The following Recommended Practices for Environmental Cleaning have been approved by the AORN Recommended Practices Advisory Board. They were presented as proposed recommendations for comments by members and others. They are effective November 15, 2013. These recommended practices are intended to be achievable recommendations representing what is believed to be an optimal level of practice. Policies and procedures will reflect variations in practice settings and/or clinical situations that determine the degree to which the recommended practices can be implemented. AORN recognizes the many diverse settings in which perioperative nurses practice, and as such, these recommended practices are guidelines adaptable to all areas where operative and other invasive procedures may be performed.

Purpose
Historically, perioperative registered nurses (RNs) have played a critical role in providing a clean environment for patients undergoing operative or other invasive procedures. In recent years, researchers have developed an increasing awareness of the role of the environment in the development of health care-associated infections and transmission of multidrug-resistant organisms (MDROs).

The literature describes a high risk of pathogen transmission in the perioperative setting due to multiple contacts among patients, perioperative team members, and environmental surfaces. Thus, thorough cleaning and disinfection of perioperative areas is essential to preventing the spread of potentially pathogenic microorganisms. Because surfaces that health care providers touch frequently may present a high risk for pathogen transmission to patients, routine cleaning of high-touch objects is an effective approach to limiting transmission of pathogens when implemented as part of a comprehensive environmental cleaning and disinfection program.

Researchers have shown that cleaning practices in the operating room (OR) have not been adequately thorough or consistent with the policies of the health care organization. Jefferson et al observed a mean cleaning rate of 25% for objects monitored in the OR setting in six acute care hospitals. These findings demonstrate that some ORs may not be as clean as previously thought, although the literature has not defined the concept of cleanliness. All perioperative team members have a responsibility to provide a clean environment for patients. Perioperative and environmental services leaders can cultivate an environment where perioperative and environmental services personnel work collaboratively to accomplish adequately thorough cleanliness in a culture of safety and mutual support.

These recommended practices provide guidance for environmental cleaning and disinfection in the perioperative practice setting and are based on the highest quality evidence available. The quality of the research investigating environmental cleaning has not yet achieved a level of rigor to thoroughly define and evaluate best practices for environmental cleaning in health care, including the perioperative setting. According to Carling, published studies have not separated cleaning thoroughness from the cleaning chemicals being evaluated, and there is a need for outcome studies to determine the impact of environmental cleaning on the transmission of disease.

Donskey found that although much of the evidence for environmental disinfection as a control strategy for reducing health care-associated infections is suboptimal, the practice of environmental cleaning is supported by several high-quality investigations. Conscientious application of these recommended practices should result in a clean environment for perioperative patients and minimize the exposure risk of health care personnel and patients to potentially infectious microorganisms. Any patient could be infected with bloodborne or other pathogens, so all surgical procedures should be considered potentially infectious. This document provides specific guidance for cleaning procedures; selection of appropriate cleaning chemicals, materials, tools, and equipment; ongoing education and competency verification; policies and procedures; and quality assurance and performance improvement processes.

Although these recommendations include references to cleaning a wide variety of surfaces, the focus of this document is specific to the environmental cleaning of perioperative areas. These recommendations may be applicable to sterile processing areas. Laundering of textiles is outside the scope of these recommendations. Environmental cleaning includes considerations for a safe environment of care, prevention of transmissible infections, and hand hygiene. These topics are addressed in separate recommended practices documents, and although they are mentioned briefly where applicable (eg, standard precautions), broader discussions are outside the scope of this document.

Evidence Review
A medical librarian conducted systematic searches of the databases MEDLINE, CINAHL, and the Cochrane Database of Systematic Reviews for meta-analyses, systematic reviews, randomized controlled and nonrandomized trials and studies, opinion documents, case reports, letters, reviews, and guidelines. Scopus was also consulted, although not searched systematically.
RP: Environmental Cleaning

Search terms included operating room, operating theater, operating suite, surgical suite, recovery room, post-anesthesia, post-anesthesia, perioperative nursing, ambulatory care facilities, surgicenters, ambulatory surgery, outpatient surgery, healthcare facilities, terminal cleaning, terminal disinfecting, terminal decontamination, cleaning schedule, cleaning program, cleaning regimen, prior patient, prior room occupant, previous patient, cleaning standard, cleaning policies, cleaning guideline, cleaning protocol, routine cleaning, hospital housekeeping, housekeeping department, environmental services, cross infection, infection control, decontamination, room decontamination, disinfection, disinfectants, adenosine triphosphate, detergents, solvents, phenols, disinfectants, hydrogen peroxide, ultraviolet rays, fluorescent light, quaternary ammonium disinfectant, sodium hypochlorite, ozone, silver, copper, gram-negative bacteria, gram-positive bacteria, viruses, Staphylococcus aureus, methicillin resistance, vancomycin, multi-drug resistant organism, clostridium, chickenpox, measles, varicella, rubeola, tuberculosis, prion diseases, prions, Creutzfeldt-Jakob disease reservoir, dust, surgical wound infection, blood, body fluids, tissues, blood spill, semen, cerebrospinal fluid, synovial fluid, vaginal secretions, pericardial fluid, peritoneal fluid, saliva, amniotic fluid, air microbiology, air pollution, bacterial load, microbial colony count, environmental microbiology, environmental cleaning, green cleaning, mop, mopping, bucket, wringer, brush, buffers, floor machine, sweepers, microfiber, microfibre, paper towel, cloths, wiping, vacuum, environmental surface, contact surface, fomites, floors and floor coverings, interior design and furnishings, mites, lice, fleas, cockroaches, vermin, flies, ants, insects, pest control, textiles, bedding and linens, beds and mattresses, curtains, laundry service, cellular phone, cellphones, cell phones, telephones, wireless communications, mobile devices, iPad, tablets, laptops, computer systems, computers, keyboards, mouse, mice, tables, beds, operating tables, mattress, stretcher, examination tables, patient transfer board, trolleys, carts, scrub sink, durable medical equipment, disposable equipment, equipment reuse, storage areas, hospitals, eye wash, operating room waste, clinical waste, medical waste, medical waste disposal, biohazardous waste, hazardous materials, formaldehyde, formalin, methyl methacrylate, storage, disposal, transport, handling, safety management, occupational health, occupational-related injuries, occupational exposure, contact precautions, standard precautions, droplet precautions, universal precautions, eye protective devices, masks, respiratory protective devices, protective clothing, gloves, goggles, gowns, environmental monitoring, luminescent measurements, checklists, visual inspection, fluorescent light, audit, tacky mat, sticky mat, hospital design and construction, demolition, construction materials, aspergillus, aspergillosis, central service department, sterile processing, sterile supply, central supply, central processing, task performance and analysis, job performance, competency-based education, continuing education, and human factors.

The search was originally limited to literature published in English between 2008 and 2013. The lead author and the medical librarian identified relevant guidelines from government agencies and standards-setting bodies, and the lead author requested additional articles that either did not fit the original search criteria or were discovered during the evidence appraisal process. The medical librarian also established continuing alerts on the environmental cleaning topics and provided relevant results to the lead author.

Articles identified by the search were provided to the project team for evaluation. The team consisted of the lead author, three members of the Recommended Practices Advisory Board, and two doctorally prepared evidence appraisers. The lead author divided the search results into topics and assigned members of the team to review and critically appraise each article using the Johns Hopkins Evidence-Based Practice Model and the Research or Non-Research Evidence Appraisal Tools as appropriate. The literature was independently evaluated and appraised according to the strength and quality of the evidence. Each article was then assigned an appraisal score. The appraisal score is noted in brackets after each reference, as applicable.

The collective evidence supporting each intervention within a specific recommendation was summarized and used to rate the strength of the evidence using the AORN Evidence Rating Model. Factors considered in review of the collective evidence were the quality of research, quantity of similar studies on a given topic, and consistency of results supporting a recommendation. The evidence rating is noted in brackets after each intervention.

Editor’s note: MEDLINE is a registered trademark of the US National Library of Medicine’s Medical Literature Analysis and Retrieval System, Bethesda, MD. CINAHL, Cumulative Index to Nursing and Allied Health Literature, is a registered trademark of EBSCO Industries, Birmingham, AL. Scopus is a registered trademark of Elsevier B.V., Amsterdam, Netherlands.

Recommendation I

A multidisciplinary team should establish cleaning procedures and frequencies in the perioperative practice setting.

Involvement of a multidisciplinary team (eg, perioperative nursing, sterile processing, environmental services, infection prevention) allows input from personnel who perform environmental cleaning in perioperative areas and from personnel with expertise beyond clinical end-users (eg, infection prevention personnel). As part of a bundled approach to implementing best practices for environmental cleaning, Havill recommended developing cleaning procedures as part of a multidisciplinary team.12

Operational guidelines for frequency of cleaning in the perioperative setting were identified as a gap in the literature based on the evidence review.
RP: Environmental Cleaning

A standardized product selection process assists in the selection of functional and reliable products that are safe, cost-effective, and environmentally friendly and promote quality care, as well as decreases duplication or rapid obsolescence.13,15

I.a. A multidisciplinary team should select cleaning chemicals for use in the perioperative setting. [2: Moderate Evidence]

A standardized product selection process assists in the selection of functional and reliable products that are safe, cost-effective, and environmentally friendly and promote quality care, as well as decreases duplication or rapid obsolescence.13

I.a.1. A multidisciplinary team should select cleaning chemicals for use in the perioperative setting. [2: Moderate Evidence]

A standardized product selection process assists in the selection of functional and reliable products that are safe, cost-effective, and environmentally friendly and promote quality care, as well as decreases duplication or rapid obsolescence.13

I.a.1. A multidisciplinary team should evaluate the following factors during selection of a cleaning detergent or disinfectant chemical:

- Environmental Protection Agency (EPA) registration and rating as hospital-grade14,15; [1: Strong Evidence]
- targeted microorganisms14; [1: Strong Evidence]
- dwell times (ie, contact times)14; [1: Strong Evidence]
- chemical manufacturers’ instructions for use14,15; [1: Strong Evidence]
- compatibility with surfaces, cleaning materials, and equipment15; [3: Limited Evidence]
- patient population (eg, neonatal)14,15; [1: Strong Evidence]
- cost15; [3: Limited Evidence]
- safety15-17; [2: Moderate Evidence] and
- effect on the environment.15 [3: Limited Evidence]

I.a.2. High-level disinfectants or liquid chemical sterilants should not be used to clean and disinfect environmental surfaces or noncritical devices.14 [1: Strong Evidence]

These chemicals are not intended for use on environmental surfaces and are not labeled for use as low-level disinfectants.14

I.a.3. Alcohol should not be used to disinfect large environmental surfaces.14 [1: Strong Evidence]

Alcohol is not an EPA-registered disinfectant. Alcohol is an antiseptic and not a detergent. Alcohol does not remove soil or debris.

I.a.4. An EPA-registered disinfectant in the concentration indicated in the manufacturer’s instructions for nurseries and neonatal patient care areas should be used when the perioperative patient population includes neonates and infants.14,15 [1: Strong Evidence]

Hyperbilirubinemia in newborns has been linked to poor ventilation and cleaning of incubators and other nursery surfaces with inadequately diluted phenolic solutions.14

I.b. A multidisciplinary team should select cleaning materials, tools, and equipment for use in the perioperative practice setting.13,15 [2: Moderate Evidence]

A standardized product selection process assists in the selection of functional and reliable products that are safe, cost-effective, and environmentally friendly and promote quality care, as well as decreases duplication or rapid obsolescence.13,15

I.b.1. A multidisciplinary team should evaluate the following factors during selection of cleaning materials, tools, and equipment:

- manufacturers’ instructions for use on surfaces to be cleaned15;
- manufacturers’ instructions for use for cleaning materials and equipment15;
- compatibility with detergents and disinfectants15;
- effect on environmental conditions in the OR (eg, temperature, humidity);
- cost15;
- personnel ergonomics and safety15; and
- effect on the environment.15

I.b.2. Reusable or single-use disposable cleaning materials (eg, mop heads, cloths) may be used.14

I.b.3. Mops that dispense cleaning solutions may be used. Using mops that dispense cleaning solutions may decrease the risk of contaminating multi-use containers of cleaning solution and reduce the risk of chemical splashes.

I.b.4. Microfiber or low-linting cotton cleaning materials (eg, mop heads, cloths) may be used.15,18,19

In a comparative study, Rutala et al reported that microfiber mopping systems were more effective than cotton string mops at microbial removal, 95% and 68% respectively, and that microbial removal with microfiber was equally effective with and without use of a disinfectant.18 Diab-Elschahawi et al found in another comparative study that although microfiber cloths were best for decontamination, cotton was most effective after multiple launderings.19 However, the laundering methods used to process the microfiber cloths in this study were at a higher temperature than that recommended by the Centers for Disease Control and Prevention (CDC), which may have altered their effectiveness.

Additional research is needed to determine the most effective material for cleaning and disinfecting environmental surfaces in perioperative areas.

I.c. A multidisciplinary team should establish cleaning frequencies for high-touch objects and surfaces.2,14,20,21 [1: Strong Evidence]

In a literature review, Dancer found that contamination of environmental surfaces that are touched frequently provides an opportunity for
hands to acquire pathogens, which could be transmitted to patients.\textsuperscript{2,20} Stiefel et al demonstrated in an observational study that touching environmental surfaces in the inpatient room of a patient colonized with methicillin-resistant \textit{Staphylococcus aureus} (MRSA) was just as likely to contaminate the gloved hands of health care personnel as was touching the patient’s skin.\textsuperscript{21} The results of this study showed that environmental surfaces may be a reservoir for pathogens that can contaminate the hands of health care personnel.\textsuperscript{21}

I.d. A multidisciplinary team and the infection prevention committee should determine when enhanced environmental cleaning procedures should be implemented to prevent the spread of infections or outbreaks.\textsuperscript{22-26} (See Recommendation VII.) [\textit{1: Strong Evidence}]

I.e. A multidisciplinary team should designate personnel responsible for cleaning perioperative areas and equipment.\textsuperscript{15,20} [\textit{2: Moderate Evidence}]

Designating cleaning responsibilities is an important component of defining cleaning procedures. In a literature review, researchers identified the importance of assigning cleaning responsibilities to reduce the number of items that personnel forget to clean.\textsuperscript{20}

I.f. A multidisciplinary team should develop cleaning and disinfection procedures for construction, renovation, repair, demolition, or disaster remediation.\textsuperscript{14} (See Recommendation VII.) [\textit{1: Strong Evidence}]

Development of cleaning procedures during construction is a critical component of an infection control risk assessment that should be completed before the start of any construction project.\textsuperscript{14}

I.g. A multidisciplinary team should develop cleaning and disinfection procedures for managing environmental contamination (eg, condensation, air contamination).\textsuperscript{14} (See Recommendation VII.) [\textit{1: Strong Evidence}]

Defining cleaning procedures before contamination occurs will guide personnel in selecting appropriate actions to decrease the risk of transmitting pathogens in the event of environmental contamination.\textsuperscript{14}