CHAPTER 3

Universal Precautions and Infection Control

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OVERVIEW

By the end of this chapter you will:

- understand the importance of infection control
- be able to describe the various levels of hand hygiene
- understand the term 'universal precautions'
- be able to set up a sterile field
- understand the various methods of achieving asepsis
- know what to do if a needlestick or sharps injury occurs.

Infection prevention and control procedures are processes or techniques that we can use to ensure that we safeguard the patient from infection. It is essential that these techniques are followed in all patient contact situations.

Handwashing and decontamination

Good hand hygiene by healthcare workers has been shown to be the single most important preventative measure to reduce the incidence of healthcare-associated infection. It is a simple, important action that helps prevent and control cross-infection.

Every practitioner is personally responsible for their hand hygiene, and must actively seek to promote and safeguard the interests and wellbeing of patients.

Before handwashing, rings, watches and bracelets must be removed (most hospitals will allow the wearing of a plain band wedding ring only; ensure that you are aware of local policy).

There are three levels of hand hygiene.

Level 1: Socially clean

This involves the use of liquid soap and running water to remove any visible soiling of the skin. It should be used before and after each task and every patient contact. This is sufficient to prevent cross-infection.

- Apply one shot of liquid soap to wet hands and wash using a 6- or 8-point technique (see Figure 3.1).
- Rinse in warm water.
- Dry thoroughly by patting with paper towels to prevent chafing.

Level 2: Intermediate or disinfection

An alcohol hand rub is used to kill any surface skin organisms.

The hand rub should be available at all washbasins, in all clinical areas and outside any isolation areas. In areas where wall-mounted dispensers are not practical, dispensers may be attached to trolleys or smaller dispensers may be clipped to staff uniform. Alcohol gel can be used as an alternative to soap and water (only if hands are physically clean), or to disinfect the hands before an aseptic procedure.

- Hands must be physically clean before application.
- Apply alcohol hand rub to clean hands and massage using a 6- or 8-point technique (follow manufacturer's recommendations for the amount to be used) (see Figure 3.2).
- Allow to dry before beginning your next task.

Alcohol hand gel will not kill *Clostridium difficile* spores – soap and water is necessary

Level 3: Surgical scrub

This involves the use of a chemical disinfection and prolonged washing to physically remove and kill surface organisms in the deeper layers of the epidermis. This should be done before any invasive or surgical procedure.

- Apply a bactericidal, detergent, surgical scrub solution to wet hands and massage in using an 8-point technique, extending the wash to include the forearms.
- Ensure the hands are positioned so as to prevent soap and water running onto and contaminating the hands from unwashed areas of the arms (high hands, low elbows technique).
- Rinse in warm water.
- Dry thoroughly by patting with sterile paper towels.
- Don sterile gown and gloves.

Figure 3.3 shows areas that are commonly missed during hand hygiene processes.

Table 3.1 shows a summary of the three techniques.

ABC of Practical Procedures. Edited by T. Nutbeam and R. Daniels. © 2010 Blackwell Publishing, ISBN: 978-1-4051-8595-0.

(a) Wet hands under running water

(b) Apply soap and rub palms together to ensure complete coverage

(c) Spread the lather over the backs of the hands

(d) Make sure the soap gets in between the fingers

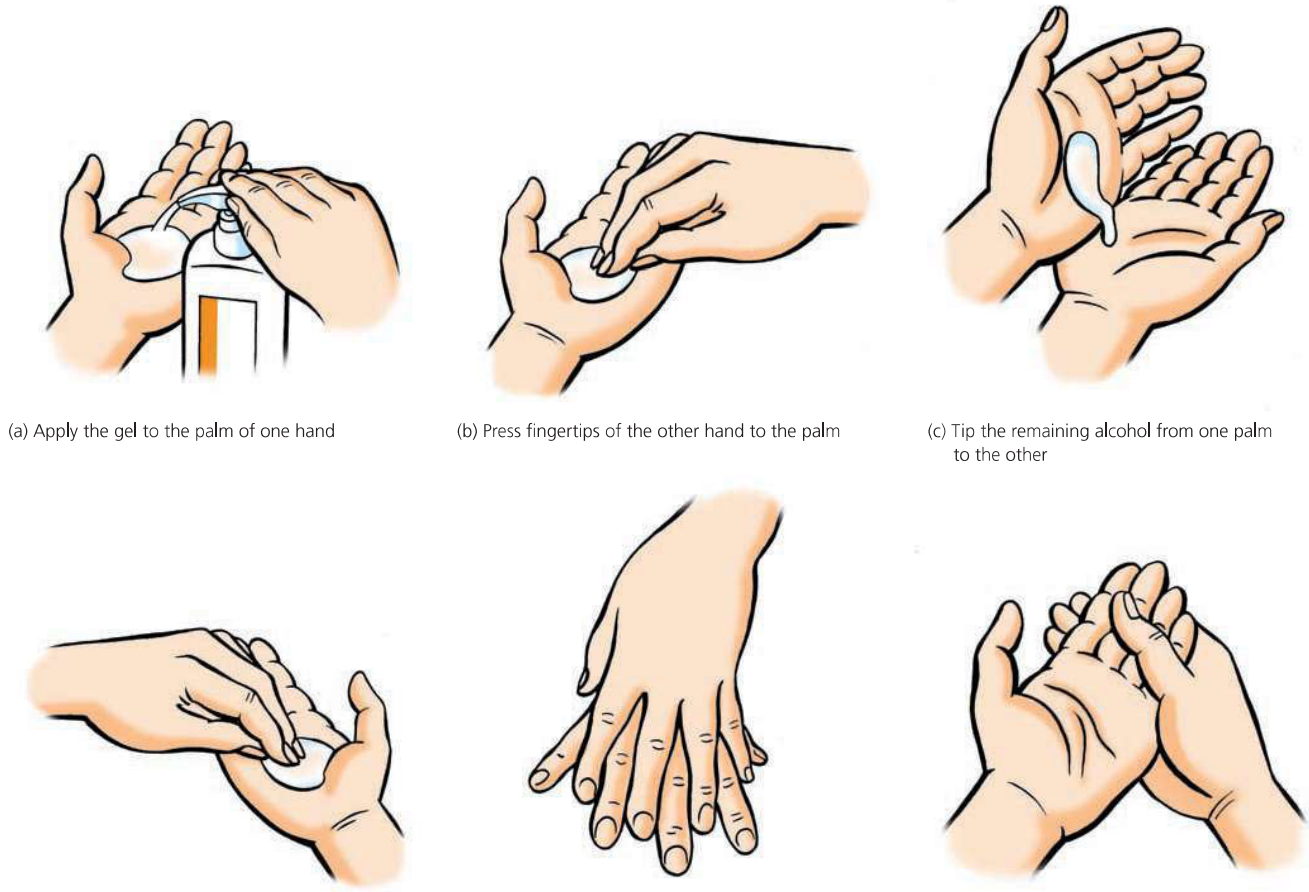
(e) Grip the fingers on each hand

(f) Pay particular attention to the thumbs

(g) Press fingertips into the palm of each hand

(h) Dry thoroughly with a clean towel

Figure 3.1 Handwashing technique. (With permission from ECOLAB.)



(a) Apply the gel to the palm of one hand

(b) Press fingertips of the other hand to the palm

(c) Tip the remaining alcohol from one palm to the other

(d) Press fingertips of the other hand to the palm

(e) Quickly spread alcohol onto all surfaces of both hands, paying particular attention to thumbs

(f) Continue spreading the alcohol until it dries

Figure 3.2 Alcohol rub decontamination technique. (With permission from ECOLAB.)

Figure 3.3 Missed areas in hand hygiene.

Table 3.1 Summary of the three levels of hand hygiene.

	Liquid soap and water	Alcohol-based handrub	Surgical scrub
	Level 1	***Level 2***	***Level 3***
Action	Removal of physical contaminants: dirt, organic matter	Killing of transient flora on physically clean hands	Disinfection and removal of transient and resident flora from hands
When	When hands are physically dirty and after using the toilet	Between patients Before applying gloves for procedures such as venepuncture, urinary catheterisation, lumbar puncture, joint aspiration, etc	Prior to surgical procedures Before applying sterile gloves to carry out a procedure where an implantable device is to be inserted such as central venous, epidural and cardiac catheters, and pacemakers

The sterile field

The sterile field is the sterile area that can be used as a work area when carrying out a sterile procedure. It is essential that this area is kept free from microorganisms and spores.

The environment

Any sterile procedures should be carried out in a clean area, free from airborne contamination. All surfaces to be used must be clean, dry, flat and stable. Any activities that will cause environmental disturbances or an increase in airborne contamination (dusting, bed-making etc.) should not be carried out immediately before an aseptic procedure. Curtains or fabric screens should be closed for 10 minutes to allow the airborne contaminates to settle. Ensure that the patient is aware of the need to maintain sterility during the procedure, as he/she may accidentally touch the sterile field.

Preparing your sterile field/trolley for the procedure

All sterile equipment is double wrapped. Packs containing sterile equipment must be unopened and the seals must be intact. The pack must be within the expiry date printed on the packaging.

All trolleys and surfaces must have been wiped or washed each day thoroughly with detergent solution. They should additionally be cleaned before each use using an alcohol-based disinfectant.

1 Wash your hands before handling the equipment and don a disposable apron and non-sterile gloves.
2 Touch only the outside layer of packaging – open the outer packs away from your body, and tip the contents onto your proposed work surface (trolley).
3 The outside of the inner wrapper is not part of the sterile field and may be touched with the hands. To open the pack, hold the corners of the wrapper only. Pull the corners out and down to expose the contents. Ensure that you do not reach across the opened pack or touch the contents.
4 The opened pack now becomes part of your sterile field.
5 Any additional sterile equipment can be tipped or dropped onto this sterile field, ensuring that the sterile surfaces are not touched.

The operator can now perform a surgical scrub and don sterile gown and gloves.

Some procedures require the operator to wear a surgical mask. This must be worn before the scrub to avoid contamination of the hands. Local policy should be adhered to.

When wearing a sterile gown and gloves, always keep your hands within view and above the waistline to prevent accidental decontamination.

Extending the sterile field

The sterile field can now be extended to include the area between the operator and the patient and surrounding the procedure site.

1 The skin is decontaminated using a bactericidal preparation of 2% chlorhexidine in 70% isopropyl alcohol, and allowed to dry.
2 Sterile drapes are opened by the operator, and held by the corners away from the body and any surfaces that will contaminate them.
3 Apply the drapes around the procedure site, also covering the area between the operator and the patient: leave only the decontaminated area of skin exposed.
4 Drapes are placed from the back to the front to avoid contaminating the operator's gown or gloves.
5 Gloves must be changed if they touch a non-sterile area.

Skin preparation solutions

Skin antisepsis before a percutaneous procedure

2% chlorhexidine in 70% isopropyl alcohol has been shown to provide very effective skin preparation. It has the dual benefits of rapid action and excellent residual activity, reducing subsequent colonisation.

Povidine iodine solution can be used if the patient has a history of chlorhexidine sensitivity.

Apply the skin preparation by rubbing the solution onto the skin commencing at the insertion site and working outwards. Rub for about 30 seconds and allow the solution to dry completely before beginning the procedure. An alternative approach, recommended for peripheral venous cannula insertion, is to use a 'criss-cross' approach in two directions to minimise the risk of missing areas.

Needlestick injury

Needlestick or sharps injuries are a daily risk for healthcare workers and can lead to infection with bloodborne viruses (BBVs) such as hepatitis or HIV. The risk of infection following a single sharps (percutaneous) injury varies depending on the type of BBV. The risk is approximately:

- 1 in 3 if the instrument is contaminated with hepatitis B
- 1 in 30 if the instrument is contaminated with hepatitis C
- 1 in 300 if the instrument is contaminated with HIV, though this depends on the infectivity of the source patient.

The chances of transmission are higher with hollow-bore needles compared to other types of sharp injury.

Prevention of needlestick and sharps injuries

There are a few simple rules to help reduce the incidence of injury.

- Do not disassemble needles from syringes or other devices – discard as a single unit.
- Do not resheath needles. If essential, use a resheathing device.
- Do not carry used sharps by hand or pass to another person.
- Discard sharps immediately after use into an approved sharps container (which you should take with you to the bedside).
- Ensure sharps containers are of an appropriate size and available at the points of use.
- Ensure sharps containers are closed securely when three-quarters full, and disposed of according to local policy.

Peripheral venous cannulae with a device that closes over the needle tip after it has been withdrawn from the cannula are available, and provide a safe option.

The risk of a percutaneous injury is increased during a surgical procedure when suture needles and scalpel blades are used. Therefore:

- use blunt suture needles where possible (not suitable for skin sutures)
- ensure that needle holders with needle tip guards are used
- use a disposable scalpel or ensure a blade removal device is used at the end of the procedure.

When taking blood samples, avoid using a needle and syringe if possible. A vacuum tube system reduces the risk of needlestick injury.

Managing accidental exposure to bloodborne viruses

Any exposure to blood or body fluids from a sharps injury, cut or bite, or from splashing into the eyes or mouth or onto broken skin, carries a risk of exposure to a BBV. All of these occurrences must be reported to, and followed up by, the occupational health team. If there is a strong suspicion of exposure to HIV, it is recommended that antiretroviral post-exposure prophylaxis (PEP) is commenced. Ideally this should be started within an hour of exposure and the full course lasts 4 weeks. In situations when the treatment is delayed but the source person proves to be HIV positive, PEP can be given up to 2 weeks after the injury (though with reduced efficacy). The occupational health team will assess the circumstances and decide whether any action is necessary to reduce the risk of HIV or hepatitis.

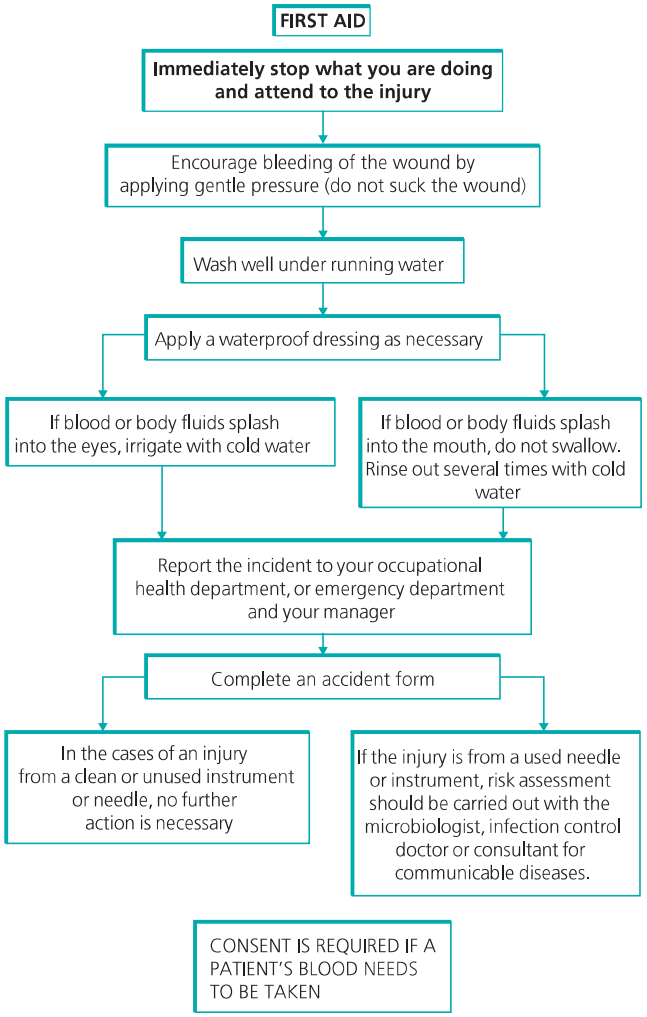


Figure 3.4 Needlestick injury protocol.

Figure 3.4 shows what to do in the event of a needlestick/sharps injury.

Legal issues

The Human Tissue Act (HTA) 2004 was introduced following a high-profile case regarding the unethical removal and retention of organs. The act requires that virtually all organs or samples taken from humans can only be tested or stored with the explicit consent of the person from whom they were taken. Failure to obtain consent can render the offender open to a fine or imprisonment. Therefore a doctor may not test a patient for HIV or hepatitis for the benefit of an injured healthcare worker if the patient refuses the test.

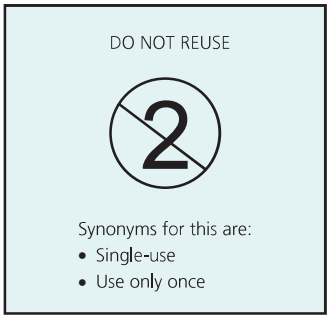


Figure 3.5 Symbol used to identify equipment that cannot be cleaned or reused.

The Mental Capacity Act (MCA) 2005 came into force on 1 October 2007. This was introduced to protect patients that lack the capacity to provide consent.

Under the MCA, all treatment decisions relating to patients over the age of 16 years who lack the capacity to consent must be necessary and made in the patient's best interests.

In the event of a needlestick injury to a healthcare worker, blood may only be taken for testing from a patient who lacks capacity or is unconscious if it is in the best interests of the patient.

Cleaning or disposing of equipment

Most equipment used in sterile procedures is disposable. Equipment that cannot be cleaned or reused can be identified by the symbol seen in Figure 3.5. Please dispose of contaminated equipment safely, and prevent injury to other healthcare workers.

Further reading

Department of Health. (2005) *Saving Lives Campaign.*

Department of Health. (2003) *Winning ways: working together to reduce healthcare associated infection in England.*

National Institute for Health and Clinical Excellence (NICE). (2003) Infection control. *NICE clinical guideline 2.* www.nice.org.uk/cg2

National Resource for Infection Control (NRIC). www.nric.org.uk.