

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 to all healthcare practices, 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. Additional practices required for some categories of patients or settings are discussed in this chapter.

Care of the Elderly

Background

The number of people older than 65 years of age is increasing globally¹ particularly in high income countries. 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

With age, a person becomes forgetful and hygiene suffers. Poor hand hygiene particularly after going to the toilet, is a major risk factor in the institutionalised elderly.⁴

Respiratory tract infections, urinary tract infections (UTI), gastrointestinal infections, and skin and soft tissue infections are the most frequent problems in this population.⁵ The incidence of UTIs increases with age, becoming nearly equal in women and men greater than 65 years of age.

Both bronchitis and pneumonia occur in the elderly. Special risk factors include swallowing disorders or poor gag reflex with aspiration, impaired muco-ciliary clearance, increased oesophageal reflux, immobility, and dehydration. As immunity wanes with age, tuberculosis (TB) 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.⁶ 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 nursing homes (NHs) or long term community facilities (LTCF) should be screened for TB routinely, e.g., yearly.

Mobilisation of residents in NHs/ LTCFs is important for prevention of several diseases. It results in improved respiratory effort and reduced incidence of atelectasis and secondary bacterial pneumonia. Mobilisation reduces circulatory stasis in peripheral parts of the body, such as legs, and reduces sacral pressure sores. Finally, mobilisation is important in reducing urinary stasis. Adequate hydration is also important to prevent formation of thick, tenacious pulmonary secretions, improve renal function, and reduce constipation.

Table 13.1. Preventing infections in the elderly

Infection	Prevention
Urinary tract infection	Adequate hydration Good personal hygiene Mobilisation Avoid continuous indwelling bladder catheters
Bronchitis and pneumonia	Vaccination policy for patients and staff Cohorting patients with respiratory illness Limiting group activities and communal dining during influenza outbreaks
Pressure ulcers	Mobilisation Keeping the patient dry Turning patient frequently Providing nutritional support Using anti-pressure devices
Diarrhoeal illnesses	Early implementation of cohorting or room closure Reinforcement of environmental disinfection Hand hygiene Isolation precautions

Endoscopy

Background

Endoscopes are complex instruments with multiple channels; cleaning and decontamination involves several steps carried out by a trained individual.⁷ Risk of infection is a result of inadequate cleaning; microorganisms colonising the equipment may be introduced into the next patient.⁷⁻⁹

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 reprocessors).¹⁰ Endoscopic Retrograde Cholangiopancreatography (ERCP) endoscopes are particularly difficult to clean.¹¹

Prevention

To minimise the risk of infection, equipment must be maintained properly and reprocessing guidelines strictly followed. Guidelines are available from the Decontamination and Reprocessing Manual for Healthcare Facilities.⁷ 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 a flexible endoscope is critical and therefore highly specialised. Most guidelines prescribe the following six steps for re-processing: cleaning, rinsing, disinfection, rinsing, drying, and storage. Whenever possible, sterilisation should replace disinfection-steam sterilisation for rigid scopes and chemical sterilisation for flexible endoscopes.

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

1. Reprocess endoscopes in a dedicated procedure room with good ventilation and natural sunlight.
2. To prevent cross contamination, the same principles apply when reprocessing any medical device; separate clean and dirty areas that are clearly demarcated.
3. Contaminated areas where accessories and specimens are handled should be separate from clean counter areas.
4. The person cleaning the endoscope must be adequately trained (preferably certified).
5. Clear standard operating procedures (SOPs) must be in place for the cleaning team to follow.
6. Manual cleaning is important; use a soft nylon brush and a medical grade, low-foaming, neutral pH detergent formulated for endoscopes.
7. Use 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.

8. Isopropyl alcohol (70- 90%) is recommended for flushing endoscope channels as part of the drying process at the end of the working day prior to storage.
9. Single-use accessories should be used in preference to reusable accessories when possible. If these accessories must be reused, the manufacturer's reprocessing guidelines are to be followed.
10. Rubber valves covering the working channel must be discarded after any procedure involving the passage of biopsy forceps, guidewires, and/or other accessories through the endoscope.

Paediatrics

Background

IPC issues apply universally and therefore are similar for adults and children. However, immature immune systems make children, particularly neonates, more susceptible to infections; the pathogens and most common HAI sites differ from those in adults.¹² Poor hand hygiene, 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, both these diseases are seasonal. Therefore, the load on the paediatric ward is high; they 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.¹²

Neonates are usually admitted to high care and intensive care units for prolonged periods of time, when they are low birth weight or are "small for dates". Their immunity is low and therefore they are subject to a higher risk of HAI, especially when medical devices, such as umbilical catheters, nasogastric tubes and intravenous lines are introduced to support their survival.

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.

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. Children do not have good hand hygiene practices

and have to be taught when to wash hands. Hard toys that have become contaminated with secretions should be washed thoroughly; air dry completely between patients. Soft toys should be washed in an automatic washing machine and air dried. Toys and playroom surfaces should be cleaned regularly and disinfected with alcohol wipes at least daily. Clean toys should be clearly separated from dirty ones.¹²

In general, control of viral respiratory and gastrointestinal transmission will require the appropriate transmission-based precautions which should include placing infected children in a single-room or use of an appropriate cohort for room placement.¹³ Ideally, all visitors would be screened for evidence of communicable disease, recent exposure to communicable disease, and, in some instances, immunisation history. At the very least, visitors should be instructed on rigorous hand hygiene and follow the IPC instructions on transmission-based precautions.

Table 13.2. Preventing infections in paediatrics and neonatology

Infection	Prevention
Communicable diseases	Vaccinate according to national guidelines
Breast milk and infant formula	Mothers should be instructed on hygienic methods of collecting expressed breast milk Feed using feeding cups
Toys	Avoid high-risk toys, such as soft/stuffed toys, that are difficult to clean and dry If purchased, must be washable in an automatic washer
Viral respiratory and gastrointestinal illnesses	Patients should be screened; isolation/precautions initiated while awaiting a diagnosis

Burns

Background

Intact skin is the first and best human defence; by disrupting the integrity of the skin, burns have a major impact on both cellular and humeral immune systems, predisposing patients to infection. Burn injury causes mechanical disruption of the skin which allows skin and environmental microbes to invade deeper tissues.

Infection risks¹⁴⁻¹⁵

Many of the same HAIs that occur in other patients occur in burn patients. However, because the level of immunity drops in such patients, the infection rates are higher as burn size increases, or it is complicated by other injuries. Infection may also be compounded by systemic depression and organ failure from toxins and shock. Burns are categorised by the percentage of skin that is involved, the depth of the burn, and the

cause of the burn, such as chemicals, heat, or electrical.

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

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

Prevention¹⁴⁻¹⁵

The primary prevention strategy is to examine the burn and to decide how quickly a skin graft can be carried out- the sooner the graft, the lower the chance of colonisation and infection.

IPC 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, especially the 5 moments of hand hygiene.¹⁶
2. Use standard precautions/routine practices.
3. Wear protective apparel if carrying out a procedure, 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. Keep the environment as dry as possible to avoid colonisation with environmental Gram-negative bacteria.
8. Restrict non-washable toys (stuffed animals, cloth objects) which can harbour bacteria and are difficult to clean.
9. Whenever possible, intravenous and central line 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, the venous catheters should remain in place for as long as they are not

infected and are required; these should not be handled unnecessarily.

10. Patients colonised with multiply resistant microorganisms need to be isolated in single rooms or cubicles to ensure physical separation from other patients.
11. Hydrotherapy is used 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. The patients in such facilities range in age from the elderly to the young. IPC practices should follow a risk assessment of procedures and practices in these cases, however it worth being aware of certain specific infections.

Infection risks

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

Intravenous drug users may have abscesses that require draining, endocarditis from unusual microorganisms, or blocked veins with a possibility of deep vein thrombosis and septic phlebitis. Those with developmental disabilities are prone to urinary tract infections and diarrhoea.

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.
2. Those who work with children should be vaccinated for typical childhood illnesses.
3. An inpatient influenza and pneumococcal immunisation program should be considered for adults. Children should be up-to-date on their immunisations.
4. 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).

5. 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.
6. Patients can be provided with a caddy or basket in which to keep personal toiletry items if they share a bathroom.
7. Disposable paper mats for individual shower use protect the patient from transmission of athlete's foot (*Tinea pedis*).
8. 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.

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.

Infections (healthcare associated or community based) can be transmitted in these settings, especially in vulnerable populations. In order to contain any infection and apply appropriate IPC precautions, it is important to gather information on the type of pathogens and their modes of transmission. To accomplish this, surveillance is necessary. In order for surveillance to be meaningful the definitions have to be specific and clearly understood, so that various datasets can be compared.

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.¹⁷ 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, particularly in low income countries where an appointment system does not usually exist. The chief risk is spread of infection by an airborne or droplet route; outbreaks of respiratory viruses have been reported in these settings, especially cross infection with TB.

Infections may also occur after procedures are 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.¹⁸

Sterilisation of medical devices, such as vaginal speculae, is often poorly performed, mainly due to the inadequate number of available devices. Often there is little or no decontamination between patients, thus leading to the likelihood of blood borne viruses or Human Papilloma Virus (HPV) transmission. Disposable items should be used whenever possible, otherwise robust sterilisation systems should be put in place.

Prevention

See Table 13.3 for general prevention measures. The difference in prevention in ambulatory care is that transmission can be reduced by simple building design measures, such as good ventilation, good spacing between patients, and areas for children to play. If the weather is good, areas outside the clinic can be used for patients to wait. IPC matters are mainly those of communicable disease; therefore transmission-based precautions in addition to standard precautions/routine practices, must be a priority. 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. Respiratory hygiene and cough etiquette is part of standard precautions/routine practices and must be promoted.¹⁹ Additional activities in these settings focus on toys and instruments/devices.

Patients should be assessed as soon as possible for signs and symptoms of potential 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. This is known as triage and protects other patients from transmission. In the examination room, consultation should take place across a table where the air is directed from behind the healthcare worker towards the patient to avoid airborne transmission.²⁰

Respiratory hygiene/respiratory etiquette measures are designed to limit droplet and aerosol spread.¹⁹ Patients presenting with cough or respiratory symptoms should be separated and provided with tissues or surgical masks, instructed to cover coughs and sneezes with a tissue, and told where to safely dispose of tissues in dustbins. Patients should be reminded to clean their hands after a cough or sneeze and a container of alcohol-based hand rub should be available.

All patients with suspected or confirmed diagnosis of TB, chickenpox, or measles should wear a procedure face mask when being transported through public areas or to other departments, such as radiology. Ideally, they should be placed in a separate room (or area) with the doors closed and a clearly displayed sign noting airborne precautions. The room should be well ventilated once such patients have left the area.

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.

Table 13.3. Preventing infections in ambulatory/community care

Infection	Prevention
Respiratory illness	Respiratory hygiene / respiratory etiquette Reduce overcrowding (provide space outside) Provide cough booths for sputum production
Communicable diseases	Establish a provisional diagnosis as soon as possible; separate the patient from the main group of patients
Toys	Limit sharing. Easily cleanable Provide place for the children to play separately or outside
Instruments	Clean, disinfect/sterilise adequately or use single use disposable items

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 (AIDS), place the patient at increased risk for infection unless they are on anti-retroviral therapy. Defects in immunity increase the vulnerability of such patients from their environment and activities that would usually be safe for patients with intact immune systems.

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.

Most infections in the immunocompromised individual are caused by the patient's own flora (endogenous infection), 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.

Prevention²¹⁻²²

The areas which require special attention from an IPC perspective are 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 must be an important part of patient care. 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. When using the toilet the patient must have clear instruction on how to clean him or herself.
3. Patients and family members, as well as healthcare workers, should be taught the importance of hand hygiene.

Staff-visitor-focused

1. Restrict the number of visitors and staff in contact with the patient, particularly while there is severe neutropenia.
2. Screening for communicable infections in visitors and staff is essential, especially during the appropriate “seasons” for certain illnesses- this can be performed verbally.
3. Healthcare workers with infections should not be allowed to look after such patients.

Environment-focused

1. Various combinations of isolation/precautions techniques, including requirements for caregivers to carry out hand hygiene, wear masks and gowns to enter rooms, use gloves for patient contact, and use sterile water, food, and linens, are recommended in an attempt to protect profound neutropenic patients from HAIs. However, there are insufficient data to provide recommendations regarding the use of these additional protective precautions.
2. High Efficiency Particulate Air (HEPA) filtration of the air supply to the room is not recommended.
3. Dust accumulation should be prevented with daily cleaning of frequently touched horizontal surfaces using a damp cloth. Cleaning methods that generate dust, such as dry dusting and mopping, should be avoided.
4. Doors to patient rooms should remain closed while any vacuuming takes place.
5. Exclude plants and flowers from units housing immunocompromised patients.
6. 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. If showers are taken, the water is to be allowed to run for at least 5 minutes before stepping into the shower.

7. Only toys that can be cleaned and disinfected should be allowed. Clean regularly or when visibly soiled.
8. Construction and renovation may result in an increased risk for healthcare-associated invasive mould infection, particularly aspergillosis. The isolation rooms for housing such patients should not be in the direct path of any construction work going on; if unavoidable, the area should be sealed off.

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 IPC principles basically remain the same. The increased risk to patients should be minimised by carrying out a risk assessment of the patient's condition, as well as the available provisions to practice good IPC, where care is provided.

Summary

Some patients have specific risk factors or require medical 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

Geriatrics

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Immunocompromised

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