afford to stay at the hospital for long periods because there is strong pressure to return to their village, where they are pivotal to the daily routine, farming, etc. Mothers can be supported by passing on the knowledge of play as taught by a play worker. Giving the sick child access to play and information facilities in hospital also helps to reduce loneliness and fear.

Some well-resourced countries have training programmes and qualifications for play specialists. These are not available in most low-income countries. However, much can be achieved by recruiting suitable people to support therapeutic, informational and recreational play with children in hospital. It is effective, as both an adjunct and core part of treatment, in the hands of a skilled play worker, and any resources can be made of local and low-cost materials.

Play workers need to have good communication and empathy skills with children and families. They also need to have a good understanding of child development and the particular needs of children in hospital (especially children who are alone and/or who have disabilities or other additional needs). In addition, play workers need to be trained in how to deal with some specific situations, such as the comatose child (the fact that these children can hear and have feelings when touched, and how to encourage the parents to talk and play with the child).

### Conclusion

The provision, organisation and financing of these services, facilities and functions, and the management of the human resources needed to service them, are as important as those needed to provide the clinical and clinical support services. A sound hospital infrastructure and management are of paramount importance for the provision of good-quality care.

Further information on other work-related issues concerning healthcare staff can be found in Sections 1.17 and 1.20.

### 1.2 Prevention of hospital-acquired infection

#### Introduction

Nosocomial or hospital-acquired infection is a major problem not only in terms of cost but also, more importantly, because it increases morbidity and mortality in patients. Such infections may affect up to 10% of all patients. Nosocomial infection requires a source of microorganisms and a chain of transmission. It is essential that all healthcare staff scrutinise their own practice to ensure that they are not part of this chain of transmission.

Please see the Maternal and Child Healthcare Initiative Manual for more information on standards of care relating to the prevention of hospital-acquired infection (http://media.wix.com/ugd/dd2ba4_ef4f40edd1cb36e9a5f41e166012e8e0.pdf).

The combination of use of powerful antibiotics and poor hygiene also predisposes to the development of antibiotic-resistant microorganisms, which are difficult both to eradicate from the environment and to treat.

Pregnant women and girls, as well as children with chronic and debilitating illness, are particularly at risk of infection. However, not all infections are related to their particular disease process, but rather they may be caused by failure of both hospital management and individual healthcare workers to introduce and adhere to strict infection control policies.

Every research study relating to the prevention of infection and cross-infection in hospitals during the last 100 years has emphasised the importance of hygienic conditions in the entire hospital.

#### Requirements and procedures

The following measures are essential in order to minimise the risks of infection and cross-infection.

**A clean and adequate water supply**

Just as water and sanitation are of central importance in the prevention of cross-infection in emergency refugee camps, they are also of vital importance in hospitals, particularly where there are vulnerable patients. Running water (both hot and cold) is preferable. Hot water should be stored at 65°C, distributed at 60°C, and the temperature then reduced to 43°C to be used from the taps. This process helps to ensure that water-borne infections such as Legionnaire’s disease are not passed on to staff or patients.

**Accessible sinks in all areas**

These should preferably be equipped with elbow-operated taps, and there should be adequate washing and toilet facilities for staff and patients.

**Effective cleaning policies**

The whole of the hospital, including the grounds, should be kept clean. Entrances should screen visitors’ shoes for dirt, and corridors need to be cleaned at least twice a day with a disinfectant (see below). **Ward areas, floors, window-sills, light fittings and curtains need to be kept scrupulously clean, but the priority is the adequacy and cleanliness of the toilets and bathrooms.** These should be kept scrupulously hygienic by frequent cleaning and disinfection. **Staff appointed as cleaners should be given adequate status and salaries to reflect the importance of the work they are doing, as well as training in how to keep the hospital clean and why this is so important.**
Effective services for disposal of human and other waste
Human and other waste should be disposed of and collected separately. Foot-operated bins are preferable, and frequent rubbish collections are essential. Ideally the hospital should have its own incinerator.

Laundry service
All bedding, towels, flannels and curtains must be regularly washed with a detergent and disinfectant. Industrial washing machines are essential.

Strict hand-washing policies
Viruses and bacteria can survive on the hands for 2 to 3 hours. Correct hand-washing technique for all staff, visitors and patients is the most important factor in the prevention of cross-infection. It is easily taught, and frequently an improvement in practice is demonstrated in the short term. However, when examined over a longer period of time, old habits and short cuts reappear.

Good hand-washing techniques are dependent on adequate supplies of clean water, ideally elbow-operated taps, a liquid soap supply and an effective method of hand drying (see Figure 1.2.1). Where it is impossible to provide liquid soap and paper towels, some ingenious solutions have been attempted. Bar soap suspended in a net bag over the sink area and individual cloth towels for each patient, changed every 24 hours or at the discharge of the patient and kept within their bed space, can be effective. Added emollient protects the hands from chafing. Antiseptics can be added to liquid soap to improve antimicrobial activity, and chlorhexidine is a cheap and effective antiseptic that is widely available throughout the world. However, there is no good evidence that this increases the effectiveness of hand washing substantially. Antiseptics should be used before invasive procedures and where there is heavy soiling with potentially contaminated body fluids or other human waste. Povidone iodine should be reserved for use as a surgical scrub.

When running water is not available or hand washing is difficult, a 70% alcohol gel is useful. This is a new but fairly expensive product that has a significant part to play in the introduction of cross-infection in high-risk areas. When rubbed on and allowed to dry, it is effective in disinfecting the hands. After initial conventional hand washing it can be used between each patient contact, but further hand washing is still recommended after every five to six rubs.

All of the above-mentioned items may be regarded as a considerable extra cost for a health service, but are cost saving when balanced against the additional medications required and sometimes unnecessary deaths caused.

All staff should have a personal responsibility for hygiene, but every ward should also identify an individual (ideally a nurse with the support of a microbiologist, if available) to be responsible for the education of all staff in techniques that will prevent the spread of infection, particularly effective hand washing and drying. This education programme will need to be ongoing, as even in the best centres these programmes are only effective for relatively short periods of time. The organisation needs to support the identified staff member in reinforcing that all grades and members of staff have responsibility for their practice (especially doctors, who should act as role models). In addition, it needs to become the norm for this identified staff member, no matter how junior they are, to be recognised as the expert in their unit, and anyone who is asked to carry out hand washing must immediately and unquestioningly comply with this request.

Repeat each movement 5 times

![Effective hand washing](image)

FIGURE 1.2.1 Effective hand washing.

Disposal of body fluids
Each ward or unit must have an area set aside for this purpose. It and all the equipment that it contains must be kept scrupulously clean and body fluids disposed of quickly, with any spillage removed immediately. If there is likely to be a risk of body fluids being contaminated with life-threatening organisms, additional precautions should be taken. After hand washing, disposable clean gloves should be used by all staff and family members who will be assisting with the toileting of patients. Care must be taken with sharp objects such as hypodermic needles, in order to protect the patient, their family, other unit visitors and staff. An empathetic approach is necessary to ensure that the patient and their family do not feel stigmatised and underserving of normal care and attention.

Cleaning, disinfection and sterilisation of equipment and furniture
The manufacturer’s instructions for individual items of equipment must always be followed. These will usually clearly state which items need to be sterilised and where disinfection will be sufficient. They will also indicate appropriate dilutions for disinfectants. All equipment should be cleaned before being sterilised or disinfected.

Sterilisation
This is the complete elimination and destruction of all forms of microbial life. This is frequently achieved by steam under pressure, dry heat, gas or liquid chemicals. Such a sterilisation system must be available in every ward where invasive procedures are undertaken, and such systems are also required for instruments and towels used in the operating theatre.
Disinfection
This is a process that eliminates the majority of microorganisms, with the exception of the most resistant endospores. It is usually accomplished using liquid chemicals called disinfectants. Hypochlorites are inexpensive and effective disinfectants. They are active against most microorganisms, including HIV and hepatitis B. However, they do have a corrosive effect on metals, and if used on fabric or carpet can bleach out colours. Hypochlorites in a diluted form (usually 0.1% solution) for domestic use are contained in household cleaners available worldwide. These household cleaners can be used in the hospital environment for general cleaning, but stronger solutions (0.5% chlorine solution) must also be available, particularly for the disposal of body fluids, for initial cleaning of bloodstained instruments, and following outbreaks of notifiable infections. A 0.5–1% solution is recommended for the treatment of blood and body fluid spills, and 0.05–0.1% solution can be used for all surfaces. Hypochlorites are available as tablets, which makes the process of dilution easier.

How to prepare high-level disinfectant solutions
The best compound for the preparation of chlorine solutions for disinfection is household bleach (also known by other names such as Clorox® and Eau de Javel). Household bleach is a solution of sodium hypochlorite which generally contains 5% (50 g/litre or 50 000 ppm) available chlorine.

Thick bleach solutions should never be used for disinfection purposes (other than in toilet bowls), as they contain potentially poisonous additives.

When preparing chlorine solutions for use, the following points should be noted:
- Chlorine solutions gradually lose strength, and freshly diluted solutions must therefore be prepared daily.
- Clear water should be used, because organic matter destroys chlorine.
- A 1:10 bleach solution (0.5%) is caustic. Avoid direct contact with the skin and eyes.
- Bleach solutions give off chlorine gas, so must be prepared in a well-ventilated area.
- Use plastic containers for mixing and storing bleach solutions, as metal containers are corroded rapidly and also affect the bleach.

Two different dilutions of bleach are used for disinfection.

1:10 bleach solution (containing 0.5% chlorine)
This is a strong disinfectant, which is used to disinfect the following:
- excreta
- bodies
- spills of blood or body fluids
- medical equipment (e.g. delivery sets, kidney dishes, suture instruments, catheters, speculum).

To prepare a 1:10 bleach solution, add one volume (e.g. 1 litre) of 1:10 bleach solution to nine volumes (e.g. 9 litres) of clean water.

Always wear gloves. Immediately after delivery or examination, clean the instruments below the level of solution in the plastic bucket using a brush. Leave for 10 minutes and then place them in soapy water, wash with a brush, and flush every catheter with a 10–20 mL syringe. Next rinse with clean water and air dry, and then sterilise or boil for 20–30 minutes. Store dry in a metal bowl.

Change the solution after 24 hours or when it becomes bloodstained.
Label buckets with tape indicating the date and time when the solution was prepared and when it needs to be changed.
0.5% solution is also used to prepare 1:100 bleach solution.

1:100 bleach solution (containing 0.05% chlorine)
This is used for the following:
- disinfecting surfaces
- disinfecting bedding
- disinfecting reusable protective clothing before it is laundered
- rinsing gloves between contact with different patients (if new gloves are not available)
- rinsing gloves, aprons and boots before leaving a patient’s room
- disinfecting contaminated waste before disposal.

To prepare 1:100 bleach solution, add one volume (e.g. 1 litre) of 1:10 bleach solution to nine volumes (e.g. 9 litres) of clean water.

Note that 1:100 bleach solution can also be prepared directly from household bleach by adding 1 volume of household bleach to 99 volumes of clean water (e.g. 100 mL of bleach to 9.9 litres of clean water), but making it up from 1:10 bleach solution is easier.

Cleaning
This is often the most neglected of the three processes, and it must precede sterilisation and disinfection. When undertaken using a disinfectant detergent, cleaning alone will effectively reduce the number of microorganisms and make safe those items that come into contact with the intact skin (e.g. blood pressure cuffs, bed rails, intravenous poles).

Isolation of patients with specific infections
For isolation procedures to be effective they need to be instituted early. Two or more patients with the same infection can be isolated together. Different isolation techniques will be needed, and the use of gowns, gloves and masks will be necessary if the infection is very contagious and/or very serious. In some cases, nursing the patient in a cubicle or single room until medical tests are complete is all that is necessary. When there is a need for gowns, gloves and masks, these will require frequent changing or washing to ensure their efficacy, and must be used by everyone who comes into contact with the patient, including medical staff and carers. Ideally, they should be used only once and then removed and discarded or sent for laundering on leaving the isolation area. An area will need to be set aside for changing, with supplies of gowns, gloves, aprons and masks. Gowns made of cotton material will need to be worn with plastic aprons. Children’s compliance with isolation techniques will improve if the element of fear is removed. This can be achieved by all medical staff allowing the child to see their face (through a window) before donning a mask. It is also essential that when children are in hospital, infection control policies do not interfere with the child’s contacts with their parents.

Infection control measures following the death of a patient
When a patient dies, the amount of time that the parents
and other family members are able to spend with them will vary according to the facilities that are available. Rituals and beliefs concerning the death of an individual, and the management of the body, usually involve religious or cultural observance. There are many beliefs surrounding the distinction between physical and spiritual life, in particular the belief that something of the individual survives death, either to be reborn through reincarnation or to fulfill their spiritual destiny in the afterlife. It is important that the correct funerary procedures, if any, are followed in order to ensure that the bereaved are not distressed by any omission which they consider important.

All societies, whether religious or not, have to deal with the problem of the death of their patients and the bereavement of parents and other close family members. Like other transitions in an individual’s life, death is usually marked by a rite of passage in which central values are restated and important social bonds re-emphasised. Precise customs vary in different religions and traditions, but common features include the washing and laying out of the corpse (which may be embalmed), and the wake, or watching over the dead body. These customs may need to be modified to prevent the spread of infection to other members of the community, or because of the need to perform post-mortem examinations to establish an exact cause of death. Effective hand-washing procedures remain of paramount importance.

In countries where the climate is characterised by extremes of temperature, refrigeration of dead bodies until they can be returned to the family is essential. Each hospital should have a mortuary building adjacent to, but separate from, the hospital. To prevent the spread of infection, staff working in the mortuary will need to be provided with separate clothing for use in that department. The use of two pairs of gloves, or thick rubber gloves and protective clothing, will be necessary for the post-mortem examination if there is suspected infection of the body with life-threatening bacteria or viruses.

The mortuary department will need to have facilities for families to see and spend time with their dead relative, and a separate comfortable area where documentation can be completed and any necessary interviews with local government officials can be conducted. The mortuary department not only provides facilities for post-mortem examination, but also, in large centres, it can be part of the government facilities for forensic post-mortems, which may provide additional resources for the hospital. Having these centres within a hospital may improve services for families, but care needs to be taken that there is a culture of openness that involves families in the consent procedures for all examinations performed after the patient’s death.

Conclusion

Each member of the hospital has a role to play in the prevention of hospital-acquired infections. The greatest responsibility lies with the healthcare professionals, particularly nurses and doctors, who in the hospital setting are in contact with patients and their families 24 hours a day, and because of this are the main perpetrators of cross-infection. However, they can also demonstrate good practice by, for example, being the catalysts for change, and improving the education of other hospital staff and families.

Further reading


1.3 Continuing medical education for healthcare professionals

Continuing medical education takes many forms, including the following:

- on-the-wards training
- short courses on the management of emergencies
- use of a readily available pocketbook
- the availability of a postgraduate education centre with library and Internet facilities
- departmental meetings
- online websites and organisations
- local (Ministry of Health) guidelines and publications
- courses and conferences

- Internet-based membership organisations (e.g. HIFA 2015 and CHILD 2015).

Every healthcare professional needs to engage in continuing medical education in order to keep up with the pace of change. They may be a long way away from a university. They may have no library within reach. They may not be sent any journals to read. They may not be able to go away for further education. In resource-limited countries they may not be able to afford a computer or Internet access, or to print out the myriad of teaching materials available on the web.