PPM ANESTHESIA & the LAW
A RISK MANAGEMENT NEWSLETTER

DON'T SETTLE. OWN. ™ ISSUE 26

Risk Management Tips for Prevention and Management of Intra-operative Fires

Burns from intra-operative fires continue to be the leading burn injury reported to Preferred Physicians Medical. Despite numerous articles, guidelines and warnings from the American Society of Anesthesiologists, the Anesthesia Patient Safety Foundation and other organizations, PPM policyholders continue to report this potentially devastating and preventable complication. Burns from intra-operative fires, like all preventable anesthesia claims or "never events," are extremely difficult and costly to defend. Given the difficulties in defending these types of cases at trial, nearly all intra-operative fire cases result in settlement, often for significant sums. In this issue, we once again focus attention on this preventable anesthesia claim. We also offer some risk management advice for preventing and managing intra-operative fires. Finally, we underscore some of the challenges in defending these preventable claims in the courtroom.

The Fire Triad

Fire requires the presence of three elements, frequently referred to as the "fire triad" or "fire triangle": (1) an oxidizer, (2) an ignition source, and (3) fuel.[1] Oxidizers in the operating room are oxygen and nitrous oxide. Ignition sources include, but are not limited to, electrosurgical or electrocautery devices, lasers, heated probes, drills, burrs and fiber-optic light cables. Fuel sources include, but are not limited to, alcohol-based prepping solutions, drapes, gauze, sponges, the patient's hair, dressings, ointments, gowns, blankets, tracheal tubes and nasal cannulae.[2] When the three elements of the "fire triad" or "fire triangle" are present in the surgical field, the risk of an intra-operative fire is extremely high.

Identifying High-Risk Procedures

The majority of burn injury cases from intra-operative fires reported to PPM involve monitored anesthesia care (MAC) with sedation and supplemental oxygen, electrocautery and alcohol-based prepping solutions. High-risk procedures include, but are not limited to, tonsillectomy, cataract or other eye surgery, tracheostomy, lesion removal and procedures involving the chest, neck and head.[3] Identifying high-risk procedures is the first step in preventing intra-operative fires.

Preventing Intra-operative Fires

Prevention of intra-operative fires begins with operating room fire safety education. Operating room fire safety includes, but is not limited to, knowledge of institutional fire safety protocols and participation in institutional fire safety education.[4] All anesthesia providers should have fire safety education with an emphasis on the risk created by an oxidizer-enriched atmosphere.[5] Additionally, all members of the surgical care team should periodically (at least annually) participate in operating room fire drills with the entire surgical care team. This formal rehearsal should take place during dedicated educational time, not during patient care.[6]

The anesthesia provider, the surgeon and the nursing staff **each** control and are responsible for at least one of the elements of the "fire triad" or "fire triangle." Therefore, every member of the surgical team plays an important role in preventing intra-operative fires. Before starting a high-risk procedure, the surgical care team should agree upon a team plan and team roles for preventing and managing an intra-operative fire.[7] Prevention of intra-operative fires includes: (1) minimizing or avoiding an oxidizer-enriched atmosphere near the surgical site, (2) safely managing fuels, and (3) safely managing ignition sources.[8]

- *Minimizing or avoiding an oxidizer-enriched atmosphere near the surgical site* is fundamental to preventing intra-operative fires. An increased oxygen concentration in the surgical field is either a direct cause or significant factor in many intra-operative fires.[9] The first question the anesthesia provider should consider when developing a plan to minimize the risk of intra-operative fire is: ***Does the patient require supplemental oxygen?*** The anesthesia provider will need to determine the patient's pulmonary function and consider the depth of sedation that will be needed for the surgery. Routine or "cookie-cutter" administration of supplemental oxygen for all patients receiving MAC with sedation has been reported to PPM and continues to increase the risk of intra-operative fires for patients who may not need supplemental oxygen for their surgery. Safe room air sedation can be accomplished by selecting patients with normal pulmonary function, by administering sedatives and narcotics carefully, and by monitoring oxyhemoglobin saturation continuously.[10] If an oxygen concentration greater than 30% is required to prevent hypoxemia during sedation, the anesthesia provider should strongly consider securing the patient's airway – especially for procedures around the head, neck and chest.[11] If an open gas delivery device (e.g. facemask or nasal cannula) is used, the surgeon should give **adequate notice** that the ignition source will be activated. The anesthesia provider should (1) **stop** the delivery of oxygen or reduce the delivery to the minimum required to avoid hypoxia, and (2) **wait** a few minutes between decreasing the flow of supplemental oxygen and approving the activation of the ignition source. Other strategies to minimize the risk of an enriched oxidizer concentration in the surgical field include open draping (wide exposure of the surgical site to the atmosphere) and blowing air over the patient's face to wash out extra oxygen.
- *Safely managing fuels* requires the nursing staff to allow alcohol or other flammable prepping solutions to adequately dry before draping. Gauze and sponges should be moistened when used in proximity to an ignition source. Water-soluble gel should be applied to the patient's eyebrows and hair for procedures around the eyes and face.
- *Safely managing ignition sources* requires the surgeon to give **adequate notice** to the nursing staff and anesthesia provider that the ignition source is about to be activated and **wait to receive approval** from the nursing staff and anesthesia provider to proceed. **Active communication between the surgeon, the nursing staff and anesthesia provider regarding activation of the ignition source in conjunction with steps to reduce fuel source risks and the oxidizer-enriched atmosphere is vitally important to prevent intra-operative fires.**

Management of Intra-operative Fires

Management of intra-operative fires includes: (1) recognizing the early signs of fire, (2) halting the procedure, (3) making appropriate attempts to extinguish the fire, (4) following an evacuation protocol when medically appropriate, and (5) delivering post-fire care to the patient.[12] Early signs of a fire include a flame or flash, unusual noises such as popping sounds, odors, smoke or heat.[13] When early warning signs of a fire are noted, there should be an immediate announcement of fire, followed by an immediate halt to the procedure.[14]

For an airway fire, the tracheal tube should be removed as quickly as possible and all flammable and burning materials should be removed from the airway.[15] The delivery of all airway gases should stop and saline should be poured into the patient's airway to extinguish any residual embers and cool the tissues. After the airway fire is extinguished, ventilation by mask should be re-established, avoiding supplemental oxygen and nitrous oxide, if possible. The tracheal tube should be examined to assess whether fragments were left in the airway. Bronchoscopy should also be considered to look for tracheal tube fragments, assess injury and remove residual debris.[16] The patient's status should be assessed and a plan devised for ongoing patient care.

For a fire outside of the airway, the delivery of the oxidizer should be stopped and all burning and flammable materials should be removed from the patient and extinguished with saline, water or a fire extinguisher.[17] After the fire has been extinguished, the patient's status should be assessed and a plan devised for ongoing patient care.

If the fire has not been extinguished after the first attempt, use a CO2 fire extinguisher in, on or around the patient. If the fire persists after use of the fire extinguisher, activate the fire alarm and evacuate the patient, if possible. Close the door to the room containing the fire and turn off the medical gas supply to the room. All fires should be treated as an adverse event and reported to PPM and the facility following the facility's protocol.[18]

Defending Intra-operative Fires in the Courtroom

While PPM successfully defends many policyholders in litigation involving allegations of wrongful death, brain damage, paralysis and other catastrophic outcomes, PPM's ability to successfully defend burns from intra-operative fires has proven much more challenging. Jurors simply will not accept that burns resulting from intra-operative fires are complications that can and do occur absent someone's negligence. As a result, plaintiff attorneys typically evaluate these types of cases as having increased settlement value, even when the injury may not be severe. Plaintiff attorneys also typically argue that intra-operative fire prevention is a "shared responsibility" and each member of the surgical care team has a duty to prevent this potentially devastating and life-threatening complication. Faced with the risk of allowing an angry jury to calculate the amount of damages to be awarded to a patient who is burned in an intra-operative fire, PPM is typically forced to settle these cases rather than defending them at trial. The following cases illustrate the challenges PPM faces when defending burn injuries resulting from intra-operative fires.

- 70 year-old female was undergoing surgical skin lesion removal from her chest. The PPM insured anesthesiologist was administering monitored anesthesia care (MAC) with sedation and 100% oxygen at 10 L/min. The surgical prep solution was part iodine and part alcohol. The surgeon was using an electrocautery instrument (Bovie) to remove the lesions. A popping sound was heard and the drapes around the patient's face and the patient's face caught on fire. The surgical care team reacted quickly and extinguished the fire. The patient suffered partial and full-thickness burns to her entire face and scalp.

  Prior to litigation being filed, PPM participated in a settlement conference with the patient and her attorney, the hospital and the surgeon. The patient was noted to have significant, permanent scarring on her face in the area around the mask and severe scarring above her upper lip. The patient made a global settlement demand in the amount of $850,000. The PPM policyholder and the hospital consented to settlement and made counter-offers. The surgeon refused to consent to settlement and did not make any settlement offers. Due to the surgeon's refusal to contribute to settlement, the patient refused to engage in further settlement negotiations. Thereafter, the plaintiff filed a lawsuit against the PPM policyholder, the surgeon and the hospital.

  The defense anesthesiology expert who reviewed this case concluded that the administration of 10 L/min of oxygen via mask ventilation for a surgery in the head, neck and upper chest areas was too high and below the standard of care.

  Defense counsel's evaluation was that this case would be extremely difficult to defend at trial and he recommended we attempt to settle this case prior to trial. PPM, with the PPM policyholder's consent, agreed to contribute $150,000 toward settlement. The hospital and surgeon each contributed $150,000 for a global settlement in the amount of $450,000.

- 45 year-old female presented for right carotid endarterectomy. The PPM insured anesthesiologist administered a right cervical block with 5 L/min oxygen via mask ventilation. The ends of the surgical drapes had been placed on the IV poles to permit ventilation under the drapes to allow the oxygen to dissipate. The surgical field was prepped by the nurse with an alcohol-based prep solution. While the surgeon was using a Bovie for hemostasis, a popping noise was heard and the surgical drapes and the patient's face caught on fire.

  The drapes and mask were removed and the flames were extinguished with water. The PPM policyholder then induced and intubated the patient. Dressings were applied and a plastic surgeon was consulted. The patient sustained severe second and third degree burns to her face. The patient was transferred to a burn unit at another facility. The patient underwent multiple debridement and grafting procedures in the burn unit. Following discharge from the burn unit, the patient underwent additional surgical procedures to improve the scars on her face and to reconstruct her nose.

  The patient sued the PPM policyholder, the surgeon and the hospital. Plaintiff's allegations against the PPM policyholder were: negligently administering oxygen in close proximity to the electrocautery; administering oxygen at a flow rate of 5 L/min which was an excessively high rate given the patient's needs (as well as being contrary to the manufacturer of the electrocautery instrument's instructions); utilizing a face mask rather than a nasal cannula; and failing to arrange the surgical drapes to prevent pooling of oxygen under the drapes resulting in a concentrated oxygen-enriched surgical field.

The defense anesthesiology expert who reviewed this case opined that the administration of oxygen at 5 L/min was too high. The defense anesthesiology expert noted that the patient had a SpO2 of 95% on room air and that could have been maintained, in most cases, without supplemental oxygen. The defense expert also felt that a nasal cannula should have been used rather than a mask, as the mask allows a greater build-up of higher oxygen concentration near the surgical field.

Plaintiff's claimed damages included permanent facial disfigurement and deformity and permanent scarring of the chest, left shoulder and arm. Plaintiff also claimed damages for permanent scarring at the graft sites on her thighs, and emotional, psychological, self-esteem fears and anxieties associated with her appearance. Plaintiff's initial settlement demand was $1.8 million.

Defense counsel's evaluation was that there was liability and the potential jury verdict range was between $1.5 million and $2 million. Defense counsel's evaluation and recommendation for settlement value range was between $750,000 and $1.2 million.

All three defendants agreed to contribute to settlement equally on a one-third basis. Prior to trial, plaintiff lowered her settlement demand to $1,675,000 globally. PPM, with the PPM policyholder's consent, contributed $558,333.33 toward a global settlement in the amount of $1,675,000.

- 88 year-old female patient underwent repair of the left inguinal hernia and excision of the 2 cm sebaceous cyst of the right neck under local anesthesia with supplemental oxygen at 3 L/min via nasal cannula. At the end of the case when the surgeon was closing the wound in the neck and cauterizing the bleeders, the Bovie tip produced an explosion followed by a large flame. Water was poured on the patient's face and the fire was rapidly extinguished. The patient suffered first and second degree burns on her face, left ear, and right shoulder. The patient was treated with Silvadene cream for her burns and was seen by a plastic surgeon. The patient's burns responded well to treatment and she was discharged with most of the burns nearly healed.

  The patient sued the surgeon, hospital and PPM insured anesthesiologist. Plaintiff alleged the PPM policyholder was negligent in allowing the oxygen to pool under the surgical drapes creating an oxygen-enriched surgical field that resulted in the intra-operative fire.

  The PPM policyholder testified that he decided to administer supplemental oxygen based on the patient's age and physical condition. The PPM policyholder testified further that oxygen delivered at 3 L/min would not have created any pooling in the surgical field. According to the PPM policyholder, the patient wasn't draped, but rather a loose surgical towel was placed on the patient's head that allowed the PPM policyholder to lift the towel approximately every 30 seconds during surgery to check the patient's face. The PPM policyholder testified further that the surgeon hadn't cleaned the tip of the Bovie following the inguinal hernia repair and there was excessive human fat on the tip that caused the explosion and fire.

  The surgeon testified that the fire was caused by a pooling of oxygen in front of the patient's face. The surgeon denied there was excessive human fat on the tip of the Bovie. The surgeon testified that he met the standard of care in this case and the PPM policyholder was responsible for eliminating the risk of intra-operative fire due to the pooling of the oxygen.

  Plaintiff produced $13,386 in medical bills to support her claim and also claimed damages for pain and suffering and permanent disfiguring scars on her face. Despite plaintiff's alleged damages, the only noticeable mark was a small scar under her nose. Prior to trial, plaintiff demanded $350,000 to settle her claims against all defendants.

  The surgeon and hospital refused to contribute to settlement. The surgeon took the position that the intra-operative fire was caused by the PPM policyholder's failure to allow the pooled oxygen to dissipate and for not communicating the presence of oxygen before he sparked the Bovie. The PPM policyholder was adamant that the low volume of oxygen did not cause any pooling under the towel and it was the surgeon's Bovie that caused the intra-operative fire.

  The PPM policyholder ultimately consented to settlement and PPM offered $25,000 to settle this case on behalf of the PPM policyholder. Neither the surgeon nor the hospital offered any money toward settlement. Plaintiff rejected PPM's $25,000 settlement offer and indicated that $100,000 globally from all defendants would likely settle this case.

After considerable efforts by PPM and defense counsel to obtain settlement contributions from the surgeon and hospital, this matter was prepared for trial. During trial the surgeon pointed the finger at the PPM policyholder and blamed him for the intra-operative fire. Defense counsel for the PPM policyholder read into evidence the Bovie manual that places all the responsibility in handling the Bovie on the surgeon.

Plaintiff's expert testified the PPM policyholder breached the standard of care because of his lack of communication regarding the oxygen administration. Plaintiff's expert also testified it was the PPM policyholder's responsibility to inform the surgeon that he planned on using oxygen. Plaintiff's expert testified further that the surgeon should have informed the PPM policyholder when he planned on using the Bovie, and that by failing to communicate with each other both the PPM policyholder and the surgeon deviated from the standard of care.

Following a two week trial, the jury returned a verdict against the PPM policyholder in the amount of $263,000. The surgeon and hospital received defense verdicts as the jury did not find any liability against either of the co-defendants.

PPM appealed the jury verdict against the PPM policyholder. PPM negotiated a post-trial settlement for $211,379 on behalf of the PPM policyholder in exchange for dismissing its appeal.

Conclusion

Intra-operative fires are potentially devastating preventable complications. Each member of the surgical care team has responsibility to minimize or eliminate the risk of intra-operative fire. Hospitals and other health care facilities should have operating room fire safety policies and protocols to educate all members of the surgical care team about intra-operative fire prevention and management. The anesthesia provider's intra-operative fire prevention safety education should focus on the risk created by an oxidizer-enriched atmosphere. Anesthesia providers must carefully consider whether to administer supplemental oxygen with an open gas delivery system for procedures utilizing electrocautery around the patient's face, head or neck. Anesthesia providers should strongly consider securing the airway for patients if an oxygen concentration greater than 30% is required to prevent hypoxemia. PPM's claims attorneys and claims specialists are available to review intra-operative fire prevention policies and protocols.

References:

1. Practice Advisory for the Prevention and Management of Operating Room Fires, *Anesthesiology* 2008;108:786-801.
2. *Id.* at 786.
3. *Id.* at 787.
4. *Id.* at 788.
5. *Id.* at 789.
6. *Id.*
7. American Society of Anesthesiologists Operating Room Fires Algorithm, *Anesthesiology* 2008;108 at 790.
8. *Id.* at 789.
9. Anesthesia Patient Safety Foundation Online Commentary to Accompany OR Fire Prevention Video. The Anesthesia Patient Safety Foundation produced an OR Fire Safety Video to promote the best practices known to prevent operating room fires. See, http://www.apsf.org/.
10. *Id.*
11. *Id.*
12. *Anesthesiology* 2008;108 at 792.
13. *Id.*
14. *Id.*
15. *Id.*
16. *Id.* at 793.
17. *Id.*
18. *Id.* at 794. ❖

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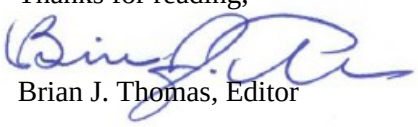
In This Issue

Intra-operative fires on or in surgical patients continue to be a risk in operating rooms despite the cessation of the use of flammable anesthetic agents over the past 25 years. Prevention of intra-operative fires requires understanding the risks and effective communication between surgical, nursing and anesthesia staffs. In this issue, we examine the cause of intra-operative fires, the responsibility for prevention of intra-operative fires and the procedures for intra-operative fire prevention and management.

Thanks for reading,



Brian J. Thomas, Editor

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