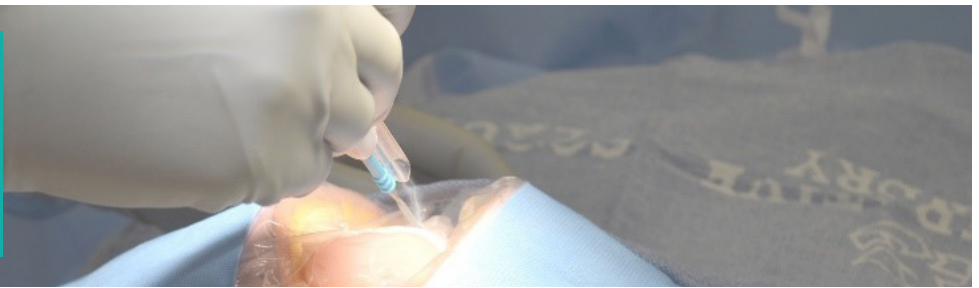


GUIDELINE ESSENTIALS

KEY TAKEAWAYS

Surgical Smoke



TAKEAWAY

The health care organization should provide a surgical smoke-free work environment.

EXPLANATION

- Under the General Duty Clause, Section 5(a)(1) of the Occupational Safety and Health Act of 1970, employers are required to provide their employees with a place of employment that is “free from recognizable hazards that are causing or likely to cause death or serious harm to employees.” **1.1.**
- **NEW** Controlling exposures to hazards and toxic substances is the fundamental method of protecting workers. The hierarchy of controls can be used as a systematic approach to identify the most effective method of risk reduction:
 - eliminating the hazard (eg, avoiding use of smoke-generating surgical devices),
 - substituting the hazard (eg, using alternative devices),
 - using engineering controls (eg, surgical smoke evacuation and filtration, room ventilation of 20 total air exchanges per hour, work practices),
 - using administrative controls (eg, policies and procedures, education and training), and
 - wearing personal protective equipment (PPE) (ie, respiratory protection). **1.3.**
- **NEW** When surgical smoke is anticipated, all members of the surgical team should understand the plan for surgical smoke management and have the opportunity to provide input into the smoke safety plan. **1.4.**
- **NEW** Using a smoke evacuation decision tool can assist with initial assessment and intraoperative reassessment of surgical smoke evacuation and filtration needs based on the type of procedure and anticipated amount of surgical smoke. **1.5.1.**

An interdisciplinary team that includes one or more perioperative RNs, surgeons, anesthesia professionals, and scrub personnel should select surgical smoke safety equipment to be used in the perioperative setting.

- Additional team members may include an infection preventionist, engineers (eg, biomedical; heating, ventilation, and air conditioning systems), and a materials manager. **1.6.**
- **NEW** In collaboration with the perioperative team, the surgical specialty physicians (eg, generalist, otorhinolaryngologist, plastic surgeon, urologist) should evaluate alternative surgical energy devices or techniques that generate less surgical smoke. **1.6.1.**
- **NEW** The perioperative team should evaluate medical devices that are intended to clear the visual field (eg, a surgical smoke precipitator) before purchase and use. **1.6.4.**

TAKEAWAY

Evacuate and filter all surgical smoke.

EXPLANATION

- Surgical smoke concentration of fine particles accumulates to unhealthy levels within the first few seconds after surgical smoke production starts, and individuals closest to the site of surgical smoke generation are at the highest risk of exposure. However, exposure to surgical smoke has been demonstrated for all members of the surgical team. **2.4.3.**
- **NEW** Use a smoke evacuator system that contains an ultra-low particulate air (ULPA) filter with an activated carbon filter when surgical smoke is anticipated. **2.2.1.**
- **NEW** When using a medical-surgical vacuum system, place an in-line ULPA filter with an activated carbon filter between the suction wall connection and the suction cannister. **2.2.2.**
 - An ULPA filter demonstrates an efficiency of no less than 99.999% at a most penetrating particle size (MPPS) (eg, 0.12 µm).
 - An activated carbon filter adsorbs odors and gases (eg, volatile organic compounds) in surgical smoke.
- Position the smoke capture device (eg, wand, tubing) of a smoke evacuation system as close to the surgical site as necessary to maximize surgical smoke capture. Capture performance is affected by the smoke evacuator flow rate, distance of the evacuator nozzle to the surgical site, tubing size, and amount of smoke generated. **2.4.**
- If there is a detectable odor when a smoke evacuation system is in use, evaluate the system to verify that
 - smoke is being captured at the site where it is being generated,
 - there is efficient air movement through the suction device,
 - an activated charcoal filter is present, and
 - the filter is within its useful life. **2.4.1.**
- If intraoperative smoke evacuation is ineffective or equipment is malfunctioning, adjustments may include
 - repositioning the smoke evacuation accessory,
 - changing the type of smoke evacuation accessory,
 - switching from wall-suction with an in-line ULPA filter to a smoke evacuator device,
 - adding an activated charcoal filter,
 - replacing the filter, or
 - adding a smoke evacuator device. **2.4.2**

TAKEAWAY

EXPLANATION

Use a surgical smoke management system during minimally invasive procedures.

- In addition to possible perioperative staff risk of exposure to surgical smoke, the risks of surgical smoke exposure to the patient during minimally invasive procedures may include
 - reduced visibility of the surgical site during the procedure,
 - potential delays during the procedure,
 - absorption and excretion of smoke by-products (eg, carbon monoxide, benzene, carboxyhemoglobinemia), and
 - possible port site metastasis. **2.5.**
- **NEW** Minimally invasive surgical smoke evacuation equipment may include trocars, tubing, or accessories with ULPA and activated carbon filtration. **2.5.1.**
- **NEW** Do not release unfiltered surgical smoke into the OR during minimally invasive procedures. **2.5.2.**
- **NEW** Before removal of trocars, the insufflation gas may be filtered using a mechanical exsufflation or a passive filtration method to prevent possible perioperative team member exposure to surgical smoke contaminants. **2.5.3.**

Wear PPE (ie, respiratory protection) as secondary protection against residual surgical smoke.

- Personal protective equipment used for respiratory protection should not be considered a replacement for effective surgical smoke evacuation and filtration. **3.1.**
- **NEW** Wear respiratory protection (eg, a surgical N95 filtering facepiece respirator) in conjunction with smoke evacuation and filtration when participating in procedures in which smoke-generating surgical devices are used on tissue containing human papillomavirus (HPV). **3.3**
 - HPV lesions treated with lasers or electrosurgery may have the potential to transmit HPV during exposure.
 - Observational studies have identified the presence of HPV DNA in surgical smoke from cervical loop electrosurgical excision procedures.
 - Possible cases of HPV transmission through surgical smoke have been reported, resulting in laryngeal and oropharyngeal squamous cell carcinoma.
- **NEW** For open smoke-generating procedures involving the liver, respiratory protection (eg, a surgical N95 filtering facepiece respirator) may be worn in conjunction with smoke evacuation and filtration. **3.4.**
 - Concentrations of fine and ultrafine particulate matter in surgical smoke from liver tissue are high compared to other tissue.
- **NEW** Notify OR team members that respiratory protection is being used as secondary protection from surgical smoke during an operative or other invasive procedure (eg, post signs at OR entrance). **3.5.**
 - Surgical smoke has the potential to reach all areas of the OR.

TAKEAWAY

EXPLANATION

Provide initial and ongoing education to and verify competency of perioperative team members for surgical smoke safety.

- Initial and ongoing education of perioperative team members facilitates the development of knowledge, skills, and attitudes that affect safe patient care and workplace safety. The health care organization is responsible for providing initial and ongoing education and verifying the competency of its personnel; however, the primary responsibility for maintaining ongoing competency remains with the individual. **4.1.**
- Providing education and completing competency verification activities before new smoke management systems and accessories are introduced helps ensure safe practice and adherence to surgical smoke management practices. **4.3.**

Develop policies and procedures for surgical smoke safety, review them periodically, revise them as necessary, and make them readily available in the practice setting in which they are used.

- Policies and procedures regarding surgical smoke safety provide guidance to perioperative team members for creating an environment that reduces the exposure of patients and the perioperative team to surgical smoke. **5.1.**
- Include procedures for reporting instances of health problems associated with surgical smoke exposure (eg, reporting to the occupational health department) in the policy. **5.3.**
 - The potential hazards of surgical smoke exposure to the perioperative team are respiratory, biologic (eg, blood, virus, bacteria), carcinogenic, chemical, cytotoxic, and mutagenic. Repeated exposure to the contents of surgical smoke increases the possibility of developing adverse effects.
- **NEW** Include procedures for reporting injuries or failures with smoke evacuator devices that potentially affect patient or staff safety. **5.4.**

Participate in quality assurance and performance improvement activities that are consistent with the health care organization's plan to improve understanding and compliance with the principles and processes of surgical smoke evacuation.

- Quality assurance and performance improvement programs assist in evaluating and improving the quality of patient care and workplace safety and in formulating plans for corrective action. **6.1.**
- Include assessment of compliance with surgical smoke evacuation in the quality assurance and performance improvement program for surgical smoke safety. Compliance indicators include
 - evacuating surgical smoke with a smoke evacuation system, a laparoscopic filter, or suction with an in-line filter during all smoke-generating procedures;
 - positioning the smoke evacuation capture device as close as possible to the generation of surgical smoke to effectively collect all traces of the smoke;
 - using smoke evacuation filters according to the manufacturer's instructions for use (eg, single use, all day);
 - wearing PPE (eg, gloves) when disposing of contaminated filters and smoke supplies; and
 - adhering to policies and procedures for smoke evacuation. **6.2.**

TAKEAWAY

EXPLANATION

- Identify barriers to implementing surgical smoke evacuation and filtration in the perioperative setting and address them through interventions to improve smoke safety practices. Barriers to implementing smoke evacuation can include
 - unreliable or inefficient smoke evacuator equipment,
 - unavailability of smoke evacuator equipment or supplies,
 - lack of support to evacuate surgical smoke,
 - noisy smoke evacuator equipment,
 - equipment that is difficult to use (eg, bulky, uncomfortable, inconvenient),
 - cost of smoke evacuator equipment,
 - knowledge gaps, and
 - competency deficits (eg, equipment use). **6.3.**
- Identify barriers to wearing recommended PPE (ie, respiratory protection) in the perioperative setting when indicated as secondary protection against residual surgical smoke and address them through interventions to improve compliance. **6.4.**