SURFACE CLEANING

Best Practices for High-Risk Areas

By Kathy Dix

Environmental services (ES) has what may seem a straightforward job — keeping the entire healthcare facility clean. But cafeterias, public waiting areas, physicians' offices, procedure rooms, operating rooms (ORs), and intensive care units (ICUs) each require a different approach.

Cleaning an OR, for example, requires a different approach than that of cleaning an ICU or a general hospital ward. Different inanimate surfaces and their requirements — sterilization, disinfection, or basic, old-fashioned cleaning — may mean different solvents, different tools, or different times of exposure.

Gordon Buntrock, director of product development, environmental services, for ARAMARK Healthcare, agrees, "All areas within the hospital are not created equal in the amount of daily cleaning and level of cleaning that has to take place. A strategy has to be created for different areas of the hospital and it is usually determined by a risk-assessment, which is based on the use of the area and the potential for transmission of infection.

"The OR is one of the most critical areas of the hospital in terms of cleaning and sanitation. The very nature of the medical procedures done in the OR requires the highest standards of cleanliness, in order to safeguard the health of the patient. Any time there are open wounds, the potential for infection is high. For these reasons, the cleaning systems used in the operating room must be the most effective available," he continues.

"Whether cleaning and sanitizing the OR, ICU or general wards, ARAMARK Healthcare uses the most effective products and tools (such as microfiber technology) available," he says. "The same products and instruments clean the OR, ICU, and general wards; however more time and detail is spent focusing on areas (like the OR and ICU) that have the greater potential for infection. There are new surfaces and cleaning products (like microfiber technology) being developed that allow for a more thorough job. The core practices the Centers for Disease Control and Prevention (CDC) recommends haven't changed, as environmental services main focus is still on the daily removal of microorganisms, rather trying to kill them."

"For routine cleaning of surfaces in the ICU or general ward, any Environmental Protection Agency (EPA)-approved product is adequate," says Edward Septimus, MD, medical director of infectious diseases and patient safety at Deaconess Billings Clinic in Montana. Septimus also serves as consultant and faculty for VHA Inc. clinical programs.

"For surgery or areas with blood, a tuberculocidal agent is used (e.g., phenolic — but it is not advised in the nursery), a quaternary ammonium with hepatitis/HIV activity is used, or 10 percent sodium hypochlorite. The reason is activity against bloodborne viruses.

There are specific pathogens that require special mention: there is good evidence that the environment can play a role with *Clostridium difficile*, vancomycin-resistant enterococcus (VRE), and *Staphylococcus aureus* (in burn units). Norovirus, influenza virus, rotavirus, and hepatitis B can survive on surfaces and occasionally are associated with transmission. Most of these agents can be decontaminated with a standard EPA-approved disinfectant except norovirus and *Clostridium difficile* (spores), for which sodium hypochlorite is preferred," he says.

"The use of molecular epidemiology to better document the role of the environment in transmission is new. Existing studies are difficult to interpret, since studies of possible transmission do not take into account measurements of environmental cleaning or hand washing."

There is debate over specific cleaning methods, too. "There is some controversy about whether or not one really needs to use a tuberculocidal agent with blood cases and whether every room of a *Clostridium difficile* patient requires sodium hypochlorite for its sporicidal activity," Septimus comments.

VHA Inc. is attempting to clear up some of the controversy through its "Transformation of the Operating Room" program. This plan aims to improve the culture and teamwork inside the OR, improve clinical outcomes and patient safety, and make the OR a positive financial source.

"In the OR, turn-around time is extremely important," says Kirsten Thompson, a technical service expert with Ecolab's healthcare division. Ecolab develops and markets cleaning, sanitizing, pest elimination, maintenance, and repair products and services for the hospitality, foodservice, healthcare and industrial markets.

"In addition, the product used should meet the requirements for efficacy against bloodborne pathogens," she adds. "Wipes impregnated with chemistry to provide short contact times are valuable in this area. Similarly in the ICU, convenience is important for cleaning with little disruption for the patient. Surface-compatible chemistries are also important for patient equipment. Ready-to-use products in wipe, spray bottle, or squirt bottle form offer the nursing staff a stable use solution of disinfectant that may be used for cleaning. For general patient room cleaning, some of the exciting advances include systems that provide both efficiency and efficacy. Housekeeping carts equipped with pre-saturated mop heads and cloths, color-coded for each area of the room to be cleaned, make the cleaning process quicker and reduce the chance of cross-contamination within the room and from room to room."

Differences in cleaning these various areas depend not only on the invasiveness of procedures done in the room, but also "whether the room is occupied or not, whether the room is an isolation room, and whether there is an organism of concern," Thompson observes. "Special products and procedures may be implemented as part of an intervention strategy for outbreaks of antibiotic-resistant organisms or spore-forming pathogens like *Clostridium difficile.*"

While several studies demonstrate the survival of microorganisms in the environment, as well as cross-contamination of materials, there is very little evidence relating environmental contamination to healthcare-associated infection, she notes. "Most of the practices today are based on what has been done in the past. The surfaces with the highest risk for pathogen transmission (bed rails, patient equipment, etc.) should certainly be disinfected, while the use of disinfectants on surfaces that pose a low risk, such as floors, may be debated. Disinfectants are routinely used on floors in North America, while hospitals in Europe typically use a general purpose cleaner.

"Certainly label contact time is an issue that is debated," Thompson continues. "Manufacturers are held to the recommendations of their EPA-approved label, which was generated from laboratory data to meet very stringent criteria. In practice, these contact times are often too long, but also don't correspond to the 'real-life' soil and contamination present on the surface. Disinfection practices surrounding *Clostridium difficile* are a hot topic. Evidence for contamination of the hospital environment by *C. difficile* is compelling, and disinfection is effective in reducing the number of *C. difficile* positive cultures in the environment. The vegetative form of *C. difficile*, such as might be found on fecies-contaminated surfaces, may be killed by hospital-grade disinfectant products or simply in the presence of air.

"There are some EPA-registered disinfectants with *Clostridium difficile* (vegetative form) claims on their labels. However, it is important to note that disinfectants or disinfectant-detergents intended for use on environmental surfaces are not effective against the spore form of *C. difficile* under practical use conditions, regardless of the class of disinfectant or the manufacturer of the product. Current expert recommendations include handwashing, barrier precautions, and meticulous environmental cleaning with an EPA-registered disinfectant for routine disinfection of rooms with *C. difficile*, but a diluted hypochlorite (a 1:10 dilution of household bleach is cited in the literature) should be considered in units with high *C. difficile* rates," she says.

"With expert recommendations, hypochlorite is recommended only in units with high rates of *C. difficile* or in outbreak situations. The routine use of bleach is discouraged, as it is very corrosive to metals, damaging to environmental surfaces including floor finish, is inactivated by organic matter, provides no more detergency than plain water, and is toxic.

Inactivation by organic matter can be significant when fecal contamination is considered, as is detergency. The CDC has stated in several guidelines that 'the actual physical removal of microorganisms by scrubbing is probably as important, if not more so, than any antimicrobial effect of the cleaning agent used.' The physical removal of the organism by cleaning with a good detergent is paramount. The combination of a hospital-grade disinfectant and superior detergency make for good product choices for this application as well as general housekeeping procedures. Stringent handwashing practices are absolutely essential for minimizing the transmission of disease via the hands. Hand hygiene is crucial in the interruption of potential disease transmission from person to person."

James Welsh, director of environmental services for Children's Memorial Hospital in Chicago, clarifies the steps necessary for cleaning surfaces in these specific areas.

For the general ward:

1. Interact with patient or guest
2. Empty waste receptacles
3. High-dust above eye level (not in occupied rooms)
4. Sanitize all horizontal surfaces (with approved disinfectant)
5. Spot-clean all vertical surfaces
6. Clean the restroom
7. Dust mop the floor
8. Inspect the room
9. Damp-mop the room
10. Interact with the patient or guest

For the OR, two types of cleaning are necessary:

1. Between-case cleaning (this is completed between each case)
A. Remove all waste and soiled linen
B. Sanitize surgical table
C. Clean sinks
D. Sanitize all horizontal surfaces
E. Spot-clean all vertical surfaces
F. Dust-mop and damp-mop rooms
G. Inspect your work

2. Terminal cleaning (which is completed at the end of the night)
A. Remove all waste and soiled linen
B. Move all rolling stock to the center of the room
C. Using wall-washing tools, sanitize all high surfaces including walls
D. Dust-mop and scrub circumference of the room
E. Sanitize rolling stock and casters moving them back to the perimeter of the room
F. Sanitize all fixed equipment in the room, including table
G. Dust-mop and scrub remainder of the floor
H. Inspect your work

Kim Dennis MacDougall, a research scientist for Kimberly-Clark Professional, points to the Guidelines for Environmental Infection Control in Health-Care Facilities from the CDC's Healthcare Infection Control Practices Advisory Committee (HICPAC). "The basic cleaning strategies include: wet-dusting horizontal surfaces daily with cleaning cloths pre-moistened with detergent or an EPA-registered hospital disinfectant or disinfectant wipes, using care when wet-dusting equipment and surfaces above the patient to avoid patient contact with the detergent/disinfectant, and avoiding the use of cleaning equipment that produces mists or aerosols. Cloths that have soaked in open containers of solutions for long periods of time are not recommended," she submits.

“Fresh solutions that are mixed frequently or closed wiper containers that prevent potential contamination from the surrounding environment are beneficial. Dispersal of microorganisms in the air from dust or aerosols is more problematic in these settings than elsewhere in healthcare facilities. Chemical germicides that are EPA-approved for use as ‘hospital disinfectants’ and that are tuberculocidal/virucidal when used at recommended dilutions and contact times can be used to decontaminate spills of blood or other body fluids that contain blood in patient-care areas. Visibly soiled areas should first be cleaned and then chemically decontaminated. For disinfection, the precleaned areas should be moistened with the appropriate germicide and allowed to air dry.

“Gloves should always be worn during cleaning and decontaminating procedures.” In differentiating between the OR, ICU, and more general areas, MacDougall says, “A key method for determining the nature of cleaning necessary is understanding the category of the surface in need of disinfection. According to the Guidelines for Environmental Infection Control in Health-Care Facilities from the CDC and HICPAC, the Spaulding classification is retained to disinfect and sterilize patient-care items or equipment. How objects or areas are disinfected depends on use; ‘critical,’ ‘semicritical,’ and ‘noncritical.’ Critical objects are those that enter sterile tissues or the vascular system or through which blood flows, such as implanted medical devices. These should be sterile when used. Semicritical items (that touch mucous membranes or non-intact skin, e.g., endoscopes, respiratory therapy equipment, and diaphragms) require high-level disinfection (i.e., elimination of all microorganisms except high numbers of bacterial spores). Noncritical items (bedpans, blood pressure cuffs, and bedside tables) require only low-level disinfection.”

And, she points out, “In 1991, the CDC proposed an additional category designated ‘environmental surfaces’ to Spaulding’s original classification to represent surfaces that generally do not come into direct contact with patients during care. Comparatively, environmental surfaces carry the least risk of disease transmission and can be safely decontaminated using less rigorous methods than those used on medical instruments and devices. Environmental surfaces can be further divided into medical equipment surfaces (e.g., knobs or handles on hemodialysis machines, X-ray machines, instrument carts, and dental units) and housekeeping surfaces (e.g., floors, walls, and tabletops).

“Cleaning is the necessary first step of any sterilization or disinfection process,” MacDougall continues. “Cleaning is a form of decontamination that renders the environmental surface safe to handle or use by removing organic matter, salts, and visible soils, all of which interfere with microbial inactivation. The physical action of scrubbing with detergents and surfactants and rinsing with water removes large numbers of microorganisms from surfaces. If the surface is not cleaned before the terminal reprocessing procedures are started, the success of the sterilization or disinfection process is compromised. The disinfectant should be mixed and applied to the surface uniformly according to the directions, and remain wet for the amount of time recommended by the manufacturer.”

"There are several concerns around cleaning, disinfection and sterilization methods," she adds. "The concerns are related primarily to safety issues, exposure to patients and workers, and environmental concerns over the disposal of cleaning solutions. It is a difficult balance to achieve when the disinfectant intended to kill harmful microbes must also do no harm to other organisms present either during use or when discarded. The ultimate goal is reduction of infections in healthcare settings, and powerful disinfectants are necessary to achieve this. Carefully examining the most efficient way to use the chemicals currently available is one way to seek this balance until a future solution is available."

Recent literature highlights the need for precise cleaning. The March 2006 issue of the *Journal of Hospital Infection* discusses environmental reservoirs of methicillin-resistant *Staphylococcus aureus* (MRSA) in isolation rooms. "Strategies to control and prevent the spread of MRSA include ... the adequate cleaning and decontamination of clinical areas," the authors write. A study of the isolation rooms of 25 patients with MRSA revealed that "Over half of the surface samples taken from the beds and the mattresses were positive for MRSA.

Identical or closely related isolates were recovered from the patient and their environment in 14 (70 percent) patients, suggesting possible environmental contamination of the isolation rooms, possibly contributing to endemic MRSA. More effective and rigorous use of current approaches to cleaning and decontamination is required," they state.[1]

Novel Methods

Steam vapor has been used for sanitation as well. When chemicals can't be used, steam vapor has been proposed as an alternative.

Thermal accelerated nano crystal sanitation (TANCS) is a treatment process that has been available since December 2004. It involves a water processor installed within the hydraulic system on select residential, commercial, and industrial steam vapor equipment. The process removes ionic minerals found in common municipal tap water and converts them to millions of nano crystals. The crystals are energized by heat to assist in the destruction of bacteria, molds and pathogenic germs by disrupting the protective cell membranes of microbes. The disruption enables the moist, high-temperature steam vapor to quickly access the cell proteins. When damaged by the hot steam vapor, the proteins can no longer support the growth or reproduction of the affected microbe. The germs are effectively and promptly destroyed. The result is a near-sterile surface using only common tap water, a condition that is important because water is not limited by the same safety or regulatory restrictions placed on disinfectant chemicals.

Rick Hoverson, principal with Advanced Vapor Technologies (AVT), in Edmonds, Wash., reports that the third-party testing performed on TANCS equipment has been very positive. Nelson Laboratories, a Nationally Recognized Test Lab (NRTL) — FDA registered and third-party certified to ISO 9001:2000 and ISO/IEC 17025 — tested the

system on samples of unglazed, clay quarry tile. The unglazed tile was used to test the TANCS system rather than glazed ceramic tile generally used in disinfectant testing because unglazed tile, due to its more porous surface, presents a more difficult disinfection challenge. Nelson Labs documented that a seven- to 10-second exposure to TANCS steam vapor produced a five- to seven-log reduction in microbes on all microorganisms tested, including spore-forming microbes.

"The data indicate that it takes an autoclave steam sterilizer from three to five minutes, to as many as 20 minutes, at temperatures of 250 degrees Fahrenheit, to achieve the results that TANCS steam vapor, at 220 degrees F, produced in seven seconds," Hoverson says.

TANCS provides many benefits in addition to the reduced time required to kill pathogenic microbes. "Operators require less time to clean an area because of the efficiency of the TANCS process," he says. "The ability to clean and disinfect an area in seconds, rather than minutes, means that personnel will be working more efficiently in addition to producing and maintaining a healthier work environment."

Regular use of equipment with TANCS processors will produce results that continue to improve over time, resulting in a disinfection base line that approaches sterilization. Surfaces that are cleaned and disinfected using this process actually become easier to clean in the future, because of the removal of residues from the surface, which speeds up the cleaning process while preventing microbial growth, the company states.

Reference

1. Sexton T, et al. Environmental reservoirs of methicillin-resistant *Staphylococcus aureus* in isolation rooms: correlation with patient isolates and implications for hospital hygiene. *J Hosp Infect* 62, Issue 2, February 2006, 187-194.