Surgical Fires: Reducing the Risk of Patient Injury

By Georgette A. Samaritan, RN, BSN, CPHRM

November 30, 2015

Surgical fires, fires that occur on or in a surgical patient, have consequences that can be devastating; these events are an increasing source of liability for anesthesiologists, surgeons and hospitals. Extrapolating from data published by the Pennsylvania Patient Safety Authority in 2012[1], ECRI estimates that 200-240 fires occur nationally each year, making the frequency of their occurrence comparable to that of other surgical mishaps (e.g. wrong-site surgery or retained instruments.).[2]

The purpose of this article is to help promote awareness of the continued risk of surgical fires, and to encourage OR personnel, anesthesiologists, surgeons and management to implement, and adhere to, patient safety recommendations such as those promulgated by the ASA Practice Advisory for the Prevention and Management of Operating Room Fires[3], the Anesthesia Patient Safety Foundation[4] and the Food and Drug Administration[5] to promote patient safety practices and share fire prevention strategies..

According to the results of a 2013 American Society of Anesthesiology (ASA) Closed Claims project study [1] in which MagMutual Insurance Company participated, 90% fire claims were electrocautery-induced, occurring in patients who
had monitored anesthesia care (MAC) with open oxygen delivery; 85% of these electrocautery-induced fires occurred during upper chest, neck, and head procedures. Nationally, electrocautery fires during MAC have increased from 6% of MAC Claims during 1985-1989 to 31% of MAC claims during 2000-2009.[6]

Lawsuits stemming from these injuries can lead to substantial awards for plaintiffs.

In a classic surgical fire case (MagMutual case file), a jury returned a favorable plaintiff verdict after finding a plastic surgeon and his corporation responsible for causing a fire in the surgeon’s ambulatory surgical center.

The patient was having a mole removed from her right eyebrow. She was sedated for the procedure, and was receiving oxygen supplementation via a face mask when the surgeon activated an electrocautery device, causing a fire to erupt. The patient alleged the surgeon was negligent in failing to communicate to the anesthesia assistant controlling the oxygen that he was going to use electrocautery so that the anesthesia assistant would know to turn off the oxygen. During the trial, the surgeon blamed the anesthesia assistant for not knowing that he was going to use electrocautery. In this case, the jury exonerated the anesthesia assistant, and found the surgeon 100% responsible for the fire. The jury also found that the surgeon concealed from the patient the true cause of the fire, and as a result awarded the patient additional money in punitive damages against the surgeon.

An Example of Patient Safety in Action: CCHS Fire Risk Assessment Score

The Christiana Care Health System (CCHS) in Wilmington, Delaware, demonstrated patient safety in action by developing a simple Fire Risk Assessment scoring tool.[7] The tool helps to identify surgical procedures at increased risk for surgical fires. The CCHS WHO Surgical Safety Checklist tool assesses the presence or absence of three elements; each element that’s present is given one point. The elements are:

1. Surgery above the xiphoid
2. Open oxygen source
3. Available ignition source (e.g., electrosurgery, laser, fiberoptic light cord)

A score of 3 indicates a high risk for a surgical fire. A score of 2 indicates a low risk, with potential for conversion to high risk. A score of 1 indicates low risk. When an operation is assessed as being at high risk for a surgical fire, the CCHS risk mitigation policy is followed to decrease the risk of surgical fire.

The CCHS Fire Risk Assessment Score can easily be included in either the WHO Surgical Safety Checklist preoperative briefing[8] or the Joint Commission’s Universal Protocol time-out, now part of the National Patient Safety Goal chapter in the Joint Commission accreditation manual. It is expected that the ongoing refinement of checklists will continue.

Recommendations to reduce the risk of surgical fires [9] include, but are not limited to:

- Conduct a fire risk assessment at the beginning of each procedure. The highest risk procedures involve an ignition source, delivery of supplemental oxygen, and the operation of the ignition source near the oxygen (e.g., head, neck, or upper chest surgery).
Use supplemental oxygen safely.

Evaluate if supplemental oxygen is needed for each patient. Any increase in oxygen concentration in the surgical field increases the chance of fire.

If supplemental oxygen is necessary, particularly for surgery in the head, neck, or upper chest area:
  - Deliver the minimum concentration of oxygen needed to maintain adequate oxygen saturation for your patient.
  - Use a closed oxygen delivery system such as an endotracheal tube or laryngeal mask whenever possible, especially if high concentrations of supplemental oxygen (greater than 30 percent) are being delivered.
  - Take additional precautions to exclude oxygen from the field if using an open delivery system. These precautions include draping techniques that avoid accumulation of oxygen in the surgical field, the use of incise or fenestrated drapes which may help isolate oxygen from the surgical site, blowing air to wash out excess oxygen, or alternatively, scavenging oxygen from the field.

Use alcohol-based (flammable) skin preparation agents safely.

Prevent alcohol-based antiseptics from pooling during skin preparation. For example, use the appropriate size applicator for the surgical site.

Remove alcohol-soaked materials from the prep area.

Allow adequate drying time, as prescribed in the labeling, for the specific product. If the product is used on hairy areas or in skin folds, extend the drying time.

Ensure the skin is dry before draping the patient and beginning surgery.

Use devices and other surgical equipment safely.

Consider alternatives to using an ignition source for surgery of the head, neck, and upper chest if high concentrations of supplemental oxygen (greater than 30 percent) are being delivered. If an ignition source must be used, know that it is safer to do so after allowing time for the oxygen concentration to decrease. It may take several minutes for a reduction of oxygen concentration in the area even after stopping the gas or lowering its concentration.

When not in use, place ignition sources, such as ESUs and electrocautery devices, in a holster and not on the patient or drapes.

Understand that surgical drapes and other fuel sources can ignite easily and burn in an oxygen-enriched environment, even if the products are described as “flame-resistant.”

Encourage communication among members of your surgical team.

Ensure the anesthesia professional delivering the gases is communicating with the surgeon controlling the ignition source and the clinician applying the skin preparation agent.

Plan how to manage a surgical fire. For example, understand how to extinguish a fire burning on a patient, develop evacuation procedures, conduct fire drills, and keep saline handy to put out a fire.

Briefly, the major changes in clinical practice that the ASA advises for head, face, neck and upper-chest surgery include the following:

- Use only air for open delivery to the face, provided that a spontaneously breathing, sedated patient can maintain his or her blood oxygen saturation without extra oxygen
- Secure the airway by using a laryngeal mask airway or tracheal tube if the patient cannot maintain safe blood oxygen saturation without supplemental oxygen, so that oxygen – enriched gases do not vent under the surgical drapes
- Discontinue the traditional practice of open delivery of 100% oxygen, with limited exceptions, such as carotid artery surgery, neurosurgery and some pacemaker implantations. In these cases, the surgical team should seek to deliver the minimum oxygen concentration necessary for adequate oxygenation, starting with an oxygen concentration of 30% and increasing as necessary.

In Summary:
Continuing education and communication among Anesthesia and the entire OR team, along with implementation of fire prevention protocols in high-fire-risk procedures, may reduce the occurrence of surgical fires. Recognition of the fire triad, particularly the critical role of supplemental oxygen by an open delivery system during electrocautery use, is crucial to prevent OR fires. Careful coordination and continuous training for all attending healthcare professionals are required to minimize the possibility of this potentially fatal event. Because surgical fires may occur in a variety of locations throughout the hospital, it is important that several departments be actively involved in training: anesthesiology, surgery, surgical services, nursing, labor and delivery, facilities management, and the safety department.


[9] Citing the U.S. Food and Drug Administration website,


Other Related Information:


The information presented in this Advisory is intended as general information of interest to physicians and other healthcare professionals. The recommendations and advice published herein do not reflect or establish a standard of care and do not establish rules for the practice of medicine. The publication of this information is not intended as an offer to insure such conditions or exposures, or to indicate that MAG Mutual Insurance will underwrite such risks for the reader. Our liability is limited to the specific written terms and conditions of actual insurance policies issued.

The information provided in this resource does not constitute legal, medical or any other professional advice, nor does it establish a standard of care. This resource has been created as an aid to you in your practice. The ultimate decision on how to use the information provided rests solely with you, the PolicyOwner.


Links