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REVIEW ARTICLE

Management of a fire in the operating room

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Abstract Operating room (OR) fires remain a significant source of liability for anesthesia providers and injury for patients, despite existing practice guidelines and other improvements in operating room safety. Factors contributing to OR fires are well understood and these occurrences are generally preventable. OR personnel must be familiar with the fire triad which consists of a fuel supply, an oxidizing agent, and an ignition source. Existing evidence shows that OR-related fires can result in significant patient complications and malpractice claims. Steps to reduce fires include taking appropriate safety measures before a patient is brought to the OR, taking proper preventive measures during surgery, and effectively managing fire and patient complications when they occur. Decreasing the incidence of fires should be a team effort involving the entire OR personnel, including surgeons, anesthesia providers, nurses, scrub technologists, and administrators. Communication and coordination among members of the OR team is essential to creating a culture of safety.

Keywords Operating room fire · Operating room safety · Fire triad · Operating room fire management

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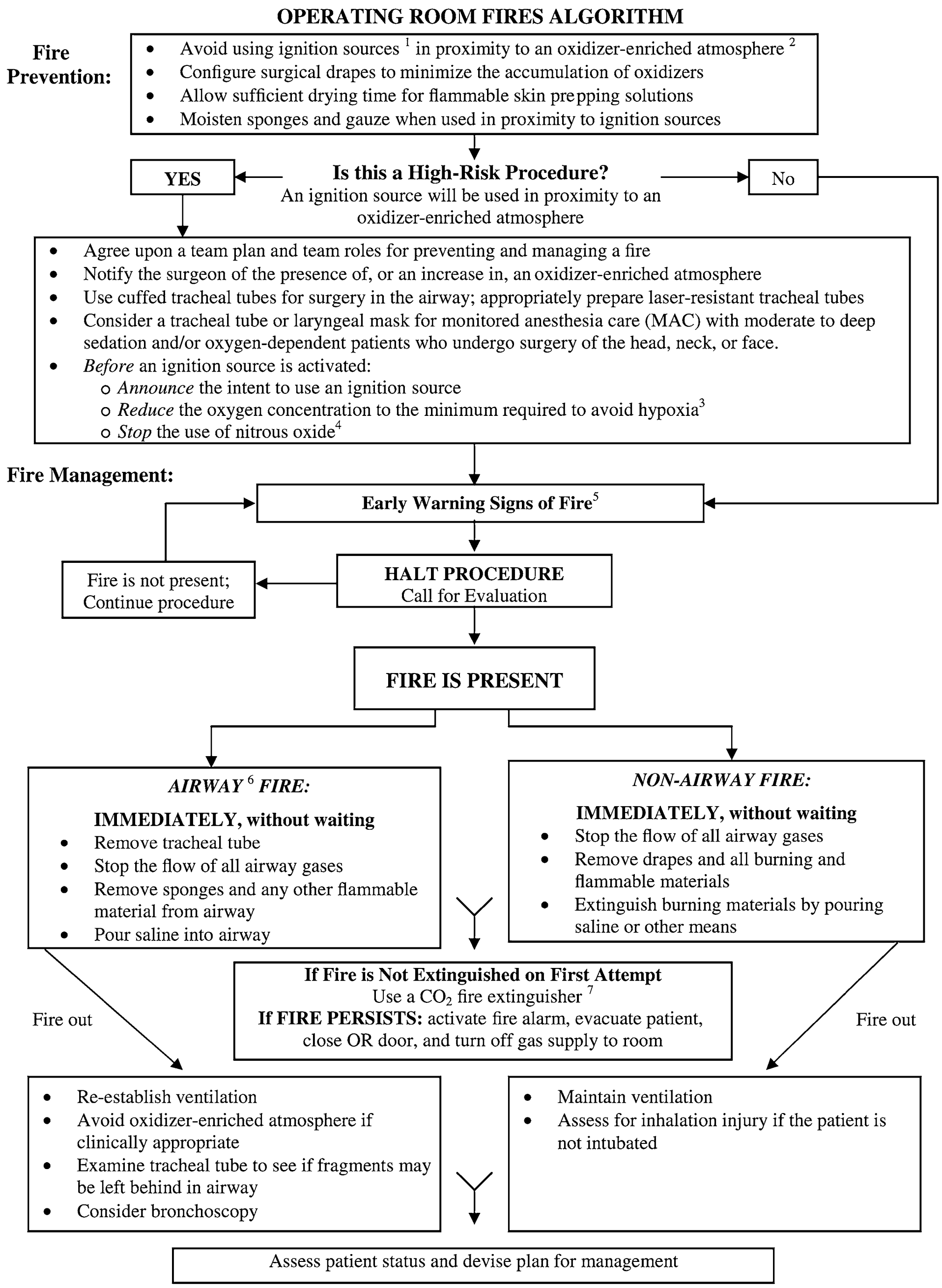
Introduction

Fires in the operating room (OR) are unexpected catastrophic events that can lead to any number of negative outcomes for the patient and surgical team. Although institutional regulations for fire prevention have evolved over the years in an attempt to reduce the frequency of fire outbreak, the incidence of fires in the OR has remained constant [1]. Understanding fire safety and prevention measures in the OR as well as proper protocol during the outbreak of a fire is necessary for all operating room staff. Based on newly available scientific literature, the American Society of Anesthesiology (ASA) this year has issued an updated Practice Advisory for the Prevention and Management of Operating Room Fires, including the updated operating room fires algorithm (Fig. 1) [2]. Additionally, the Anesthesia Patient Safety Foundation (APSF) has created an 18-min video on fires in the operating room, and has proposed a Fire Prevention Algorithm (Fig. 2) [3, 4]. Finally, The Association of Perioperative Registered Nurses (AORN) and the ECRI Institute have each recently come up with safety recommendations, emphasizing prevention and surgical team communication [5, 6].

Fires in the OR can be prevented. They should rarely, if ever, occur with fire safety and prevention training and proper surgical technique. Still, these potentially lethal events continue to occur. The entire OR team must partake in implementing safety programs for this issue.

The true incidence of surgical fires is difficult to quantify [1]. Currently, in the United States no federal decree mandates the reporting of surgical fires and no nationally maintained repository that catalogues the number of fire events exists. Furthermore, confidentiality statements in malpractice settlements further obfuscate the true number of fire events [7]. In the published literature, the range is as



[1] Ignition sources include but are not limited to electrosurgery or electrocautery units and lasers.

[2] An oxidizer-enriched atmosphere occurs when there is any increase in oxygen concentration above room air level, and/or the presence of any concentration of nitrous oxide.

[3] After minimizing delivered oxygen, wait a period of time (*e.g.,* 1-3 min) before using an ignition source. For oxygen dependent patients, *reduce* supplemental oxygen delivery to the minimum required to avoid hypoxia. Monitor oxygenation with pulse oximetry, and if feasible, inspired, exhaled, and/or delivered oxygen concentration.

[4] After stopping the delivery of nitrous oxide, wait a period of time (*e.g.,* 1-3 min) before using an ignition source.

[5] Unexpected flash, flame, smoke or heat, unusual sounds (*e.g.,* a "pop," snap or "foomp") or odors, unexpected movement of drapes, discoloration of drapes or breathing circuit, unexpected patient movement or complaint.

[6] In this algorithm, airway fire refers to a fire in the airway or breathing circuit.

[7] A CO_2 fire extinguisher may be used on the patient if necessary.

Fig. 1 Operating room fire algorithm. Reproduced with permission [4]

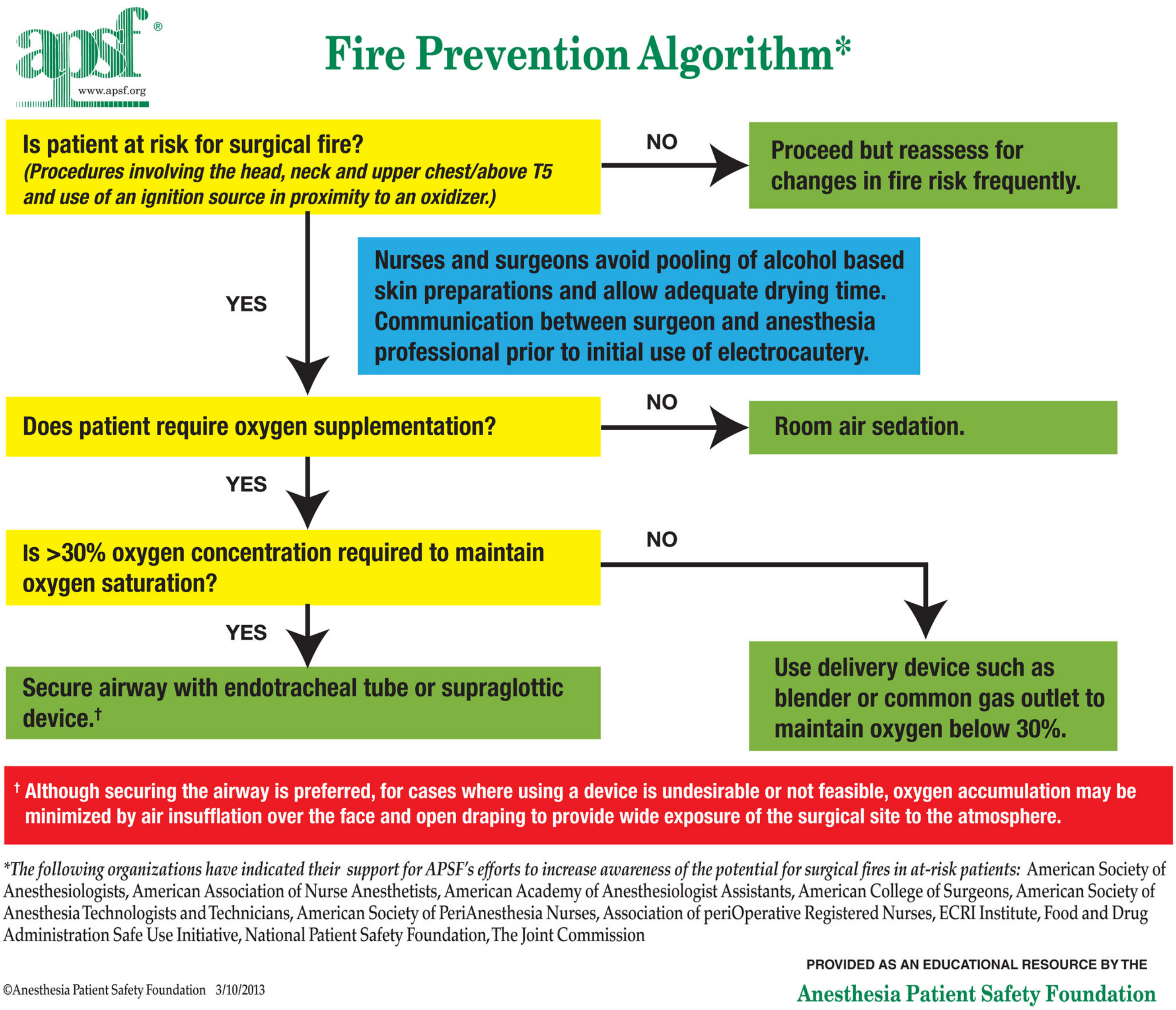


Fig. 2 The anesthesia patient safety foundation fire prevention algorithm. Reproduced with permission [4]

low as 100 and as high as 650 fires per year in the United States [6, 8]. Of these, 20–30 fires lead to injury with 1–2 leading to death [6]. Additionally, a 2006 study found that 17 % of the anesthesia malpractice claims resulted from disputes in which the patient suffered burns from a surgical fire [9]. Malpractice claims resulting from fires in the operating room are effectively indefensible from a medicolegal perspective due to their preventable nature [10]. Needless to say, a working knowledge of fire prevention, fire safety, and fire awareness is indispensable for all members of the OR team.

The fire triad

There are three specific elements that are required to start a fire: a fuel supply, an oxidizing agent, and an ignition source [11]. Jointly, they constitute the fire triad or the fire triangle. The fire triad is interdependent and removing any one component eliminates the potential of a fire outbreak altogether. An abundance of different materials in the OR may act as each leg of the fire triad. Thus, identification of potential elements of the triad is imperative to avoid the mixing of a combustible combination (Table 1).

All things flammable can be a potential fuel source in the OR, the most obvious fuel being the linens, prepping agents, and dressings [11]. Less apparent potential fuel sources are the patient's body tissues or contents within the body (e.g. methane gas in the GI tract), ointments, and medical equipment. In the past, combustible anesthetic gases (e.g. ether, cyclopropane) were ubiquitous and thus often functioned as a fuel supply. However, by halogenating alkanes in the late 1960s to early 1970s, anesthesiologists developed non-flammable, less toxic agents that

Table 1 List of commonly found fire triad items in the OR

Igniters	Electrocautery devices, lasers, heated probes, drills, burrs, argon beam coagulators, fiber optic light cables, defibrillator pads, overhead surgical lights, electrical equipment
Fuels	Tubes; sponges; drapes; gauze; alcohol-based prepping solutions; degreasers like ether and acetone; masks; patient's hair, skin, or tissue; dressings; ointments/tinctures; gowns; gastrointestinal tract gasses; bed linens; gloves; packaging materials; endotracheal tubes
Oxidizers	Oxygen, nitrous oxide

Compiled from ECRI [11]

quickly became the anesthetics of choice (e.g. halothane, isoflurane, sevoflurane, desflurane) [12, 13].

Ignition results from the production of a spark or a concentrated source of heat. Commonly used tools in the OR that can produce these are electrosurgical/electrocautery units (ECU), lasers, and light sources [11]. One study questioning active otolaryngologists concluded that 91 % of fires were started by either electrocautery units or lasers [14]. Along the same lines, a large retrospective review of surgical fires based on the ASA Closed Claims analysis noted that electrocautery-induced fires have been increasing in incidence between 2000 and 2009. [15] According to this study, OR fires presented over 4 % of all surgical anesthesia claims during this time period, with electrocautery-related fires during monitored anesthesia care being the most common source of claims. Claims related to fire were more likely to result in a payment compared to all other non-fire surgical cases. It is important to be aware that even once these tools are powered off, there may be enough heat built up in the device to lead to ignition.

Oxygen is the most common oxidizing agent in the OR. At sea level, inspired atmospheric air is composed of 21 % oxygen. In the OR, oxygen can be delivered directly to the patient at higher concentrations in oxygen-enriched mixtures, resulting in what is known as an oxygen enriched atmosphere (OEA) [11]. Although nitrous oxide itself is not considered an oxidizing agent, when heated, it can decompose into its constituent elements, increasing the ambient oxygen. Therefore, it is important to note that nitrous oxide can produce an OEA. As such, for the purposes of this review nitrous oxide will be treated similarly to oxygen. In an OEA, ignition happens more readily: fires burn hotter and are harder to extinguish [16]. Furthermore, things that normally do not burn in room air can combust easily in an OEA [16]. A study that evaluated the flammability of surgical drapes found that the time to ignition was inversely proportional to the ambient oxygen concentration [16]. Also, it was noted that the time to ignition of flammable drapes versus non-flammable surgical drapes in an OEA was negligible [16].

The division of labor and fire safety responsibilities

The different roles of the individuals that comprise the surgical team creates a division of labor. The division of labor leads to a natural division of fire safety responsibility, too. Accountability for each element of the fire triad rests with a separate member of the team: the anesthesiologist is largely responsible for oxidizer monitoring in and around the patient, the surgeon is generally responsible for surgical instrument control that may cause ignition, and nurses oversee combustible materials [11]. Cognizance of each team member's respective part of the fire triad is vital to prevent a combination which may result in combustion or explosion. In the event of a fire, it is important that the surgeons, nurses, and anesthetists present in the OR act in an organized and coordinated fashion, despite a division of responsibility, to extinguish the fire as soon and safely as and as possible.

Steps to fire safety: preparation, prevention, management

Preparation

The initial step to reducing negative outcomes from surgical fires is preparation. Preparation can be thought of as the safety measures taken before a patient is brought to the OR. This starts with routine checks of the availability and functional status of the fire safety equipment. The location of fire extinguishers, sterile saline, fire alarms, medical gas valves, self-inflating bag-valve masks and flashlights should be visibly marked and easily accessible [17]. Certain items that must be readily available for use in the OR include sterile saline, a fire extinguisher, replacement airway supplies (endotracheal tubes, breathing circuit tubing, etc.), drapes and sponges [18]. Walkways to the ORs should be free from obstacles that may either block access to the fire safety equipment and medical gas valves or impede evacuation routes of an OR altogether [17].

Some surgical procedures should be considered high risk as the steps of the surgery require employing all three components of the fire triad in close proximity which greatly increases the probability of combustion (Table 2) [2]. For this reason, the most common high risk procedures are oropharyngeal or facial surgeries. Approximately 21 % of the OR fires that do occur involve these sites [19]. Therefore, a preoperative discussion amongst the surgical team should help stratify the risk level of a fire event based on the surgery being performed as well as the materials to be used during the procedure [20]. The 'fire risk assessment score' is a simple tool that was developed to do just that [21]. It can be done in seconds during "time out". The

Table 2 High risk fire surgeries

Oropharyngeal surgeries: tonsillectomy, adenotonsillectomy
Facial surgery: removal of lesions on head, face, neck, cataract or other eye surgery
Endoscopic laser surgery: removal of laryngeal papillomas
Cutaneous/transcutaneous surgery
Tracheostomy
Burr hole surgery

Adapted from ASA Practice Advisory [2]

scale is from 0 (very low risk) to 3 (high risk), with 1 point allotted for each of the following: surgical site above the xiphoid, open oxygen source (e.g. face mask/nasal cannula), use of ignition source (e.g. cautery, laser). If a high risk situation is predicted (score 3), the team should develop a plan to minimize this risk by taking the proper high risk precautions.

All OR personnel (surgeons, anesthetists, surgical techs, nurses, students) should be trained in fire safety procedures. Proper training should include an explanation and understanding of the designated roles in the event that a fire occurs. (Table 3) Additionally, team members should learn appropriate rescue methods and evacuation practices which include turning off the medical gases, activating the fire alarm and initiating a 'Code Red'. It is essential that OR staff become familiar with the different classes of fire extinguishers and trained on how to use them. (Table 4) Carbon dioxide fire extinguishers are the recommended type of fire extinguisher for use in the OR due to the broad spectrum of coverage (approved for class B, class, C and partial class A coverage) [22]. Following training, a fire drill may be conducted to assess the OR team's proficiency. The drill can also help familiarize them with the exits, evacuation routes, location of the extinguishers, and shut off valves for medical gas and electrical supplies. One case report explains that an OR fire drill improved the team's response to a fire event [23]. These drills should be performed at regular intervals in accordance with local, state, and The Joint Commission (TJC) guidelines.

Intraoperative prevention

The second step is prevention. Prevention is the precautions that can be taken during the course of surgery. These precautions will help to reduce the risk of morbidity and mortality from fire. One of the most fundamental yet frequently overlooked factors is intraoperative communication amongst members of the OR team. It has been shown that a communication deficiency is associated with an increased risk of sentinel events and medical errors [24]. Further demonstrating this fact, problems in communication were concluded to be the root cause of more than 60 % of sentinel events reported to The Joint Commission [25]. The use of clear, directed communication facilitates the exchange of information amongst the OR team leading to a safer environment for patient care [24, 26]. For example, the anesthesiologist can request that he/she be notified a few minutes prior to when the surgery team will employ the use of a laser or ECU as oxygen should be turned off at least 1 min prior to ECU or laser use. This will allow sufficient time for the supplemental oxygen to dissipate thus reducing the likelihood of OEA during ECU or laser usage [8]. If any doubt as to the existence of an OEA exists, the suction can be used to help vacate the cavity of any residual oxygen. Conversely, the anesthesiologist should

Table 3 Preassigned tasks in the event of OR fire

Anesthesiologist
Turn off oxygen/nitrous oxide and maintain ventilation with mask respirator (i.e., ambu bag)
Communicate with the circulator to turn off the medical gas shutoff valves
Disconnect all electrical equipment on the anesthesia machine
Disconnect any leads, lines, or other equipment that may anchor the patient
Maintain the patient's anesthesia during transport
Surgeon
Remove from the patient materials that may be on fire
Control bleeding and prepare the patient for evacuation
Conclude the procedure as soon as possible
Place sterile towels or covers over the surgical site
Scrub nurse
Remove from the patient materials that may be on fire and help put out the fire
Obtain sterile towels or covers for the surgical site and instruments
Gather a minimal number of instruments onto a tray or basin and place them with the patient for transport
Assist with patient transfer from the OR table to a stretcher/bed for transport out of the OR
Circulating nurse
Ensure the patient's safety by remaining with him or her and comforting him or her
Activate the fire alarm system and call the fire code to alert all necessary personnel
Extinguish small fires or douse them with liquid if appropriate
Remove any burning material from the patient or sterile field, and extinguish it on the floor
Collaborate with the anesthesia on the need to turn off the medical gas shutoff valves
Carefully unplug all equipment if the fire is electrical
Be aware of the safest route for escape
Obtain a transport stretcher if necessary
Remove IV solutions from poles and place them with the patient for transporting out of the OR

Adapted from AORN Guidance Statement [5]

Table 4 Fire extinguishers

(a) National Fire Protection Association (NFPA) classes of fire extinguishers	
Class A	For use on wood, paper, cloth, and most plastics (e.g., combustible materials)
Class B	For use on flammable liquids or grease
Class C	For use on energized electrical equipment
(b) How to use a fire extinguisher—'PASS' mnemonic	
P	Pull the pin
A	Aim the nozzle at the base of the fire
S	Squeeze the handle
S	Sweep the stream back and forth across the base of the fire

inform the surgeon when an ignition source will be near an OEA [2].

Another element to consider is combustible prepping agents. Flammable, alcohol-based prep solutions should be avoided altogether if possible, as they have been implicated in fires both in laboratory studies and real clinical environments [27]. Surgeons should allow combustible (e.g. alcohol-based) skin prepping solutions sufficient time to dry and vapors to disperse before draping the patient [28]. In a study that attempted to simulate the OR setting that lead to a fire event, it was discovered that no combustion would occur after waiting 5 min for the alcohol based prep solution to dry [27]. Some suggest manually drying the prep site with a cotton swab and draping the edges overlaid with clear surgical tape to block vapor leakage into the surgical site [28]. If the patient is draped prior to drying, the drapes may soak up the solution or the vapors can pool in the surgical field. When either of these situations occurs, the addition of a heat source may easily lead to rapid ignition [29].

The method of surgical draping is another essential factor to consider. A study by Greco et al. [30] concluded that use of supplemental oxygen increases oxygen pooling under the surgical drapes or in body cavities which may result in a fire. Thus, they recommended arranging surgical drapes to minimize pooling oxygen when supplemental oxygen is required [30]. Suggested techniques for reduction of oxygen pooling while using supplemental oxygen during facial surgery include the "open face" draping technique, use of compressed air beneath drapes in unsedated patients, and stopping supplemental oxygen flow 60 s before the use of a potential ignition source [30]. Another technique to further reduce ambient oxygen levels is to suction in and around the mouth to decrease the ambient oxygen [1]. These methods can reduce the amount of oxygen and lower the possibility of unintentionally producing an OEA.

Several minor but pertinent recommendations to reduce fire outbreak during surgery exist. Suggestions include housing the ECU in the plastic holster and disconnecting or turning off light sources when not in use. Cautery tips should be kept clean to reduce heat buildup and sparking [12]. Sponges and gauze should be moistened with saline when used in close range to possible sources of ignition [2]. Coarse body hair or lanugo near the surgical site should be coated in water-based jelly to decrease the risk of ignition [31]. The use of potential igniters near fuel sources should be avoided while an OEA exists. For example, "cold cutting" (e.g. surgical scissors, scalpel) should be used to enter visceral lumens to avoid the ignition of naturally produced methane gas [32]. "Cold cutting" should also be used to enter the peritoneal cavity in patients undergoing emergent laparotomy when the presence of free gas or bowel perforation is suspected [33]. Additionally, one can achieve hemostasis on a leaking blood vessel with a stat or a vessel loop as opposed to an ECU.

As dictated by the division of labor, the anesthesiologist monitors the oxygen (±nitrous oxide) that is delivered to the patient. His/her primary responsibility is to titrate the inspired oxygen to the minimum acceptable oxygen saturation [22]. There are multiple ways to decrease the oxygen levels in the operating room. The anesthesiologist must choose which method is most appropriate based the surgical procedure that is being done. Because oxygen and nitrous oxide are both colorless and odorless, it is essential to convey their continued flow in the surgical field to the surgeons during the procedure. One study concluded that an OEA has been present in 75 % of the fires that have occurred [19]. This underscores the importance of the anesthesiologist's selected oxygen delivery method as he/she alone can significantly decrease the chance of a fire occurring.

From the beginning, the anesthesiologist should decide whether supplemental oxygen is needed or if the patient can be sedated safely on room air. In surgeries involving the head, face, neck or upper chest that require 100 % oxygen supplementation, the APSF and the ECRI now recommend that rather than delivering it openly via nasal cannula, it should be delivered directly to the patient's airway by intubation or laryngeal mask when possible [6]. In a study that compared the effect of open (e.g. nasal cannula) versus closed (e.g. nasopharyngeal tube system) delivery methods on ambient oxygen levels, it was found that the closed system significantly decreases ambient oxygen levels essentially to the level of room air [34].

The closed delivery method often utilizes endotracheal tubing (ETT) to deliver air directly to the lungs. However, this presents the issue of the tubing itself serving as the fuel source especially during oropharyngeal surgeries which often employ the use of ECU or lasers. One study noted that polyvinylchloride, red rubber, and silicone endotracheal tubes can be ignited at oxygen concentrations as low as 26 %, only slightly above the 21 % of atmospheric air [35]. In the past, this issue was bypassed by covering the tube with reflective tape rendering it safe to use with lasers. Now, modern endotracheal tubes are made to be "laser resistant" and such tubing should be used in oropharyngeal surgeries in which the lasers or cauteries will be in close proximity to the ETT [36]. Regardless of type of ETT used, it is recommended that during airway surgery that requires a laser, the FiO_2 should be less than 30 % when possible. Nitrous oxide should be avoided altogether [13]. Additionally, ETTs with cuffs should be used, particularly during oropharyngeal surgeries because the cuffs help limit oxygen leaks [37]. Filling the cuff with dyed saline can help to identify any accidental perforation of the tube sooner [38].

Not only is the method of oxygen delivery important, but the oxygen concentration (e.g. FiO_2) and flow rate at which it is delivered are important as well. The flow rate of the supplemental oxygen, such as that used with a nasal cannula, should be set to the lowest possible setting to reduce unnecessary overflow while still maintaining safe blood oxygenation saturation levels which should be closely monitored by pulse oximetry [39]. One study found that oxygen flow rates and FiO_2 are inversely related to time to ignition in the oropharyngeal surgical model [39]. Although a fire was easily started when using 100 % O_2, a longer exposure to an active electrocautery was required for ignition as the FiO_2 decreased [39]. Furthermore, neither ignition nor sustained flames could be achieved with a FiO_2 less than 50 % in these oropharyngeal surgical models [39]. According to ECRI Institute recommendations, flash fire hazard can be minimized with oxygen levels at 30 percent or below.

Management of fire

The existence of a fire is normally indicated by smoke, flashes, and/or flames. However, a fire may be preceded by other possible signs, for example unusual sounds, odors, heat, movement of the drapes or the breathing circuit, patient movements or complaints [2]. When a member of the OR staff notices any of these signs, he/she should warn the rest of the team, surgery should be stopped and it should be established if there is a fire or risk of a fire developing. If there is no fire, then the surgery can proceed as planned. However, if there is a fire, members of the team should stop surgery, announce its presence, and begin the preassigned fire management tasks (Table 3).

There are two types of fire in the OR: on/in the patient or in the room but away from the patient. This branch point will help direct the method of extinguishing the fire in the safest way possible. If the fire is not located on the patient, but rather on a piece of surgical equipment, that machine should be unplugged and removed from the OR so that it can be extinguished outside of the OR. However, if the machine is unable to be removed from the OR, a fire extinguisher should be used to put out the fire. One should activate the fire alarm and alert the OR front desk and emergency number for the hospital. If the smoke risk is too high or the fire is still not adequately controlled then consider evacuating the OR, shutting the door, and turning off the medical oxygen supply.

When the burning object is located on the patient, it should be removed and the flames should be extinguished away from the patient with water or saline [22]. If sterile saline is not available, an alternative technique is to hang moist surgical towels over the forearm and use them in a sweeping motion away from the patient's airway [18]. Simultaneously, oxygen flow to the patient should be stopped [40]. Note that the above actions should be done even if this contaminates the sterile field [40]. Just as the fire needs the three components of the fire triad to start, it needs the same three components to continue to burn. In other words, eliminating any one part of the triad should result in extinguishment of the fire.

It is important to be aware that many of the modern drapes are water resistant and actually repel water. Thus, in order to effectively extinguish the burning drapes, they should be submerged in water (e.g. sink, bucket) [41]. Additionally, fire blankets should not be used in the setting of OR fires on patients. The blanket can concentrate the heat from the fire to the patient while the fire continues to burn under the blanket unbeknownst to the OR staff if an oxygen source continues to supply it [6].

When the fire is inside the patient, saline or sterile water can be poured into the body cavity to extinguish the fire. If an airway fire with a burning ET tube occurs, most agree that extubating the patient is best to avoid thermal injury to the oropharynx, trachea and/or lungs [2]. The flow of all gases should be stopped, saline or sterile water should be poured into the airway, and any burning and/or flammable materials should be eliminated from the airway [2]. The patient should be mask ventilated with room air until he/she has been reassessed and cleared for reintubation [22]. Note the exception to the above rule is in the case of patients with difficult to intubate airways; consider leaving the ET tube in place to avoid losing access [42].

When the fire is unable to be extinguished with saline or water alone, consider using a carbon dioxide fire extinguisher (dual class BC rating) [22, 43, 44] (Table 4). If at this point the fire is too big and still cannot be safely controlled, the fire alarm should be activated, and the OR front desk should be informed. Shortly thereafter, the OR should be evacuated with the door closed and the gas supply to the room turned off [2]. If a room has to be evacuated, a wet towel should be placed at the base of the door and the door is not to be reopened by the OR staff. After the fire, the room should be left untouched so that the fire department in conjunction with a hospital safety official can conduct a thorough investigation into the etiology of the fire.

Once the patient is clear of imminent danger, he/she should be reevaluated by a member of the OR team. The patient should be assessed for smoke inhalation related injuries even when the fire does not involve the airway [2]. After a fire occurring in the airway, the patient should continue to be ventilated without the use of supplemental oxygen or nitrous oxide when safely possible. Furthermore, consider bronchoscopy to assess for thermal injury, retained ET tube pieces or other residual matter prior to proceeding to reintubation [2].

Teamwork and creating a culture of safety

Fires are just as much a danger today as they were in the days of flammable anesthetics such as ether. It could be argued that fires are an even greater danger today, as perioperative personnel are less vigilant due to the non-flammable nature of anesthetic agents currently used [22]. Furthermore, the routine use of modern surgical tools such as lasers and ECUs can serve as ignition sources whereas supplemental oxygen and nitrous oxide combined with omnipresent fuel sources creates the perfect contemporary recipe for combustion. The risk of fire exists when the components of the fire triad are in close proximity. Thus, precautions must be taken to avoid or at the very least minimize the potential for these sentinel events.

Since the risk of fire will always be present during a surgery that includes all three components of the fire triad, the goal for the OR team is to minimize this risk. This is accomplished by educating OR teams on fire safety preparation, prevention, and management. Despite the fact that there is an inherent risk of fire with any surgery, the reality is that most of them are easily preventable [45]. Several case reports suggest that lack of knowledge of fire safety has led to injury and even death from fires in the OR [46, 47].

As a team, each member of the OR personnel is responsible for encouraging a culture of fire safety [5]. The key to fire safety is preventing the amalgamation of an ignition source, fuel source, and oxidizer in time and space. However, the division of responsibility among the OR personnel leads to an inherent focus on a single part of the triad by the surgeon, nurse, or anesthetist as opposed to the triad as a whole [22]. This challenge underscores the need for team planning before the case and clear communication during the case [5]. To determine which staff members participate in the fire safety and prevention workshops, a study conducted in 2011 surveyed several hospitals [18]. While it was encouraging to note that many institutions are holding these seminars, which is an acknowledgement of the need for fire safety education, it was noted that these workshops were being conducted for the surgeons, surgical nurses, and anesthetists separately. As stated above, communication and coordination amongst the members of the OR team is fundamental to a safe, efficient response to a fire. Thus, when developing institutional policies to reduce the risk of fire outbreak, a multidisciplinary approach including all involved healthcare professionals should be used [48].

Conclusion

Operating room fire is a relatively rare, but still a persistent occurrence in clinical practice. As a result, the circumstances surrounding them are generally well understood and are preventable. Surgical fires have the potential for high morbidity and mortality. Due to the infrequent nature of occurrences, a centralized reporting system should be developed to catalogue the events. Furthermore, a standardized root cause analysis will help to elucidate the circumstances by which a sentinel event took place. Ultimately, this database could be used to educate healthcare providers and policy makers about how and why fires occur and could help prevent fires in the future through the development of nationalized guidelines [46]. Although fires in the OR are rare events, their incidence is not declining. In order to see a decrease in the frequency of fires, it is imperative that OR personnel become familiar with the fundamentals of fire safety, prevention and management, and follow fire safety recommendations promulgated by national organizations.

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