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Outpatient Surgery

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Are Your ORs Smoke Free?

They should be. Here's expert advice to overcome the 3 obstacles you're likely to encounter.

Kay Ball, PhD, RN, CNOR, FAAN

Perioperative nurses experience some respiratory ailments at twice the rate of the general population. That's according to my PhD research and random sampling of AORN members. Consider that inhaling smoke generated from the destruction of a single gram of tissue during electrosurgery is equivalent to smoking 6 cigarettes in 15 minutes. Nurses exposed to surgical plumes have reported eye, nose and throat irritation, headaches, nausea, dizziness, excessive coughing, fatigue, skin irritation and increased allergies. The reasons to properly evacuate harmful surgical smoke are obvious, so why don't more nurses and surgeons take the threat of surgical smoke seriously?

1. **Lack of available equipment.**

Placing a smoke evacuator in every OR has traditionally been difficult for administrators to justify because older devices were noisy, bulky dinosaurs that surgeons didn't want to listen to and nurses didn't want to set up. Newer smoke evacuators, however, are equipped with quieter motors that let staff and surgeons perform their routines without noise disruptions. They also feature smaller footprints, meaning they can be hung in ORs or placed within columns to keep floor space free of cords and hoses.

Outfit each of your ORs with a smoke evacuation system to increase compliance with your surgical smoke evacuation protocols. Your staff will be more likely to use the devices if they don't have to waste valuable minutes between cases searching for an evacuator that's passed from room to room.

When shopping for a smoke-capturing device, look for models with adequate:

- **Suction power.** This is measured as the velocity of air movement at the suction tip. Devices designed for fluid removal do not always have adequate suction power to remove contaminants from the air, despite what manufacturers of those devices might claim.
- **Filtering capacity.** Smoke evacuators must contain an ultra-low penetration air (ULPA) filter with 0.1 micron filtration capability, which is nearly 100% effective in capturing particulate matter (only 1 in 1 million particles will escape capture). Moisture filters or high-efficiency particulate air (HEPA) filters aren't as effective.
- **Motor rating.** Many smoke evacuators are powered by turbine pumps, which take a few seconds to ramp up to speed. That slight pause between activation and full power delays smoke evacuation at the surgical site, letting harmful particles escape capture. A smoke evacuator with a rotary vein pump generates immediate negative

static pressure at the suction tip for instant smoke removal from the surgical site.

- **Ease of use.** Some evacuators feature built-in sensors that automatically turn the device on and off when smoke is created and removed. These devices work in step with the activation and deactivation of the electrosurgery unit or laser system. Others are toggled on and off by a foot pedal. Those features are intended to engage the systems only when needed to limit noise pollution in the OR.

National Smoke Evacuation Guidelines

The American National Standards Institute states, "Airborne contaminants shall be controlled by the use of localized exhaust ventilation or a smoke evacuator and respiratory protection." OSHA recognizes that lasers and electrosurgical plume contain toxic, mutagenic and carcinogenic elements, and mandates the removal of atmospheric contaminants with acceptable engineering controls and local ventilation, including smoke evacuation systems.

AORN's position statement on the topic says surgical smoke and bioaerosols can and should be controlled. They say you're responsible for learning about the dangers of surgical smoke and taking steps to minimize its risks, which includes the use of local exhaust ventilation (smoke evacuator) at 1-micron filtration at 99.999% efficiency, personal protection equipment and educational programs that require staff to demonstrate competencies on smoke evacuation equipment and supplies.

The Joint Commission advises hospitals to minimize risks associated with selecting, handling, storing, transporting, using, and disposing of hazardous gases and vapors. It says hazardous gases and vapors include, but are not limited to, glutaraldehyde, ethylene oxide, vapors generated while using cauterizing equipment and lasers, and gases such as nitrous oxide.

A new standard issued by the Canadian Standards Association has raised the surgical smoke safety bar. It's the first standard dedicated to surgical smoke safety that covers plume generated from surgical and therapeutic devices. It addresses all evacuation systems, including dedicated, central, in-line and free-standing devices, and mandates compliance with smoke evacuation protocols instead of suggesting it.

Canadian healthcare leaders take surgical smoke safety very seriously, do a tremendous job of educating surgical professionals about the importance of smoke evacuation and support the front line with policies that demand compliance with national guidelines. We'd do well to learn from our neighbors to the north.

— *Kay Ball, PhD, RN, CNOR, FAAN*

Consider the types of cases that are performed in your facility when deciding which smoke evacuation method is appropriate. Removing smoke using a wall suction device designed primarily for fluid removal is the simplest method and, because it evacuates less than 5 cubic feet of smoke per minute, is suitable for procedures that generate very small amounts of plume, such as vocal cord polyp removal or laparoscopies. When wall suction is used, an in-line ULPA filter must be placed in the suction line between the suction device and the wall connection. Standalone evacuation systems should be used for procedures that generate greater amounts of smoke, such as abdominal surgery, mastectomies and total hip replacement..

2. Staff competency.

I'm passionate about educating perioperative professionals about the hazards of surgical smoke and recently completed a PhD dissertation on the topic. My research revealed that key indicators of compliance are unrelated to age, level of education or professional experience. In fact, surgeons and nurses are more inclined to evacuate smoke if they read articles about surgical smoke safety, attend a talk at a conference on the topic, receive proper training on smoke evacuation devices and work in a facility with smoke safety policies that are reasonable, appropriate and easy to understand and apply.

So how can you get your surgical staff on board with your smoke evacuation efforts? Start by presenting the smoke evacuation statements offered by various governing bodies (see "National Smoke Evacuation Guidelines" on page 40). Follow that up with a few facts about surgical smoke dangers and the consequences of inhaling this plume.

For example, surgical smoke is comprised of carbonized tissue, blood and intact viruses and bacteria. In addition, 80 different chemicals have been isolated from pyrolyzed smoke plumes, including benzene, toluene, formaldehyde, cyanide and acrolein. Surgical smoke is evenly distributed throughout ORs. Its particles travel about 40 mph, and its concentration rises from 60,000 particles per cubic foot to over 1 million within 5 minutes of electrosurgical unit activation. Air quality in the OR returns to normal 20 minutes after an ESU is turned off. Research has examined the viability of contents found in surgical smoke and demonstrated a high probability of disease transmission through the smoke.

After educating your staff about the dangers of inhaling surgical smoke, conduct regular in-services on the proper use of smoke evacuation systems. A simple skills assessment form lets you track your staff's performance and progress in remaining compliant with established smoke safety protocols. The form includes "Met" and "Not Met" checkboxes next to a list of performance criteria. Is your staff able to identify the type of smoke evacuation needed for small, medium and large smoke-producing cases? Can they assemble an in-line filter system? Are they able to test smoke evacuation units for proper function before surgery, use them properly during cases and properly dispose of their supplies following a procedure? By observing your staff in action and using the skills assessment form, you'll identify problem areas to address during future educational sessions or changes to your smoke evacuation policy.

3. Surgeon pushback.

A surgeon who cared about his wallet more than the safety of his staff once told me that surgical smoke is "the smell of money." Your surgeons might not share the same cavalier attitude, but physicians are notorious for downplaying the dangers of surgical smoke. They might be unaware of the risks because they spend less time in the same OR as nurses and techs do, limiting their repeated exposure to harmful plumes. Some are understandably hesitant to trial smoke evacuators if they were last exposed to noisy, bulky, older models. But with less intrusive devices available today and a greater understanding of the dangers of surgical smoke, refusing to add smoke evacuation to your standard safety protocols due to surgeon pushback is inexcusable.

Turn the tables on stubborn docs by targeting a single physician who can promote your message at the front line. Present research that outlines the dangers of surgical smoke, hitting them with peer-reviewed data that often drives their clinical decisions. Follow up with an evaluation of the newer evacuators, highlighting the features that make them quieter and less intrusive at the surgical site than past models.

Effective staff education programs and clearly established smoke evacuation policies will empower your nurses and techs to demand that surgeons follow smoke safety precautions in the OR. Add smoke evacuator supplies to your surgeons' preference cards, place posters throughout your ORs to remind surgeons and staff about the dangers of surgical smoke and support nurses who refuse to work cases when smoke evacuators aren't used. In the end, you

need to create a work environment where your nurses and techs feel comfortable telling a surgeon, "We share the same air. Using a smoke evacuator is a workplace safety issue that protects us both."

Smoke screens

To make smoke evacuation work well in your facility, combine the findings of scientific research and a financial analysis of your smoke evacuation options with support from your safety committee or manager, infection control leader and risk management guru. The time to act is now. As Erin Andersen, MS, RN, OHNP, associate professor at the University of California, San Francisco, asked in 2005, "In hindsight, will healthcare professionals be embarrassed about their cavalier attitudes toward surgical smoke as they once were with cigarette smoke?"

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