NCPS Nebraska Coalition for Patient Safety

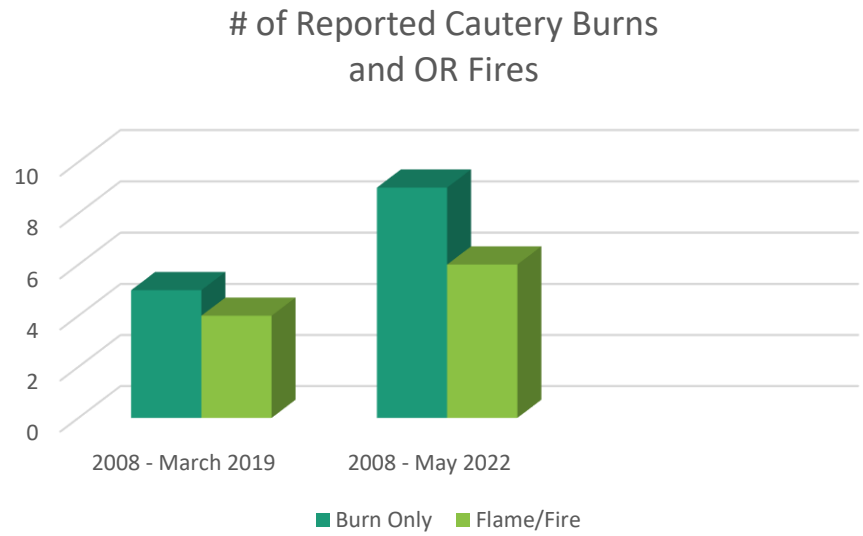
Patient Safety Alert

June 2022

Cautery Burns and OR Fires

Situation

Cautery Burns and OR Fires are rare events but can result in significant patient harm when they do occur. ECRI Institute's Vice President of Accident and Forensic Investigation, Mike Bruley, notes that virtually all surgical fires are preventable and their impact lessened through an understanding of fire and how to fight it.[1] Recently NCPS has had several such incidents reported and so a 2019 Patient Safety Alert on Cautery Burns and OR Fires has been revised to include additional NCPS data and updated resources for your consideration.

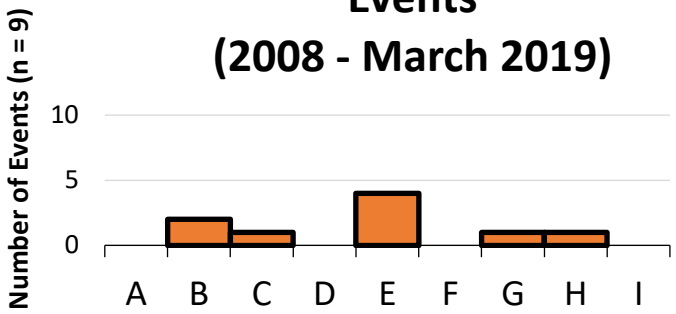


This Safety Alert is made possible through the committed efforts of NCPS organization members in reporting patient safety events. We encourage NCPS organization members to report patient safety events to NCPS. *We improve safety when we learn together!*

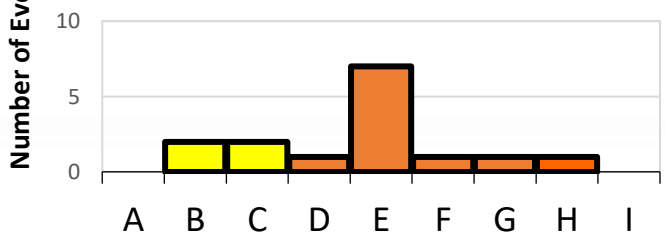
Cautery Burns and OR Fires

Situation

Severity for Cautery Related Events (2008 - March 2019)



Severity for Cautery Related Events (2008 - May 2022)



NCC MERP Index of Error Severity

A	Circumstances or events occur that have the capacity to cause error.
B	An error occurred, but the error did not reach the patient.
C	An error occurred that reached the patient, but did not cause patient harm.
D	An error occurred that reached the patient and required monitoring to confirm that it resulted in no harm to the patient, and/or required intervention to preclude harm. Harm does not reach patient.
E	An error occurred that may have contributed to or resulted in temporary harm to the patient and required intervention.
F	An error occurred that may have contributed to or resulted in temporary harm to the patient and required an initial or prolonged hospital stay.
G	An error occurred that may have contributed to or resulted in permanent patient harm.
H	An error occurred that required intervention necessary to sustain life.
I	An error occurred that may have contributed to or resulted in patient death.

An increase in the severity levels of cautery related events (D, E, and F) has been noted when the data from March 2019 to May 2022 is included in the aggregate.

Cautery Burns and OR Fires

Background

- There are nearly 100 OR fires annually in the United States, most are caused by electrocautery devices.[2,3]
- It is estimated that up to 20 serious injuries and one or two patient deaths are the result of those 100 fires.[4]
- Three items are required for a fire to start: ignition source, fuel, and an oxidizer.[5]
- An ECRI analysis of case reports found[1]:

  Most common ignition source – Electrosurgical equipment (68%)
  Lasers (13%)

  Most common fire location – Airway (34%)
  Head or face (28%)
  Elsewhere inside or outside the patient (38%)

  An oxygen-enriched environment was a contributing factor - 74% of all cases

Cautery Burns and OR Fires

Assessment

Review of NCPS data found the following proximal causes:

- **Environment**
  - Workflow disruption
  - Other: end of case
- **Equipment**
  - Equipment failure/malfunction
  - Equipment improperly operated
  - Other: Improper storage when not in use, not using appropriately, use of preventative insulated tip
- **Human Performance**
  - Knowledge deficit/training insufficient
  - Performance (human) deficit
  - Loss of situational awareness
- **Management System**
  - Monitoring inadequate/lacking
  - Procedure/Protocol not followed
  - System safeguards inadequate
  - Other: equipment not inspected prior to use
- **Supplies**
  - Label (manufacturer's) design
  - Liquid Adhesives
- **Other**
  - Silo culture/Barriers to team communication
  - Variation in surgeon practice

Cautery Burns and OR Fires

Assessment

Review of NCPS data found the following specific causal factors:

- **Environment/Equipment**
  - Inspection/maintenance of cautery machine lacking/inconsistent
  - Extended length cautery pencils do not fit in the regular cautery holsters
  - Signage/labeling of supply containers (flammability) unclear
  - Storage of adhesives – lack of control
- **Human Factors/Training**
  - Awareness among staff about flammability of liquid adhesives lacking
  - Awareness of fire procedures and location of alarm pulls lacking
  - Surgical tech orientation/experience
  - Lack of orientation for new providers
- **Rules/Policies/Procedures**
  - Skin prep policy not updated/not followed
  - Fire and safety precautions in perioperative services policy not updated/not followed
  - Accessibility to liquid adhesives not consistent/controlled
  - Cautery safety – placement of device/heat source when not in use, timing of use in relation to use of adhesives/flammable liquids, use of insulated tips

Cautery Burns and OR Fires	

Assessment	Additional specific causal factors found:
	• **Human Factors/Communication**
	  • Communication about use of adhesives lacking
	  • Did not escalate concern/advocate for patient safety
	  • Language barrier
	• **Organizational**
	  • Lack of clear ownership for cautery equipment location/safety
	  • Adhesives not perceived as flammable materials
	  • Perception of inability to approach physician to raise safety concern

Cautery Burns and OR Fires

Recommendation

❑ **Consider utilizing AORN's Fires Prevention Assessment Protocol in your organization.**

See AORN Guidelines - Clinical Resources - Fire Safety Tool Kit - Association of periOperative Registered Nurses[5] ***Fire Prevention Assessment Protocol***

❑ **Review ECRI Best Practices for Fire Prevention Which Include**[4]**:**

1. Empowering staff to question the need for 100 percent O2 for open delivery during facial surgery and as a general policy, use air or FIO2 at <30 percent for open delivery (consistent with patient needs).
2. Not draping the patient until all flammable preps have fully dried.
3. During oropharyngeal surgery: Soak a gauze or sponges used with uncuffed tracheal tubes to minimize leakage of O2 into the oropharynx, and keep them wet; and moisten sponges, gauze and pledgets (and their strings) so that they will resist igniting.
4. When performing electrosurgery, electrocautery, or laser surgery: Place electrosurgical electrodes in a holster or another location off the patient when not in active use; and place lasers in STANDBY when not in active use.

❑ **Review Joint Commission Recommendations for OR Fire Prevention**

1. Informing staff members, including surgeons and anesthesiologists, about the importance of controlling heat sources by following laser and ESU safety practices.
2. Developing, implementing, and testing procedures to ensure appropriate response by all members of the surgical team to fires in all areas where invasive procedures are performed.
3. Reporting any instances of surgical fires as a means of raising awareness and helping to prevent potential future fires.

See Joint Commission Sentinel Event Alert 29[1]

Cautery Burns and OR Fires

Recommendation

❑ **Consider Adding the Following Items to Your Organization's Fire Risk Assessment Conducted During the Surgical Timeout:**

1. Identifying the location and proper use of fire extinguishers nearest the operating room (OR).
2. Identifying the location of the nearest fire alarm switch.
3. Identifying where the OR gas supply system cutoff valves are located and how they are used.
4. Identifying the location of the OR's main electrical circuit breakers.

See Improving Preoperative Timeouts for Better Surgical Fire Readiness[8]

❑ **Periodically Review and Revise Surgical Timeout Checklist**

1. Involve OR staff since they are aware of actual practice and know what is no longer being done and what has been added since the previous revision; verify this "drift" is within best practices.

See Improving Preoperative Timeouts for Better Surgical Fire Readiness[8]

❑ **Routinely Perform Mock Code Red Fire Drills in All Areas Where Procedures/Surgery is Performed**

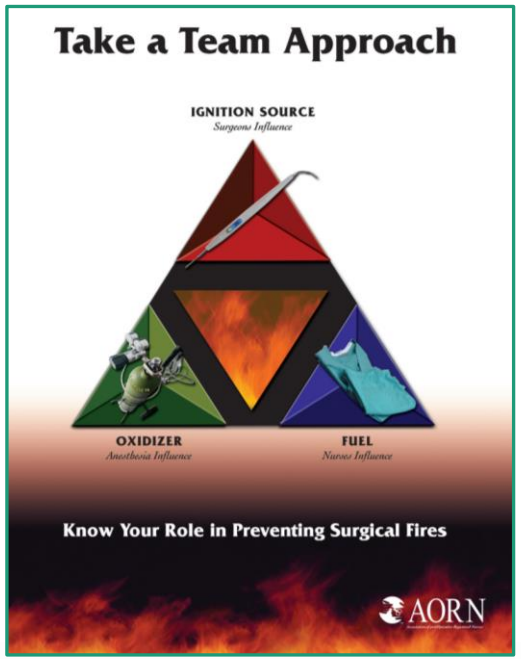
1. Develop a checklist/worksheet to verify all needed steps are taken for the type of fire being simulated.
2. Ensure staff know their roles for fires of the various types of fires that may occur.

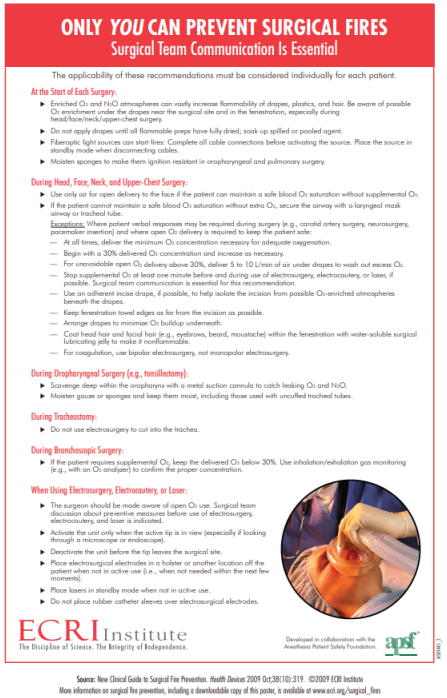
See AORN Guidelines - Clinical Resources - Fire Safety Tool Kit - Association of periOperative Registered Nurses[5]
OR Fire Drill Worksheets and Duties of Perioperative Team Members During a Fire

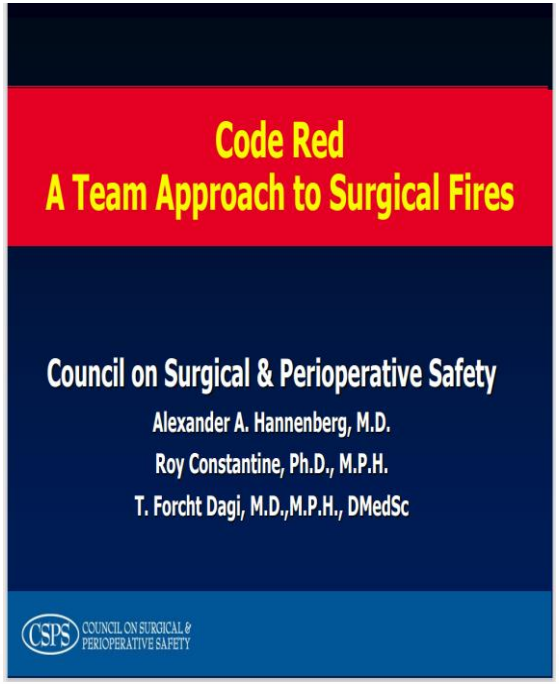
Cautery Burns and OR Fires

Recommendation

- ❑ Utilize available resources to emphasize and ensure the needed team approach to preventing cautery related incidents including surgical fires.[5,6,7]







	Cautery Burns and OR Fires	Yes	No	What action is needed?
Self Assessment	Does your organization have a reliable process for evaluating products for flammability? Does the process include assessing the need for each flammable product that is used, where it is used, and if safer alternatives are available?			
	Are all topical anesthetics, skin preps, and dressings used in surgical procedures (in or out of the OR) evaluated for flammability and safe use?			
	Are safety data sheets (SDS) for new products/solutions available and *easily accessible* to staff?			
	Is responsibility assigned for reviewing new products and ensuring warning labels, directions and safety information are clear and *easily accessible*?			
	Does your organization have a policy for the use of cautery or other ignition sources *after* application of solutions or dressings that may be flammable?			
	Do you monitor compliance with safe processes, such as sequencing and drying times? Is accountability for monitoring compliance assigned?			
	Does your organization have a process to assess staff/surgeon/medical residents' knowledge of how to prevent cautery burns and OR fires? Is the process the same for "traveling" staff?			

	Cautery Burns and OR Fires	Yes	No	What action is needed?
Self-Assessment	Does your facility perform a fire risk assessment prior to each surgery as part of the pre-op protocol? Does it include: • a review of products to be used in the procedure and their potential for flammability or a fuel source for a fire? • identifying the location and proper use of fire extinguishers nearest the operating room (OR)? • identifying the location of the nearest fire alarm switch? • identifying where the OR gas supply system cutoff valves are located and how they are used? • identifying the location of the OR's main electrical circuit breakers? *See AORN Fire Prevention Assessment Protocol[5] and Improving preoperative timeouts for better surgical fire readiness[8]*			
	Does you organization have a written Code Red policy? Does it address specific job role responsibilities during a fire? Does it require a post code evaluation or debrief? Are identified gaps corrected in a timely manner? Is the information shared with the appropriate hospital departments and/or committees? *See AORN Duties of Perioperative Team Members Managing a Fire[5]*			
	Does your organization routinely perform Mock Code Red Fire Drills? (*For Joint Commission Accredited organizations this is a requirement. See Standard EC.02.03.05. For others, verify what is required by Nebraska State Fire Marshall and DHHS).* Are identified gaps in staff performance, equipment, and/or processes corrected in a timely manner? *See AORN OR Fire Drill Worksheets[5]*			

References

1. The Joint Commission. Sentinel Event Alert; Issue 29, June 24, 2002

2. Jones, T., Black, I., Robinson, T., Edward L.(2019). Operating Room Fires. *Anesthesiology.* 130: 492-501. https://pubs.asahq.org/anesthesiology/article/130/3/492/19230/Operating-Room-Fires

3. Hempel, S., Maggard-Gibbons, M., Nguyen, D., et al. Wrong-site surgery, retained surgical items, and surgical fires; a systematic review of surgical never events. *JAMA Surg.* 2015;150(8):796-805. doi:10.1001/jamasurg.2015.0301

4. ECRI. A clinician's guide to surgical fires: how they occur, how to prevent them, how to put them out [guidance article]. Health Devices 2003; 32(1):5-24.

5. AORN. Fire Safety Resources.0cd197aea84455d6908/t/5bc7710e104c7b96e82b9e9f Available at https://aorn.org/guidelines/clinical-resources/tool-kits/non-member-tool-kits/fire-safety-tool-kit-nonmembers

6. ECRI. New clinical guide to surgical fire prevention. *Health Devices.* 2009 Oct;38(10):319. Only you can prevent surgical fires, surgical team communication is essential poster. Available at https://d84vr99712pyz.cloudfront.net/p/pdf/solutions/afig/surgical-fire-poster.pdf

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7. Council on Surgical & Perioperative Safety. Code red a team approach to surgical fires. Available at https://static1.squarespace.com/static/579770cd197aea84455d6908/t/5bc7710e104c7b96e82b9e9f/1539797284864/CSPS_Code+Red+A+Team+Approach+to+Surgical+Fires.pdf

8. Livingston, E. Improving preoperative timeouts for better surgical fire readiness. *JAMA Surgery*. April 2022; Vol. 157, Number 4

Other Resources

Apfelbaum, J., Caplan, R., Barker, S., et al; American Society of Anesthesiologist Task Force on Operating Room Fires. Practice advisory for the prevention and management of operating room fires: an updated report by the American Society of Anesthesiologists Task Force on Operating Room Fires. *Anesthesiology.* 2013;118(2):271-290.