Operating Room Fires
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Incidence
Operating room fires, while rare, can have extremely devastating consequences, including burns, inhalation injuries, psychological trauma, and death. Approximately 550-650 surgical fires occur annually in the United States, which is similar to the rate of wrong site surgeries. Electrocautery and lasers are the most common ignition sources, oxygen is the most common oxidizer source, and surgery on the head and neck is the most common site for fires.

Components
Three components are required to produce a fire, which is referred to as the fire triad: ignition source, oxidizer source, and fuel source. Fuel sources include prepping agent such as chlorhexidine, drapes, towels, sponges, dressings, endotracheal tubes, PPE equipment, aerosols, blankets, etc. Ignition sources include electrocautery equipment, lasers, fiberoptic light sources, and sparks from surgical drills, and defibrillators, among other things. The oxidizer source is almost always oxygen.

Prevention
There are several things that can be done to prevent OR fires from occurring in the first place. First, fire safety education and protocols should be in place. Operating Room fire drills and simulation training can improve the response to fires by OR staff members. Second, there should be preparation prior to the case if a high risk situation exists. The team should discuss specific roles if a fire should occur, and fire management equipment should always be available. Specific supplies that should always be available include several containers of sterile saline, an appropriate fire extinguisher, replacement endotracheal tubes, guides, facemasks, rigid laryngoscope blades, replacement breathing circuits, and replacement drapes and sponges.

More importantly, there are specific methods to reduce the risk of OR fires that involve managing fuel, ignition sources, and oxidizers. Using saline to moisten all sponges and packing material, letting all alcohol based prep solutions dry prior to using ignition sources, and arranging drapes in a way to avoid oxygen accumulation are ways to reduce OR fire risk. To manage the oxidizer source, the lowest supplemental oxygen concentration should be used that is clinically safe, especially when the ignition source is near the oxidizer source. To manage the ignition source, using lower voltages of electrocautery equipment is helpful, and using bipolar instead of monopolar current reduces risk.

There are even more stringent guidelines for high risk procedures in terms of managing fuel sources. During laser surgery near the airway, laser resistant endotracheal tubes are less likely to ignite or melt than conventional tubes when surgery is occurring near the airway. The most
Finally, the patient will require post fire care, and ventilation will need to be reestablished. If the fire is within the breathing circuit or in the airway, such as during laser laryngeal surgery or other ENT procedures, the first, and most important step is to remove the endotracheal tube from the patient, and turn off the flow of gases and oxygen simultaneously, and begin using bag-mask ventilation. Post-fire care is more involved in these cases. The endotracheal tube should be examined to assess the damage to the patient’s airway. Rigid bronchoscopy might be needed to assess airway injury and for possible removal of foreign materials.

**References**

**Management**
If a fire does occur in the operating room, but not in the airway, there are specific steps that should be taken to manage the fire. First, recognizing that a fire is present is extremely important. The fire should be immediately extinguished. The procedure must be halted and the surgeon notified. Pouring saline on the source, removing drapes and any flammable material, turning off the oxygen source and disconnecting the circuit, and using fire extinguishers are methods used to extinguish fires. If the fire cannot be extinguished, evacuation should be considered. If evacuation occurs, the fire alarm should be activated, door closed to contain fire, and the gas supply to the room should be turned off.

**Effective tubes for preventing fires during laser surgery include copper foil wrapped tubes, aluminum foil wrapped tubes, or stainless steel tubes. These laser resistant tubes should always be cuffed, and the cuffs should be filled with saline instead of air. Methylene blue should also be added to the saline so that damage to the tube by a laser or ignition source can be immediately detected.**

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