



Cleaning House:

How to prevent office infections

By John Embil, MD, FRCPC;
Brenda Dyck, RN, BScN, CIC; Judy McLeod, RN, CIC;
Karen Olekson, RN, CIC; and Debbie Ormiston, HRT, CIC



What are health-care associated infections?

Infections acquired in hospital, also known as nosocomial infections, have been extensively described and have been shown to complicate and prolong hospital admissions.¹ Health-care associated infections is a more generic term that encompasses the acquisition of infection in any type of health-care setting, whether it is an acute, long-term care facility or even a private office.

Health-care associated infections may occur as a consequence of having in-dwelling devices, such as urinary catheters, intravascular access catheters, and endotracheal tubes. Hospital and office equipment have been shown to act as fomites in the transmission of infectious agents.

Devices that have been implicated in infection transmission include: colonoscopes transmitting the Hepatitis C virus,² commode chairs transmitting *Clostridium difficile*,³ electronic rectal thermometers transmitting vancomycin-resistant *Enterococci* (VRE),⁴ and a hand-held shower transmitting methicillin resistant *Staphylococcus aureus* (MRSA).⁵ Stethoscopes and their fabric covers have been implicated as potential sources of nosocomial infection,⁶⁻⁹

In this article:

1. How are office infections transmitted?
2. How to prevent infection transmission.
3. How to clean and disinfect the office.
4. How to manage medical waste.

as have physicians' lab coats, particularly the cuffs and pockets, which were most heavily contaminated with *S. aureus* (Figure 1).¹⁰

In a prospective study evaluating the role of hand-



Figure 1. Stethoscope and cover.

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Practice Pointer

Some of the basic concepts in infection prevention are as follows:

1. Wear protective attire and use barrier devices appropriate for the procedure you are performing and the type of exposure anticipated, to prevent occupational exposure to infectious material.
2. Use hand hygiene after examining the patient, after glove removal, before handling the patient chart or your pen or other office articles.
3. Wash hands and other potentially contaminated skin or mucosal surfaces immediately and thoroughly, if accidentally contaminated with infectious material.

washing in the transmission of VRE, it was noted that environmental surfaces, such as countertops, bedrails, stethoscopes, and telephones could harbour this microorganism.¹¹ It was specifically noted that the bacteria persisted for 60 minutes on the telephone handpiece. Transmission of blood borne viruses between patients has occurred through contamination of multidose vials of medication and saline (Figure 2).^{12,13}

What are routine practices?

Routine practices refers to patient care practices for the routine care of all patients. These practices consist of hand hygiene (hand washing/hand antisepsis); the use of gloves, masks/eye protection, faceshields, and gowns; patient placement and accommodation; management/reprocessing of patient care equipment and supplies; and environmental control (Table 1).

How is infection transmitted?

Contact Transmission

This form of transmission includes direct contact,



Ms. Dyck is an infection control practitioner at the Health Sciences Centre, Winnipeg, Manitoba.



Dr. Embil is an associate professor, department of medicine, section of infectious diseases, University of Manitoba and director, infection control, Health Sciences Centre, Winnipeg, Manitoba.



Ms. Olekson is an infection control practitioner at the Health Sciences Centre, Winnipeg, Manitoba.



Ms. McLeod is an infection control practitioner at the Health Sciences Centre, Winnipeg, Manitoba.



Ms. Ormiston is an infection control practitioner assistant at the Health Sciences Centre, Winnipeg, Manitoba.

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Table 1

Suggestions to prevent infection transmission^{14,15,16}

1. Dispose of sharps (needles, syringes, lancets, glass) in puncture resistant containers for either incineration or landfill disposal according to municipal guidelines.
2. Consult your local College of Physicians and Surgeons, local health authorities, and/or Health Canada Guidelines for disinfection and sterilisation of equipment and environmental surfaces in your office.
3. Ensure that you and your employees are familiar with current Infection Prevention and Control recommendations.
4. Practice hand hygiene (hand washing, or use alcohol based hand sanitisers when hands are not visibly soiled).
5. Masks, eye protection, or face shields should be worn to prevent splashes to eyes, nose, and mouth in activities where blood, body fluids, secretions, or excretions may lead to contamination.
6. Gowns should be worn to protect uncovered skin and prevent soiling of clothing from splashes of blood, body fluids, secretions, or excretions.
7. Do not perform a procedure that you believe could put your patient or yourself at risk of infection.
8. Ensure that you and your staff participate in employee immunisation programs.
9. Whenever possible, use single use products and devices to minimise the transmission of infectious agents between patients. Articles that touch the patients' intact skin should be clean.
10. Regularly maintain all office equipment so that it is in optimal working condition. Reusable equipment that touches mucous membranes or non-intact skin must be disinfected with an approved hospital grade disinfectant, according to the manufacturer's recommendations, between patient use.
11. Used needles and other sharp instruments should be handled in such a fashion to avoid injury during their use, disposal, or reprocessing.
12. Dispose of blood/body fluid waste in sealed impervious containers according to local legislation, either in a sanitary sewer or by incineration.

indirect contact, and large droplet transmission as summarised below:

Direct and Indirect Contact:

Direct contact transmission occurs when microorganisms are transferred by means of direct physical contact between an infected or colonised individual and a susceptible host (body surface to body surface) (Figure 3).

Indirect contact occurs passively when microorganisms are transferred to the susceptible host by means of an intermediate object, such as contaminated hands that have not been washed between patients,

contaminated instruments, or other inanimate objects in the patient's immediate environment.¹⁴

Droplet Transmission:

Droplet transmission is a form of contact transmission where large droplets (> 5 µm in diameter) are generated from the respiratory tract of a patient during coughing, sneezing, or procedures, such as suctioning, bronchoscopy, or reprocessing soiled equipment. These droplets are propelled a short distance, < 1 m, through the air and deposited on the nasal or oral mucosa of a new host.¹⁵ This has been witnessed with the transmission of *Neisseria meningitidis* in

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Figure 2. Multidose vials may become contaminated.

army barracks where carriage rates increased when the recruits' beds were < 1 m apart. Large droplets do not remain suspended in the air. Although Haemophilus influenzae type B, N. meningitidis and Bordetella pertussis are transmitted by droplets, they are fragile and do not survive in the environment of the patient or on hands.¹⁵

Other organisms expelled in large droplets, are known to remain viable on objects in the patient's environment. These organisms include viruses such as the Respiratory Syncytial Virus (RSV), influenza, parainfluenza and rhinovirus. They can survive in the environment and can be picked up on the hands of patients or caregivers.¹⁵

Airborne Transmission

Airborne transmission addresses the dissemination of microorganisms by aerosolisation. In this circumstance, microorganisms are contained in droplet nuclei (the small airborne particles, $< 5\mu\text{m}$) resulting from evaporation of large droplets or in dust particles containing skin squames or other debris that remain suspended in the air for prolonged

periods of time.¹⁵ These microorganisms may be widely dispersed by air currents and inhaled by susceptible hosts who may be quite a distance away from the source patient, even in different rooms or hospital wards.¹⁵ Airborne transmission is the most difficult to manage, requiring control of air flow through special ventilation systems.¹⁵

Airborne transmission from source patients with tuberculosis, varicella, measles (rubeola), and smallpox has occurred.¹⁵

Common Vehicle Transmission

Common vehicle transmission refers to a single contaminated source such as food, medication, intravenous fluids, and hospital equipment. These may serve to transmit infection between multiple susceptible hosts. Transmission can be prevented by means of appropriate maintenance and decontamination of equipment, as well as by following appropriate policies and procedures for the handling of materials for injection and ingestion.¹⁴

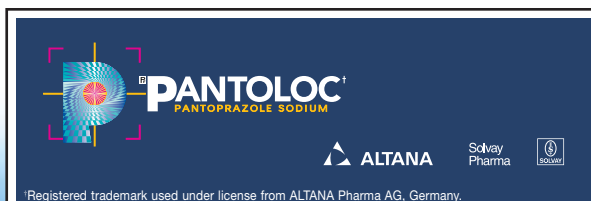
Vector-borne Transmission

Vector-borne transmission refers to transmission by insect vectors. Insect vectors pose less of a hazard to patients and staff than the other methods by which microorganisms may be transmitted and acquired. It is, of course, critical that the patient-care areas be kept free of vermin and insects.

How should I clean and disinfect my office?

Appropriate cleaning, disinfection, and sterilisation of patient-care equipment are important practices for limiting the transmission of infectious agents related to reusable patient-care equipment (Figure 4).

The frequency of cleaning and disinfecting the health-care environment may vary according to the



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type of surface to be cleaned, the number of people and amount of activity in the area, the risk to patients, and the amount of soiling.¹⁴ Horizontal surfaces have a higher number of organisms than vertical surfaces, ceilings, and smooth intact walls.

Disinfectants are used on inanimate objects, while antiseptics are used on living tissue.¹⁴ Decisions concerning the appropriate methods or products are complex, given the many types and compositions of medical devices and the great variety and combination of cleaning, disinfection, and sterilisation methods available. A number of different agents and methods exist for cleaning, disinfecting and sterilising patient-care equipment, but each is dependent upon the type of equipment and its intended use. Items that enter sterile body cavities must be sterile, while items that contact non-intact skin or mucous membranes must be given a high level disinfection. Equipment can be classified into critical, semi-critical, and non-critical, depending upon its degree of invasiveness.

The concepts are summarised as follows:

- **Critical items** are instruments and devices that enter sterile body cavities, including the vascular system. These items present a high risk of infection if the item is contaminated with any microorganisms. These items must be sterilised to ensure that no microbial life is present. All items that come in contact with the circulation, non-intact mucous membranes, and normally sterile body sites must be sterile.
- **Semi-critical items** are those that come in contact with non-intact skin or mucous membranes, but do not penetrate them routinely. These devices must be meticulously cleaned followed by high-level disinfection. High-level disinfection destroys living bacteria, mycobacteria fungi, and enveloped and non-enveloped viruses, but do not necessarily destroy bac-

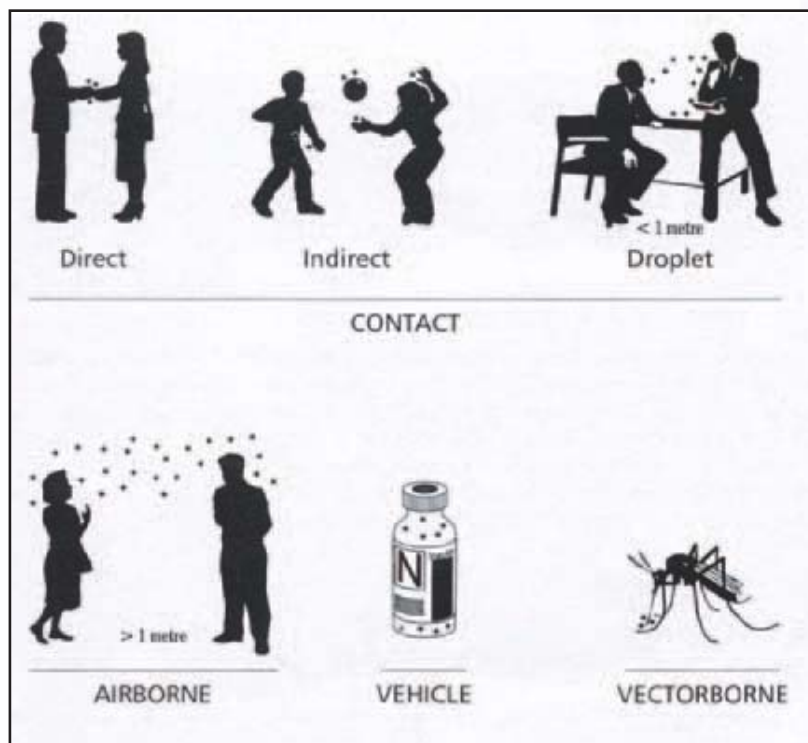


Figure 3. How infectious agents can be transmitted from one person to another (Modified from Health Canada. Infection Control Guidelines: Prevention and control of occupational infections in healthcare. CCDR 2002; 28S1:1-263.

terial spores.

- **Non-critical items** are those that only have contact with the skin, such as blood pressure cuffs, surfaces of medical equipment, doorknobs, handles, and other environmental surfaces. These should undergo cleaning when visibly soiled.

What do these measures mean?

Cleaning entails the removal of organic matter left on medical devices, which may shield microorganisms, protect them from the actions of disinfectants or sterilants, or may interact with the disinfectant or sterilant to neutralise the activity of the process. Cleaning involves sorting and soaking the equipment, removing the organic matter, rinsing, and drying them for subsequent use. Cleaning is accomplished with water, detergents, and mechanical action. Cleaning reduces or

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eliminates the reservoirs of potential pathogenic organisms. Detergents are adequate for most housekeeping activities in health-care settings.

Except during outbreaks, no special environmental cleaning techniques are advocated for organisms, such as *C difficile*, MRSA, or VRE. During an outbreak, however, thorough environmental cleaning and disinfection with a disinfectant that has demonstrated effectiveness against a specific microorganism may be required.¹⁴

Special care must be taken with blood/body fluid spills. Appropriate personal protective equipment should be worn for cleaning a blood spill, *i.e.*, gloves, faceshield if splashing is likely, and other protective attire such as gowns, aprons, overalls, or shoe covers as indicated in the case of a large spill. The blood/body fluid spill area must be cleaned of obvious organic matter before applying a disinfectant, as hypochlorites and other disinfectants are substantially inactivated by blood and other materials.¹⁴

Disinfection is the inactivation of disease-producing microorganisms. Disinfection does not destroy bacterial spores. Disinfection is required when the cleaning process does not render the item safe for its intended purpose. The three major methods for disinfection include liquid chemicals [alcohols, hypochlorite solutions, iodophors, phenolics, quaternary (ammonium compound)]; glutaraldehyde (chlorine-based compound); pasteurisation; and ultraviolet radiation. The level of disinfection achieved (low-level versus high-level) depends upon the contact time, temperature, type and amount of organic material, and type and concentration of the chemical disinfectant's active ingredient.¹⁴ Always follow the manufacturer's recommendations with regard to the selection and use of the specific disinfecting agents. Disinfectants are not usually needed in housekeeping activities in health-care settings, but are necessary in specified areas, *e.g.*, surgical suites, intensive care units, transplant units, and the surface of dialysis machines. Disinfection is accomplished by liquid or powdered chemicals.

Practice Pointer

Tips for the proper use of gloves:^{14,15,16}

- They are not required for routine care activities in which contact is limited to the patient's intact skin.
- Single use disposable gloves must not be reused or washed.
- Gloves should be used as an additional measure, not as a substitute for handwashing.
- They should be worn when handling items visibly soiled with blood, body fluids, secretions, or excretions.
- Gloves should be worn if there are open lesions on your hands.
- Gloves should be worn when contact with blood, body fluids, excretions, secretions, mucous membranes, and draining wounds or non-intact skin is likely. Gloves should be put on directly prior to performing a procedure and should be removed immediately after completion of care or procedure.
- Gloves should be changed between direct care activities with same patient.
- Gloves, sponges, dressings, and surgical drapes soiled or soaked with blood or secretions must be placed in an impervious bag and disposed of in a local landfill.

Sterilisation is the destruction of all forms of microbial life, including bacteria, viruses, spores, and fungi.¹⁴ Sterilisation is the process by which a device is rendered free from microorganisms. This may be achieved using a number of different techniques. Sterilisation must be monitored carefully to ensure that the process is occurring correctly.

How should my office be cleaned?

Although microorganisms are ubiquitous in health-care settings, inanimate materials are seldom responsible for the direct spread of infec-

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tions. Exceptions to this include MRSA, VRE, and *C difficile*, where transmission has been demonstrated by means of inanimate objects.^{3-5,17} Although there is virtually no risk of transmitting infectious agents to patients by way of the inanimate environment, soiled items could contribute to secondary transmission by contaminating hands of health-care workers or by contact with medical equipment that will subsequently come in contact with patients.¹⁴

What about linen?

The potential for transmission of infection from soiled linen is negligible. When appropriate precautions are followed by care givers and laundry workers for collecting, transporting, handling, washing, and drying soiled linen, the risk of cross infection can be virtually eliminated.

All linen that is soiled with blood, body fluids, secretions or excretions, or contaminated with lice or scabies should be handled using the same precautions regardless of source or care setting. Only surgical gowns and linens used in sterile procedures should be sterilised according to standard methods. Disposable items may be more cost-effective in some situations.

How should waste from my office be managed?

There is a public perception of higher infection risk from medical waste as compared with household waste, despite evidence to the contrary. Waste management guidelines are based on the principles of disease transmission and esthetic concerns. Human biomedical waste consists of anatomic, microbiology/laboratory, blood/body fluid, sharps, and isolation waste. Biomedical waste is not necessarily infectious. Waste documented to be associated with risk of disease transmission are sharps contaminated



Figure 4. When was the last time you cleaned your stethoscope?

with blood. Aerosolisation of the tubercle bacilli from medical waste has been reported.¹⁵ The ability of other waste to cause disease depends on the virulence of the microorganism, susceptibility of the host, and a portal of entry. As there is no objective method to determine infection risk from waste, it is commonplace to regulate waste when it is suspected of containing pathogens capable of producing disease. This practice is not supported by evidence of risk from waste or of decreased disease transmission associated with these practices. Medical waste generated in health-care settings is no more hazardous than household waste.

The treatment of infectious waste is to render it non-infectious. In some instances this may be stipulated by local regulatory authorities consisting of either chemical decontamination, steam sterilisation, disposal to a landfill, sanitary sewer, or incineration. Safety measures for waste handlers should be followed with a focus on prevention of exposure to pathogens from sharps or infectious waste leaking from containers. Waste handlers should wear appropriate protective attire for the risk anticipated and be offered hepatitis B immunisation.¹⁴ CME

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Take-home message

- To avoid transmitting infection to your patients and to yourself, adhere to routine practices.^{14,15,16}
- Routine practices consist of hand hygiene (hand washing/hand antisepsis), the use of gloves, masks/eye protection, faceshields, gowns, patient placement/accommodation, management/reprocessing of patient-care equipment and supplies, and environmental control.^{14,15,16}

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