



**Cleaning and
disinfecting
patient care
equipment is
an important
infection prevention
strategy for patients
receiving care in the
home.**

Home care and hospice patients are often immunocompromised with indwelling medical devices in place that are being managed at home, and many have communicable diseases or conditions. Generally, the home is a safer environment for care than either an acute care hospital or ambulatory care setting because person-to-person transmission of microorganisms is less likely.

One of the risks for transmitting infections to home care and hospice patients is the use of improperly cleaned and disinfected medical equipment. When equipment is shared and not cleaned in between patient use, transmission of organisms can occur. In home care, sterilization and high-level disinfection of patient care items is not practical, but theoretically could be accomplished by chemical sterilants or boiling. In general, if a product used in home care requires high-level disinfection performed or sterilization, it is purchased sterile by the manufacturer and will not be addressed. This article will present evidenced-based guidelines and recommendations on the preferred methods for cleaning and disinfecting patient-care equipment commonly used by staff in the home setting.

Spaulding Classification Scheme

Earle H. Spaulding devised a classification scheme more than 30 years ago for disinfecting and sterilizing patient-care items and equipment (Spaulding, 1968). This classification scheme is based on categorizing patient care equipment as

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critical, semicritical, or noncritical and the degree of risk for patient infection from contamination involved in the use of these items. The system also establishes three levels of germicidal activity (i.e., sterilization, high-level disinfection, and low-level disinfection) for strategies within the three classes of medical devices (i.e., critical, semicritical, and noncritical).

Critical Items

Critical items enter sterile tissue or the vascular system (e.g., needles, indwelling urethral catheters), and carry a high risk for infection if they are contaminated with any microorganism. Therefore, critical items should be sterile because any microbial contamination could transmit disease.

Semi-critical Items

Semi-critical items contact mucous membranes or non-intact skin. In home care, these items include an oral thermometer and respiratory therapy equipment. Semi-critical devices should be managed the same way regardless of whether the patient is known to be infected with HBV, HCV, HIV, or M. tuberculosis. Some semi-critical items that may come in contact with non-intact skin for a brief period of time (i.e., bed side rails) are usually considered non-critical surfaces and are disinfected with intermediate-level disinfectants. When using an oral thermometer from the nursing bag, use a probe cover to reduce the level of microbial contamination and disinfect the thermometer after removing the probe cover with ethyl or isopropyl alcohol (70-90 percent).

Non-critical Items

Non-critical items are those that come in contact with intact skin but not mucous membranes. A home care patient's intact skin acts as a barrier to most microorganisms; therefore, the sterility of these items is "not critical." Non-critical items can be divided into two categories:

- Non-critical patient care items may include a blood pressure cuff, laptop computer keyboard, stethoscope, nursing bag taken into the home, pulse oximeter, etc. Virtually no risk has been documented for transmission of infectious agents to patients through non-critical items when they are used as non-critical items and do not contact non-intact skin and/or mucous membranes (Rutala, W.A., Weber, D.J., et al, 2008).
- Non-critical environmental surfaces include the floor, bedside tables, side rails on a hospital bed in the home, television remote, light switches, and the patient's furniture. Many of these non-critical environmental surfaces are frequently touched by the staff member's hands and potentially could contribute to secondary transmission by contaminating the home care and hospice staff members'

hands or by contacting medical equipment or non-critical patient care items that subsequently contact patients. This reinforces the need for staff to perform hand hygiene prior to having direct patient contact with the patient.

Cleaning Patient Care Equipment

Cleaning is the act of removing visible organic residue (e.g., blood and tissue) and inorganic salts from patient care equipment and preparing it for safe handling and/or further decontamination. Cleaning should be accomplished using water with detergents or enzymatic products that are capable of removing visible organic and inorganic residues. In home care, cleaning is done manually with friction (i.e., rubbing or scrubbing the soiled item by hand with a cloth to remove soil) and fluidics (i.e., using a detergent or enzymatic product with water)...a "technical" way of describing the process of cleaning by the "good old soap and water method." Another cleaning method is mechanical cleaning and can be accomplished through a washer-disinfector (e.g., dishwasher).

Patient care equipment must be thoroughly cleaned before it can be disinfected. This includes getting into the "nooks and crannies" (i.e., in crevices, serrations, joints, and lumens of instruments, devices, or equipment). Patient care equipment should be cleaned as soon as practical after use in the home. Before cleaning, inspect the equipment's surfaces for cracks or breaks in integrity that would impair either the cleaning or disinfection process, and throw out or repair any equipment that cannot be properly cleaned, and disinfected.

Decontamination is the use of physical or chemical means to remove, inactivate, or destroy pathogens on a surface or item to prevent transmission of infectious agents and render the item or surface safe for handling, use, or disposal (OSHA, 1991). The physical act of scrubbing with a detergent or surfactant and rinsing with water (i.e., cleaning) removes a large number of microorganisms from soiled or contaminated surfaces. Thus, cleaning is a form of decontamination.

Disinfecting Patient Care Equipment

Disinfection is a process that eliminates most pathogenic microorganisms, except bacterial spores, on inanimate objects. Disinfection is not the same as sterilization as the disinfection process does not kill bacterial spores. Only sterilization can eliminate all forms of microbial life, including spores. Other factors which affect the efficacy of disinfection include: the amount of soiling; type and level of microbial contamination; concentration of and exposure time to the germicide; physical nature of the object (e.g., crevices, hinges, and lumens); presence of biofilms; and temperature and pH of the disinfection process. If patient care equipment is not properly cleaned, the item cannot be disinfected (Rutala, W.A., Weber, D.J., et al, 2008).

Levels of Disinfection

There are three levels of disinfection: 1) High-level disinfection kills all microorganisms except large numbers of bacterial spores; 2) Intermediate-level disinfection kills mycobacteria, vegetative bacteria, most viruses, and most fungi, but does not necessarily kill bacterial spores; and 3) Low-level disinfection kills most vegetative bacteria, some fungi, and some viruses.

Disinfection of Patient Care Equipment

Critical medical devices and instruments that enter normally sterile tissue or the vascular system or through which a sterile body fluid flows (e.g., blood) should be sterile. Home care organizations generally do not perform sterilization procedures, but some medical equipment classified as critical items, such as urethral catheters used for intermittent catheterization may be reused. The physician's orders, the patient's age and health status, the home environment, and the patient's or caregiver's abilities determine whether frequently used critical items, such as respiratory catheters or urethral catheters, will be disinfected between use or whether sterile products will be purchased and used on a one-time basis (Rhinehart and McGoldrick, 2006).

Most patient care equipment used by home care and hospice staff as well as surfaces touched by staff in the home would be considered non-critical. It is called non-critical as it carries little risk of causing an infection in patients or staff. However,

patient care equipment (e.g., blood pressure cuffs, stethoscopes) can become contaminated with infectious agents (e.g., MRSA) and contribute to the transmission of infections. Therefore, non-critical medical equipment surfaces should be disinfected with an EPA-registered low- or intermediate-level disinfectant at a minimum of when visibly soiled and on a regular basis (CDC, 2008). The term "regular basis" is to be defined by the home care and hospice organization. It is suggested that vital sign equipment and supplies be cleaned and disinfected with a low- or intermediate-level disinfectant in the home after use and prior to placing the equipment back in the nursing bag for use on another patient.

When a patient is on Contact Precautions or standard precautions when a patient known to be infected or colonized with a multidrug-resistant organism (e.g., MRSA) the home care organization can either:

- Provide the patient with disposable equipment, if available;
- Provide the patient with organization-owned equipment for their temporary use (i.e., retained in the home and not placed back in the nursing bag after use during the home visit). This is also called "dedicated equipment". When the patient is discharged from service, the equipment is taken by to the organization in a bag (a non-biohazard-labeled

bag is acceptable as long as the equipment is not visibly soiled with blood or other potentially infectious material as defined by OSHA), labeled in a manner that designates the equipment “to be cleaned”. The “dirty” equipment is then returned to the home care or hospice organization, placed in an area designated for storing equipment to be cleaned and disinfected. Once the equipment is cleaned and disinfected, it should be stored in a manner as “ready for patient use”; or

- Provide the patient with equipment that is retained by the patient after use and not returned to the organization for cleaning and disinfecting (McGoldrick, 2009).

Disinfecting Contaminated Patient-Care Equipment

Standard disinfection procedures should be followed for disinfecting patient-care equipment contaminated with:

- Emerging pathogens (e.g., Cryptosporidium, Helicobacter pylori, Escherichia coli O157:H7, Clostridium difficile, Mycobacterium tuberculosis, Severe Acute Respiratory Syndrome Coronavirus)
- Bioterrorist Agents
- Bloodborne Pathogens (HBV, Hepatitis C Virus, HIV)
- Antibiotic-Resistant Bacteria (e.g., Vancomycin-Resistant Enterococci, Methicillin-Resistant Staphylococcus aureus,

Multidrug-resistant Tuberculosis) (Rutala, W.A., Weber, D.J., et al, 2008).

What’s important to note is that equipment should be cleaned and disinfected according to the classification of the equipment (i.e., critical, semi-critical, and non-critical) and not according to the type of organism.

Disinfectant Contact Time

Contact time is the amount of time that the item or surface is to be kept “wet” with the disinfectant up through the complete drying of the disinfectant on the surface (McGoldrick, 2009). An important issue concerning the use of disinfectants for non-critical medical devices and surfaces (i.e., blood pressure cuffs, etc.) in home care and hospice is that the contact time specified on the disinfectant’s label can be very lengthy. Most EPA-registered hospital disinfectants have a label contact time of 10 minutes. Such a long contact time may not be practical for home care and hospice staff’s visit productivity. There are some EPA-registered disinfectants that have shortened contact times of one to three minutes, and staff should consider using these disinfectants.

By law, all applicable label instructions on EPA-registered products must be followed (i.e., remains on the equipment for 10 minutes). If the home care or hospice staff member applies the disinfectant with a contact time of less than the manu-

facturer required time frame (i.e. less than 10 minutes), the home care or hospice organization assumes liability from any injuries resulting from off-label use, and is potentially subject to enforcement action under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA).

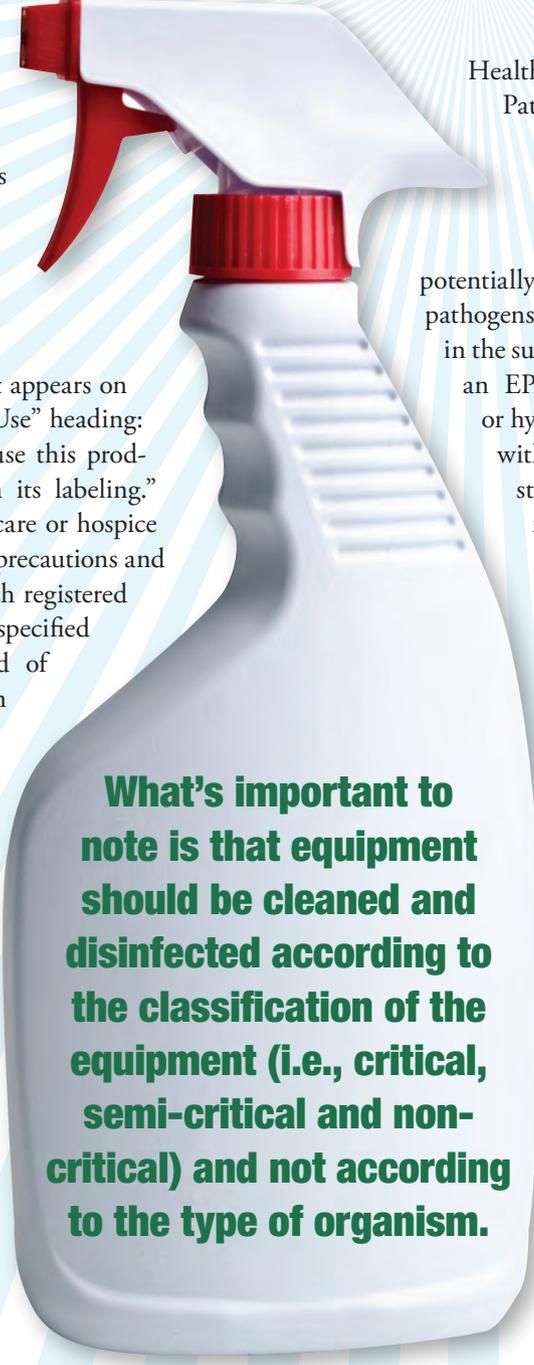
The following standard statement appears on all labels under the "Directions for Use" heading: "It is a violation of federal law to use this product in a manner inconsistent with its labeling." This statement means that a home care or hospice staff member must follow the safety precautions and use directions on the labeling of each registered product. If they do not follow the specified use-dilution, contact time, method of application, or any other condition of use, that practice is considered a misuse of the product and potentially subject to enforcement action under FIFRA (Rutala, W.A., Weber, D.J., et al, 2008).

The Laws Governing "Contact Time"

Federal laws and regulations govern the sale, distribution, and use of disinfectants. In general, the EPA regulates disinfectants and sterilants used on environmental surfaces and the FDA regulates liquid chemical sterilants and high-level disinfectants used on critical and semi-critical devices. In the United States, sanitizers, disinfectants, or sterilants are regulated by the Antimicrobials Division, Office of Pesticides Program, EPA, under the authority of the Federal Insecticide, Fungicide, and Rodenticide Act (FIFRA) of 1947, as amended 792. Under FIFRA, any substance or mixture of substances intended to prevent, destroy, repel, or mitigate any pest (including microorganisms but not including those in or on living humans or animals) must be registered before sale or distribution (EPA, 2008)

Other regulations impacting the cleaning and disinfecting of medical equipment include the Occupational Safety and

Health Administration's (OSHA) Bloodborne Pathogen Standard. This standard requires that all equipment and environmental and working surfaces be cleaned and decontaminated with an appropriate disinfectant after contact with blood or other potentially infectious materials. When bloodborne pathogens other than HBV or HIV may be present in the surfaces being cleaned, OSHA requires that an EPA-registered tuberculocidal disinfectant or hypochlorite solution (diluted 1:10 or 1:100 with water) be used. In the home setting, staff cannot know what other pathogens may be in the material being cleaned, and therefore always use an EPA-registered tuberculocidal disinfectant. The most current list of these disinfectants can be located on the EPA's web site at http://www.epa.gov/oppad001/list_e_mycobact_hiv_hepatitis.pdf.



What's important to note is that equipment should be cleaned and disinfected according to the classification of the equipment (i.e., critical, semi-critical and non-critical) and not according to the type of organism.

Products Used for Disinfection in the Home Setting

Disinfectants are antimicrobials applied to inanimate objects and are generally not to be used on the skin as they can cause tissue injury. Chemical disinfectants used in home care include alcohol, chlorine compounds, hydrogen peroxide, phenolics, quaternary ammonium compounds, and iodophors. Other products used in home care for disinfection include ammonia, baking soda, vinegar, Borax, and liquid detergent. These disinfectants are not registered with EPA and staff should not use these for disinfecting equipment used in the home for patient care.

Chlorine solution can be stored at room temperature for up to 30 days in a capped, opaque plastic bottle with a 50 percent reduction in chlorine concentration after 30 days of storage. These products are now commercially available in a ready-mix solution and do not have to be prepared by home care staff. If a bleach solution needs to be prepared, an EPA-registered sodium hypochlorite product is preferred, but if such products are not available in the home, generic versions of sodium hypochlorite solutions (e.g., household chlorine bleach) can be used.

In the home setting, disinfection most commonly occurs by wiping a piece of equipment objects with a single-use disposable cloth or prep pad impregnated with a disinfectant. This is effective on the home for small surfaces to achieve a low-level disinfection. Supplies and other non-electronic products may also be immersed or soaked in a liquid disinfectant or disinfected by wet pasteurization (i.e., boiling). In home care, it is best to purchase ready to use wipes or sprays as products to perform disinfection. Single-use disposable towels or prep pads impregnated with a disinfectant can be used for low-level disinfection of small surfaces on noncritical patient care equipment or surfaces.

Sometimes, these wipes are not sufficient and the equipment needs to be sprayed with a disinfectant. Spraying electronic medical equipment, such as ventilators, infusion pumps, patient controlled-anesthesia pumps, and sequential compression device pumps, can pose risks from corrosion of the electronic circuitry by the disinfecting or cleaning solutions penetrating the equipment's housing. This has occurred and resulted in equipment fires and other damage, equipment malfunctions, and health care worker burns (FDA, 2007). Typically, manufacturers recommend wiping the housing with a soft cloth dampened with a mild detergent and water. To avoid damage to the electronic circuitry of electronic medical equipment during cleaning and disinfecting:

- Obtain the manufacturer's labeling instructions accompanying the equipment (such as the user manual or on the manufacturer's website).
- Review the labeling for any cautions, precautions, or warnings about wetting, immersing, or soaking the equipment.
- Review the manufacturer's cleaning and maintenance instructions and ensure all staff are trained and follow these instructions.
- Protect the electronic medical equipment from contamination whenever possible:
- Avoid unnecessary touching of the equipment during patient care, especially with contaminated hands or gloves.
- Position the equipment to avoid contact with any anticipated spatter.
- Avoid laying contaminated items on unprotected surfaces of the equipment.
- Use barriers on equipment surfaces that you expect to touch with contaminated hands or when contact with spatter cannot be avoided (McGoldrick, 2009).

Summary

Bringing medical equipment and devices into the home that has not been properly cleaned and disinfected constitutes an important reservoir for transmission of infection. By effectively combining the use of hand washing, barrier precautions, and meticulous cleaning and disinfection with an EPA-registered product, we should be able to continue to keep the home environment a safe place for our patients to receive care.

References

1. Food and Drug Administration (FDA, 2007). Public Health Notification from FDA, CDC, EPA and OSHA: Avoiding Hazards with Using Cleaners and Disinfectants on Electronic Medical Equipment. <http://www.fda.gov/cdrh/safety/103107-cleaners.html>. Accessed on 10/31/07.
2. Environmental Protection Agency (EPA), Washington, D.C. <http://www.epa.gov/oppad001/chemregindex.htm>. Accessed on January 7, 2009.
3. McGoldrick, M. (2009). Cleaning and Disinfection. Home Care Infection Prevention and Control Program. www.HomeCareandHospice.com.
4. Occupational Safety and Health Administration (OSHA, 1991): Occupational safe exposure to bloodborne pathogens: final rule, Washington, DC, 1991, Department of Labor, Docket No. H-370.
5. Rhinehart, E., McGoldrick, M. (2006). Infection Control in Home Care and Hospice. Jones & Bartlett: Sudbury, MA.
6. Rutala, W.A. Weber, D.J., and the Healthcare Infection Control Practices Advisory Committee (HICPAC). (2008). Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. www.cdc.gov. Accessed on January 7, 2009.
7. Spaulding EH. Chemical disinfection of medical and surgical materials. In: Lawrence C, Block SS, eds. Disinfection, sterilization, and preservation. Philadelphia: Lea & Febiger, 1968:517-31.



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