

Fire Safety for the Oral and Maxillofacial Surgeon and Surgical Staff



LisaMarie Di Pasquale, DDS, MD^a,
Elie M. Ferneini, DMD, MD, MHS, MBA^{a,b,c,*}

KEYWORDS

• Fire safety • Fire prevention • Fire management • Patient safety • Surgical fires

KEY POINTS

- Fire in the operating room is a life-threatening emergency that demands quick and efficient intervention.
- Because the circumstances surrounding fires are generally well-understood, virtually every operating room fire is preventable.
- Before every operating room case, thorough preprocedure “time outs” should address each team members’ awareness of specific fire risks and agreement regarding fire concerns and emergency actions.
- Fire prevention largely centers on recognition by all surgical team members of the 3 constituent parts of the fire triad necessary for fire formation.
- Regular fire drills should guide in developing policies and procedures to prevent surgical fires; delivering optimal patient care in emergent situations requires surgical team training, practicing emergency roles and specific actions.

INTRODUCTION

Fires in the operating room are unanticipated, devastating events that can lead to significant morbidity, even mortality, for the patient and medical personnel. The actual incidence of fires is difficult to quantify. Currently, in the United States there is no federal requirement for reporting a surgical fire and no centralized archive exists that classifies the total number of fires.^{1–5} Estimates state as few as 100 and as many as 650 operating room fires occur annually in the United States.^{3,6} Results from studies at the ECRI Institute and the US Food and Drug Administration estimate that operating room fires cause approximately 20 serious patient injuries to occur annually, with 1 to 2 deaths per year.^{3,7,8}

Despite scrupulous attention to patient safety, the incidence of operating room fires does not seem to be decreasing.⁷ In 2008, the Joint Commission on Accreditation of Healthcare Organizations (JCAHO) made reducing the incidence of surgical fires a targeted initiative. Noting the unique environment of the operating room and the extreme morbidity often caused by surgical fires, JCAHO declared the need for “response and prevention strategies to be specific to the setting.”⁵

As oral and maxillofacial surgeons, the topic of fire safety demands attention and preparedness. Approximately 78% of all fires occur during facial, neck, and tonsil surgery.⁹ In addition, understanding fire safety and prevention measures, as well as protocol and management of an actual fire, are

^a Division of Oral and Maxillofacial Surgery, Department of Craniofacial Sciences, University of Connecticut, 263 Farmington Avenue, Farmington, CT 06030, USA; ^b Private Practice, Greater Waterbury OMS, 435 Highland Avenue, Suite 100, Cheshire, CT 06410, USA; ^c Beau Visage Med Spa, 435 Highland Avenue, Suite 100, Cheshire, CT 06410, USA

* Corresponding author. Beau Visage Med Spa, 435 Highland Avenue, Suite 100, Cheshire, CT 06410, USA.
E-mail address: eferneini@yahoo.com

necessary for all operating room staff.⁷ The most prevailing matter with surgical fires is that they are nearly always preventable.³ All members of the surgical team must understand the root cause and the constituent parts in the outbreak of a fire to prevent the catastrophe. With proper fire safety and prevention training for all operating room personnel and with the use of proper surgical technique, fires simply should not occur.⁷

CAUSES OF FIRE

Fires can occur in any setting, provided these 3 elements are in close proximity under the right conditions: (1) heat or an ignition source, (2) fuel, and (3) an oxidizer.^{10,11} Patients are at greatest risk of fire injury when all 3 elements of the fire triad are in close vicinity.^{12,13} Unfortunately, the oxygen-rich atmosphere, flammable materials, and ignition sources are abundant in the operating room and routinely a part of the sterile field.^{3,12} Specific to oral and maxillofacial surgery, objects with potential for ignition are often in close proximity to multiple fuel sources in a confined environment with high levels of circulating oxidizing agents.⁶ The fire triad is interdependent; thus, eliminating any 1 element removes the potential of a fire outbreak altogether.⁷ Fire safety is everyone's responsibility and each component can be controlled to a certain degree by either the surgeon, the anesthesia provider, and/or nursing team members.¹²

IGNITION SOURCES

The most common ignition source cited in operating room fires is the electrosurgical unit, which is used in approximately 85% of surgeries; supplemental oxygen was also present in most cases.^{5,14} Lasers are another common ignition source, and even the extreme heat generated by the high-intensity (fiber-optic) light cords can serve as an ignition source.¹⁰ The electric surgical unit produces heat by concentrating electrical current at the tip of the electrode, which can reach several hundred degrees. If this occurs in an oxygen-rich environment or if a fuel source is present, a fire may result.^{1,5} Orofacial surgery creates just such an environment, and if these instruments are used, they may potentially ignite endotracheal tubes, possibly starting a fire in the airway itself.³ Other standard operating room equipment, such as light cables and boxes, drills, saws, burs, argon beam coagulators, and defibrillators may all serve as potential ignition sources.³

FUEL SOURCES

The modern-day operating room is full of available fuel sources (**Box 1**). The most obvious are linens,

prepping agents, dressings, and even personal protective equipment, which can easily burn.⁷ Only the water-based preparation solutions, such as betadine, contain no alcohol and can be considered nonflammable.⁵ However, most of the current preparation solutions contain some alcohol, and flammability is directly related to their alcohol concentration.^{5,7} Surgeons should allow alcohol-based skin preparation solutions sufficient time to dry before draping the patient.⁷ Although 2 to 3 minutes is recommended often, a total of 5 minutes should be allowed to pass to permit the alcohol content to evaporate.⁵ In addition, ointments, tinctures, and degreasers such as mastisol or benzoin can serve as another potentially combustible fuel source because they are made of high concentrations of alcohol.⁵

The patient's body itself can provide numerous fuel sources. Gastrointestinal gases (methane, hydrogen), desiccated tissue, and hair are a few elements that can support fire. In the past, combustible anesthetic gases were used widely and thus often functioned as a fuel supply.⁷

Surgical equipment burns readily, including tourniquet cuffs, tubing, wound drains, drapes, and packing materials. Even drapes that are labeled as 'nonflammable' can be a fuel source in an environment that promotes fire.⁵ One study that evaluated surgical drapes found the higher the oxygen concentration in the room, the faster the nonflammable drapes would ignite and burn. Interestingly, if the oxygen level was high enough, flammable and nonflammable drapes had nearly identical combustion times.¹⁵

Despite the obvious devastation of a surgical fire burn, another factor in injury is the toxic chemicals produced by the combustion of materials.⁷ Potentially hazardous fumes such as carbon monoxide, ammonia, and cyanide may result from the ignition of medical equipment. These toxic byproducts pose an additional harm to patients and staff.

OXIDIZER

Oxidizers are substances that lower the temperature at which a fuel will ignite, thus increasing the chance of a fire.¹⁰ The primary oxidizer in the operating room is oxygen itself.³ Nitrous oxide should not be disregarded as an oxidizer agent. When heated, nitrous oxide decomposes into its constituent elements, thereby increasing the ambient oxygen.^{7,10} Nitrous oxide can also support combustion by exothermal dissociation, thereby releasing heat and oxygen. In fact, fires involving oxygen and/or nitrous oxide mixtures can be as severe as those involving 100% oxygen. In the operating room, the ignition source is generally

Download English Version:

<https://daneshyari.com/en/article/5642421>

Download Persian Version:

<https://daneshyari.com/article/5642421>

[Daneshyari.com](https://daneshyari.com)