Reducing the Danger of Surgical Smoke Exposure to Health Care Workers

Education Is Key in Encouraging Organizations to Adopt Safety Guidelines

Although more and more states are adopting smoking restrictions in workplaces, restaurants, and bars to protect people from the dangers of second-hand cigarette smoke, health care workers continue to be exposed to similar dangers every day in the form of surgical smoke.

During surgical procedures that use a laser or electrosurgical unit, the thermal destruction of tissue creates a smoke byproduct. According to the National Institute for Occupational Safety and Health (NIOSH)—the federal agency responsible for conducting research and making recommendations for preventing work-related illness and injuries—research studies have confirmed that this smoke plume can contain toxic gases and vapors such as benzene, hydrogen cyanide, and formaldehyde; bioaerosols; dead and live cellular material (including blood fragments); and viruses. At high concentrations, the smoke causes ocular and upper respiratory tract irritation in health care personnel, and it creates visual problems for the surgeon. Although there has been no documented transmission of infectious disease through surgical smoke, the potential may exist for generating infectious viral fragments, particularly following treatment of venereal warts. The issue of surgical smoke is of equal concern in hospital inpatient operating rooms, hospital outpatient departments, and freestanding ambulatory surgery centers. The Occupational Safety and Health Administration (OSHA) estimates that 500,000 workers are exposed to laser and electrosurgery smoke each year.

NIOSH, the Association of periOperative Registered Nurses (AORN), and the American National Standards Institute (ANSI) support the use of smoke evacuation systems. In fact, ANSI standard Z136.3-2005 establishes guidelines for developing and managing a laser safety program, which includes methods to control airborne waste contaminants to patients and staff. Safety recommendations developed by NIOSH are outlined in the sidebar on page 5.

"There is no such thing as safe smoke."

—Vangie Dennis, R.N., C.N.O.R., C.M.L.S.O., advanced technology manager, Surgical Services Support, Gwinnett Medical Center, Atlanta

Still, broad adoption of the NIOSH recommendations has yet to take hold. "There is always resistance to change, especially when personnel have concerns that a change may interfere with a surgical procedure," explains one industry expert. "We continue to see organizations that view surgical smoke as a necessary evil. But when there are established safety guidelines that can mitigate this risk without interference, we have an obligation to protect health care workers from potential harm."

An Educational Approach That Spreads Awareness

OSHA can cite hospitals for not making an effort to control smoke emission in laser or electrosurgical procedures through a clause that covers all hazardous conditions. In Section 5(a)(1) of the Occupational Safety and Health Act, OSHA's General Duty Clause (GDC) states:

> Each employer shall furnish to each of his [sic] employees employment and a place of employment which are free from recognized hazards that are causing or are likely to cause death or serious physical harm to his [sic] employees.

OSHA's limited ability to enforce elimination of unsafe practices involving such surgical procedures has led many to stress the need for a more concentrated campaign. "In many ways, this is an education issue rather than an enforcement issue," says Vangie Dennis, R.N., C.N.O.R., C.M.L.S.O., advanced technology manager, Surgical Services Support, at Gwinnett Medical Center near Atlanta. "There are still

operating room personnel who are unaware of the issue, who do not realize that they are breathing human body parts. There are surgeons using smoke evacuators for laser procedures but not electrosurgery, which is actually more dangerous because this procedure emits more particulates."

The Joint Commission, through routine site visits conducted by its surveyors, consistently assesses the safety practices of health care organizations. That includes examining practices in the operating and special procedure rooms. "Not only do our surveyors look at how clinical risk—such as wrong-site surgery—is being minimized in these settings, they also look to see how physical risk is being managed," says John Fishbeck, R.A., associate director, Division of Standards and Survey Methods at The Joint Commission. "For example, our surveyors look to see what the organization is doing to reduce the risk of surgical fires, a National Patient Safety Goal for 2007; the hazards associated with surgical smoke would be another area they might explore."

An organization's response to surgical smoke is addressed in Joint Commission Standard EC.3.10—"The organization manages its hazardous materials and waste risks." This standard requires health care organizations to identify materials and waste products that need special handling because of the risk they may pose to patients and staff and implement procedures to minimize these risks. These materials and wastes include chemicals, infectious waste, radioactive waste, hazardous energy sources (for example, ionizing or non-ionizing radiation, lasers, microwaves, and ultrasound), and hazardous vapors (such as glutaraldehyde, ethylene oxide, nitrous oxide, and surgical smoke).

The Joint Commission's efforts to encourage a blame-free culture in health care also ties into the educational push for surgical smoke safety, according to Fishbeck. "It's important that personnel feel comfortable to speak out about their exposure concerns," he says. "The danger is very real, yet there is a culture in many organizations that still subtly discourages discussion of changes that involve cost issues. We always have to prioritize safety over cost."

Kay Ball, R.N., M.S.A., C.N.O.R., F.A.A.N., perioperative consultant and past president of AORN, is insistent that cost concerns can be overcome and that eliminating all surgical smoke should be the goal of every surgical team member. "Surgical crews in an ambulatory setting, for example, are less apt to have access to smoke evacuators due to cost constraints," says Ball. She is currently at work on a doctoral dissertation and research on how

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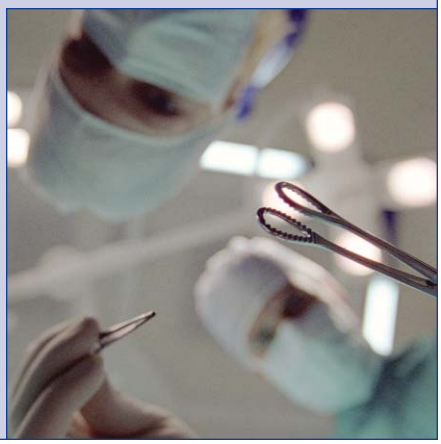
Sidebar. NIOSH Research on Surgical Smoke

NIOSH research has shown that airborne contaminants generated by surgical devices can be effectively controlled. Recommended ventilation techniques include a combination of general room ventilation and local exhaust ventilation (LEV). General room ventilation is not by itself sufficient to capture contaminants generated at the source. The two major LEV approaches used to reduce surgical smoke levels for health care personnel are portable smoke evacuators and room suction systems.

A smoke evacuator contains a suction unit (vacuum pump), a filter, a hose, and an inlet nozzle. A smoke evacuator should have high efficiency in airborne particle reduction and should be used in accordance with the manufacturer's recommendations to achieve maximum efficiency. A capture velocity of about 100 to 150 feet per minute at the inlet nozzle is generally recommended. It is also important to choose a filter that is effective in collecting the contaminants. A high-efficiency particulate air (HEPA) filter or equivalent is recommended for trapping particulates. Various filtering and cleaning processes can also remove or inactivate airborne gases and vapors.

Compared to smoke evacuators, room suction systems can pull at a much lower rate; they were designed primarily to capture liquids rather than particulates or gases. If these systems are used to capture generated smoke, users must install appropriate filters in the line, ensure that the line is cleared, and ensure that filters are disposed of properly. Generally speaking, the use of smoke evacuators is more effective than the use of room suction systems to control the generated smoke from non-endoscopic laser/electric surgical procedures.

There are many commercially available smoke evacuator systems; all of these LEV systems must be regularly inspected and maintained to prevent possible leaks. Users should also utilize control measures such as "universal precautions," as required by the OSHA Bloodborne Pathogen standard, which limits occupational exposure to blood and other potentially infectious materials because any exposure could result in transmission of bloodborne pathogens, which could lead to disease or death.



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to achieve 100% compliance with evacuating surgical smoke in every operating room (from hospitals to freestanding facilities). "The key is consistent education on the negative consequences of inhaling surgical smoke and the ease of employing smoke evacuation methods," she says.

An Inclusive Approach That Supports Change

In her role in Surgical Services Support, Vangie Dennis's inclusive approach to change helped transform the way surgical smoke is dealt with at Gwinnett. "In the past, there was inconsistent use of smoke evacuators and no real understanding of the hazards of electrosurgical smoke," she says. "We now use smoke evacuators with any procedure that emits smoke. Getting to that point involved a proactive strategy to optimize workplace safety."

Having been involved with Laser Institute of America and certified as a Medical Laser Safety Officer, Dennis was abreast of the hazards associated with surgical smoke exposure and put together an educational plan that involved Gwinnett's administration, physicians, and other staff. "We provided them with research and information that outlined the dangers of surgical smoke and, with their input, set out a strategy to apply safe practices without disrupting the flow of surgical procedures," she says. "We've found that when you involve everyone in the process, you pave the way for a smooth transition." Subsequently, organizations able to tout safe practices are better able to retain and recruit nursing staff.

With the Joint Commission, ANSI, AORN, NIOSH, and others bringing greater attention to the dangers of surgical smoke, Dennis sees promise in the pace of progress. "In continuing to make a priority of this issue, these institutions can help enlighten organizational leaders, surgeons, and staff and help support their efforts to apply established safety guidelines," she says. "There is no such thing as safe smoke. While surgeons and other staff take risks everyday in their commitment to treat others, we must also remain committed to limiting those risks as best we can."