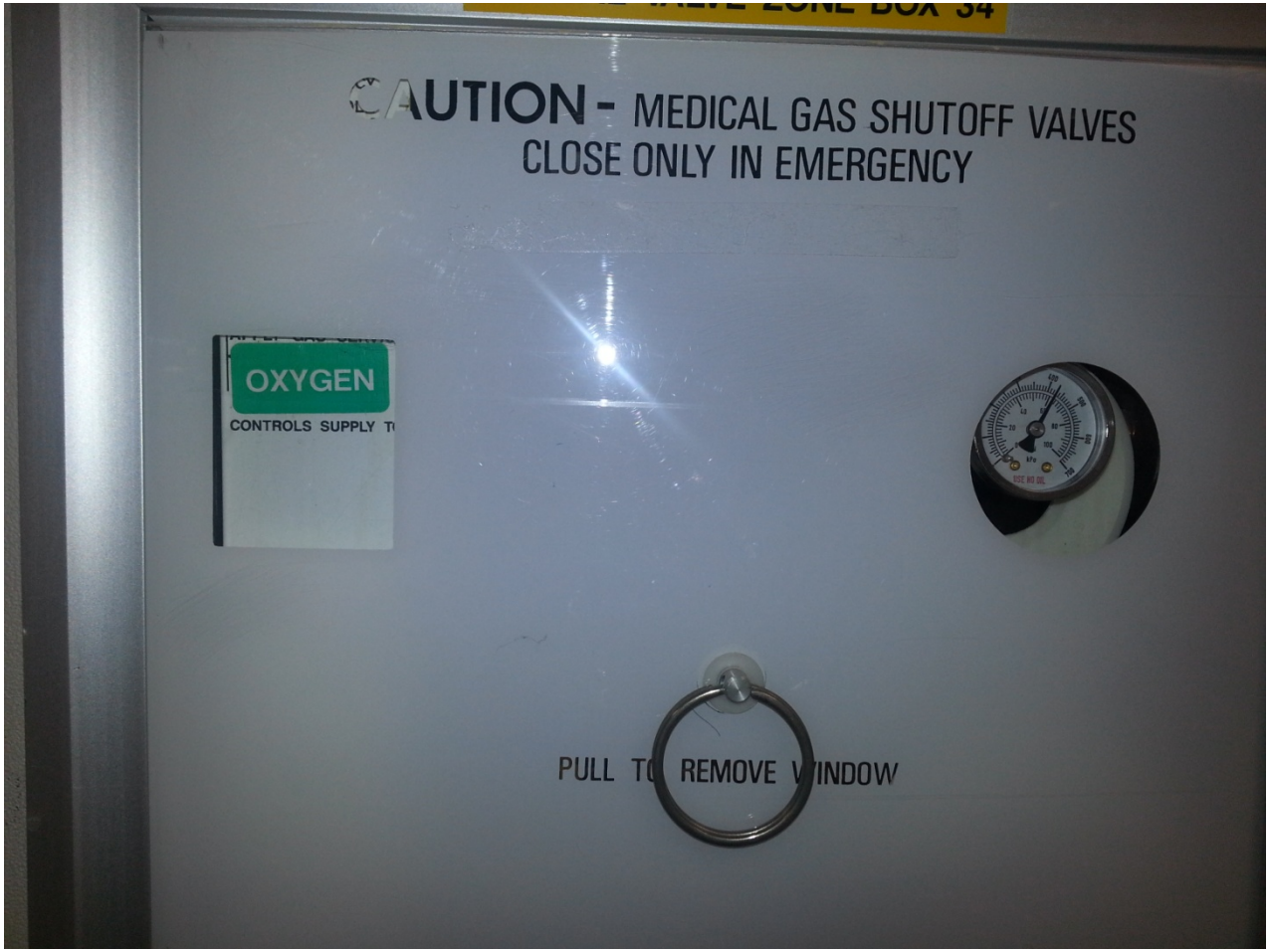
Pull Stations are located

- One at the beginning of each hallway
- One by room 4.

Medical Pipeline Zones



Room Pipeline Shut Off Cover



Room Pipeline Shut Off

APSF: Fire Safety Video

Please view this 18 minute Anesthesia Patient Safety Foundation video.

Review for Operating Room Personnel:

- Do you know who the triad members of the team are?
- Do you need more personnel for assistance; Operating Room or Anesthesiology?
- Do you need to have the O2 turned off to the room, including flow meters? Who makes this call: Anesthesiologist
- Does the anesthesia machine need to be taken out of service?
- Is there any electrical equipment for the surgeon that needs to be discontinued?

Important Considerations:

- How badly is the patient burned?
- Is this now considered a crime scene?

Important Considerations The OR space after the event:

- Once the patient is safe and no longer in danger:
  - The room must remain as is. Nothing can be cleaned or removed.
  - All evidence must be preserved. Evidence is needed to complete fire investigations by the Fire Marshal for state reporting, Syracuse Fire Department incident reporting , criminal and/or legal investigations as well as internal assessments of equipment and/or failures.
  - Forensics may need to take pictures.

Upstate Medical University

- Emergency phone for fire: 4-5555
- Hospital Fire Policy: (FO1) Fire Safety Procedures
- Upstate Outpatient Surgery Center Fire Policy: (Oper UO2)

References

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- Anesthesiology News, “Management of the Patient at Risk for an Operating Room Fire”, October 2013
- Power Point, AORN
- Jeffrey M. Feldman, MD, MSE, Jan Ehrenwerth, MD, and Richard P. Dutton, Md. “Thinking Outside the Triangle: A New Approach to Preventing Surgical Fires”, April 2014. Volume 118. Number 4
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- Elizabeth Frost, M.D. Drug Safety: “Letting Some Light into the Black Hole of the OR: , 2nd Annual Anesthesia Tech Continuing Education Lecture Series, December, 2014
- Contributor: Fire Marshal William MacDonald
- Produced by: Joyce M. Freeman, BS., Cer.A.T.