

Infection prevention

Could technology lend a hand in cleaning of ORs?

Manual cleaning is performed by humans, and thus will always be imperfect. Could technology lend a hand?

Some hospitals and a few ORs are adopting an extra disinfection step—employing robot-like machines that can disinfect an entire room.

The machines are meant to augment—not replace—manual cleaning.

These technologies have some compelling data, but “they’re not the magic bullet,” cautions Patti Costello, director of the Association for the Healthcare Environment.

OR Manager talked with researchers from 2 companies that make these no-touch systems about their application in the OR. The systems use hydrogen peroxide vapor (HPV) (Bioquell, UK) and pulse-xenon ultraviolet (UV) light (Xenex, San Antonio, Texas).

OR applications

Jon Otter, PhD, scientific director for Bioquell and lead author of a new review of automated whole-room disinfection systems in the *Journal of Hospital Infection*, lists 4 situations in which this technology might be applied in the OR:

- after surgery in a patient infected with a particularly virulent organism, for example, a multidrug-resistant gram-negative organism such as *Acinetobacter baumannii*
- as part of a program to prevent infection transmission
- in commissioning an OR after construction or another event that has taken the OR out of service
- when there is an infection outbreak with a particular pathogen associated with a specific operating room.

Adding UV to terminal cleaning

Texas Health Southwest in Fort Worth elected to add the pulse-xenon system to its cleaning protocol for its 8 ORs in January 2012.

“We were looking at ways to decrease our surgical site infection rates, which appeared to be multifactorial,” says the infection preventionist, Katherine Rhodes, BSN, RN, CIC, COHN-S, CHSP.

The pulse-xenon system is deployed in each OR daily at the end of manual terminal cleaning as well as after construction and certain dirty-infected (Class IV) cases.

“It’s almost impossible, even with good manual cleaning, to hit every surface,” she says. “There is so much complex equipment in an OR. We knew there were areas that would be missed.”

The pulse-xenon process takes about 15 minutes per OR. The company analyzes each room to determine how much time and how many positions are needed for the UV light to strike all targeted surfaces. The machine is operated by the same staff who perform the manual cleaning.

Culturing during product evaluation showed that adding the pulse-xenon process did reduce the numbers of viable organisms. After a year of use, Rhodes says she’s awaiting updated SSI data, which will be the real test.

Here are brief descriptions of the HPV and pulse-xenon systems provided by the companies’ researchers.

What are the technologies?

HPV

HPV systems deliver a heat-generated hydrogen peroxide vapor through a high-velocity air stream to distribute the vapor evenly through an enclosed area. The Bioquell system has a generator, monitoring modules, and remote control pedestal for operating the system in the enclosed area. Steris has a similar system using vaporized hydrogen peroxide (VHP). Both systems are Environmental Protection Agency-registered sterilants.

Pulse-xenon UV

The Xenex system works by pulsing xenon, an inert gas, twice a second in a xenon UV flash lamp. This produces ultraviolet C radiation, which penetrates cell walls of microorganisms, fusing their DNA so they cannot reproduce or mutate, effectively killing them on surfaces.

What is the clinical evidence?

HPV

In patient rooms, HPV disinfection has been shown to significantly reduce the risk of transmitting a multidrug-resistant organism (MDRO) from a prior room occupant.

In a new study from Johns Hopkins Hospital published in *Clinical Infectious Diseases*, patients admitted to patient rooms decontaminated with HPV were significantly less likely to acquire MDROs than control patients. Over 1,300 rooms were decontaminated using HPV during the study with no health and safety problems reported. Bioquell provided the HPV generators and supplies.

Pulse-xenon UV

One study, conducted at MD Anderson Cancer Center and published in *Infection Control and Hospital Epidemiology*, compared the pulse-xenon system with standard terminal cleaning of patient rooms. The pulse-xenon system showed a significant reduction in the microbial load and eliminated vancomycin-resistant *Enterococcus* on sampled surfaces using a 12-minute cycle in multiple positions.

Two abstracts on OR disinfection have been submitted for the 2013 meeting of the Association for Professionals in Infection Control and Epidemiology (APIC), notes Mark Stibich, PhD, MHS, chief scientific officer for Xenex:

- One study, comparing a 3-hour terminal cleaning with a 38-minute quick clean followed by 2 5-minute positions of the pulse-xenon unit, found contamination on sampled surfaces was reduced by about half.
- The second study evaluated contamination when the pulse-xenon device was used nightly versus standard cleaning and also found contamination was reduced by about half.

How is the system operated?

HPV

The Bioquell HPV system has 2 units, a generator and an aeration unit, for a single room. Door and air vents must be sealed. Monitoring is conducted to ensure there is no leakage of vapor and to verify the concentration is below recommended exposure limits before patients or personnel reenter the room.

There is a service option, in which the company owns and operates the equipment, or a purchase option, in which the hospital owns the equipment and the company provides training for the staff.

Pulse-xenon UV

The Xenex system is in a portable 3-foot-tall unit with a pulsed xenon flash lamp. There are also a UV feedback sensor, a control panel, and a door sensor.

The company recommends how the machine needs to be positioned, trains the staff to operate the device, and then validates the protocol. Stibich says that during the 5-minute cycle, the high-intensity UV light reflects throughout the room, “effectively saturating the room with germicidal light.”

How long does the process take?

HPV

Depending on an OR’s size and the air-handling configuration, the HPV process would take up to 4 hours, Otter says. For a single patient room, the reported cycle time is 1.5 to 2.5 hours.

Pulse-xenon UV

Two studies have shown decontamination of a 400-square foot OR would require 2 5-minute positions of the system, says Stibich.

What is the cost?

The cost of the Bioquell HPV system is about \$50,000 plus consumables. The Xenex bundled cost, including training, service, and replacement bulbs, is about \$82,000. ❖

—Pat Patterson

References

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