

Chapter 13

Special Populations

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Key points

- Basic healthcare-associated infection prevention strategies apply, regardless of patient type or setting.
- Additional strategies may be required for special populations.
- Strategies designed for hospitals may need adapting for other health care settings which lack guidelines or evidence-based information.

Introduction

Basic healthcare-associated infection (HAI) prevention strategies apply, regardless of the patient type or setting. These strategies are presented in other chapters and include hand hygiene, standard precautions, isolation/precautions, staff education, aseptic techniques, and vaccination. However, additional practices are required for some patients or settings and are discussed in this chapter.

Geriatrics

Background

The number of people older than 65 years of age is increasing globally.¹ The elderly are susceptible to infection as a result of underlying illness, multiple medications, and alterations in immune function. Residents of nursing homes (NH) or long-term care facilities (LTCF) are particularly at risk.^{2,3}

Risk factors

Respiratory tract infections, urinary tract infections (UTI), gastrointestinal infections, and skin and soft tissue infections are the most frequent problems in this population.⁴ The incidence of UTIs increases with age, becoming nearly equal in women and men > 65 years old.

Both bronchitis and pneumonia occur in the elderly. Special risk factors include swallowing disorders or poor gag reflex with aspiration, impaired mucociliary clearance, increased esophageal reflux, immobility, and dehydration. Tuberculosis may occur in the elderly; often due to reactivation of old disease.

Cellulitis of the skin is also seen in the elderly. Predisposing factors include chronic oedema, venous insufficiency, unrecognised trauma, diabetes mellitus, and dry skin.

Diarrhoea is a significant cause of morbidity, particularly in institutionalised older persons.⁵ Pathogens may be spread by ingestion of microorganisms or toxins from (1) an infected person, (2) contaminated food or water, (3) contaminated objects in the environment, or (4) infected animals.

Prevention

See Table 13.1 for general prevention measures. Indwelling bladder catheters should be avoided whenever possible, and antimicrobials used only for symptomatic infections.

Prevention of bronchitis and pneumonia includes vaccination for patients and caregivers. In all settings there should be policies on distribution of pneumococcal and influenza vaccine for patients over 60 years of age. There should also be discussion of a policy on influenza vaccine for staff. Residents and staff of NHs/LTCFs should be screened for tuberculosis at a routine frequency, e.g., yearly.

Mobilisation of residents in NHs/LTCFs is important; it results in improved respiratory effort and reduced incidence of atelectasis and secondary bacterial pneumonia. Adequate hydration is also important to prevent formation of thick, tenacious pulmonary secretions.

Table 13.1. Preventing infections in the elderly

Infection	Prevention
Urinary tract infection	Adequate hydration Good personal hygiene Mobilisation
Bronchitis and pneumonia	Vaccination Cohorting patients with respiratory illness Limiting group activities and communal dining
Pressure ulcers	Mobilisation Keeping the patient dry Providing nutritional support
Diarrhoeal illnesses	Early implementation of cohorting or room closure Reinforcement of environmental disinfection Hand hygiene Isolation precautions

Endoscopy

Background

Endoscopy involves risks due to the complexity of the instruments. The patient's own microorganisms may be spread by the endoscope (rare) or microorganisms colonising the equipment may be introduced into the patient.⁶

Risk factors

Many outbreaks have been caused by defective equipment or inadequate cleaning and disinfection of endoscopes or accessories between patients (due to contaminated water rinses or contaminated automatic endoscope reprocessors⁷). To minimise the risk of infection, equipment must be maintained properly and reprocessing guidelines strictly followed.

Prevention

In addition to the external surface of endoscopes, the internal channels for air, water, aspiration, and accessories are exposed to body fluids and other contaminants. Cleaning is therefore critical. Most guidelines prescribe the following six steps for re-processing: cleaning, rinsing, disinfection, rinsing, drying, and storage. Whenever possible, sterilisation should replace disinfection.

Special infection prevention and control (IPC) principles for endoscopy:

1. To prevent cross-contamination in an endoscopic procedure room, most areas of the room should be designated as clean areas.
2. Contaminated areas where accessories and specimens are handled should be separate from clean counter areas.
3. Manual cleaning is important, including brushing, using a medical grade, low-foaming, and neutral pH detergent formulated for endoscopes.
4. Automatic disinfection, rinsing, and drying of all exposed surfaces of the endoscope, when available. Water for automatic endoscope reprocessors should be free from particles and microorganisms.
5. Isopropyl alcohol is recommended for flushing endoscope channels as part of the drying process at the end of the working day prior to storage.
6. Single-use accessories should be used in preference to reusable accessories when possible.

7. Rubber valves covering the working channel must be discarded after all procedures involving the passage of biopsy forceps, guidewires, and/or other accessories through the endoscope.

Paediatrics

Background

IPC issues are generally similar for adults and children. However, youth and immature immune systems make children more susceptible to infections; the pathogens and most common HAI sites differ from those in adults.⁸ Close contact with patients, siblings and family, uncontrolled body fluids, and play areas create unique opportunities for the spread of infection.

Infection risks

Many of the HAIs that occur in adults also occur in children, e.g., bloodstream and surgical site infections. However, children are susceptible to other pathogens, such as respiratory syncytial virus (RSV) and rotavirus; their lack of immunity affects the likelihood and severity of infection. Children are also often admitted to hospital with respiratory and gastrointestinal viral infections; they may then serve as a source of infection for others. Children at higher risk for HAI include those in intensive care, patients with cancer, solid organ transplant and haematopoietic cell transplantation recipients, and neonates.⁸

Prevention

See Table 13.2 for general prevention measures. Prevention of HAIs in children includes measures taken for adults with a focus on invasive devices and procedures. Additional preventive activities centre on vaccination, care of human milk/formula and toys, patient placement, and family/visitors.

Staff may transmit infection to children and vice versa, so staff and patients should maintain up-to-date vaccinations.

Pumping, collection, and storage of breast milk create opportunities for bacterial contamination and cross-infection, if equipment is shared between mothers. Appropriate cleaning and use protocols should be developed. Proper preparation and storage practices for powdered infant formula decrease the risk of microbial growth.⁸

Children are often in close proximity to one another and spend time in common areas, such as playrooms, where sharing of toys, equipment, and secretions can occur. Toys that have become contaminated with secretions should be washed thoroughly; treat them with a nontoxic, low-level disinfectant (e.g., bleach 1:100) and air dry completely between patients. Alternatively, a combined detergent disinfectant may be used. Toys and playroom surfaces should be disinfected as often as possible. Clean toys should be clearly separated from dirty ones.⁸

In general, control of viral respiratory and gastrointestinal transmission should include placing infected children in a single-room or use of an appropriate cohort for room placement.¹¹ Ideally, all visitors would be screened for evidence of communicable disease, recent exposure to communicable disease, and, in some instances, immunisation history.

Table 13.2. Preventing infections in paediatrics

Infection	Prevention
Communicable diseases	Vaccinate according to national guidelines
Breast milk and infant formula	Mothers should be instructed on hygienic methods Proper cleaning and disinfection of breast pumps
Toys	Avoid high-risk toys, such as soft/stuffed toys, that are difficult to clean and dry.
Viral respiratory and gastrointestinal illnesses	Patients should be screened; isolation/precautions initiated while awaiting a diagnosis.

Burns

Background

Significant burns have a major impact on both cellular and humeral immune systems, therefore predisposing patients to infection. Burn injury causes mechanical disruption of the skin which allows skin and environmental microbes to invade deeper tissues.

Infection risks¹²⁻¹³

Many of the same HAIs that occur in other patients occur in burn patients.

The incidence of infection is higher, particularly in patients with larger burns. As burn size increases, or it is complicated by other injuries, the risk of infection increases.

Wound infection can occur in surgically created wounds, such as excised burns, donor sites, and grafted wounds, which have not epithelialised. Burn wound cellulitis occurs in uninjured skin surrounding the burn wound or donor site.

Most deaths after severe burns are due to wound sepsis or complications of inhalation injury. Burn patients are also at risk for developing sepsis secondary to pneumonia, device-related infections, and suppurative thrombophlebitis.

Prevention¹²⁻¹³

Preventive strategies include strict aseptic technique, use of sterile gloves and dressing materials, wearing masks for dressing changes, and spatial separation of patients, either using single rooms or cubicles. The following IPC strategies are recommended by burn treatment facilities:

1. Emphasise hand hygiene before and after patient contact.
2. Use standard precautions/routine practices.
3. Wear protective apparel, e.g., aprons or gowns, before each patient contact and discard after leaving the patient's room.
4. Change gloves when soiled and before continuing with care at another site on the same patient.
5. Ensure appropriate cleaning and disinfection of reusable equipment before use on another patient.
6. Restrict plants and flowers at the bedside of patients with burn injuries because they harbour Gram-negative microorganisms, such as *Pseudomonas* species, and fungi.
7. Restrict non-washable toys (stuffed animals, cloth objects) which can harbour bacteria and are difficult to clean.
8. Whenever possible, catheters should be placed through unburned skin, preferably at a sufficient distance from the wound to prevent contamination of the insertion site. Because this is not always feasible in patients with large burn injuries who require long-term vascular access, frequent change of the catheter may be attempted to decrease risk of infection.
9. Patients colonised with multiply resistant microorganisms need to be

isolated in single rooms or cubicles to ensure physical separation from other patients.

10. Hydrotherapy is used routinely in some facilities; however it has been associated with outbreaks, particularly among patients with large burns. Some prefer to use local wound care with sterile saline solution instead. If hydrotherapy is used, shower tables are less risky than immersion. Disinfection protocols generally describe rinsing the tanks or equipment with a solution of sodium hypochlorite after each use.

Behavioural Health

Background

Behavioural health care provides prevention, intervention, and treatment services in the areas of mental health, substance abuse, developmental disabilities, and sexuality.

Infection risks

Geriatric patients in behavioural health often acquire urinary tract and upper respiratory infections. Skin and soft tissues are also frequent sites of infection in this specific population.

Prevention

The following are examples of general IPC strategies in this setting:

1. Staff should be aware of their immune status and practice standard precautions/routine practices. Those who work with children should be vaccinated for typical childhood illnesses.
2. An inpatient influenza and pneumococcal immunisation program should be considered for adults. Children should be up-to-date on their immunisations.
3. Mixing of patient clothing should be prevented. Special consideration should be given to the clothing of patients with incontinence, wound infections, or lesions, and suspected or confirmed cases of scabies or lice (e.g., use bleach in wash water, dry clothing on hot setting, or decontaminate washer and dryer after each use).
4. Procedures with regard to lice and scabies should include identification of illness, monitoring for transmission, treatment (includes staff monitoring of the application of treatment) and follow-up, and housekeeping procedures.

5. Patients can be provided with a caddy or basket in which to keep personal toiletry items if they share a bathroom.
6. Disposable paper mats for individual shower use protect the patient from transmission of athlete's foot (*Tinea pedis*).
7. Disposable razors for shaving should be provided and discarded after use in an appropriate sharps container. If electric shavers are provided, a protocol for cleaning and disinfecting the shaver after each use is needed.
8. For electroconvulsive therapy, there should be procedures for hand hygiene, use of gloves, and the cleaning and disinfection of equipment. Reusable items such as bite blocks and laryngoscope blades require high-level disinfection.

Ambulatory/Community Care

Background

Ambulatory/community care settings provide health care to patients who do not remain overnight; examples include physician's surgeries, clinics, dental surgeries, diagnostic treatment centres, and physical and occupational therapy centres.

Specific IPC problems include determining which infections require surveillance, what definitions to use, who will conduct the surveillance, to whom the data will be reported, and who will be responsible for implementing any required changes. Implementing measurement and operational definitions for HAI can be challenging as no standards are available. Definitions used in hospitals, long term care facilities, or home care may be adapted.

Process surveillance or audit is an important aspect of IPC in these settings. Surveys/audits provide a way to introduce and track improvements. Audits consisting of a standard list of criteria that are checked at each site are commonly used.

Infection risks

The overall risk of HAIs is lower in ambulatory/community settings than in hospitals.¹⁴ The visits are brief, environmental contamination is lower, less invasive procedures are performed, and, in general, the population is healthier.

One risk factor is exposure to infection in waiting rooms. Many patients and visitors may be congregated in common waiting areas. The chief risk is spread of infection by an airborne or droplet route; outbreaks of respiratory viruses have been reported in these settings.

Infections may also occur after procedures performed in ambulatory settings. Several outbreaks have been attributed to re-use of single use items. *Burkholderia cepacia* bacteraemia and hepatitis B and C infections have been attributed to reuse of needles and syringes and use of multidose vials of medication.¹⁵

Prevention

See Table 13.3 for general prevention measures. Prevention of HAIs includes those measures taken in hospitals, i.e., standard precautions/routine practices, hand hygiene, safe medication and needle use, and aseptic practices. Additional activities in these settings focus on communicable diseases, respiratory hygiene, toys, and instruments/devices.

Patients should be assessed as soon as possible for signs and symptoms of potentially communicable illnesses, particularly productive cough, diarrhoea, undiagnosed rash, bleeding, and wound or eye drainage. Patients with these conditions should be placed in a separate room as soon as possible.

Respiratory hygiene / respiratory etiquette measures are designed to limit droplet spread. Patients presenting with cough or respiratory symptoms should be provided with tissues or surgical masks and instructed to cover coughs and sneezes with a tissue and where to safely dispose of tissues. Patients should be reminded to clean their hands after a cough or sneeze and a container of alcohol based hand rub should be available.

Patients with suspected or known tuberculosis, chickenpox, measles, mumps, rubella, or bacterial meningitis should wear a surgical mask and be placed in a separate room with the door closed and a sign placed on the door to inform staff of necessary precautions. After a patient with suspected tuberculosis leaves an examination room, close the door and allow the room to ventilate before using it again.

Sharing of toys should be limited to prevent cross transmission, although spread of infection by shared toys is rare. If toys are provided, they should be readily cleanable (no stuffed animal toys).

Instruments are re-processed in many ambulatory/community settings. All re-usable instruments and medical devices require written procedures for cleaning and disinfection or sterilisation. The use of safer medical devices designed to reduce the risk of needle-stick injuries should be evaluated.

Immunocompromised Populations

Background

The severe neutropenia of treatment regimens and certain underlying diseases, coupled with invasive devices and procedures which bypass the physical barriers to infection, result in a high frequency of infection in these patients. In addition, illnesses such as acquired immune deficiency syndrome, place the patient at risk for infection. Because of defects in immunity, environments and activities that would be safe for patients with intact immune systems present hazards for these patients.

Infection risks

There are four broad categories of risk factors that predispose the immune compromised host to infection: 1) granulocytopenia; 2) immune system defects; 3) destruction of protective barriers, e.g., skin and mucous membranes, and 4) environmental contamination/alteration of microbial flora.

Table 13.3. Preventing infections in ambulatory care

Infection	Prevention
Respiratory illness	Respiratory hygiene / respiratory etiquette
Communicable diseases	Wear a surgical mask and place in a separate room with the door closed
Toys	Limit sharing Easily cleanable
Instruments	Clean, disinfect/sterilise properly

Many infections in the immunocompromised individual are caused by the patient's own flora, especially during periods of severe neutropenia. Because of conditioning or other immunosuppressive therapy, patients undergoing chemotherapy and haematopoietic stem cell transplantation (HSCT) or solid organ transplantation are at increased risk of infection.

Prevention¹⁶⁻¹⁷

General concerns include ventilation, construction/renovation, equipment, plants, play areas and toys, health-care workers, visitors, skin and oral care, and general HAI prevention. See the guidelines section of this chapter for information on HSCT recipients.

Patient-focused

1. Good oral and dental hygiene are important. The oral cavity is a reservoir for microorganisms capable of causing life-threatening infection. Any severe mucositis experienced by patients predisposes the spread of these microorganisms into the bloodstream.
2. Patients and family members, as well as healthcare workers, should be taught the importance of hand hygiene.

Staff-visitor-focused

1. Screening programs for communicable infections in visitors and staff are essential, especially during the appropriate "seasons" for certain illnesses.
2. Every effort should be made to restrict from direct patient care activities all healthcare workers with infections that may be spread to immunocompromised patients.

Environment-focused

1. Various combinations of isolation/precautions techniques, including requirements for caregivers to wear masks and gowns to enter rooms, gloves for patient contact, and sterile water, food, and linens, are recommended in an attempt to protect neutropenic patients from HAIs. However, there are insufficient data to provide recommendations regarding the use of these additional protective precautions.
2. Dust accumulation should be prevented with daily cleaning of frequently touched horizontal surfaces. However, cleaning methods that generate dust, such as dry dusting and mopping, should be avoided.

3. Doors to patient rooms should remain closed while any vacuuming takes place nearby.
4. Exclude plants and flowers from units housing immunocompromised patients.
5. Showers for immunocompromised patients have been controversial. Several studies have suggested an association between aerosols from showerheads and aerators and outbreaks of *Legionella*, *Acinetobacter*, and even *Aspergillus* sp.
6. All toys are to be cleaned and disinfected regularly and when visibly soiled or mouthed. Toys that cannot be washed or disinfected after use should be avoided.
7. Construction and renovation may result in an increased risk for healthcare-associated invasive mould infection, particularly aspergillosis. Whenever possible, immunocompromised patients should avoid construction or renovation areas.
8. Containment measures necessary to protect at-risk populations from dust include adequate barriers with air-tight seals and negative pressure inside a construction site.

International Perspectives

The epidemiology of infectious diseases and antibiotic resistance varies by geographical area. Endemic diseases and microbial flora of patients can impact the practice of IPC. Despite these differences, the principles should basically remain the same; that is, recognise that the patient is at increased risk for certain types of infection and minimise that risk to the extent possible.

Summary

Some patients have specific risk factors or require interventions that place them at increased risk of HAIs; general IPC practices are applicable, regardless of health care setting. However, thoughtful adaptation of these practices may be necessary in certain types of settings or with certain groups of patients.

Applicable Guidelines/Resources

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Immunocompromised

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