

# **Environmental Cleaning Guidelines for Healthcare Settings**

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## **Executive Summary**

This document deals with cleaning of the physical environment in health care as it relates to the prevention and control of infections. It is targeted to those who have a role in the management of cleaning/housekeeping services for the health care setting. This includes administrators, supervisors of Housekeeping Departments, Infection Prevention and Control professionals, supervisors of construction/maintenance projects and public health officers.

This document provides Infection Prevention and Control practices for:

- a) Understanding the principles of cleaning and disinfecting environmental surfaces;
- b) Infection transmission risk assessment to guide level of cleaning;
- c) Cleaning practices for different types of care areas, including specialized cleaning for antibiotic-resistant microorganisms;
- d) Frequency of cleaning;
- e) Cleaning strategies for spills of blood and body substances
- f) Cleaning practices for non-critical equipment and furnishings;
- g) Handling of laundry and bedding;
- h) Cleaning practices during and following completion of construction projects.

## Glossary

**Adenosine Triphosphate (ATP):** A source of energy that can be easily stored and used when needed for cellular functions

**Agar dish/plate:** Is a petri dish that contains a growth medium (typically agar plus nutrients) used to culture microorganisms

**Antiseptic:** An agent that can kill microorganisms and is applied to living tissue and skin.

**Aerobic Colony Count (ACC):** Total number of viable aerobic bacteria sampled from a given surface. Usually expressed as the number of colony forming units per area (e.g. cfu/cm<sup>2</sup>)

**Benchmarking:** A standard or point of reference against which things may be compared

**Bioburden:** Degree of microbial contamination or microbial load; the number of microorganisms contaminating an object

**Bioluminescence:** The biochemical emission of light by living organisms

**Cleaning:** The physical removal of foreign material (e.g., dust, soil) and organic material (e.g., blood, secretions, excretions, microorganisms). Cleaning physically removes rather than kills microorganisms. It is accomplished with water, detergents and mechanical action.

**Colony-forming unit (cfu):** A quantitative measure of the amount of organisms. Usually expressed as the number of viable organisms per unit sampled (e.g. mL for liquids, mg for solids and cm<sup>2</sup> for surfaces)

**Contaminated linen:** Refers to linen that represents a substantial hazard to those who may be exposed to it. This includes linen from patients with cholera, dysentery, enteric fever, anthrax, plague, Ebola fever, Lassa fever, Marburg fever, smallpox and SARS. Linen which is grossly soiled with blood or other body fluids or excreta may be considered as contaminated and treated in the same manner

**Disinfectant:** A product that is used on surfaces or medical equipment/devices which destroys disease-causing pathogens or other harmful microorganisms but might not kill bacterial spores. Disinfectants are applied only to inanimate objects. Some products combine a cleaner with a disinfectant.

**Disinfection:** The inactivation of disease-producing microorganisms. Disinfection does not destroy bacterial spores. Medical equipment/devices must be cleaned thoroughly before effective disinfection can take place. See also, *Disinfectant*.

**Detergents** : remove organic material and suspend grease or oil.

**HAI:** healthcare associated infection

**Hand Hygiene:** A general term referring to any action of hand cleaning. Hand hygiene relates to the removal of visible soil and removal or killing of transient microorganisms from the hands. Hand hygiene may be accomplished using soap and running water or an alcohol-based hand rub (ABHR).

**Hand Washing:** The physical removal of microorganisms from the hands using soap (plain or antimicrobial) and running water.

**Health Care Setting:** This refers to hospitals and intermediate and long term care facilities

**Heat labile:** For linen, this refers to items which are not able to withstand thermal disinfections at temperatures  $>60^{\circ}\text{C}$

**Hospital Clean:** The measure of cleanliness routinely maintained in patient/resident care areas of the health care setting. Hospital Clean is '*Hotel Clean*' with the addition of disinfection, increased frequency of cleaning, auditing and other infection control measures in client/patient/resident care areas.

**Hotel Clean:** A measure of cleanliness based on visual appearance that includes dust and dirt removal, waste disposal and cleaning of windows and surfaces. Hotel clean is the basic level of cleaning that takes place in all areas of a health care setting.

**Safety Data Sheet (SDS):** A document that contains information on the potential hazards (health, fire, reactivity and environmental) and how to work safely with a chemical product. It also contains information on the use, storage, handling and emergency procedures all related to the hazards of the material. SDSs are prepared by the supplier or manufacturer of the material.

**Medical Equipment/Device:** Any instrument, apparatus, appliance, material, or other article, whether used alone or in combination, intended by the manufacturer to be used for human beings for the purpose of diagnosis, prevention, monitoring,

treatment or alleviation of disease, injury or handicap; investigation, replacement, or modification of the anatomy or of a physiological process; or control of conception.

**Micro-organism:** A microscopic organism which includes bacteria, viruses, fungi, algae, and protozoa;

**Occupational Health and Safety (OHS):** Preventive and therapeutic health services in the workplace provided by trained occupational health professionals, e.g., nurses, hygienists, physicians.

**Personal Protective Equipment (PPE):** Clothing or equipment worn by staff for protection against hazards.

**Reprocessing:** The steps performed to prepare used medical equipment for use (e.g., cleaning, disinfection, sterilization).

**Relative Light Units (RLU):** A unit for measuring cleanliness by assessing the levels of Adenosine Triphosphate (ATP). The intensity of the emitted light is proportional to the concentration of ATP.

**Used linen:** Refers to any linen which has been used in patient care without gross soiling

# Chapter 1      Infection Control and the Environment

Health care-associated infections (HAIs) are infections that occur as a result of health care interventions in any health care setting where care is delivered. Factors that increase the risk to patients/residents for the development of HAIs include:

- a. Advanced age
- b. Greater acuity
- c. Increasing numbers of immunocompromised clients/patients/residents
- d. Complex treatments
- e. Increasing antimicrobial use in hospitals and institutional health care settings, creating a large reservoir of resistant microbial strains
- f. Infrastructure repairs and renovations to aging hospitals and long-term care homes creating the risk of airborne fungal diseases caused by dust and spores released during demolition and construction.

In addition, overcrowding, understaffing and pressures to move more patients through the health care system can challenge completion of environmental cleaning.

## 1.1 Evidence for Cleaning

The potential for contaminated environmental surfaces to contribute to transmission of pathogens depends on the following factors: <sup>1,2</sup>

- a. Ability of pathogens to remain viable for prolonged periods of time on variety of dry environmental surfaces
- b. Ability of pathogens to remain virulent after environmental exposure
- c. Frequency with which they contaminate surfaces commonly touched by patients and healthcare workers

- d. Whether or not levels of contamination are sufficiently high to result in transmission to patients
- e. Relative pathogen resistance to disinfectants used on environmental surfaces (*C. difficile*, Norovirus)

Pathogens such as methicillin-resistant *Staphylococcus aureus* (MRSA), vancomycin-resistant enterococci (VRE) and *C. difficile* have the ability to remain viable on dry surfaces for days, weeks or even months.<sup>3</sup>

The environment of the health care setting has been shown to be a reservoir for infectious agents such as bacteria (e.g. MRSA, VRE, *C. difficile*, *Acinetobacter baumannii*, *Bacillus* spp.), viruses (e.g., influenza, Norovirus, Rotavirus) and fungi (e.g., *Aspergillus* spp., *Fusarium* spp., *Penicillium* spp.).

Environmental contamination may contribute to transmission when healthcare workers contaminate their hands or gloves by touching contaminated surfaces, or when patients come into direct contact with contaminated surfaces.<sup>4,5</sup> Scientific evidence suggests that environmental contamination plays an important role in the spread of MRSA and VRE, e.g., admitting a new patient to a room previously occupied by a MRSA- or VRE-positive patient significantly increases the risk of acquisition for MRSA or VRE.<sup>1,6,7</sup> Outbreaks have been brought under control with infection control measures that include enhanced cleaning.<sup>8,9,10,11</sup>

Health care facilities may be categorized into two components for the purposes of environmental cleaning:<sup>12</sup>

- a. ‘*Hotel component*’ is the area of the facility that is not involved in patient/resident care; this includes public areas such as lobbies and waiting

rooms, offices, corridors, elevators, stairwells and service areas. Areas designated in the hotel component are cleaned with a ‘*Hotel Clean*’ regimen.

- b. ‘*Hospital component*’ is the area of the facility that is involved in client/patient/resident care; this includes client/patient/resident units (including nursing stations), procedure rooms, bathrooms, clinic rooms, and diagnostic and treatment areas. Areas designated in the hospital component are cleaned with a ‘*Hospital Clean*’ regimen.

## **1.2 The Patient/Resident Environment and High-touch Surfaces in Health Care Settings**

Housekeeping surfaces can be divided into two groups – those with minimal hand-contact (e.g., floors, and ceilings) and those with frequent hand-contact (“high touch surfaces”).<sup>13</sup> Carling’s work has helped define 14 high touch surfaces / points that would require cleaning on a more frequent schedule than “minimal touch housekeeping services”.<sup>14</sup> These are:

### Patient Area

1. Tray table
2. Bedside table
3. Side rail
4. Call box
5. Telephone
6. Chair
7. Room door knobs

### Toilet Area

8. Sink

9. Toilet seat
10. Toilet handle
11. Toilet door knobs
12. Toilet hand hold
13. Bathroom light switch
14. Bedpan cleaner

Surfaces closer to the patient/resident pose a greater risk for transmission than those situated further away. Furthermore, frequently touched surfaces are more likely to harbor and transmit microbial pathogens. It would therefore, be cost-effective to concentrate cleaning resources on high risk, high touch surfaces.

#### **Recommendation**

- 1. Focus cleaning resources on high risk high touch surfaces as frequently touched surfaces are more likely to harbor and transmit microbial pathogens.***

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## **Chapter 2      Selection of Finishes and Surfaces in the Health Care Setting in Areas Where Care is Delivered**

Housekeeping surfaces require regular cleaning and removal of soil and dust. Health care facilities should have policies that include the criteria to be used when choosing furnishings and equipment for patient care areas. In general, the following factors are to be considered in these criteria:

- a. Choosing finishes, furnishings and equipment that are easily cleaned
- b. Ensuring compatibility of the health care setting's cleaning and disinfecting agents with the items and surfaces to be cleaned <sup>1,2</sup>

It is highly recommended that Infection Prevention and Control, Occupational Health and Safety and Housekeeping Services work collectively in decision making with respect to choices of furniture and finishing for facilities.

Attention is to be paid to the following when choosing finishes and surfaces: <sup>1,2</sup>

- a. Easy maintenance and repair e.g. sharp corners on floors are to be avoided, instead, rounded corners are recommended for easy cleaning and maintenance
- b. Fabrics used in upholstered furniture in patient care areas must be fluid-resistant, non-porous and able to withstand cleaning with hospital-grade disinfectants
- c. Choose materials that are less likely to support microbial growth e.g. plastic and metal. Wet organic substrates (e.g. wood) should be avoided in hospital areas with immunocompromised patients <sup>3</sup>

- d. Cloth items such as curtains, pillows, mattresses and soft furnishings should:
  - i. Be seamless where possible or have double-stitched seams;
  - ii. Be easily accessed for cleaning;
  - iii. Have removable covers for cleaning;
  - iv. Have foam cores that are resistant to mould;
  - v. Not be damaged by detergents and disinfectants;
  - vi. Be quick-drying; and
  - vii. Be maintained in good repair.
  
- e. Carpets are not recommended in areas where there is the likelihood of spills of contaminated liquids or alcohol-based hand rub. These include wards (particularly around sinks), and laboratory areas. Such liquids pose a flammability risk. Carpets should especially not be used in patient care areas housing immune compromised patients (e.g. burn units, intensive care units, operating rooms, transplant and oncology units) given the risk of infection from dust and particulates containing environmental microorganisms including fungi.<sup>4</sup>
  
- f. Plastic coverings, including mattress covers and pillow covers, should be cleaned with hospital approved cleaning agents on a regular basis and inspected for damage. Mattresses and pillow covers should be replaced when torn, cracked or have evidence of liquid penetration or are visibly stained.

## **2.1 Hospital Equipment**

Infection Prevention and Control should be consulted when purchasing new equipment. Factors to note include keypads and monitoring screens that can be easily cleaned and disinfected. Plastic skins may be effective to cover computer

keyboards, allowing ease of cleaning but must be compatible with the health care setting's cleaning and disinfecting products.

### **Recommendation**

- 1. It is highly recommended that Infection Prevention and Control, Occupational Health and Safety and Environmental Services work collectively in decision making with respect to choices of furniture and finishing for facilities.***

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## **Chapter 3      Cleaning Agents and Disinfectants**

Infection control aspects in housekeeping practices are important factors contributing to a safe and healthy environment in the hospital as well as at home. Although hand hygiene is important to minimize the impact of transmission of infections, cleaning and disinfecting of environmental surfaces is fundamental in reducing their potential contribution to the incidence of healthcare-associated infections (HAIs). “Routine cleaning is necessary to maintain a standard of cleanliness and the process must be effective and consistent”.<sup>2</sup>

### **3.1 Detergents and Cleaning Agents**

“Detergents” or “soaps” are cleaning agents that make no antimicrobial claims. Their cleaning activity can be attributed to their detergent properties, which result in removal of dirt, soil and various organic substances.

However the use of a detergent solution improves the quality of cleaning. Microorganisms may present as "visible dirt" which requires routine cleaning to help elimination.

### **3.2 Disinfectants**

The choice of disinfectant, its concentration, and exposure time are based on the risks for infection associated with use of the equipment and other factors discussed in this guideline. Since organic material will inactivate many disinfectants, it must be removed from surfaces before applying the

disinfectants.<sup>4</sup> Refer to Table 1 which illustrated a list of properties of an ideal disinfectant.

**Table 1 - Properties of an ideal disinfectant**

<b>Broad spectrum</b>	Should be active against many antimicrobial types
<b>Fast acting</b>	Should produce a rapid kill
<b>Not affected by environmental factors</b>	Should be active in the presence of organic matter (e.g. blood, sputum, faeces) and compatible with soaps, detergents, and other chemicals
<b>Nontoxic</b>	Should not be harmful to the user or patient
<b>Surface compatibility</b>	Should not corrode instruments and metallic surfaces and Should not cause the deterioration of cloth, rubber, plastics, and other materials
<b>Residual effect on treated surfaces</b>	Should leave an antimicrobial film on the treated surface Easy to use with clear label directions
<b>Odorless</b>	Should have a pleasant odor or no odor to facilitate its routine use
<b>Economical</b>	Should not be prohibitively high in cost
<b>Solubility</b>	Should be soluble in water
<b>Stability</b>	Should be stable in concentrate and use-dilution
<b>Cleaner</b>	Should have good cleaning properties
<b>Environmentally friendly</b>	Should not damage the environment on disposal

Adopted from CDC, 2008.

There are many commonly-used surface disinfectants listed in Table 2<sup>5,6</sup> which include alcohols, quaternary ammonium compounds (QATs), phenolics, chlorine compounds as well as two new approaches (refer to Table 3<sup>4</sup>) to room decontamination; ultraviolet irradiation and hydrogen peroxide (HP) systems.

**Table 2 - Types of Chemical Disinfectants**

Disinfectants	Recommended Use	Precautions
<p><b>Alcohol</b> e.g. Isopropyl, Ethyl alcohol, methylated spirit.</p>	<ul style="list-style-type: none"> <li>• Rapidly bactericidal, tuberculocidal, fungicidal, and virucidal but do not destroy bacterial spores.</li> <li>• Smooth metal surfaces, table tops and other surfaces on which bleach cannot be used.</li> <li>• Effectively to disinfect non- critical items such as oral and rectal thermometers, hospital mobiles, BP cuffs and stethoscopes etc.</li> </ul>	<ul style="list-style-type: none"> <li>• Flammable, toxic, to be used in cool and well- ventilated area, avoid inhalation.</li> <li>• To be kept away from heat sources. electrical equipment, flames, hot surfaces.</li> </ul>
<p><b>Quaternary Ammonium Compounds</b> e.g. Alkyl dimethyl benzyl ammonium chloride, Alkyl dimethyl ethylbenzyl ammonium chloride</p>	<ul style="list-style-type: none"> <li>• Commonly used in general environmental cleaning of noncritical surfaces, such as floors, furniture, and walls.</li> </ul>	<ul style="list-style-type: none"> <li>• Relatively non toxic and less corrosive</li> <li>• Dilutions in use may get contaminated and grow gram negative bacteria</li> </ul>

Disinfectants	Recommended Use	Precautions
<b>Phenolics</b> e.g. Benzyl-4-chlorophenol, Amylphenol, Phenylphenol	<ul style="list-style-type: none"> <li>• Effective and good for general use on vegetative bacteria, lipid containing viruses and <i>Mycobacterium tuberculosis</i>.</li> <li>• Have limited or no efficacy for use against spores or non-lipid viruses.</li> <li>• Use on environmental surfaces (e.g. locker, bedrails) and on noncritical medical devices.</li> </ul>	<ul style="list-style-type: none"> <li>• Phenolics should not be used to clean infant bassinets and incubators as hyperbilirubinemia in infants were reported.</li> <li>• If phenolics are used for terminal cleaning of infant bassinets and incubators, the surfaces should be rinsed thoroughly with water and dried before reuse of infant bassinets and incubators.</li> </ul>
<b>Sodium hypochlorite</b> [e.g. Sodium dichloroisocyanurate (NaDCC)]	<ul style="list-style-type: none"> <li>• Kills fast and has broad spectrum actions against a wide range of gram-negative and gram-positive bacteria and spores.</li> </ul>	<ul style="list-style-type: none"> <li>• PPE are required while handling and using undiluted</li> <li>• Corrosiveness to metals</li> <li>• Flammable, toxic, to be used in cool and well-ventilated area, avoid inhalation.</li> </ul>

**Table 3 – New technologies in room decontamination**

Type	Advantages	Disadvantages
<b>Ultraviolet (UV) light</b> <ul style="list-style-type: none"> <li>• Uses UV to decontaminate surfaces by reflecting UV from walls, ceilings, floors and calculates the operation total dosing/ time to deliver the programmed lethal dose for</li> </ul>	<ul style="list-style-type: none"> <li>• Reliable biocidal action against a wide range of pathogens</li> <li>• Room decontamination is rapid for vegetative bacteria (~15 mins)</li> <li>• Does not require to seal off the room</li> </ul>	<ul style="list-style-type: none"> <li>• Can only be done for terminal cleaning</li> <li>• All patients and staff must be evacuate from room</li> <li>• Does not remove dust and stains</li> <li>• Sensitive use parameters (e.g. UV dose delivered)</li> </ul>

Type	Advantages	Disadvantages
pathogens. <ul style="list-style-type: none"> <li>• Reduces colony count of pathogens by &gt;99.9% within 20 minutes.</li> </ul>	<ul style="list-style-type: none"> <li>• UV is residual free</li> <li>• Low operating cost as no consumable products</li> </ul>	
<b>Hydrogen peroxide (HP) System – Vapors/ mist.</b>  <ul style="list-style-type: none"> <li>• Using of dry mist technology</li> <li>• Offer uniform diffusion of HP solution even in hard-to reach and hidden areas.</li> </ul>	<ul style="list-style-type: none"> <li>• Reliable biocidal activity against wide range of pathogens</li> <li>• Residual free</li> <li>• Does not give rise to both health and safety concerns</li> </ul>	<ul style="list-style-type: none"> <li>• Only can be carried out for terminal cleaning</li> <li>• All personnel must be evacuated from room</li> <li>• Decontamination process takes approximately 2-5 hours</li> <li>• Substantial capital costs</li> </ul>

In summary, the selection of an ideal disinfectant usually depends on its effectiveness in destroying a specific organism. Studies have also shown that the human factor, frequency and duration of cleaning respectively also played a vital role in the entire cleaning process.

### Recommendations

- 1. Routine cleaning is necessary to maintain a standard of cleanliness.**
- 2. The selection of an ideal disinfectant will greatly depend on its effectiveness in getting rid of a specific organism.**
- 3. All chemicals should be properly labeled and stored to eliminate any potential risk of contamination and injuries<sup>7</sup>.**

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# Chapter 4      **Cleaning Best Practices for Patient Care Areas**

## **4.1    General Principle**

The primary purpose of ensuring best practices is to protect the patient/resident, staff and visitors in the healthcare facility by minimizing the possible spread of infections in the facility.

### **A      Resources for Environmental Cleaning**

There should be adequate resources to help achieve the prime objective of optimal cleanliness in the facility. These include:

- a. an assigned individual, who has appropriate certification e.g. Certificate of Competency (Healthcare), to be responsible for overall housekeeping of facility
- b. written policies and procedures for cleaning and disinfection of patient/resident areas and equipment that include:
  - i. Defined responsibility for specific items and areas;
  - ii. Clearly defined lines of accountability;
  - iii. Procedures for daily and terminal cleaning and disinfection;
  - iv. Procedures for cleaning in construction/renovation areas;
  - v. Procedures for specific environmentally-hardy microorganisms such as *C. difficile*;
  - vi. Procedures for outbreak management; and
  - vii. Cleaning and disinfection standards and frequency;
- c. Adequate manpower to allow thorough and timely cleaning and disinfection;
- d. Provision for additional environmental cleaning capacity during outbreaks that does not compromise other routine patient care cleaning;

- e. Education and continuing education of cleaning staff;
- f. Regular monitoring of environmental cleanliness

## **B Contracted Services**

When general housekeeping services are contracted out, the contract must clearly outline the infection control-related responsibilities. These should include not only the housekeeping procedures, but also the contracting agency's responsibility for employee health and mandatory training. Contract staff must work collaboratively with Infection Prevention and Control, Nursing and Occupational Health & Safety to ensure the safety of patients/residents, staff and visitors.

The following should be included in the legal agreement with the service provider:

- a. The Occupational Health and Safety policies of the contracting services must be consistent with the facility's Occupational Health and Safety policies as they relate to infection prevention and control, including immunization (including annual influenza vaccination); transparent sharing of information related to work place exposure incidents; access to staff health policies and measures related to Additional Precautions; and outbreak investigation and problem-solving, as required under the Ministry of Health.
- b. Recognition that ever-changing activity levels and cleaning protocols will potentially impact on the cost of service; contracts should support (without penalty or financial barrier) a proactive and cooperative environment to consistently implement appropriate cleaning measures; and
- c. There should be clear expectations regarding the levels of cleaning frequency and standards.

## **C Staffing Levels**

An adequately staffed Housekeeping Department is one of the most important factors that govern the success of environmental cleaning in a health care setting. Staffing levels must be appropriate to each department of the health care facility, with the ability to increase staffing in the event of outbreaks.

General staffing levels may be calculated by adding the average time taken for a worker to complete individual tasks. Average cleaning time is the normal time required for a qualified worker, working at a comfortable pace, to complete an operation when following a prescribed method. Education and training are important factors in determining average cleaning time; a new worker will not work at the same pace and as efficiently as an experienced worker. Written procedures and checklists for cleaning will assist in standardizing cleaning and disinfection times and will ensure that items are not missed during the cleaning.

Supervisory staffing levels must be appropriate to the number of staff involved in cleaning. Supervisory staffs have responsibilities to ensure staff training and compliance when using PPE. Supervisors are also responsible for training and auditing staff on cleaning procedures. Adequate supervisory staffing levels will help ensure that these requirements are being met.

The following factors should be considered when determining appropriate staffing levels for cleaning and supervisory staff in a health care setting:

### **a. Building Factors**

- i. Age of the facility – older buildings are harder to clean
- ii. Design of the facility – e.g. amount of walking required to complete a task

- iii. Size of the facility
- iv. Room temperature
- v. Exposure of facility to outside dust and soil, e.g. construction site
- vi. Type of floors and walls
- vii. Presence of carpet and upholstered furniture

**b. Occupancy Factors**

- i. Occupancy rate and volume of cases
- ii. Patient mix/type of care in the area (e.g. acute care, long-term care, clinic)  
vs. no care in the area (e.g. public area)
- iii. Frequency of cleaning required in an area (e.g. once daily vs. after each case)
- iv. Square metres to be cleaned in patient care areas
- v. Square metres to be cleaned in non-patient care areas
- vi. Admissions/discharges by unit/area – more rapid turnover requires a shorter turnaround time for rooms and equipment
- vii. Facility rates of VRE and *C. difficile* associated diarrhea – additional staff will be required due to extra cleaning and disinfection required for VRE and *C. difficile* as well as the requirement to put on and remove PPE
- viii. Additional Precautions rooms – extra time will be required to put on and remove PPE

**c. Equipment Factors**

- i. Type of cleaning tools/equipment available (e.g. automated floor cleaner vs. mop and bucket)
- ii. Method of cleaning (i.e. equipment, chemicals, materials and physical ergonomics) and placement of custodial closets

#### **d. Training Factors**

- i. Amount and level of training given to new staff will influence supervisory staffing levels
- ii. Auditing activities will influence supervisory staffing levels
- iii. Staff experience (inexperienced staff will work slower than experienced staff)

#### **e. Legislative Requirements**

- i. Amount of regulatory responsibility a supervisor may have

## **4.2 Frequency of Routine Cleaning**

The frequency of cleaning and disinfecting individual items or surfaces in a particular area or department depends on:

- a. Whether surfaces are high-touch or low-touch,
- b. The type of activity taking place in the area and the risk of infection associated with it (e.g., critical care areas vs. meeting room),
- c. The vulnerability of clients/patients/residents housed in the area,
- d. The probability of contamination based on the amount of body fluid contaminating surfaces in the area.

Using these criteria, each area or department in a health care setting may be evaluated and assigned a risk score for cleaning purposes, as illustrated in Table 2. Each score will relate to a particular level of routine cleaning frequency. If the activity or vulnerability of clients/patients/residents in an area changes, the risk score will change as well, impacting on the cleaning frequency.

## **A. Frequency of Contact with Surfaces**

All surfaces in a health care setting have the potential to harbor pathogenic microorganisms. The potential for exposure to pathogens is based on the frequency of contact with a contaminated surface and the type of activity involved. For example, a conference room table would have less potential for exposure to pathogens than the doorknob in a patient/room. High-touch surfaces will require a more frequent cleaning regimen.

Most, if not all, environmental surfaces will be adequately cleaned with soap and water or a detergent/disinfectant, depending on the nature of the surface and the type and degree of contamination. The process and products used for cleaning and disinfection of surfaces and medical equipment must be compatible with the surfaces/equipment.

The following designations should be used in the Risk Stratification Matrix (Table 2) to determine the frequency of cleaning.

### **a. High-touch Surfaces**

High-touch surfaces require more frequent cleaning and disinfection than minimal contact surfaces.<sup>1</sup> Cleaning and disinfection is usually done at least daily and more frequently if the risk of environmental contamination is higher (e.g. intensive care units).

### **b. Low-touch Surfaces**

Low-touch surfaces are those that have minimal contact with hands. Examples include floors, walls, ceilings, mirrors and window sills. Low-touch surfaces require cleaning on a regular (but not necessarily daily) basis, when soiling or spills occur,

and when a patient/resident is discharged from the health care setting. Many low-touch surfaces may be cleaned on a periodic basis rather than a daily basis if they are also cleaned when visibly soiled.

## **B. Vulnerability of the Patient/Resident Population**

Different populations of patients/residents have differing vulnerabilities based on their susceptibility to infection. In some populations, such as bone marrow transplant or burn patients, susceptibility to infection is very high and may be impacted by their environment. The frequency of cleaning may be higher in areas with vulnerable client/patient/resident populations.

The following designations should be used in the Risk Stratification Matrix to determine the frequency of cleaning (Table 2):

### **a. More Susceptible**

These are patients/residents who are more susceptible to infection due to their medical condition or lack of immunity. These include those who are immunocompromised (e.g. oncology patients; those in transplant and chemotherapy units; neonates; those who have severe burns, i.e. requiring care in a burns unit and those undergoing invasive or operative procedures (e.g. hemodialysis).

### **b. Less Susceptible**

For the purpose of risk stratification for cleaning, all other individuals are classified as less susceptible.

## **C. Probability of Contamination of Items and Surfaces in the Health Care Environment**

The probability that a surface, piece of equipment or care area will be contaminated is based on the activity in the area, the type of pathogens involved and the microbial load. Areas that are heavily soiled with blood or other body fluids will require more frequent cleaning and disinfection than areas that are minimally soiled or not soiled. (e.g. lounges, offices).

The following designations should be used in the Risk Stratification Matrix to determine the frequency of cleaning (Table 2).

### **a. Heavy Contamination**

An area is considered to be heavily contaminated if surfaces and/or equipment are exposed to copious amounts of blood or other body fluids (e.g. birthing suite, autopsy suite, cardiac catheterization laboratory, burns unit, hemodialysis unit, Emergency Department, bathroom if the patient/resident has diarrhea or is incontinent).

### **b. Moderate Contamination**

An area is considered to be moderately contaminated if surfaces and/or equipment are contaminated with blood or other body fluids as part of routine activity (e.g. client/patient/resident room, bathroom if client/patient/resident is continent) and contaminated substances are contained or removed (e.g. wet sheets). All patient/resident rooms and bathrooms should be considered to be, at a minimum, moderately contaminated.

### **c. Light Contamination**

An area is considered to be lightly contaminated or not contaminated if surfaces are not exposed to blood, other body fluids or items that have come into contact with blood or body fluids (e.g. lounges, libraries, offices).

## **D. Factors that will impact on environmental cleaning:**

### **a. Probability of contamination with pathogens**

#### **i. Heavy Contamination (score = 3)**

An area is designated as being heavily contaminated if surfaces and/or equipment are routinely exposed to copious amounts of fresh blood or other body fluids (e.g., birthing suite, autopsy suite, cardiac catheterization laboratory, haemodialysis station, Emergency room, patient/resident bathroom if visibly soiled).

#### **ii. Moderate Contamination (score = 2)**

An area is designated as being moderately contaminated if surfaces and/or equipment does not routinely (but may) become contaminated with blood or other body fluids and the contaminated substances are contained or removed (e.g. wet sheets). All patient/resident rooms and bathrooms should be considered to be, at a minimum, moderately contaminated.

#### **iii. Light Contamination (score = 1)**

An area is designated as being lightly contaminated if surfaces are not exposed to blood, other body fluids or items that have come into contact with blood or body fluids (e.g., lounges, libraries, offices)

## **b. Vulnerability of population to infection**

### **i. More Susceptible (score = 1)**

Susceptible clients/patients/residents are those who are most susceptible to infection due to their medical condition or lack of immunity. These include those who are immunocompromised (oncology, transplant and chemotherapy units), neonates (level 2 and 3 nurseries) and those who have severe burns (i.e., requiring care in a burn unit).

### **ii. Less Susceptible (score = 0)**

For the purpose of risk stratification for cleaning, all other individuals and areas are classified as less susceptible.

## **c. Potential for exposure**

### **i. High-touch surfaces (score = 3)**

High-touch surfaces are those that have frequent contact with hands. Examples include doorknobs, telephones, call bells, bedrails, light switches, wall areas around the toilet and edges of privacy curtains.

### **ii. Low-touch surfaces (score = 1)**

Low-touch surfaces are those that have minimal contact with hands. Examples include walls, ceilings, mirrors and window sills.

**Table 1 Frequency of cleaning based on risk stratification matrix**

Total risk score	Risk type	Minimum cleaning frequency
7	High	Clean after each case/event/procedure and at least twice per day Clean additionally as required
4-6	Moderate	Clean at least once daily Clean additionally as required (e.g., gross soiling)
2-3	Low	Clean according to a fixed schedule Clean additionally as required (e.g. gross soiling)

**Table 2 Example of frequency of cleaning risk stratification matrix in a facility**

Location	Probability of contamination	Potential for Exposure	Population	Total Score	Interpretation
	Light: 1 Moderate: 2 Heavy: 3	High-touch: 3 Low -touch: 1	Less susceptible: 0 More susceptible: 1		
Autopsy/mortuary	3	3	0	6	Clean at least once daily. Clean additionally as required (e.g. gross soiling)
Cardiac catheterization and angiodynography area	2	3	1	6	Clean after each case/event/procedure and at least twice daily Clean additionally as required (e.g. gross soiling)
Emergency room - trauma room	2	3	1	6	Clean after each case/event/procedure and at least twice daily Clean additionally as required (e.g. gross soiling)
ICU	2	3	1	6	Clean after each case/event/procedure and at least twice daily Clean additionally as required (e.g. gross soiling)
Laboratory	3	3	0	6	Clean at least once daily Clean additionally as required (e.g. gross soiling)
Patient/resident room	2	3	1	6	Clean at least once daily Clean additionally as required (e.g. gross soiling)
Physiotherapy	1	3	0	4	Clean at least once daily Clean additionally as

					required (eg. gross soiling)
Public areas: corridors, elevators, stairwells, lobbies	1	1	0	2	Clean according to a fixed schedule Clean additionally as required (e.g. gross soiling)
Resident activity room (ILTC)	2	3	0	5	Clean at least once daily Clean additionally as required (e.g. gross soiling)

### 4.3 Equipment

Non-critical medical equipment that is within the patient/resident's environment and shared by patients/residents (e.g. imaging equipment, electronic monitoring equipment, commode chairs) requires cleaning and disinfection after each use. Selection of new equipment must include consideration for effective cleaning and disinfection needs. The health care setting should have written policies and procedures for the appropriate cleaning and disinfection of equipment that clearly define the frequency and level of cleaning and which assigns responsibility for cleaning. A system should be in place to clearly identify equipment which has been cleaned and disinfected.

#### Recommendations

1. ***Adequate resources must be devoted to Housekeeping Services in all health care settings to ensure:***
  - a. ***Single individuals with assigned responsibilities;***
  - b. ***Written procedures for cleaning and disinfection of care areas and equipment that include:***
    - i. ***Defined responsibility for specific items and areas;***
    - ii. ***Clearly defined lines of accountability;***
    - iii. ***Procedures for daily and terminal cleaning and disinfection;***



## References

1. Sehulster L, Chinn RY. Guidelines for environmental infection control in health-care facilities. Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). MMWR Recomm Rep 2003;52(RR-10):1-42. Available from:  
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# **Chapter 5     Routine   Cleaning   and   Disinfection**

## **Methods**

Routine cleaning and disinfection are necessary to maintain a standard of cleanliness, reduce microbial contamination and control or minimize the spread of infectious agents from infected patients to other patients or hospital personnel. The criteria to determine the frequency of cleaning and disinfecting individual items or surfaces in a particular area or department via the use the Risk Stratification Matrix had been addressed in Chapter 4. This chapter addresses the cleaning and disinfection practices for high-touch items and surfaces that are more prone to contamination in direct patient care areas.

### **5.1     General Principles**

#### **A.     Personal Safety / PPE**

Every cleaning staff must be trained on personal protection/safety and comply with the instruction. Failure to comply with instructions will increase the risk for the cleaning staff and causing an accident which harms themselves or others. The cleaning staffs have a responsibility to co-operate with the employer by working safely and efficiently. Hand hygiene is to be observed at all times and the PPE to be worn must comply with the institution's policy.

#### **B.     Cleaning Equipment, Material and Chemical**

The cleaning staff shall check the availability of the necessary cleaning equipment, material and chemical before commencing cleaning.

#### **C.     Cleaning Chemical Contact Time**

The cleaning staff shall allow adequate contact time, as per the manufacturer's recommendation, after the application of the cleaning chemical onto the surfaces.

#### D. Cleaning Sequence

The cleaning is performed from the least contaminated to the most contaminated item and the cleaning of Isolation rooms is performed after completion of cleaning all the non-Isolation rooms.

## 5.2 Routine Cleaning and Disinfection Methods

**Table 1 Frequency of routine cleaning**

S/N	CLEANING METHOD	HIGH-TOUCH	LOW-TOUCH	MINIMUM CLEANING FREQUENCY
1.	Routine Bed Cleaning	Bed Rails		At least once daily
		Control Panel		
		Call Bell		
		Cardiac Table		
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
2.	Routine Bed Cleaning (On Contact Precautions)	Bed Rails		At least once daily
		Control Panel		
		Call Bell		
		Cardiac Table		
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
		Main Door Knob		
		Tap Head		
3.	Discharged Bed Cleaning	Bed Rails	Bed Frame	Upon bed discharge
		Control Panel	Mattress	
		Call Bell	Wall	
		Cardiac Table		
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
4.	Discharged Bed Cleaning (On Contact Precautions)	Bed Rails	Bed Frame	Upon bed discharge
		Control Panel	Mattress	

		Call Bell	Wall	
		Cardiac Table	Ceiling	
		Bedside Locker		
		Chair		
		Switches		
		Telephone		
		Tap Head		
5.	Toilet cleaning	Switches		At least once daily
		Main Door Knob		
		Tap Head		
		Grab Bar		
		Cubicle Door Knob		
		Flushing Button		
		Toilet Seat Cover		

### **Recommendations**

- 1. Every cleaning staff must be trained on personal protection/safety and comply with instructions.**
- 2. The cleaning staff shall allow adequate cleaning chemical contact time, as per the manufacturer's recommendation, after the application of the cleaning chemical onto the surfaces.**
- 3. The cleaning is performed from the least contaminated to the most contaminated item and the cleaning of isolation rooms is performed after completion of cleaning all the non-isolation rooms.**
- 4. High-touch and low-touch surfaces and the cleaning frequency for direct patient care areas should be identified.**

### **References**

1. Centres for Disease Control and Prevention, Healthcare Infection Control Advisory Committee. Guidelines for Environmental Infection Control in Health-Care Facilities, 2003.
2. PIDAC – Best Practices for Environmental Cleaning for Prevention and Control of Infections (December 2009)

## **Chapter 6      Cleaning Food Preparation Area**

Food Preparation areas should be kept clean at all times. Institutions should implement systems on frequency of cleaning and periodically conduct audits to ensure a clean environment during food preparation.

### **Cleanliness of appliances, Crockery, Utensils and Receptacles**

- All crockery, utensils, receptacles and food-contact surfaces used in the preparation, serving, display, or storage of food must be thoroughly clean without any stains or food residue. These should be replaced periodically.
- All appliances used must be kept in good working condition. Staff should periodically look for and replace any appliances, crockery, utensil or receptacle which is chipped, broken, cracked or damaged.
- Knives, meat mincers and cutting boards should be cleaned regularly after each use and wooden chopping boards must be free of loose fragments, with a more thorough cleaning performed after cutting any raw meat, fish or poultry products to prevent cross-contamination.<sup>3</sup>
- All appliances, crockery, utensils and receptacles should be stored in a dry clean area where the food-contact surfaces are protected from dust and other potential sources of contamination.
- All appliances, crockery, utensils and receptacles (including ice makers and ice storage receptacles) should be located away from exposed or unprotected sewage lines, leaking water pipes, or open stairwells that may lead to potential contamination.
- Keep ice-making machines clean at all times. Ice storage compartments must be emptied and cleaned once a week. Remove all ice and clean all surfaces with soap or detergent solution. During cleaning inspect the gaskets, door tacks and guides.<sup>3</sup>

- Pest control services must be engaged to check on all food preparation areas for public health and hygiene purposes.<sup>1</sup>

### **Disposal of refuse and food waste**

Any area designated for the disposal of refuse and food waste should be properly designed such that they are rat-proof, sheltered from weather elements and easy to clean with proper drainage fittings. All food waste should be discarded in sealed containers.

### **Renovation, Construction and Containment**

All institutions should ensure adherence with their Infection Control Policy for any renovation or construction within the premises. Education programs for facilities and construction workers, health-care staff caring for high-risk patients and persons responsible for controlling indoor air quality heightens awareness that minimizing dust and moisture intrusion from construction sites into patient care areas helps to maintain a safe environment.<sup>1</sup> Housekeepers should perform final cleaning upon completion of construction for newly constructed or renovated areas before allowing patients to enter the areas.

### **Recommendations**

- 1. Institutions should implement systems on frequency of cleaning and periodically conducts audits to ensure a clean environment during food preparation.***
- 2. All food waste should be discarded in a sealed container.***
- 3. All institutions should follow the individual hospital Infection Control Policy for precautions relating to any renovation or construction within the premises.***

## References

1. Centers for Disease Control and Prevention. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC).  
MMWR 2003;133-136
2. APIC Text of Infection Control and Epidemiology, 2009, Environmental Services, pp. 100-1 to 100-13.
3. Food Hygiene Guidelines, <http://www.nea.gov.sg>. Accessed June 11, 2012.

## Chapter 7      Assessment of Cleanliness and Quality Control

Housekeeping is responsible to ensure that the quality of cleaning maintained in the health care setting meets appropriate infection prevention and control best practices. The responsibility for ensuring that the standardized cleaning practices are adhered to lies not just with the person performing the task but also with the direct supervisor and management of the department or agency providing the cleaning service. It is important to incorporate elements of quality improvement into an enhanced cleaning program, including monitoring, audits and feedback to staff and management.<sup>1-5</sup>

The role of an enhanced cleaning program should be carefully considered for hospitals. There are several benefits of an enhanced compared to a conventional program (outlined in table 1).<sup>1-5</sup>

**Table 1      A comparison of the elements of conventional environment hygiene monitoring with enhanced programs<sup>1</sup>**

Conventional Program	Enhanced Program
<ul style="list-style-type: none"> <li>• Subjective Visual Assessment</li> <li>• Deficiency approach</li> <li>• Episode evaluation</li> <li>• Problem detection feedback</li> <li>• Open definition of correctable solutions</li> </ul>	<ul style="list-style-type: none"> <li>• Objective quantitative assessment</li> <li>• Performance oriented</li> <li>• Ongoing cycle monitoring</li> <li>• Objective performance feedback</li> <li>• Goal focused structured process improvement model</li> </ul>

Monitoring should be an ongoing activity built into the routine cleaning regimen. Periodical monitoring should take place immediately after cleaning to ensure that the cleaning has been carried out to an appropriate and agreed standard. Data from monitoring should be retained and used in trend analysis and compared with benchmark values that have been obtained during the validation of the cleaning program.

Checklists and audit tools will assist supervisory staff in monitoring and documenting cleaning and disinfection. Result feedback to Housekeeping staff has been shown to increase motivation and engagement with resulting improvements in cleaning scores<sup>3</sup>.

Auditing the cleanliness of the health care setting periodically and whenever changes to methodologies are made is essential to ensure that achievable standards are maintained and consistent over time<sup>1-7</sup>.

Audits should:

- a) Be measurable;
- b) Highlight areas of good performance;
- c) Facilitate positive feedback;
- d) Identify areas for improvement; and
- e) Provide a measurement that may be used as a quality indicator.

Measures of cleanliness, as applied to each item in the health care setting, ensure a consistent, uniform interpretation of what is considered to be clean. Measures of cleanliness are used for:

- a) Training new Housekeeping staff;
- b) Feedback for Housekeeping staff;
- c) Conducting cleaning audits; and
- d) Ensuring that cleaning expectations are clear and achievable for all staff.

There are several methods of evaluation available to determine if effective cleaning has been implemented, including observation of the environment following cleaning and other newer technologies:

- a. Direct and indirect observation (e.g., visual assessment, observation of performance, patient/resident satisfaction surveys);
- b. Residual bioburden (e.g., environmental culture, adenosine triphosphate – ATP bioluminescence); and
- c. Environmental marking tools (e.g. fluorescent marking).

The advantages and limitations of various monitoring approaches and tools must also be considered. As summarized in Table 2 and described below, there are several systems that may be potentially useful for enhanced programmatic monitoring.<sup>1, 3, 6-16</sup>

**Table 2 Summary of 5 different methods used in evaluating environmental hygiene<sup>1</sup>**

<b>Method</b>	<b>Ease of Use</b>	<b>Identifies Pathogens</b>	<b>Useful for Individual Teaching</b>	<b>Directly Evaluates Cleaning</b>
<b>Covert Observation</b>	Low	No	Yes	Yes
<b>Swab Cultures</b>	High	Yes	Not studied	Potentially
<b>Agar Plate cultures</b>	Good	Limited	Not studied	Potentially
<b>Fluorescent gel</b>	High	No	Yes	Yes
<b>ATP system</b>	High	No	Yes	Potentially

## **7.1 Direct and Indirect Observation**

Observation of the cleaned environment and of the individuals doing the cleaning may be accomplished directly with the use of checklists and other monitoring tools completed by supervisory or other trained staff; or indirectly, as feedback from clients/patients/residents based on their 'perceptions' of cleanliness. Both of these methodologies have been standardized but quantification of results is difficult.

### **A. Visual Assessment**

Commonly accepted measures of cleanliness rely on visual assessment following cleaning as an indicator of cleanliness. This however has been shown to be an unreliable indicator to assess actual microbial contamination.

A visually clean surface may not be microbiologically or chemically clean. Visibly clean surfaces are free from obvious visual soil; chemically clean surfaces are free from organic or inorganic residues.

Visual assessment must be quantified in order to make it usable for auditing purposes. Malik et al<sup>17</sup> provides an example of a scoring system used for visual assessment (see Table 3).

**Table 3 Example of a Scoring System for Visual Assessment<sup>3</sup>**

<b>Quantification of Visual Assessment Techniques</b>	<b>Example – 25 items inspected:</b>
<b>Record a site as clean if the dust, debris and soil are absent</b>	Clean = 20 items
<b>Record a site as clean if the dust, debris and soil are present</b>	Dirty = 5 items
<b>Calculate the cleaning rate as a percentage</b>	Cleaning Rate = 80% of items

The pass rate for visually clean surfaces will vary with the type of activity taking place in the area.

### **B. Observation of Individual Performance**

Visual observation of individuals should be done by trained observers on a routine basis to ensure consistency and reproducibility of observations and evaluations over time. Timely feedback and refresher training should be provided to the observed individual and should become incorporated in the individual's performance review.

Advantages of visual observation when performed using consistent criteria and feedback to staff include:

- a) ease of implementation and maintenance;
- b) cost-effectiveness;
- c) durability of results;
- d) staff engagement;

Disadvantages of visual observation include:

- a) difficulty in standardizing the methodology;
- b) labour intensive; and
- c) results might be impacted by the Hawthorne effect

Checklists and other audit tools may be used on a regular basis by supervisory staff to assess the level of cleanliness and adherence to the standardized practices.

### **C. Patient/Resident Satisfaction Surveys**

The results of Patient/Resident Satisfaction Surveys are an indication of the perception of the services and of the environment in which they are serviced. Perceptions are not always indicative of the services that have been provided nor are perceptions always indicative of the state of the environment in which those services are provided.<sup>3</sup>

If surveys are used as an audit tool, the responses to questions must be measurable (e.g., 'yes' for a positive response, 'no' for a negative response); there must be a benchmark/baseline that is used for comparison/assessment (e.g., data from previous surveys); and there should be standardized delivery of the survey (e.g., collect survey data for the same two-week period each year from clients/ patients/ residents on the same unit, then compare percentage of positive responses to those of previous years).<sup>3</sup>

## **7.2 Measures of Cleanliness: Residual Bioburden**

Microbiologically clean surfaces are those with a microbial load that is at an acceptable level (i.e., below the level required for transmission, if known). Assessing the residual bioburden, i.e., the actual bacterial and viral load that remains on an item or surface following cleaning is not recommended except under specific circumstances.

## **A Environmental Culture**

Routine environmental cultures in health care settings are neither cost-effective nor generally recommended.

### **Benchmarking environmental cultures:**

- There is no clear evidence on what is the accepted international standards for “microbial clean”<sup>1</sup>
- Current evidence proposes that microbial counts should be  $\leq 2.5$  CFU/cm<sup>2</sup>.<sup>1</sup>

### **Methods of measuring:**

There are two methods for measuring surface contamination:

- Aerobic colony count (ACC): monitors total number of bacteria
- Indicator organisms: look at key pathogens e.g. *S. aureus* or MRSA – recommended (but not internationally accepted guidelines)  $< 1$  cfu/cm<sup>2</sup>

### **Methods of culture:**

- Moistened swab underestimates colony counts compared with press plates/RODAC plates.

The presence of a particular microorganism on an environmental surface does not confirm it as the cause of a patient/resident infection, even if it is the same strain. Decisions to conduct environmental sampling must be made in collaboration with the Microbiology laboratory.

## **B ATP Bioluminescence**

Adenosine triphosphate (ATP) is a chemical substance that is present in all living cells, including bacteria and viruses. Detection of this substance would indicate that

organic material is still present on an object or surface. ATP detection involves the use of an enzyme and substrate from the firefly which is combined with ATP picked up from the environment on a swab. The resulting bioluminescence or output of light may be measured using a sensitive luminometer. Results are expressed as Relative Light Units (RLU).<sup>3, 12-16</sup>

ATP bioluminescence is a quantitative method rather than a qualitative method of detection, which reflects the amount of bioburden rather than the type of bioburden present. ATP testing can be used to provide instant feedback on surface cleanliness, demonstrating deficiencies in cleaning protocols and techniques to staff. It may also be used for the evaluation of novel cleaning methods such as steam cleaning and microfibre cloths. Disadvantages include that non-specific elevation of RLU readings occur with residual organic soil, dead bacteria and use of bleach. RLU measurements do not correlate precisely with microbial counts; however, higher microbial counts are associated with higher RLU readings.

*Note: Benchmark values of 250 RLU to 500 RLU have been proposed. Additional studies from multiple health care settings are needed before an ATP bioluminescence threshold indicating adequate surface cleanliness can be established.*<sup>3 10-16</sup>

### **7.3 Measures of Cleaning: Environmental Marking**

Environmental marking measures the thoroughness of cleaning using a surrogate marking system. It involves the use of a colorless solution that is applied to objects and surfaces in the client/patient/resident environment prior to cleaning, followed by detection of residual marker (if any) immediately after cleaning, usually involving fluorescence under ultraviolet (UV) light.

Solutions used as markers must be environmentally stable, dry quickly, be easily removed with light cleaning and be invisible in regular room light but be easily visualized using other means. The marker solution is applied to high-touch surfaces in patient/resident rooms prior to cleaning, then evaluated to see if the solution was removed by the cleaning. Environmental marking may be used either on a daily basis to assess routine cleaning, or prior to discharge to assess terminal cleaning.<sup>3, 10-16</sup>

This methodology may be quantified:

- a) by calculating the percentage of marked objects/surfaces that were cleaned in a particular room or area; or
- b) by deriving a cleaning score (e.g., 3 = heavy fluorescence, 2 = moderate fluorescence, 1 = light fluorescence, 0 = no fluorescence).<sup>3</sup>

### **Recommendations**

- 1. *There should be a process in place to measure the quality of cleaning in the health care setting.***
- 2. *Methods of auditing should include both visual assessment and if possible one of the following tools: residual bioburden or environmental marking.***
- 3. *Results of cleaning audits should be collated and analysed with feedback to staff.***
- 4. *An environmental action plan should be developed to identify and correct cleaning deficiencies.***

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## Chapter 8 Laundry and Bedding

### Introduction

Linen may become contaminated by blood, body fluids or excreta and by skin shedding. Hospital linen thus poses an infection risk to staff during handling on the ward, during transport or processing at the laundry.<sup>1-5</sup>

Linen may also be an infection risk to patients by returning potential pathogens to the immediate patient environment if inadequately laundered or allowed to become recontaminated.<sup>1-5</sup>

Although pathogenicity from linen is thought generally to be low, nosocomial outbreaks related to linen and laundering have been reported for *Streptococcus pyogenes*, *Salmonella enterica*, methicillin-resistant *Staphylococcus aureus*, vancomycin-resistant Enterococci, *Acinetobacter baumannii*, *Pseudomonas aeruginosa*, *Bacillus cereus*, mucormycosis, gastrointestinal viruses, hepatitis A and scabies.<sup>6-16</sup>

Safe handling practices are required to prevent unnecessary exposure to infection from soiled or infectious linen.<sup>5,6</sup> Washing practices must be sufficient to remove potential pathogens from linen including enveloped viruses and vegetative bacteria.<sup>3,5,7</sup> Under specific circumstances, it may be required to ensure spore forming organisms are also removed from linen.<sup>5</sup> Laundry cleaning and hygiene practices must prevent microbial recontamination of washed linen.

## **8.1 Linen handling**

### **A General:**

- a. Care must be taken to ensure all sharps or patient equipment is removed from linen. Injury from sharps hidden in linen is a significant risk for environmental services workers and laundry staff.
- b. Staff should wear gloves and apron during linen handling. Any skin lesions on hands must be covered. Masks are not required. Hand hygiene must be practiced after linen handling.
- c. To minimize aerosolization of any organisms contaminating linen, linen should not be rinsed, shaken or sorted in the clinical area.
- d. Do not place used linen on the floor or any other surfaces.
- e. Do not re-handle used linen once bagged.
- f. Do not overfill linen bags.
- g. Beds and mattresses should be wiped down according to hospital infection control policies.

### **B Used linen:**

- a. Used linen should be placed in identifiable linen bags at the point of use. Linen bags may be colored or have other markings which identifies the bag as containing used laundry.

### **C Contaminated linen:**

- a. Contaminated linen should be placed into specifically identifiable bags at point of use. These bags should be colored or have markings indicating that they contain potentially infectious linen. Bags should be impervious to fluids to prevent any leakage of infectious material. The bag should be placed into a secondary container for transport.

**D Heat labile linen:**

- a. Heat labile linen should be placed into marked linen bags and handled as above.

## **8.2 Laundry process**

**A Handling at laundry**

- a. Linen should be sorted for washing by laundry staff wearing gloves and aprons. Masks are not required but any lesion on hands must be covered. Laundry staff should receive instruction in proper use of personal protective equipment and hand hygiene.
- b. There must be a workflow which includes physical separation of dirty linen from that which has already been cleaned.

**B Wash protocol**

- a. Heat stable:
  - Linen should be washed according to minimum requirements as outlined in international guidelines<sup>3, 16</sup>
  - Temperature and time requirements must include time for mixing and penetration into large loads.
  - Temperature must achieve >65°C for at least 10 minutes, minimum cycle time 14 minutes for low loading or 18 minutes for high loading; or preferably 71°C for at least 3 minutes, minimum cycle time 7 minutes for low loading or 11 minutes for high loading.
- b. Contaminated:
  - Requirements outlined above will eliminate most infectious agents with the exception of spore forming organisms. If removal of spore forming organisms is necessary, chemical disinfection with sodium

hypochlorite to achieve a free chlorine concentration of >180 ppm in the second rinse is recommended.<sup>12</sup>

- If linen is heavily soiled, a sluice cycle should be used before the disinfectant cycle.

c. Heat labile:

- Heat labile fabrics should be processed separately using chemical disinfection (e.g. sodium hypochlorite at >150 ppm free chlorine) at low temperature.
- No recommendation is made regarding disinfecting agent for usual laundry requirements.

## **C Drying**

- a. Workflow must ensure separation of washed from unwashed linen. Handling of washed linen should prevent re-contamination.

## **D Laundry cleaning and maintenance**

- a. Cleaning and disinfecting of all working areas including technical equipment, storage shelves should be performed on a regular basis and records kept.
- b. Temperature gauges should be regularly checked and calibrated. Volumes, concentrations and expiry dates of disinfectants used should be monitored. Daily records should be maintained.
- c. Written quality control system should be introduced and regularly monitored. Control measures should include risk of cross-transmission, temperature, disinfectants (including concentration).
- d. Servicing of equipment should be performed to manufacturers' recommendations

- e. Water should not be allowed to be stored overnight in a continuous batch tunnel washer. If down time of more than three hours occurs, thermal disinfection is recommended prior to use.

### **8.3 Linen storage and transport**

- a. Clean linen should be packaged, stored and transported in such a way as to protect it from contamination. This includes physical separation on different trolleys/areas from unwashed linen (used/contaminated linen) during transport, loading/unloading and storage.
- b. A designated area for clean linen must be provided. This should be designed in such a way as to protect linen from re-contamination.

### **8.4 Microbial testing of linen**

Testing of linen for viable micro-organisms is not recommended routinely. It is preferred to monitor time and temperature parameters of washing. If sampling is performed, it should be noted that no internationally accepted guidance for safe bacterial count has been made. A 6 log reduction in total colony count after washing and drying has been suggested. Alternatively, bacterial counts of  $\leq 1-2$  colony forming unit (CFU)/10 cm<sup>2</sup> have been proposed to indicate adequate microorganism removal. It should be noted that surface/contact sampling of linen yields lower bacterial counts than immersion method, but is easier to perform and does not damage sampled items.<sup>3-5,7,15</sup>

## **Recommendations**

- 1. *Safe handling of linen is required to prevent exposure of environmental services workers and laundry staff to infection risk.***
- 2. *Knowledge of personal protective equipment, hand hygiene and safe work practices is required.***
- 3. *The aims of washing hospital linen must also include neutralization or eradication of infectious agents.***
- 4. *Care must be taken to prevent recontamination of clean linen prior to re-use.***

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## **Chapter 9      Care and Storage of Cleaning supplies and Cleaners' rooms**

### **9.1 Cleaners' Room**

These rooms should be provided throughout the facility to maintain a clean and sanitary environment. Ideally there should be at least one room per patient/resident floor dedicated for the cleaner to perform housekeeping duties and should not be used for other purposes. The room should be well ventilated and the size is determined by the number of rooms to be cleaned and amount of equipment stored<sup>1</sup>

#### **Care & Storage of cleaning supplies**

1. The size of the room should be appropriate to the amount of materials, equipment, machinery<sup>2</sup> and chemicals stored within the room and utilized in accordance with Occupational Health & Safety guidelines.<sup>3</sup>
2. Rooms should be well ventilated with suitable lighting. Locks should be fitted to doors.<sup>3</sup>
3. Rooms should be easily accessible in relation to the area it serves and free from clutter to enable cleaning of work surfaces.<sup>2</sup>
4. Rooms should be inspected on a regular basis to ensure is maintained in accordance with good hygiene practices.
5. PPE such as eye protection, gloves and gowns should be available for use. They should be stored in clean cupboards and not open racks where contamination is possible.
6. Room should have an appropriate water supply and a slop hopper, deep sink and hand wash basin/floor drain.
7. Room should not contain personal supplies, food or beverages.<sup>2</sup>

8. Room should have safe chemical storage and access. All chemicals and materials should be stored above the floor on appropriate shelving at accessible height.
9. Cleaning and disinfection equipment should be well maintained, in good repair and be cleaned and dried between uses.
  - i) Automated dispensing systems are preferred over manual dilution for accurate calibration.
  - ii) Disinfectants should be dispensed into clean, dry, appropriately-sized bottles clearly labeled and dated. No top up is allowed and it should be discarded after the expiry date.
  - iii) Safety Data Sheet (SDS) should be easily available in case of accidents.<sup>3</sup>
  - iv) Mop heads should be laundered daily and dried thoroughly before storage.
  - v) Cleaning carts should have a clear separation between clean and soiled items, should never contain personal items and should be thoroughly cleaned at the end of the day.<sup>2</sup>

## **9.2 Soiled utility rooms**

Each patient/resident care area should be equipped with a room that may be used to clean soiled patient/resident equipment that is not sent for central reprocessing. The soiled utility rooms should be separate from and have no connection with the clean utility/clean supply rooms.<sup>2</sup>

Guiding principles to minimize the risk of infection transmission in clinical areas that generate soiled equipment, soiled linen and waste:

1. The soiled utility room should provide adequate space for:
  - i) waste receptacles and soiled linen receptacles
  - ii) storing and transporting soiled linen in covered leak proof containers.

iii) equipment and products for cleaning and sanitizing bedpans, urinals, and basins.

iv) closed cupboards or covered bins for containing clean supplies such as bedpans, urinals, basins, incontinence supplies, and lab supplies such as urine dipsticks, specimen containers.

\*If closed cupboards are not available, ensure open shelves are located away from “splash risks” around sinks, and bedpan sanitizers.

v) PPE are available and accessible to protect staff during cleaning and disinfecting procedures<sup>2</sup>.

2. Hand washing sink with soap and towel dispensers.
3. No supplies stored on the floor or under sink, it should be stored 15 cm from the floor<sup>5</sup>.
4. Protect supplies from dust and moisture; no outer warehouse or shipping boxes are allowed<sup>5</sup>.
5. A work counter and clinical sink with a hot and cold mixing faucet is required. If a soiled utility room is used only for temporary holding of soiled materials, the work counter and clinical sink is not required; however, facilities for cleaning bedpans must be provided elsewhere. Soiled utility rooms/workrooms should not be used to store unused equipment.<sup>4</sup>

Items that can be stored in Soiled Utility Room include:

1. Cleaning supplies and products readily available for non-housekeeping staff.
2. Soiled equipment, soiled laundry.
3. PPE to wear while cleaning items including eye protection, masks, fluid resistant apron, household gloves.
4. General and biohazardous waste containers.

Items that should not be kept in a Soiled Utility room include:

1. Skin antiseptics/cleansers.
2. Personal hygiene supplies (soaps, mouth care products, lotions).
3. Sterile items such as wound dressings.
4. Items cleaned after use, e.g. commodes should to be stored elsewhere.
5. In long-term care homes, cleaning carts shall be equipped with a locked compartment for storage of hazardous substances. Each cart shall be locked at all times when not attended.

### **Recommendations**

- 1. Clean utility room should be separated from soiled utility room.**
- 2. All chemical cleaning agents and disinfectants should be appropriately labeled and stored in a manner that minimize the risk of contamination, inhalation, skin contact or personal injury.**
- 3. MSDS must be readily available for each item in case of accidents.**
- 4. Automated dispensing system is preferred to ensure integrity of dilution ratios. If a refillable bottle is filled with a disinfectant solution, it should never be topped up with fresh disinfectant. Always use a clean, dry, appropriately-sized bottle, label the product and date it. The product should be discarded when past the expiry date for stability.**

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## **Chapter 10    Education**

All housekeepers must undergo a documented orientation session.<sup>2</sup> The training should be completed before new staff members are allowed to work without direct supervision.

The orientation program should include cleaning techniques, highlighting on the high touch areas, cleaning agents and infection control practices e.g.: blood borne pathogens, isolation precautions and standard precautions, N95 particulate respirator and waste disposal. As a minimum, training must be given in the performance of cleaning tasks, the use of cleaning equipment, control of infection, employee health, manual handling, fire, health and safety and site orientation.<sup>2</sup>

All educational programs for housekeepers should be geared to the education level of the workers and their English proficiency.<sup>2</sup> The program is also recommended to be delivered in different languages with the use of visual aids, demonstrations, repetition, and hands-on training. Trainers for the education programs, whether external professionals or supervisory staff, should be appropriately qualified.

All housekeepers are recommended to undergo performance improvement program and competency testing program.<sup>2</sup> Staff should be assessed on their competency after the training to evaluate their level of understanding. The training should be repeated in its entirety every year for the housekeepers or sooner if a competency issue has been identified. All housekeepers are recommended to have written training records that are signed and dated by the trainer and trainee.

## **Recommendations**

- 1. All housekeepers must undergo a documented orientation session.**
- 2. All housekeepers are recommended to have written training records that are signed and dated by the by the trainer and trainee.**

## **References**

1. Centers for Disease Control and Prevention. Guidelines for environmental infection control in health-care facilities: recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC).  
MMWR 2003;133- 136
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# **Chapter 11 Occupational Health and Safety Issues**

## **Related to Environmental Services**

Due to fact that cleaning staff are working in healthcare facilities, the risk of exposure to infectious diseases exists. Hence, occupational health and safety issues include staff immunization, appropriate use of Personal Protective Equipment (PPE), staff exposures to blood and body fluids and other infection hazards, and staff safety issues.

### **11.1 Immunization (Protection) of cleaning staff**

Appropriate immunization will include:

- a) annual influenza vaccine
- b) hepatitis B vaccine as they may be exposed to contaminated sharps during work.

Contracts with supplying agencies should include the above immunizations for contracted staff.

### **11.2 Personal Protective Equipment (PPE)**

PPE shall be provided for all cleaning personnel, and replaced when defective.

Cleaning staff should wear PPE:

- a) For protection from microorganisms;
- b) For protection from chemicals used in cleaning; and
- c) To prevent transmission of microorganisms from one patient environment to another.

Training is to be provided in the correct use, application and removal of PPE.

PPE to be used to protect non-intact skin or mucous membranes and to prevent contact with blood, body fluids, secretions, excretions, include:

- a) Gloves when there is a risk of hand contact with blood, body fluids, secretions or excretions, or items contaminated with these;
- b) Gown if contamination of uniform or clothing is anticipated; and
- c) Mask and eye protection or face shield where appropriate to protect the mucous membranes of the eyes, nose and mouth during activities involving close contact (i.e. within two metres) with patients likely to generate splashes or sprays of secretions (e.g. coughing, sneezing).

### **11.3 Staff Exposures**

There must be written policies and procedures for the evaluation of staff (employees or contract workers) who are, or may be, exposed to blood or body fluids and other infectious hazards that include:

- a) A sharps injury prevention program;
- b) Timely post-exposure follow-up and prophylaxis when indicated.

#### **Recommendations**

- 1. Housekeeping staff should be given appropriate immunization cover, namely, annual influenza vaccine and the hepatitis B vaccine.**
- 2. PPE shall be provided for all housekeeping staff and replaced when defective.**

## Summary of Recommendations

1. *It is highly recommended that Infection Prevention and Control, Occupational Health and Safety and Environmental Services work collectively in decision making with respect to choices of furniture and finishing for facilities.*
2. *Routine cleaning is necessary to maintain a standard of cleanliness.*
3. *The selection of an ideal disinfectant will greatly depend on its effectiveness in getting rid of a specific organism.*
4. *All chemicals should be properly labeled and stored to eliminate any potential risk of contamination and injuries.*
5. *Adequate resources must be devoted to Housekeeping Services in all health care settings to ensure:*
  - a. *Single individuals with assigned responsibilities;*
  - b. *Written procedures for cleaning and disinfection of care areas and equipment that include:*
    - i. *Defined responsibility for specific items and areas;*
    - ii. *Clearly defined lines of accountability;*
    - iii. *Procedures for daily and terminal cleaning and disinfection;*
    - iv. *Procedures for cleaning in construction/renovation areas;*
    - v. *Procedures for specific environmentally-hard microorganisms such as C. difficile;*
    - vi. *Procedures for outbreak management; and*
    - vii. *Cleaning and disinfection standards and frequency;*
  - c. *Adequate human resources to allow thorough and timely cleaning and disinfection;*
  - d. *Education and continuing education of cleaning staff;*
  - e. *Monitoring of environmental cleanliness; and*

- f. Ongoing review of procedures.*
- 6. If housekeeping services are contracted out, the Occupational Health and Safety policies of the contracting services must be consistent with the facility's Occupational Health and Safety policies.*
  - 7. Housekeeping Services staffing levels should reflect the physical nature and the acuity of the facility; levels of supervisory staff should be appropriate to the number of staff involved in cleaning.*
  - 8. Cleaning schedules should be developed, with frequency of cleaning reflecting whether surfaces are high-touch or low-touch, the type of activity taking place in the area and the infection risk associated with it; the vulnerability of the client/patients/residents housed in the area; and the probability of contamination.*
  - 9. Non-critical medical equipment requires cleaning and disinfection after each use.*
  - 10. Each health care setting should have written policies and procedures for the appropriate cleaning of non-critical medical equipment that clearly defines the frequency and level of cleaning and which assigns responsibility for the cleaning.*
  - 11. Institutions should implement systems on frequency of cleaning and periodically conducts audits to ensure a clean environment during food preparation.*
  - 12. All food waste should be discarded in a sealed container.*
  - 13. All institutions should follow the individual hospital Infection Control Policy for precautions relating to any renovation or construction within the premises.*
  - 14. There should be a process in place to measure the quality of cleaning in the health care setting.*

- 15. Methods of auditing should include both visual assessment and if possible one of the following tools: residual bioburden or environmental marking.**
- 16. Results of cleaning audits should be collated and analyzed with feedback to staff.**
- 17. An environmental action plan should be developed to identify and correct cleaning deficiencies.**
- 18. Safe handling of linen is required to prevent exposure of environmental services workers and laundry staff to infection risk.**
- 19. Knowledge of personal protective equipment, hand hygiene and safe work practices is required.**
- 20. The aims of washing hospital linen must also include neutralization or eradication of infectious agents.**
- 21. Care must be taken to prevent recontamination of clean linen prior to re-use.**
- 22. Clean utility room should be separated from soiled utility room.**
- 23. All chemical cleaning agents and disinfectants should be appropriately labeled and stored in a manner that minimizes the risk of contamination, inhalation, skin contact or personal injury.**
- 24. MSDS must be readily available for each item in case of accidents.**
- 25. Automated dispensing system is preferred to ensure integrity of dilution ratios. If a refillable bottle is filled with a disinfectant solution, it should never be topped up with fresh disinfectant. Always use a clean, dry, appropriately-sized bottle, label the product and date it. The product should be discarded when past the expiry date for stability.**
- 26. All housekeepers must undergo a documented orientation session.**
- 27. All housekeepers are recommended to have written training records that are signed and dated by the by the trainer and trainee.**
- 28. Housekeeping staff should be given appropriate immunization cover, namely annual influenza vaccine and the hepatitis B vaccine.**

***29. PPE shall be provided for all housekeeping staff and replaced when defective.***

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