

CHAPTER 5

INFECTION PREVENTION AND CONTROL



This chapter provides information on the following:

- basic concepts of infection prevention for male circumcision services
- key components of standard precautions
- the importance of and steps for hand hygiene
- appropriate usage of personal protective equipment for male circumcision
- safe injection practices—safe handling of hypodermic needles, sharps and syringes, and safe use of syringes with safety features
- key steps involved in properly processing and decontaminating instruments and other items
- safe handling and disposal of infectious waste materials and used disposable kits
- resources for providing post-exposure prophylaxis

5.1. KEY CONCEPTS AND PRACTICES

Infection prevention and control practices are vital to protect clients and clinic staff from exposure to infection. Preventing and controlling infection in clients is essential for both their safety and the public's acceptance of the male circumcision procedure. A major concern in all clinics (not only in male circumcision clinics) is the potential transmission of bloodborne pathogens, such as hepatitis B virus, hepatitis C virus and HIV, to other clients or health care workers. The risk of acquiring hepatitis B virus due to an unsafe injection was 6% to 30%. The risk of acquiring hepatitis C virus infection due to a needle-stick (sharps) injury was 0.5%, and the risk of acquiring HIV after a needle-stick (sharps) injury was estimated at 0.3–0.6% (that is, transmission of three–six HIV infections for every 1 000 such injuries) (1). In general, if measures taken are sufficient to prevent hepatitis B virus transmission, they will also prevent all other bloodborne infections, including hepatitis C virus and HIV.

In health care facilities, most instances of infection transmission can be prevented through the application of **standard precautions** (2, 3). Standard precautions are a set of good practices known to prevent and control the transmission of infection and include (2–4) the following:

- hand hygiene
- use of personal protective equipment
- environmental cleanliness, including safe management of blood or bodily fluid spills
- decontamination of medical devices, patient care items and equipment
- safe use, handling and disposal of needles, syringes and sharp instruments
- proper disposal of all clinical waste
- aseptic practices
- respiratory hygiene
- safe management of linens

This chapter describes the standard precautions most relevant to male circumcision services. These precautions should be implemented at all times.

Immunization is another effective strategy for reducing the risk of infection transmission in the workplace. In many countries, hepatitis B vaccination is mandatory or strongly recommended for health care workers because this protects the

workers and clients. Clinic managers should ensure that clinics follow national protocols regarding hepatitis B vaccination of providers.

Even with standard precautions and mandatory immunization for health workers in place, accidents can occur. In the event of accidental exposure, such as a needle-stick (sharps) injury, clinics are urged to manage occupational exposure to bloodborne pathogens, such as hepatitis B virus, hepatitis C virus and HIV, by following a well-defined protocol that includes 1) the initiation of post-exposure prophylaxis as soon as it is safe to do so, and 2) the completion of the recommended 28-day course of post-exposure prophylaxis (see Box 5.1). There are many challenges to providing effective post-exposure prophylaxis, including early provision and adherence to the full course of the treatment. Given these challenges, full compliance with infection prevention and control practices is still the best way to protect health care workers.

Box 5.1. What to do if there is a needle-stick (sharps) injury

Despite best efforts, needle-stick (sharps) injuries do occur. The injured health care worker must balance his/her risks with the safety of the client. The following guidelines can help health care workers address needle-stick (sharps) injuries:

- As soon as it is safe to do so (with regard to client safety), the health care worker with the needle-stick (sharps) injury should stop what he/she is doing, remove gloves, and wash both hands and the area of the needle-stick (sharps) injury with soap and plenty of water. **No** antiseptics or scrubbing brushes should be used.
- If the provider is in the middle of a male circumcision procedure, then another qualified provider should take over and complete the procedure. If no other qualified provider is present, then the injured provider should ensure that any critical step is complete (for example, any active bleeding has been stopped), wash both hands and the area of the needle-stick (sharps) injury (as described below), change gloves, and then complete the procedure.
- As soon as the health care worker with the needle-stick (sharps) injury is able to do so, he/she should inform senior staff or managers at the clinic and follow clinic protocols for managing the needle-stick (sharps) injury.
- Each clinic should have a written standard operating procedure for managing a needle-stick (sharps) injury. The standard operating procedure will vary across locations and depend on the resources available at a clinic. Each clinic should have a protocol (or standard operating procedure) that was written in consultation with the appropriate referral centre. The protocol should include clear advice about what actions the injured provider should perform to mitigate the risk of hepatitis and HIV; also, it should be in accord with national standards and take into account international guidance on avoiding exposure to bloodborne pathogens (see Annex 5.1).

5.1.1. Hand hygiene and surgical hand disinfection

5.1.1.1. Hand hygiene

Hand hygiene is part of standard precautions. Proper hand hygiene practices are one of the most important in infection prevention and control to prevent cross infections (see Annex 5.2). Standard practices for hand hygiene include thorough handwashing using nonmedicated soap and water or an alcohol-based handrub. At a minimum, before and after each new client, all health care workers should wash their hands with soap and water or use an alcohol-based handrub, as recommended by the World Health Organization's *5 moments of hand hygiene (5)*; if using an alcohol-based handrub to clean hands, then the hands must be physically clean (not visibly soiled) before using the handrub (see Annexes 5.2 and 5.3).

5.1.1.2. Surgical hand disinfection

- Steps before starting surgical hand preparation

The hands of the surgical team should be cleaned upon entering the surgical area by washing the hands with a nonmedicated soap. Surgical staff should keep nails short and avoid the use of artificial nails and/or nail polish. All jewellery (rings, watches, bracelets) must be removed from hands before entering the operating theatre. Wash hands and arms with a nonmedicated soap before entering the operating theatre area or if hands are visibly soiled. The first wash of the day should include a thorough cleaning of the area under the fingernails and subungual areas using a nail

file. Nail brushes should not be used, as they may damage the skin and encourage shedding of squamous epithelial cells from the skin. If considered essential, then a single-use sterile disposal sponge should be used (5).

- Surgical handscrubbing

World Health Organization recommends that surgical hand preparation be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable alcohol-based handrub—before donning sterile gloves and before performing the surgical procedure (6). Surgical handscrub refers to surgical hand preparation with antimicrobial soap and water. Surgical handrub refers to surgical hand preparation with a waterless, alcohol-based solution (5).

A full surgical handscrub with antimicrobial soap and water is required **at the start** of the day (see Annexes 5.4 and 5.5). After the first surgical handscrub with soap and water, repeat the handscrub without performing the step of washing hands with nonmedicated soap (noted in Section 5.1.1.1) or use an alcohol-based handrub product for surgical hand preparation (see below).

Surgical handscrub with soap and water can be performed between cases if there is any residual talc or biological fluids present after gloves are removed.

Hands should also be washed upon re-entering the area, for example, after lunch or after using the bathroom.

- Hand disinfection using alcohol-based handrub

After the first handscrub with an antiseptic soap and water, an alcohol-based handrub can be applied between surgical cases; hands must be physically clean (not visibly soiled). Follow the technique illustrated in images 1–17 in Annex 5.4 before moving to the next procedure. It is essential that after applying an alcohol-based handrub, the hands must be completely dry before putting on sterile gloves for the next procedure.

When choosing an alcohol-based handrub, health care facilities should regularly procure products with proven efficacy (that is, products that comply with European Norms, American Society for Testing and Materials International or equivalent international standards). Health care facilities should implement international recommendations and position no-touch or elbow-operated alcohol-based handrub dispensers in surgical scrub rooms. Alternatively, antimicrobial soap, clean running water and disposable or clean towels for each health care worker should be available in the scrub room.

5.1.1.3. Hand care

Frequent and repeated use of soaps and other detergents is responsible for chronic dermatitis among health care workers, and this can be reduced by the addition of humectants/emollients to hand hygiene products to help moisturize the skin. In addition, skin irritation is also found due to the presence of other ingredients, for example, antimicrobial agents, fragrances and preservatives present in the hand hygiene formulation.

Health care workers may sometimes need to use lotions or creams to soothe their skin. Some hand care products are also responsible for skin sensitization, so only suitable hand creams or lotions should be used. Use of perfumed lotions or creams can also cause dermatitis, so their use should be avoided. Lotions or creams should be supplied in small, individual-use containers that are *not* refilled. However, regular and repeated use of lotions or creams at the work site is not recommended because it can lead to greasy or slippery hands.

Dermatitis is caused by drying or allergies, and severe dermatitis causes small cracks or tears in the skin. Severe dermatitis is not common, but, when it does occur, it can increase a person's risk of acquiring an infection. Staff with an allergy or adverse reaction to hand hygiene products should use alternative products as recommended by an occupational health department or dermatologist, per the facility's protocol.

If potentially infectious blood or another bodily fluid splashes onto nonintact skin, or if there is a potentially infective sharp injury, the area should be immediately washed with water and soap; an alcohol-based handrub or any antiseptic should **NOT** be used. Then, the individual should seek advice on the need for post-exposure prophylaxis (see Annex 5.1).

5.1.2. Personal protective equipment

Personal protective equipment is designed to protect both health care workers and clients from exposure to infectious agents. This equipment works by providing a physical barrier against microorganisms, helping health care workers avoid contaminating their hands, mucous membranes and broken skin (eyes, nose, mouth and face), clothing, hair and shoes; it also helps to prevent health care workers from transmitting infections to clients and other staff. Personal protective equipment includes gloves, surgical masks, protective eyewear (face shield or goggles), cap or hair cover, apron, gown and footwear. Footwear should be enclosed and capable of protecting health care workers from injury due to accidental contact with sharps and other contaminated items. Open footwear must never be worn in the operating theatre. If there is a risk of spillage of blood or other high-risk bodily fluids, surgical waterproof boots should be worn. Plastic shoe covers should *not* be used for the purpose of protecting footwear.

In male circumcision services, the following personal protective equipment is recommended:

- **Sterile surgical gloves:** Sterile surgical gloves are used for performing the procedure and changing dressings. The use of surgical gloves does not replace the need for hand hygiene. These gloves must **not** be reused to provide care to more than one client.
- **Nonsterile examination gloves:** These are used by many health care workers when handling and examining clients before or after the procedure, for example, when doing the genital screening examination. If nonsterile gloves are used, new gloves should be used for each client. All staff must perform hand hygiene immediately **after** removing gloves and on arriving at the clinic, and they must also keep their hands clean throughout the day. Also, health care workers should perform hand hygiene after removing gloves and before having contact with a client, per the World Health Organization's *5 moments of hand hygiene (5)*.
- **Masks:** Surgical masks protect mucous membranes of the mouth and nose from coming into contact with possible splashes of blood or other bodily fluids, and they should be worn by anyone undertaking a procedure that is likely to generate such splashes. Surgical masks are designed to resist fluids and are preferred over cotton or gauze masks. The provider doing the circumcision should wear a mask because of the chance of coming into contact with splashes of blood or other bodily fluids.
- **'Theatre' (surgical) gowns:** The operating team should wear impermeable, cuffed-wrist and sterile theatre gowns. Gowns contaminated with blood or bodily fluids should be removed as soon as possible and bagged for laundering or discarded as clinical waste if they are disposable.

5.1.3. Safe handling of sharps and injection practices

All clinic staff should be trained in the safe handling of hypodermic needles, syringes and sharp instruments (sharps) (see Box 5.2).

- To prevent needle-stick (sharps) injuries, the World Health Organization's *Guideline on the use of safety-engineered syringes (7)* recommends "the use of syringes with a sharps-injury-protection feature (safety-engineered syringes), as opposed to syringes without a sharps-injury-protection feature, by health care workers delivering intramuscular, subcutaneous or intradermal injectable medications to patients." Note that it is necessary to withdraw the syringe to check that local anaesthetic is not injected into a blood vessel; therefore, it is not appropriate to use safety-engineered syringes that are designed to prevent plunger withdrawal (7).
- Needles and syringes should never be reused because of the high risk of infecting the client with bloodborne viruses, such as hepatitis B, hepatitis C and HIV.
- Hypodermic (hollow-bore) needles are the most common cause of injuries to all types of health care workers:
 - Health care workers are most often stuck by hypodermic needles during client care.
 - Cleaning staff are most often stuck by needles when laundering surgical linens or disposing of them.
 - Housekeeping staff are most often stuck by needles when disposing of infectious waste material.

- Do not recap a needle because it is safer to dispose of a needle and syringe directly into a sharps container **without** recapping. However, there may be an instance when recapping is advisable. For example, if the provider has finished giving anaesthetic and there is some medication remaining in the syringe, which may or may not be needed later during the procedure, leaving the open needle uncapped is a hazard. If a needle must be recapped, then use the one-handed needle recapping technique.
 - “Step 1: Place the cap on a flat surface like the table or counter with something firm to ‘push’ the needle cap against
 - Step 2: Holding the syringe with the needle attached in one hand, slip the needle into the cap without using the other hand
 - Step 3: Push the capped needle against a firm object to ‘seat’ the cap onto the needle firmly using only one hand.”
(8)
- Syringes with sharps-injury-protection features are available, and the World Health Organization’s *Guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health care settings* (7) recommends that “all countries should transition by 2020 to the exclusive use, where appropriate...of [World Health Organization’s] prequalified (or equivalent) safety-engineered injection devices, including [reuse prevention] and [sharps injury prevention] devices.”

Box 5.2. Safe use and disposal of hypodermic needles and syringes

- Do not use disposable needles and syringes more than once.
- Do not disassemble the needle and syringe after use.
- Do not bend or break needles before disposal.
- Dispose of the needle and syringe together in a puncture-resistant container.

5.1.3.1. Sharps containers

Clearly labelled, puncture-proof and tamper-proof sharps safety boxes or containers (see Fig. 5.1) are a key component in efforts to keep injuries from disposable sharps to a minimum.

- Place sharps containers as close to the point of use as possible and practical (ideally, within arm’s reach) but away from busy areas. Avoid placing containers near light switches, overhead fans or thermostat controls—places where people might accidentally put their hands in them. Never place sharps containers on the floor.
- Attach containers to walls or other surfaces at a convenient height, if possible, so that staff can use and replace them easily.
- Mark the container clearly so that people will not mistakenly use it as a rubbish bin.
- Mark the fill line (at the three quarters full level). Do not shake the container to settle its contents to make room for more sharps.
- **Never** fill the containers more than three quarters full.
- **Never** attempt to empty the sharps container.

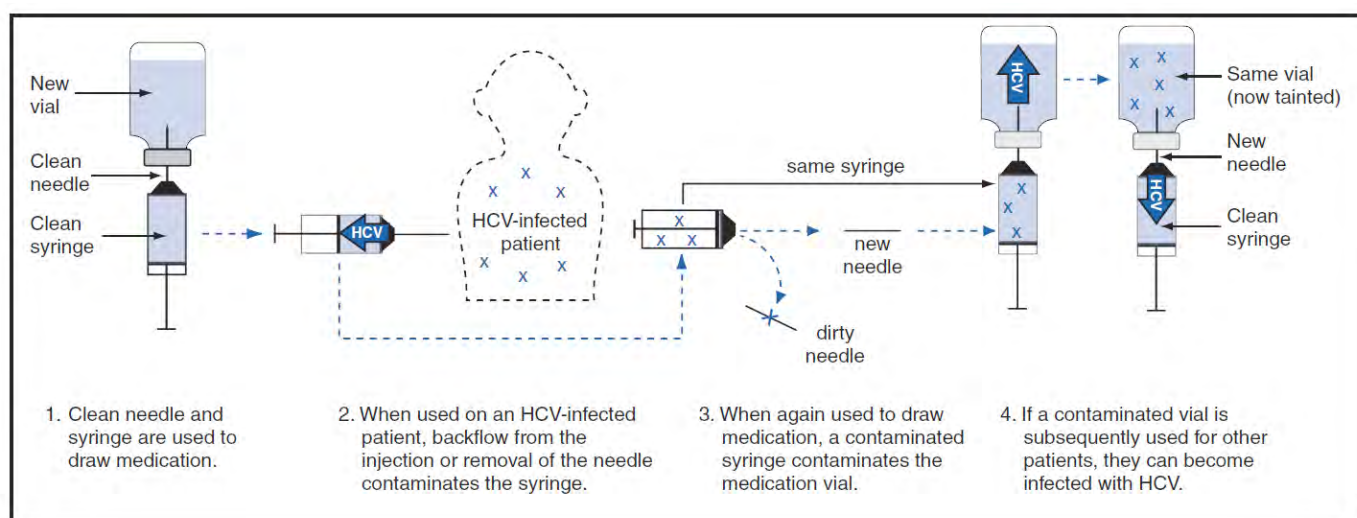
Fig. 5.1. Sample sharps container



5.1.3.2. Preventing contamination of medicine vials

The practice of reusing syringes can transmit bloodborne infections, such as hepatitis B virus, hepatitis C virus and HIV, to clients. In fact, the syringes do not have to be used on multiple patients for this to occur. Fig. 5.2 shows how bloodborne pathogens are transmitted via unsafe injection practices.

Fig. 5.2. How vials get contaminated through double-dipping



Source: (9)

Using the same syringe to inject more than one client from a multidose vial is also called **double-dipping**. Double-dipping is a dangerous and unsafe practice. In the context of male circumcision, here is a typical scenario in which this can happen after a syringe is used to draw local anaesthetic from a multidose vial and inject that medication into a client, the syringe is then reused, with or without a new needle, to draw more medication from the vial. When the same syringe is used to enter the vial, even for the same client, the entire multidose vial is contaminated. When that contaminated vial is used for the next client(s), even if **new syringes and new needles** are used, infections can be transmitted (see Box 5.3).

Syringes with reuse prevention features are available and are included in the World Health Organization's *Guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health care settings* (7). This guidance includes the recommendation to transition by 2020 to the exclusive use of syringes with sharps-injury-protection and reuse prevention features for therapeutic injections, where appropriate. In this *Manual*, guidance to include such safety-engineered syringes for local anaesthetic injection in male circumcision has been agreed upon by the experts who developed the safety-engineered recommendation, which was based in part on a study done during male circumcision procedures (10).

Because of the need to aspirate repeatedly while advancing the needle to prevent injection directly into a blood vessel, reuse prevention syringe models used for administering local anaesthetic must permit repeated aspiration and injection

without disabling the syringe. (The disabling mechanism in such syringes may engage with deliberate activation by pressing a button, or the disabling mechanism engages automatically once the plunger is **fully** depressed. This second option may be more effective in preventing unsafe practices.) Additional desirable features for the injection of local anaesthetic include sharps injury prevention features and detachable needles (the latter to allow the use of a larger-gauge needle to draw the anaesthetic and a smaller-gauge needle to inject the anaesthetic). More information on the use of reuse prevention syringes in male circumcision and a description of a pilot experience is available (7, 10).

Box 5.3. Infection rate due to reuse of injection equipment

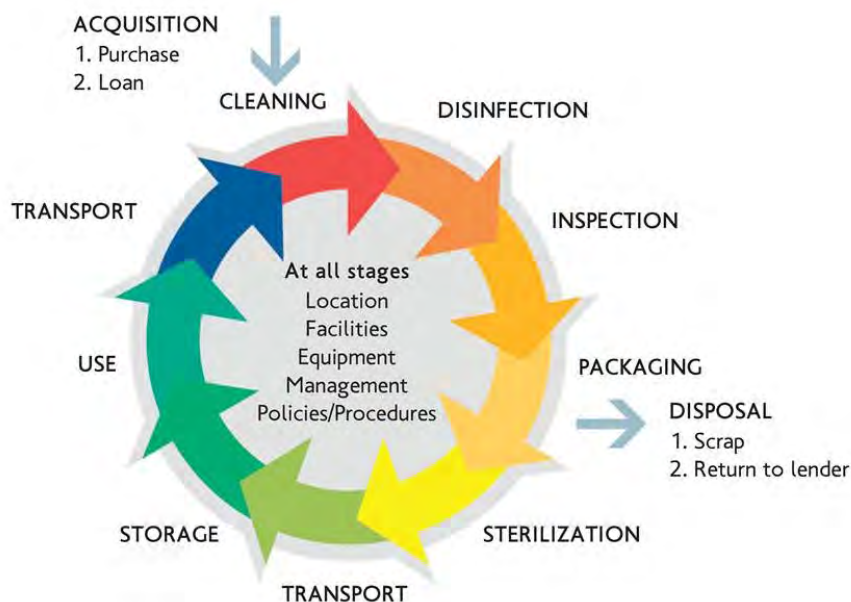
In 2010, estimates showed that the practice of unsafe injections caused 1.7 million new cases of hepatitis B virus, about 200 000 new cases of hepatitis C virus infections and about 25 000 new cases of HIV (1).

5.2. DECONTAMINATION AND PROCESSING OF INSTRUMENTS

Decontamination is a complex and highly specialized subject. This section provides a brief summary on the decontamination and reprocessing of reusable medical devices and patient care items or equipment. Details are given in *Decontamination and reprocessing manual for health-care facilities* (11). Decontamination is an important process for safe circumcision. It is usually undertaken by staff other than those performing the male circumcisions; however, it is important that all are aware of the decontamination process.

Decontamination is the use of physical or chemical means to remove, inactivate or destroy pathogenic microorganisms from a surface or item so that it is no longer capable of transmitting infectious particles, thereby being rendered safe for handling, use or disposal. The term is used in this document to cover cleaning, disinfection and sterilization (see Fig. 5.4 and Table 5.1).

Fig. 5.3. The decontamination life cycle



Source: reproduced by permission of the World Health Organization (11)

Table 5.1. Level of decontamination

Cleaning	The physical removal of body materials, dust or foreign material. Cleaning will reduce the number of microorganisms as well as the soil, therefore allowing better contact with the surface being disinfected or sterilized and reducing the risk of soil being fixed to the surface. Removal of soil will also reduce the risk of inactivation of a chemical disinfectant and the multiplication of microorganisms. The removal of contamination from an item to the extent necessary for further processing or for intended use.
Disinfection	The destruction or removal of microorganisms at a level that is not harmful to health and is safe to handle. This process does not necessarily include the destruction of bacterial spores.
Sterilization	The complete destruction or removal of microorganisms, including bacterial spores. Sterility State of being free from viable microorganisms. Sterilization Validated process used to render a product free from viable microorganisms.

Source: reproduced by permission of the World Health Organization (11)

5.2.1. Decontamination of instruments

All medical devices that are reprocessed, such as surgical instruments, **must be cleaned thoroughly** before they are disinfected and sterilized. Soaking medical devices in any disinfectant solution prior to cleaning or during transportation is not recommended, as there is a danger of spilling contaminated fluids and possible damage to instruments.

Used medical devices must be placed in a container or tray and kept moist until they are removed. These trays (and accompanying checklist) should be transported in a robust trolley (preferably with closed sides) to the decontamination area. Used devices should be received, checked and sorted for cleaning in the area designated for dirty devices. Cleaning is done either manually or by automated methods. Appropriate personal protective equipment must be worn.

5.2.2. Risk assessment of contaminated instruments

The risk of transferring microorganisms from instruments and equipment depends on the following factors:

- the presence of microorganisms, their number and their virulence
- the type of procedure that is going to be performed (invasive or noninvasive)
- the site in the body where the instrument, items or equipment will be used

Risk assessment for the reprocessing of medical devices was best described by Spaulding (12) and has since been modified. After thorough cleaning, the decision to disinfect or sterilize is based on whether the device is stable to heat or not. The body site where the instrument or equipment will be used or will have contact with will determine whether cleaning or high-level disinfection or sterilization is required. The Spaulding classification categorizes medical devices as critical, semicritical or noncritical, depending on the risk of infection transmission (see Table 5.2).

Table 5.2. Spaulding classification of equipment decontamination (12)

CATEGORY	DEFINITION	LEVEL OF MICROBICIDAL ACTION	METHOD OF DECONTAMINATION	EXAMPLE OF COMMON ITEMS AND EQUIPMENT IN THE MALE CIRCUMCISION CLINIC
High (critical)	Medical devices involved with a break in the skin or mucous membrane, or entering a sterile body cavity	Kills all microorganisms	Sterilization (usually heat if heat stable or chemical if heat sensitive)	Surgical instruments used for male circumcision Disposable syringes, needles and sutures supplied sterilized by the manufacturer
Intermediate (semicritical)	Medical devices in contact with mucous membranes or nonintact skin	Kills all microorganisms except high numbers of bacterial spores	High-level disinfection by heat or chemicals (under controlled conditions, with minimum toxicity to humans)	Respiratory therapy and anaesthetic equipment, flexible endoscopes, vaginal specula, reusable bedpans and urinals or urine bottles, equipment, patient bowls, etc.
Low (noncritical)	Items in contact with intact skin	Kills vegetative bacteria, fungi and lipid viruses	Low-level disinfection, that is, cleaning	Blood pressure cuffs, stethoscopes, diathermy machine leads, etc. Environmental surfaces, including the operating theatre table and other environmental surfaces

The following guidelines, which are based on the *Decontamination and reprocessing of medical devices for health-care facilities (11)*, should be followed **before** sending instruments to the sterile supply department or decontamination unit for cleaning:

- Wear personal protective equipment to protect yourself.
- Remove and dispose of items appropriately—dispose of sharps, such as scalpel blades and syringes with attached needles, and any separate needles into a sharps container.

At the end of the male circumcision procedure, the provider doing the male circumcision procedure is responsible for segregating sharps from drapes and reusable surgical instruments, and placing them into a sharps container. This is particularly important for protecting the other staff who clean instruments and dispose of drapes.

- Remove gross contamination (usually blood) from instruments by wiping them with a clean, dry cloth; precleaning (for example, by soaking or spraying) prevents contaminants from drying on devices and makes them easier to clean (11).
- Dispose of single-use circumcision devices and any other medical device according to their manufacturer's instructions for use (11).
- Use cleaning products that are appropriate for medical devices and approved by the device's manufacturer (11).
- Contain contaminated items in dedicated, fully enclosed, leak-proof and puncture-proof containers before transport (11).

5.2.3. Cleaning of instruments (reusable and single use) (11)

Cleaning is the first and most essential step in reprocessing surgical instruments after they have been used. It is the removal of visible soil, organic and inorganic materials from objects and surfaces. Cleaning must happen before disinfection or sterilization.

Cleaning and processing should be done in batches. Separate single-use (disposable) instruments from reusable instruments before cleaning and processing them to prevent mixing the two types of instrument. This will help ensure that single-use instruments are not reused.

Before any decontamination can take place, used devices are prepared for reprocessing at the point of use to ensure that they are safe for transport and are minimal risk to staff. This is not a substitute for cleaning. Point-of-use preparation helps prolong the life of surgical instruments, as dried blood and saline can cause the decomposition of stainless steel and make surgical instruments much more difficult to clean.

Used instruments should be cleaned as soon as possible after their use. If it is not possible to clean instruments, they should be rinsed and then soaked in water, or in water and enzymatic detergent solution (saline solution should not be used; see Box 5.4), until they can be cleaned. Prolonged soaking should be avoided.

Box 5.4. Do not soak instruments in disinfectant prior to cleaning

Soaking instruments in 0.5% hypochlorite (bleach) solution, or in any other disinfectant during transport or before cleaning, is **not** recommended for the following reasons:

- The disinfectant may damage/corrode the instruments.
- The disinfectant may be inactivated by blood and bodily fluids, which could become a source of microbial contamination and formation of biofilm.
- Transportation of contaminated items soaked in chemical disinfectant to a decontamination area may pose a risk to health care workers, resulting in inappropriate handling and accidental damage.
- Soaking may contribute to the development of antimicrobial resistance to disinfectants.

Source: (11)

Contaminated items should be contained in dedicated, fully enclosed, leak-proof and puncture-proof containers prior to transport. Soiled instruments should be opened and kept moist.

To ensure that instruments are in working order, once the instruments have been cleaned, they should be inspected for any visible damage and for proper functioning before they are further processed (see Chapter 3). Failure to properly clean an instrument may allow foreign material—in particular, old blood clots—to accumulate in hard-to-clean parts of the instrument, such as the hinge joints of forceps and scissors, or the serrations or teeth on the blades of forceps (11).

Cleaning is accomplished manually by brushing or flushing and using cleaning chemicals (neutral detergent) and water. Alternatively, the facility may have mechanical cleaning equipment, such as ultrasonic or washer disinfectors. Irrespective of what is available, reusable instruments must be thoroughly cleaned before disinfection or sterilization. Single-use instruments must be cleaned before their disposal. See *Decontamination and reprocessing of medical devices for health-care facilities* (11) for more information.

5.2.3.1. Instructions for manually cleaning instruments

- Wear thick household or utility gloves to help protect your hands.
- Wear protective eyewear, a mask and a plastic apron to prevent contaminated fluids from splashing into your eyes or onto your body.
- Use neutral detergent, if available. Do not use steel wool or abrasive cleaners, especially on metal (they cause scratches and promote rusting).
- Using a soft brush, scrub instruments **under the surface of the water** to prevent splashing; pay particular attention to small parts that may trap debris (for example, teeth, joints or screws).

- Rinse the instruments with clean water.
- Dry the instruments using a towel or allow them to air-dry.

5.2.4. Sterilization of instruments (reusable instruments only)

Sterilization is a reduction in the number of microorganisms by more than 10^6 (that is, more than 99.9999% of the microorganisms are killed). This reduction is achieved by heat and pressure in an autoclave, by the use of chemicals or by irradiation (13). Sterilization results in the destruction of all microorganisms, including bacterial endospores. Sterilization is necessary for surgical instruments, sutures or needles that will be used during male circumcision.

This section gives examples of sterilization methods appropriate for processing reusable items used for male circumcision procedures. Wet sterilization using steam is the most widely used method.

5.2.4.1. Thermal sterilization

- **Dry heat sterilization:** In this process, the item is exposed to 150°C (300°F) for 150 minutes or to 170°C (340°F) for 60 minutes in a dry-heat oven.
- **Moist heat (autoclaving, see Annex 5.6):** In this process, the recommendation is to expose the item to 121°C (250°F) for 15 minutes or to 134°C (270°F) for 3 minutes.

5.2.4.2. Chemical disinfectants

Disinfection by chemicals will destroy most microorganisms, but not bacterial spores. Chemical disinfection should only be used if heat treatment is impractical or may cause damage to the equipment. High-level disinfection refers to a process using an agent that is normally used for disinfection purposes. The outcome of a disinfection procedure is affected by the following:

- presence of organic load (bioburden) on the item
- type and level of microbial contaminant present before the item is cleaned
- concentration of disinfectant
- exposure time
- physical structure of the object
- temperature and pH of the disinfection process

In addition to the effective cleaning of items or equipment, the concentration and contact time are critical factors that determine the effectiveness of the disinfection process. Chemical disinfectants used are glutaraldehyde and peracetic acid. (Sodium hypochlorite solution, commonly known as bleach, is **NOT appropriate for high-level disinfection of instruments and must not be used, as it may damage the instruments.**) To achieve effective decontamination, it is important to follow the manufacturer's instructions for using the disinfectant to understand what items are compatible with the disinfectant and how long items should be in contact with the disinfectant. For some agents, the recommended concentration required for effective disinfection can be checked using test strips provided by the manufacturer.

5.2.4.3. Guidelines for storage of sterile packs

After sterilization, the packs are removed and allowed to cool. If there is an adequate supply of surgical trays and equipment, appropriate storage in the sterile supply department has to be provided before the packs are dispatched to the operating theatre. Proper storage of sterile instruments and equipment is essential to ensure that the product maintains its level of sterilization or disinfection. The sterile pack storage area has specific requirements:

- Sterile packs should be protected from dust, sun and rain during transportation.
- Sterilized instruments should be stored in a clean, dry and protected environment.

- Storage containers should not be made of absorbent material, such as wood.
- The area must have adequate lighting.
- The area should be free from damp, have good air circulation and have a constant temperature (no extremes) of 15–28°C.
- Storage shelves should be located at a minimum distance of 30 cm off the floor, 45 cm from the ceiling and 5 cm away from the wall.
- The shelf walls should be smooth and easy to clean.
- Access to the area should be restricted.
- The packs should be placed on open racks rather than on closed shelves. The packs should be placed as a single layer to prevent moisture accumulating between the packs.
- Labels and expiry dates should be clearly displayed.
- The pack inspection register should be clearly visible.
- The date of sterilization should be marked on the package, and the oldest packages should be used first (that is, first in, first out). Dates provide information on when the packages were sterilized but do not guarantee the sterility of the packs; therefore, the general condition of the pack should be examined before use, and packages should be inspected to verify they meet the requirements of a sterile product.
- Pack and materials should be stored so that they can be accessed without the need to move or handle other materials because the more an item is handled, the greater the chance of damage to the packaging.
- Once a sterile pack has been opened, its contents should no longer be considered sterile.
 - Providers should avoid opening sterile wrapped packs to remove only one instrument. If this has to be done, the whole pack is no longer sterile, and the remaining instruments in the pack must not be used for another client because they may transmit infection.

5.3. ENVIRONMENTAL CLEANING AND MANAGEMENT OF SPILLS (6)

5.3.1. Environmental cleaning

Between each case, thoroughly wipe clean and disinfect flat surfaces, such as the instrument trolley and operating table, that all surfaces health care workers can readily touch with their hands and surfaces that may have come in contact with the client's blood or bodily fluids. The floor should be wiped clean after any spills. At the end of each day, there should be a more thorough cleaning that includes all doorknobs, cupboard handles, all flat surfaces of floors, shelves, window ledges, tops of procedure lamps, etc. Periodically, there should be a deep cleaning that includes walls and ceilings. Staff must clean first using a detergent solution and then use the appropriate disinfectant (see Box 5.5), per local procedures and protocols, which should be consistent with recommendations and best practice for infection prevention and control. Detergent and/or disinfectant solutions must be discarded after each use (see Table 5.3).

Box 5.5. Bleach solutions for cleaning—not for high-level disinfection

Many different disinfectant solutions are available, and these solutions have varying degrees of effectiveness. In most countries, the most widely available solution is sodium hypochlorite solution (commonly known as bleach), which is a particularly effective antiviral solution. Although sodium hypochlorite is appropriate for environmental cleaning and management of spills, it is **NOT appropriate for high-level disinfection of instruments and MUST not be used on them.**

Table 5.3. General principles for environmental cleaning

- Cleaning is an essential first step prior to any disinfection process to remove dirt, debris and other materials.
- The use of a neutral detergent solution is essential for effective cleaning. It removes dirt while improving the quality of cleaning by preventing the build-up of biofilms and thus increasing the effectiveness of chemical disinfectants.
- If disinfectants are used, they must be prepared and diluted according to the manufacturer's instructions. Too high and/or too low concentrations reduce the effectiveness of disinfectants. In addition, high concentrations of disinfectant may damage surfaces.
- Cleaning should always start from the least soiled areas (cleanest) first to the most soiled areas (dirtiest) last and from higher levels to lower levels so that debris may fall on the floor and is cleaned last [...].
- Detergent and/or disinfectant solutions must be discarded after each use.
- Avoid cleaning methods that produce mists or aerosols or disperse dust, for example, dry sweeping (brooms, etc.), dry mopping, spraying or dusting.
- Routine bacteriological monitoring to assess the effectiveness of environmental cleaning is not required but may be useful to establish the potential source of an outbreak and/or for educational purposes [...].

Source: reproduced by permission of the World Health Organization (6)

5.3.2. Decontamination of surfaces and larger equipment

Before starting to clean, wear appropriate personal protective equipment; then, use appropriate disinfectant solutions to reduce the bioburden and inactivate any infectious agents on surfaces, fixtures and larger equipment. Appropriate items and equipment, such as instrument trolleys, procedure tables, etc., must be cleaned and decontaminated between patients. When cleaning and disinfecting diathermy equipment, manufacturer's instructions for use should be followed. Reusable noncritical items, such as blood pressure cuffs or stethoscopes, should be checked for soiling or blood contamination. If they are contaminated, they should be cleaned and disinfected in accordance with the manufacturer's instructions for use. If there is gross soiling, particularly if there is wear and tear, then the item should be replaced.

5.3.3. Methods to clean blood spills

Splashes and drips

- Wear nonsterile gloves for this procedure.
- Wipe the area immediately with a paper towel or an absorbent cloth.
- Discard paper towel or absorbent cloth immediately as clinical/infectious waste.
- Disinfect area with 10 000 ppm of sodium hypochlorite (bleach) solution.
- Dry surface with disposable paper towels.
- Discard gloves and paper towels as clinical/infectious waste in accordance with local policy.
- Wash hands with soap and water, and dry hands immediately afterwards.

Larger spills

- All spills must be removed *gently and carefully*. *Always wear appropriate gloves*; use a single-use plastic apron if contamination of the body is likely. Use of gown, face shield, mask and goggles are *not* necessary.
- Cover the area of spill with sodium dichloroisocyanurate (NaDCC) granules (if available), or cover the spill with disposable paper towels or cloths soaked in 10 000 ppm of sodium hypochlorite solution. Leave paper towels or cloth for three to five minutes. *Do not pour* the solution directly onto the spill, as it may cause splashing and widen the area of contamination.
 - **Note:** Blood has a very high level of viscous organic matter poorly penetrated by any disinfectant and will need to be *treated as infectious even if disinfection is attempted*.
- Lift the soiled paper towels/cloths or scoop up the absorbed granules. Discard all into a clinical waste bag in accordance with local policy.
- Clean the area with water and a detergent solution.
- Wipe the surface area with fresh 1 000 ppm of sodium hypochlorite solution and rinse with water, as the sodium hypochlorite solution may be corrosive.
- Dry the surface with disposable paper towels.
- Remove gloves and plastic apron, and discard them as clinical waste in accordance with local policy.
- Wash hands with soap and water, and dry hands immediately.

5.4. SAFE HANDLING OF WASTE

5.4.1. Waste management

The purpose of waste management is to do the following:


- Protect health care workers who handle waste items from accidental injury.
- Prevent the spread of infection to health care workers and the local community.

About 15% of the waste generated in health care facilities is hazardous and requires special methods for its collection, storage, transportation, treatment and final disposition. The other 85% of waste is nonhazardous and can be recycled, treated or disposed of as regular municipal waste, but only if this waste is properly segregated at the point of care. The following waste categories are generated in the context of male circumcision:

- nonhazardous waste (general waste and recyclable waste)
- hazardous waste (infectious waste, for example, waste contaminated with blood; pathological waste, for example, excised foreskins; sharps waste, for example, needles and scalpels)

Protecting public health through waste management can be achieved by a variety of methods. These can be summarized in an order of preference called the waste hierarchy, with the most desirable method at the top and the least desirable at the base (see Fig. 5.4). The most preferable approach is to avoid producing waste as far as possible, thus minimising the quantity entering the waste stream. Where practicable, those waste items that can be safely recovered for secondary use is the next most preferable method. Waste that cannot be recovered must then be dealt with by the least preferable options, such as treatment or land disposal to reduce their health and environmental impacts (13).

Fig. 5.4. The waste management hierarchy

METHODS	Most preferable
Prevent	
Reduce	
Reuse	
Recycle	
Recover	
Treat	
Dispose	

5.4.2. Segregation and collection of waste

The appropriate waste receptacle (bags, bins, sharps boxes) should be available in each medical and other waste-producing area. This allows for segregation of waste at the point of its generation and reduces the need to carry waste through a health service area. To guide staff and reinforce good habits, posters showing the type of waste that should be disposed of in each container should be placed near the bins (that is, on the walls as appropriate).

Containers for infectious waste should not be placed in public areas because clients and other clinic visitors may use the containers and come into contact with potentially infectious waste. Infectious waste bins should be located as close as possible to where waste is generated (for example, nursing stations, procedure rooms or points of care). Placing sharps containers and segregation bins on treatment trolleys enable medical staff to segregate waste at the bedside or other treatment site.

Collection times should be fixed and appropriate to the quantity of waste produced in each area of the health care facility. Generally, pathological and infectious waste should be collected at least once per day. General waste should not be collected at the same time or in the same trolley as infectious or other hazardous waste.

Waste bags/bins and sharps containers should be filled to no more than three quarters full (or to the fill line on sharps bins when marked). Once this level is reached, they should be sealed so they can be collected. Plastic bags should never be stapled but may be tied in a knot or sealed with a plastic tag or tie. Replacement bags or containers should be available at each waste generation area.

Education and training must be provided to all health care workers who are responsible for segregating and collecting waste.

5.4.2.1. Segregation, packaging and disposing of sharps

Disposable sharp items, such as hypodermic needles, require special handling because these items are most likely to injure health care workers who handle them.

Steps for segregation and packaging of sharps in a sharps box are:

- Do not recap needles, or disassemble needles or syringes. Activate the sharps-injury-protection feature if it is present.
- Place needles and syringes to be disposed of in a puncture-resistant sharps container.
- **Close the sharps container tightly when it is three quarters full.** Be sure that no sharp items are sticking out of the container.
- Wear heavy-duty utility gloves.
- Remove the sharps container from the procedure area and place it in the storage area when it is ready for disposal.
- Dispose of the sharps container by incinerating, encapsulating or burying it.
- Remove utility gloves, and wash and dry them (wash daily or when visibly soiled).
- Perform hand hygiene.

5.4.3. Storage of waste

Waste storage areas for health care facilities should be protected from pests and the public (especially children and scavengers), with access limited to authorized personnel. Waste storage areas should be kept locked.

5.4.3.1. General nonhazardous waste storage

General nonhazardous waste should be stored and collected for disposal in the communal landfill/dumpsite or communal waste incinerator. This waste should be collected at least weekly. The waste storage area should be enclosed, paved and connected to a public road. The gate should be big enough that the collection vehicles can enter.

5.4.3.2. Infectious and sharp waste storage

The storage place must be identifiable as an infectious waste area by using the biohazard symbol. The storage floor and walls should be sealed or tiled to allow easy cleaning and disinfection. Storage times for infectious waste (for example, the gap in time between waste generation and treatment) should not exceed the following:

- in temperate climate, 72 hours in winter and 48 hours in summer
- in warm climate, 48 hours in the cool season and 24 hours in the hot season

If a refrigerated storage room is available, infectious waste can be stored for more than a week if it is kept cool at a temperature no higher than between 3–8°C.

5.4.3.3. Pathological waste storage

Pathological waste is considered to be biologically active, and gas formation during the storage should be expected. To minimise gas formation, storage places should have the same conditions as places for storing infectious and sharps waste. Where possible, waste should be stored under refrigerated conditions.

5.4.4. Waste treatment

5.4.4.1. Recycling of nonhazardous waste

Recycling or smelting is the process of turning used materials (waste) into new products. The potential advantages include reduced need for a landfill, and reduced consumption of fresh raw materials, energy-usage air pollution (from incineration) and water pollution (from landfilling). Recycling requires the organization and regular collection of waste; otherwise, large volumes of waste must be safely stored in between collections. In this case, clinics have to take special care to ensure that stored waste is not accessed by unauthorized personnel for inappropriate use. See Annex 5.7 for more information.

5.4.4.2 Treatment of hazardous waste

It is recommended that waste treatment techniques that minimise formation and release of chemicals or hazardous emissions be given priority. In general, the decontamination of infectious and sharp waste by steam (for example, by autoclaving) or other nonburn technology should preferably be used in the treatment of infectious waste (14). Sharp and infectious waste are normally treated together in the same treatment system. After collection, the sharp waste is treated by incineration or by alternative treatment technologies like autoclaving. In both cases, the needles will be decontaminated but still have a physical risk of pricking (waste handlers can be pricked after the waste is treated—but without getting infected).

5.4.4.3. Autoclaving of infectious and sharp waste

Autoclaving is the most common type of steam treatment and utilizes saturated steam, which is under pressure, to decontaminate waste (see Annex 5.6). In this process, potentially infected air that is evacuated from the autoclave is filtered effectively (for example, through a high-efficiency particulate air filter). Autoclaves operate at a temperature of 121°C to 134°C. Autoclaves that do not have an integrated shredder should ensure that the air is removed from the autoclave chamber before the waste is decontaminated (for example, by a vacuum pump), as air remaining in the waste can inhibit the decontamination efficiency of the autoclaving process.

5.4.4.4. Incineration of hazardous waste

Incineration is a high-temperature (850°C to 1 100°C) dry oxidation process that reduces organic and combustible waste to inorganic incombustible matter and results in a very significant reduction of waste volume and weight. In accordance with the Stockholm Convention (14), the best available technology should be used to achieve an emission of lower than 0.1 ng toxic equivalents per m³ of dioxin and furan. Primary measures for incinerators are two burning chambers (850°C/1 100°C); auxiliary burner; two seconds of residence time of air in the second chamber; sufficient oxygen content; and high turbulence of exhaust gases. The primary measures described here should be a minimum standard. By applying primary measures, a performance around 200 ng toxic equivalents per m³ of dioxin and furan can be achieved (14).

5.4.5. Final disposal of health care waste

The final disposal of health care waste is of the utmost importance. Failure to develop a suitable solution for the disposal of health care waste can lead to public health and environmental problems that could negate a project's environmental monitoring and mitigation plan.

General nonhazardous and hazardous waste should not be disposed of on the premises of health care facilities.

Nonhazardous waste should be collected regularly by the municipality or transported by the facility to a known and safely managed public disposal site. All hazardous waste should be treated to eliminate the hazardous properties before disposal or should be disposed in an engineered landfill designed for hazardous waste. Note that the disposal of pathological

wastes may be bound by sociocultural, religious and aesthetic norms and practices. A traditional option is the internment (burial) in cemeteries (13).

Low- and middle-income countries often lack proper facilities for the disposition of hazardous waste. Options outlined in this section may be implemented but should be considered transitional, interim solutions. Appropriate treatment and disposal of hazardous waste depends on the local conditions and regulations. This section describes briefly three internationally recognized methods of disposal of decontaminated sharp waste, disposable nonsharp metal instruments, pathological waste and ash from incineration. The most environmentally favourable option should be used wherever reasonably practicable. Each of the three methods is discussed in more detail in Annex 5.7 or in *Decontamination and reprocessing of medical devices for health-care facilities* (11). No matter the option selected, all wasted instruments **must** be decontaminated and stored appropriately before disposal.

5.4.5.1. Disposal of sharp and nonsharp metal waste

Even after decontamination, sharps waste may still pose physical risks. Waste consisting of nonsharp metal instruments must be secured to ensure that they are not reused. This waste can be disposed of in safe sharps pits on the health care facility's premises or encapsulated by mixing waste with immobilizing material, like cement, before disposal. These procedures are only recommended in cases where the waste is handled manually and the landfill for general waste is not secured.

5.4.5.2. Pathological waste disposal

Placenta pits can be effective in low-resource settings. They need to be located at specific sites to avoid contaminating the ground water, and they need to be locked and fenced for security. Natural degradation and draining of liquid into the subsoil greatly reduces the volume of waste in the pit and facilitates the inactivation of pathogens. Pathological waste may be disposed of at a landfill when no other treatment options are available. However, disposal should be in a prespecified area to prevent recyclers or scavengers coming into contact with the waste. Waste should also be covered as quickly as possible.

5.4.5.3. Disposal of hazardous ash

Fly ash and bottom ash from incineration are generally considered to be hazardous because they may contain heavy metal, dioxins and furans. These ashes should preferably be disposed of in sites designed for hazardous wastes. For example, they can be disposed of at designated cells at engineered landfills, encapsulated and placed in specialized monofill sites, or disposed of in the ground in an ash pit. See Annex 5.7 for more information.

5.4.5.4. Burying waste

In health care facilities with limited resources, burial of nonhazardous waste near the facility may be the only practical option for waste disposal. To limit health risks and environmental pollution, some basic rules should be followed:

- Restrict access to the disposal site. Build a fence around the site to keep away animals, scavengers and children.
- Line the burial site with a material of low permeability (such as clay), if available.
- Select a site at least 50 m away from any water source to prevent contamination of the water table.
- Ensure that the site has proper drainage, is located downhill from any wells, is free of standing water and is not in an area that floods.

KEY MESSAGES

- Health care workers need to follow recommended practices for preventing infection to protect their patients (clients), themselves and other health care workers from exposure to hepatitis B virus, hepatitis C virus, HIV and other infections.
- Hand hygiene greatly reduces the number of disease-causing microorganisms on hands and arms. It is the most important way of limiting the spread of infection. Hands should be washed with soap and water before each new client; otherwise, an alcohol-based handrub should be used.
- Appropriate personal protective equipment should be worn to protect both clients and health care workers from exposure to infectious microorganisms.
- Sterile gloves should be worn during the male circumcision procedure or when performing any invasive procedure. To avoid spreading infection from person to person, a new pair of gloves should be worn for each new client contact.
- All health care workers should be trained in the proper handling of sharp instruments. Hypodermic (hollow-bore) needles can cause injuries to clinic staff at all levels (for example, health care workers can be stuck by hypodermic needles during client care, cleaning and housekeeping; also, health care workers may be exposed to needle-stick [sharps] injuries when washing soiled instruments and disposing of infectious waste material).
- Health care workers should be trained to never enter medication vials with needles or syringes that have already been used in an injection—even for the same client.
- Syringes with safety features, including reuse prevention and sharps injury protection, are available, and both are appropriate for use.
- Health care workers should wear clean or heavy-duty gloves when handling contaminated items.
- Each clinic should have a written standard operating procedure for the management of anyone with a needle-stick (sharps) injury. The protocol should include clear advice about what actions the health care worker with the needle-stick (sharps) injury should take to mitigate the risk of acquiring hepatitis B virus, hepatitis C virus and HIV. Also, the protocol should be in accord with national standards and should take into account international guidance on avoiding exposure to bloodborne pathogens.
- Vaccination of health care workers against hepatitis B virus protects staff and their clients, and should be implemented in accordance with national protocols.
- Safe and environmental friendly management of waste should be performed along the complete logistic chain: segregation, transport, storage, treatment and disposal.

ANNEX 5.1. MANAGING OCCUPATIONAL EXPOSURE TO BLOODBORNE PATHOGENS, HEPATITIS AND HIV THROUGH POST-EXPOSURE PROPHYLAXIS

Overview

Health care workers are at increased risk of accidental exposure to bloodborne pathogens—such as hepatitis B and C viruses and HIV—while providing male circumcision services.

A minimum approach to health and safety practices for health care providers and waste workers includes (11) the following:

- implementation of standardized management approaches
- compulsory vaccination for the hepatitis B virus for all health care workers, including cleaners and staff who handle medical waste
- provision of sharps disposal boxes for safe disposal of used needles, syringes and other sharps
- compliance with hand hygiene standards
- availability of appropriate personal protective equipment—mask, face shield or goggles, rubber apron and utility gloves (at the bare minimum, every health care worker handling waste should have a face shield and utility gloves)
- appointment of a clinic staff member or designated staff to additional or dedicated responsibility for infection control, including waste management

Immediately after any needle-stick (sharps) injury, the person injured should—as soon as it is safe to do so—hand over his/her duties to another provider and wash the area with plenty of soap and water. Antiseptics or caustic agents, such as bleach, should not be used. Flush any exposed mucous membranes with plenty of water. The clinic should have a system to quickly report any needle-stick (sharps) injuries to the nearest health facility that provides post-exposure prophylaxis services so that this can be given to the injured health care worker according to the national guidelines.

Managing potential exposure to hepatitis B or C (15, 16)

Steps to follow when a health care worker has potentially been exposed to either hepatitis B virus or hepatitis C virus:

STEP 1: Provide immediate care to the exposure site.

- Wash the exposed skin and any wound with soap and water.
- Flush mucous membranes with water.
- **DO NOT** use any antiseptic or caustic agents, such as bleach.

STEP 2: Consult the clinician in charge of post-exposure prophylaxis management as soon as possible (see Table A5.1.1):

The clinician who is in charge of post-exposure prophylaxis will:

- Determine the risk associated with the exposure by type of fluid and type of exposure.
- Find out whether the exposed health care worker has had a hepatitis B vaccination.
- Assess the health care worker's immune status by measuring the hepatitis B virus core antibodies and surface antibodies.
- Measure hepatitis C virus antibodies and alanine aminotransferase, and, if positive for hepatitis C virus, test for viremia to confirm current infection.

STEP 3: Evaluate the exposure source.

- Make a detailed clinical evaluation of the source.
- Determine the hepatitis B virus vaccination and immune status of the source.
- Test known sources for hepatitis B virus surface antigen and antihepatitis C virus antibodies.

Table A5.1.1. Prophylaxis after occupational exposure to hepatitis B virus

Vaccination status and antibody response of exposed provider	Treatment		
	Source is positive for hepatitis B surface antigen.	Source is negative for hepatitis B surface antigen.	Source is unknown or is not available for testing.
Previously vaccinated	No treatment	No treatment	No treatment
Unvaccinated	Single dose of hepatitis B immunoglobulin and full hepatitis B virus vaccination	Full hepatitis B virus vaccination	Full hepatitis B virus vaccination
Known responder ^a	No treatment	No treatment	No treatment
Known nonresponder ^b	Single dose of hepatitis B immunoglobulin and revaccination or second dose of hepatitis B immunoglobulin	No treatment	If the source is a known high risk, manage as if source were positive for hepatitis B surface antigen.
Antibody response unknown	Test exposed person for hepatitis B surface antibodies: If level is adequate, no treatment is necessary. If level is inadequate, give a single dose of hepatitis B immunoglobulin and hepatitis B vaccine booster.	No treatment	Test exposed person for anti-HBs: If level is adequate, no treatment is necessary. If level is inadequate, give hepatitis B vaccine booster and check titre in one to two months.

^a A known responder is a person who has an adequate level of serum antibody (hepatitis B surface antibodies ≥ 10 mIU/mL).

^b A known nonresponder is a person with inadequate response to vaccination (hepatitis B surface antibodies < 10 mIU/mL).

Managing potential exposure to HIV (17)

This section details steps to follow when a health care worker has potentially been exposed to HIV.

The current recommendations for HIV post-exposure prophylaxis aim to harmonize regimen with the current treatment regimen for adults and children (17). The key components of managing occupational exposure to HIV and up-to-date recommendations for the use of antiretroviral therapy are described below

STEP 1: Provide immediate care to the exposure site.

- Wash the exposed skin and any wound with soap and water.
- Flush mucous membranes with water.
- **DO NOT** use any antiseptic or caustic agents, such as bleach.

- Report the event to the health care provider in charge of post-exposure prophylaxis management. The report should include identification of the exposed person, the date and time of exposure, the type of fluid, nature of the exposure and details about the source, as recommended by national post-exposure prophylaxis guidelines.

STEP 2: Establish eligibility for post-exposure prophylaxis.

- Check for parenteral or mucous membrane exposure (for example, splashes to the eye, nose or oral cavity).
- Check for exposure to blood (this is the most likely situation, usually because of needle-stick [sharps] injury or, more rarely, blood-stained saliva or genital secretions because of problems with managing the airway or problems with catheterisation).
- Post-exposure prophylaxis is not indicated if the exposed health care worker is known to be HIV positive, source is known to be HIV negative or exposure is limited to intact skin.
- Testing the source of the exposure and the exposed health care worker is helpful. If this information cannot be obtained, then HIV post-exposure prophylaxis may still be given. The prophylaxis administration decision is sometimes based on an individual's concerns as well as the HIV prevalence in the community.

STEP 3: Prescribe post-exposure prophylaxis.

- Initiate post-exposure prophylaxis as early as possible, ideally within 72 hours of the exposure.
- Continue post-exposure prophylaxis for 28 days.
- Provide enhanced adherence counselling and address any drug interactions.
- Follow the World Health Organization's recommendations for post-exposure prophylaxis for HIV (see Box A5.1.1) (17).

STEP 4: Follow up.

- Provide follow-up for adherence and any side effects of antiretroviral treatment, and address any other questions that individual may have.
- Arrange for an HIV test to be undertaken three months after the exposure.
- Link HIV care and treatment, including preventive measures for protecting others, in case HIV test results are positive.
- Provide additional counselling and other preventive interventions as needed and if test results are negative.

There are many challenges to providing effective post-exposure prophylaxis, including early provision of and adherence to the full course of post-exposure prophylaxis. In a global review of adherence to post-exposure prophylaxis, only 56% of the people completed the full 28-day course (17). Given these challenges, full compliance to infection prevention and control practice remains the best option to protect health care workers.

Box A5.1.1. The World Health Organization's recommended daily dosage of antiretroviral therapy for 28 days for adults and adolescents (17)

An HIV post-exposure prophylaxis regimen with two antiretroviral agents is effective, but three drugs are preferred.

Recommended backbone regimen:

- Tenofovir (TDF) 300 mg once a day + lamivudine (3TC) 300 mg once a day (or 150 mg twice daily)

OR

- Tenofovir (TDF) 300 mg once a day + emtricitabine (FTC) 200 mg once a day

Recommended third drug:

- Lopinavir/ritonavir (LPV/r) 400 mg/100 mg twice a day

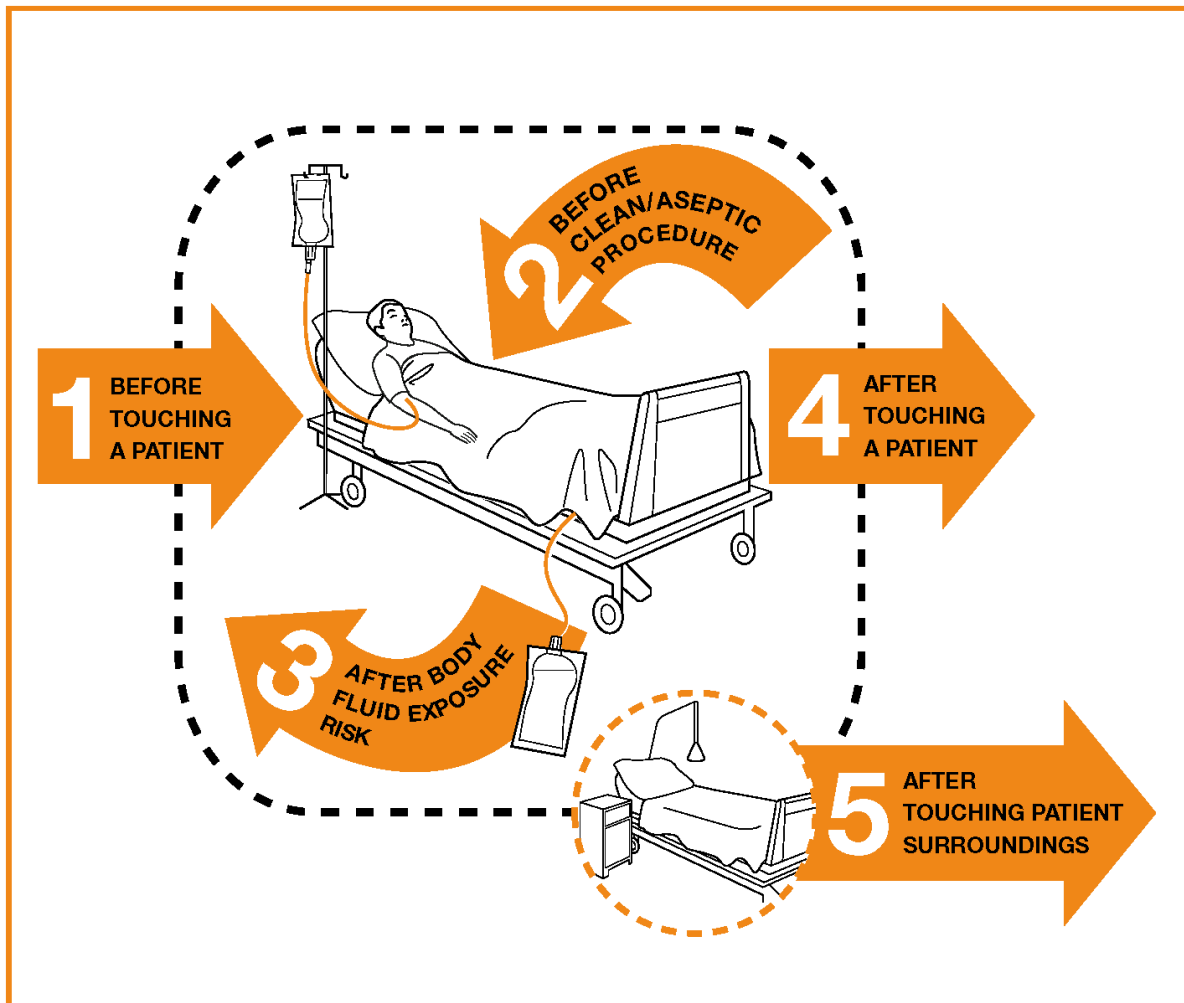
OR

- Atazanavir/ritonavir (ATV/r) 300 mg + 100 mg once a day

Raltegravir (RAL), darunavir/ritonavir (DRV/r) or efavirenz (EFV) can be considered as alternative options, depending on drug availability.

Note: Some national guidelines may recommend different antiretroviral agents to those listed above, in particular dolutegravir (DTG). The World Health Organization will be issuing updated post-exposure prophylaxis guidelines in 2018, which will reflect the potential use of dolutegravir and possibly other agents.

ANNEX 5.2. MY 5 MOMENTS OF HAND HYGIENE

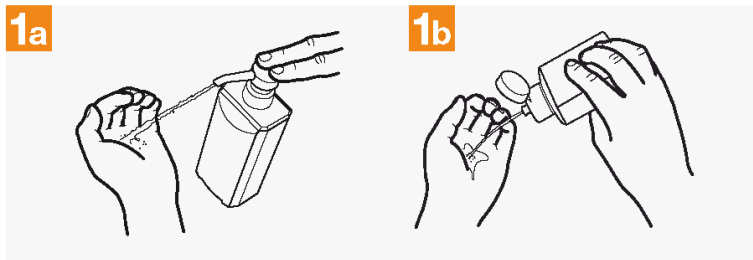


Source: reproduced by permission of the World Health Organization (5)

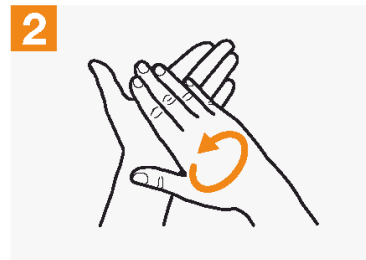
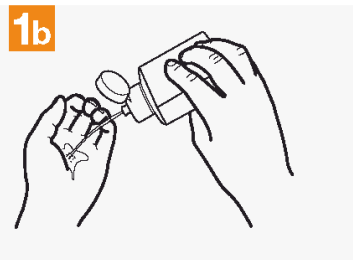
ANNEX 5.3. HAND HYGIENE TECHNIQUE WITH ALCOHOL-BASED FORMULATION

Hand Hygiene Technique with Alcohol-Based Formulation

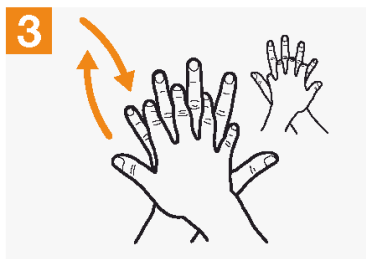
 Duration of the entire procedure: 20-30 seconds



1a Apply a palmful of the product in a cupped hand, covering all surfaces;



2 Rub hands palm to palm;



3 Right palm over left dorsum with interlaced fingers and vice versa;



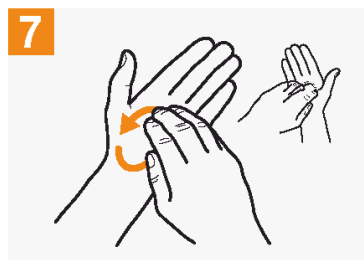
4 Palm to palm with fingers interlaced;



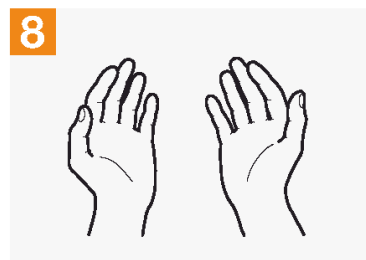
5 Backs of fingers to opposing palms with fingers interlocked;



6 Rotational rubbing of left thumb clasped in right palm and vice versa;



7 Rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa;



8 Once dry, your hands are safe.

Source: reproduced by permission of the World Health Organization (5)

ANNEX 5.4. SURGICAL HANDRUBBING TECHNIQUE

Surgical Handrubbing Technique

- Handwash with soap and water on arrival to OR, after having donned theatre clothing (cap/hat/bonnet and mask).
- Use an alcohol-based handrub (ABHR) product for surgical hand preparation, by carefully following the technique illustrated in Images 1 to 17, before every surgical procedure.
- If any residual talc or biological fluids are present when gloves are removed following the operation, handwash with soap and water.



1 Put approximately 5ml (3 doses) of ABHR in the palm of your left hand, using the elbow of your other arm to operate the dispenser.



2 Dip the fingertips of your right hand in the handrub to decontaminate under the nails (5 seconds).



Images 3-7: Smear the handrub on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds).



Images 8-10: Now repeat steps 1-7 for the left hand and forearm.

11 Put approximately 5ml (3 doses) of ABHR in the palm of your left hand as illustrated, to rub both hands at the same time up to the wrists, following all steps in images 12-17 (20-30 seconds).

12 Cover the whole surface of the hands up to the wrist with ABHR, rubbing palm against palm with a rotating movement.



13 Rub the back of the left hand, including the wrist, moving the right palm back and forth, and vice-versa.

14 Rub palm against palm back and forth with fingers interlinked.

15 Rub the back of the fingers by holding them in the palm of the other hand with a sideways back and forth movement.

16 Rub the thumb of the left hand by rotating it in the clasped palm of the right hand and vice versa.

17 When the hands are dry, sterile surgical clothing and gloves can be donned.

Repeat this sequence (average 60 sec) the number of times that adds up to the total duration recommended by the ABHR manufacturer's instructions. This could be two or even three times.



Source: reproduced by permission of the World Health Organization (6)

ANNEX 5.5. SURGICAL HAND PREPARATION^a

RECOMMENDATION
<p>The panel recommends that surgical hand preparation be performed either by scrubbing with a suitable antimicrobial soap and water or using a suitable ABHR before donning sterile gloves. (<i>Strong recommendation, moderate quality of evidence</i>)</p>
RATIONALE FOR THE RECOMMENDATION
<p>The GDG noted that surgical hand preparation is vitally important to maintain the lowest possible contamination of the surgical field, especially in the event of sterile glove puncture during the procedure. Appropriate surgical hand preparation is recommended in the WHO <i>guidelines on hand hygiene in health care (1)</i> issued in 2009 and in all other existing national and international guidelines on the prevention of SSI.</p> <p>Moderate quality evidence shows the equivalence of handrubbing with an ABHR and handscrubbing with antimicrobial soap and water for surgical hand preparation for the prevention of SSI.</p>
REMARKS
<p>The available evidence on SSI as an outcome is limited to three RCTs. The trials compared handrubbing (with alcohol-based preparations) vs. handscrubbing (with PVP-I, CHG or plain soap) for surgical hand preparation and showed no significant difference between the two methods.</p> <p>Evidence from additional studies using the bacterial load on participants' hands as the outcome demonstrated that some ABHR formulations are more effective to reduce colony-forming units than scrubbing with water and antimicrobial or plain soap. The relevance of this outcome to the risk of SSI remains uncertain and the GDG considered this as indirect evidence and concluded that the recommendation could not be developed based on this surrogate outcome. Only evidence from RCTs with an SSI outcome was taken into account for the recommendation development.</p> <p>The WHO hand hygiene guidelines recommend preferably using "a product ensuring sustained activity". It was assumed that the sustained activity ensured by certain products (for example, CHG) was desirable, but there was no evidence that these products were more effective in directly reducing the risk of SSI. In the absence of such evidence, the GDG decided not to make any recommendations on specific products with or without a sustained effect and it emphasized the need to define what is considered a "suitable" product.</p> <p>The hands of the surgical team should be clean upon entering the OR by washing with a non-medicated soap. Once in the operating area, repeating handrubbing or scrubbing without an additional prior handwash is recommended before switching to the next procedure.</p> <p>It should be kept in mind that the activity of ABHRs may be impaired if hands are not completely dried before applying the product or by the handwashing itself. Hence, surgical handscrub and surgical handrub with alcohol-based products should not be combined sequentially (1).</p> <p>When choosing ABHR, health care facilities should regularly procure products with proven efficacy (that is, complying with European norms or those of the American Society for Testing and Materials or equivalent international standards) to implement this recommendation and position no-touch or elbow-operated dispensers in surgical scrub rooms. Alternatively, antimicrobial soap, clean running water and disposable or clean towels for each health care worker should be available in the scrub room.</p> <p>In LMICs where ABHR availability is limited, WHO strongly encourages facilities to undertake the local production of an alcohol-based formulation according to WHO guidance, which has been demonstrated to be a feasible and low-cost solution (1, 2).</p>

REMARKS (CONTINUED)

Skin irritation, dryness, dermatitis and some rare allergic reactions are adverse events that can occur following frequent scrubbing for surgical hand preparation. Although these are less frequent with ABHRs and more frequent with iodophors, even well-tolerated ABHRs containing emollients may cause a transient stinging sensation at any site of broken skin (cuts, abrasions). Allergic contact dermatitis or contact urticaria syndrome caused by hypersensitivity to alcohol or to various additives present in some ABHRs are rare occurrences. ABHR preparations with strong fragrances may be poorly tolerated by a few health care workers with respiratory allergies. Studies of surgeon preferences indicate a primary preference for ABHRs with a higher tolerability and acceptability, due mostly to the shorter application time required and fewer skin reactions. Care must be taken to avoid contact with the eyes when using preparations with CHG 1% or greater as it may cause conjunctivitis or serious corneal damage. Ototoxicity precludes its use in surgery involving the inner or middle ear. Direct contact with brain tissue and the meninges should be avoided. The frequency of skin irritation is concentration-dependent, with products containing 4% most likely to cause dermatitis when used frequently for antiseptic handwashing. True allergic reactions to CHG are very uncommon (1).

Alcohols are flammable and health care workers handling alcohol-based preparations should respect safety standards.

Source: reproduced by permission from the World Health Organization (6)

^a Refer to source for works cited in the table.

ANNEX 5.6. DISINFECTION BY STERILIZATION, IN LINE WITH THE WORLD HEALTH ORGANIZATION'S GUIDANCE

Sterilization by autoclaving (pressured steam) is the preferred option for reusable surgical instruments. In some settings, high-level disinfection is the only acceptable alternative to sterilization. Disinfection is less effective than sterilization because although it destroys most microorganisms, it does not destroy spores (particularly tetanus spores). High-level disinfection can be achieved using either steam or chemical disinfectants. Chemical disinfectants are generally used for heat-sensitive instruments and equipment that are used in critical procedures, and which cannot be sterilized using heat. Chemical disinfection can be achieved by soaking instruments in 2% glutaraldehyde or 0.55% peracetic acid.

To determine how long an item should be immersed in pressured steam, follow the item's manufacturer's instructions for use; time for a given item varies according to concentration and pH. Chemical disinfectants must be used in a well-ventilated room; health care workers should wear personal protective equipment and follow the manufacturer's instruction for using the disinfectant. Thorough cleaning of instruments is **essential** before they are disinfected and sterilized to ensure removal of blood or caked organic matter, which may harbour spores or bacteria.

ANNEX 5.7. SPECIFICATIONS OF WASTE MANAGEMENT PROCEDURES ADAPTED (11)

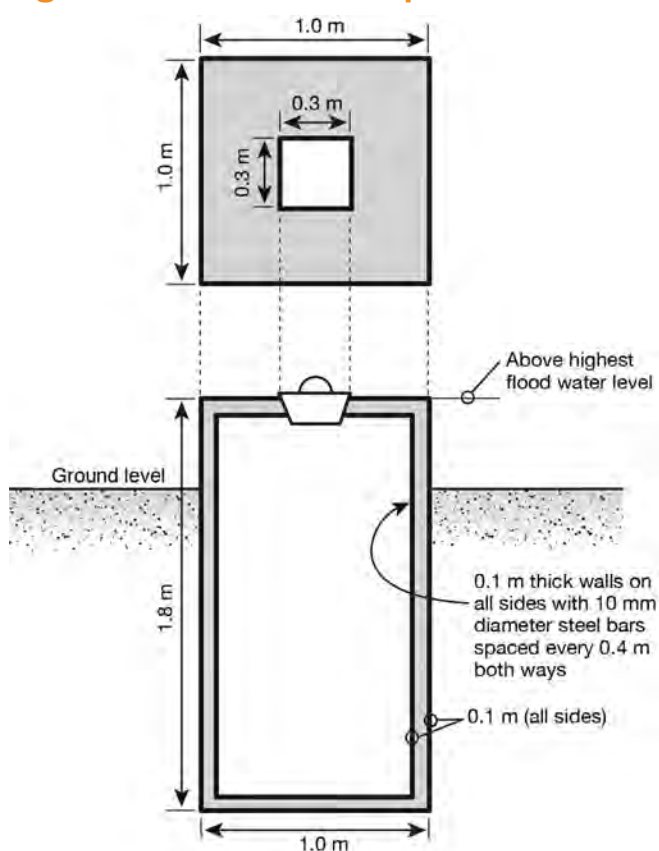
A5.7.1. Sharps pit or concrete vault

Before deciding on the pit or concrete vault method of disposal, the likely volume of waste that will be deposited should be considered. If single-use safe syringes suitable for local anaesthesia are available, it is likely that a sharps pit or concrete vault will not be big enough or will fill up too quickly because the whole syringe has to be disposed of with the needle.

A5.7.1.1. Constructing a sharps pit or concrete vault (see Fig. A.5.7.1)

- Dig a pit (minimum size of 1 m × 1 m × 1.8 m) that does not reach the ground water level. Make sure the pit is large enough to accommodate sharps and instruments for an estimated period of time. The site must be isolated and at least 30 m away from dwelling units and sources of ground water supply.
- Construct the concrete walls and slabs of the pit. Provide the slab with an opening or manhole for easy deposition of collected sharps and syringes. The manhole should be extended a few centimetres above the soil's surface to overcome infiltration of surface water.
- Deposit inside the pit or vault the collected safety boxes filled with used sharps and other instruments.
- Install a security fence around the site.
- When full, fill the vault or pit with concrete to seal.

Fig. A.5.7.1. Construction specifications



A5.7.1.2. Handling waste to be buried in the pit or vault

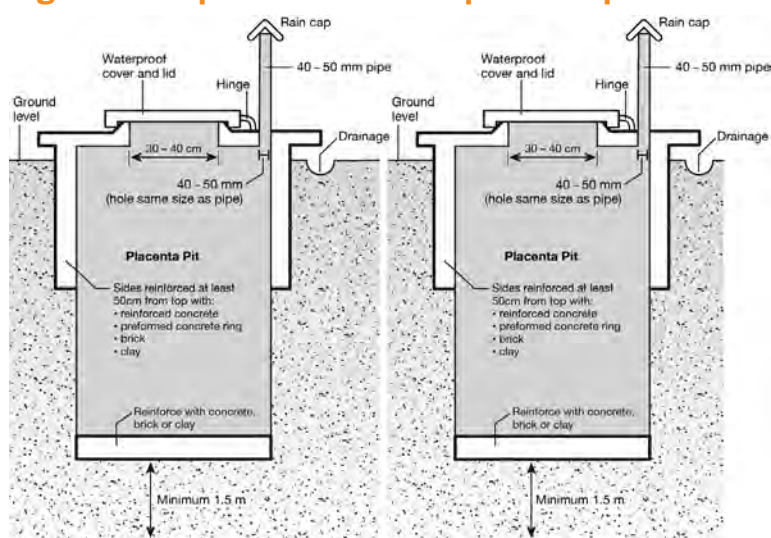
- Wear the required personal protective equipment, including reusable utility gloves, apron, protective shoes and face protection.
- Remove the decontaminated nonsharp metal instruments from the secure storage area. To reduce the potential for cross-contamination, keep the decontaminated nonsharp metal instruments separated from other contaminated waste that is not going to be buried. Place the waste in a rigid plastic container or wheelie bin.
- Carefully transport the instruments in the rigid plastic container or wheelie bin to the pit or vault.
- Slowly pour the instruments into the pit or vault.
- Clean the rigid plastic container or wheelie bin using standard cleaning procedures.

A5.7.2. Pathological waste pit

Pathological waste pits need to be located at specific sites to avoid contaminating the ground water, and the pits need to be locked and fenced for security. Natural degradation and draining of liquid into the subsoil greatly reduces the volume of waste in the pit and facilitates the inactivation of pathogens. Pathological waste may be disposed of at a landfill when no other treatment options are available. However, disposal should be in a prespecified area to prevent recyclers or scavengers coming into contact with the waste. Waste should also be covered as quickly as possible.

Below are the structural characteristics of a pathological (or placenta) waste pit (see Fig. A5.7.2):

- This pit encloses and secures organic material, the components of which degrade during aerobic bacterial processes. It is important that enough air can float into the pit for the biodegrading process and to avoid smelling its effects. This can be solved by placing an air pipe into the pit. The pipe should rise above the pit (about 1 m over ground) and should be covered with a fly grid to prevent insect breeding inside the pit.
- The upper part of the pit should be made of concrete and should be accessible by a pathway made of concrete.
- The feeding door of the pit should be made of metal and be located in the middle of the pit, thereby ensuring the most effective distribution of waste in the pit. The bottom of the pit should be compressed soil—if possible, clay.
- The depth and width of the pit depend on the geological structure of the ground. Proposed dimensions are 3 m deep, 1.5 m wide and 1.5 m long ($3 \times 1.5 \times 1.5 \text{ m} = 6.75 \text{ m}^2$).
- The pit should be fenced and locked to avoid unauthorized access.

Fig. A5.7.2. Specifications of a placenta pit

There should be two pathological waste pits next to each other. Periodically, the waste should be covered with a layer of soil. After the first compartment is filled to 80% of its capacity, it should be closed, and the second one should start to be filled. As the second one fills, the first pit's content has decomposed and the volume has reduced by 60%, so the first pit can be filled again.

A5.7.2.1. Operation of a placenta pit

Health care workers handling placentas and operating the placenta pit should:

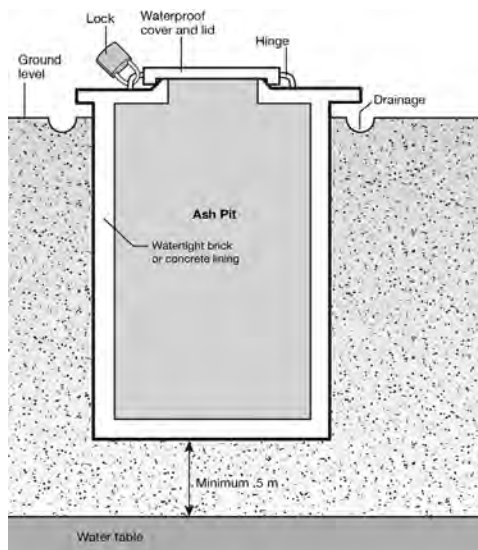
- Wear appropriate personal protective equipment to avoid any accidental exposure to blood and bodily fluids.
- Perform hand hygiene before and after wearing personal protective equipment.
- Dispose of the organic waste into the pit immediately when it arrives at the pathological waste pit.
- Make sure that the pit's lid is always shut when it is not in use.
- Disinfect the empty organic waste bins with a 0.1% sodium hypochlorite (bleach) solution. Rinse the bins with clean water, and then clean them with water and soap. (Do not mix sodium hypochlorite and soap together.)
- Close the pit down when the level of the organic waste is about 0.5 m underneath the slab. Put a thick layer of wood ash on top of the organic waste and top up with compacted soil if the pit is closed permanently.

Most organic waste will decompose into harmless matter, so it is possible to empty a pit that has been closed down for at least two years. The general public may find the removal of these remainders offensive. Take particular care to avoid injuries with sharps that have accidentally been discarded in the organic waste pit. A new permanent burial place, such as a landfill, should be found for the remaining organic waste.

A5.7.3. Ash disposal pit

Ash from incineration is considered to be hazardous because it may contain heavy metals and other toxic materials. Ash should be disposed of properly in hazardous waste sites, such as in engineered landfills, encapsulated and buried, or disposed of in an ash pit (see Fig. A5.7.3). Health care workers handling ash should wear appropriate personal protective equipment (for example, utility gloves, plastic apron, goggles and mask or N95 respirator).

Fig. A5.7.3. Specifications of an ash pit



A5.7.4. Recycling and smelting of decontaminated disposable instruments

- Transport will collect the decontaminated instruments according to a schedule arranged by the central or regional warehouse manager, recycling or smelting facility and transport company or contractor, where applicable.
- The instruments will be collected with a consignment or chain-of-custody form. It is the responsibility of the central or regional warehouse manager to check the consignment or chain-of-custody form against the removed instruments, record the details on the form and sign the form accordingly. The transport company or contractor assumes responsibility for the waste once it leaves the premises.
- The driver will deliver the instruments to the recycling or smelting facility, where the facility's representative will sign the consignment form and then assume final responsibility for them.

A5.7.5. Encapsulation

- Care and precautions should be taken to avoid cutting hands when placing decontaminated single-use instruments in the drums. It is important to wear the appropriate personal protective equipment, such as thick rubber gloves, apron, protective shoes (steel-toed boots) and goggles.
- Once a drum is filled to 75% of its capacity, a mixture of lime, cement and water (15:15:5%) is added, and the drum is filled to capacity. A larger quantity of water may sometimes be required to attain a satisfactory liquid consistency.
- Steel drum lids should then cover the drums and be sealed by spot welding the seams.
- The sealed drums should be placed at the base of a landfill and covered with fresh municipal solid waste. For ease of movement, the drums may be placed on pallets that can then be put on a pallet transporter.

REFERENCES

1. Pepin J, Chakra CAN, Pepin E, Nault V, Valiquette L. Evolution of the global burden of viral infections from unsafe medical injections, 2000–2010. *PLOS One*. 2014;(6):e99677. doi: 10.1371/journal.pone.0099677.
2. Loveday HP, Wilson JA, Pratt RJ, Golsorkhi M, Tingle A, Bak A, et al. epic3: national evidence-based guidelines for preventing healthcare-associated infections in NHS hospitals in England. *J Hosp Infect*. 2014;86:S1–S70. doi: 10.1016/S0195-6701(13)60012-2.
3. Siegel JD, Rhinehart E, Jackson M, Chiarello L, Health care infection control practices advisory committee. 2007 Guideline for isolation precautions: preventing transmission of infectious agents in health care settings. *Am J Infect Control*. 2007;35(10):S65–S164. doi: 10.1016/j.ajic.2007.10.007.
4. Standard precautions in health care: aide-memoire. Geneva: World Health Organization; 2007 (http://www.who.int/csr/resources/publications/EPR_AM2_E7.pdf, accessed 22 August 2017).
5. WHO guidelines on hand hygiene in health care. Geneva: World Health Organization; 2009 (http://apps.who.int/iris/bitstream/10665/44102/1/9789241597906_eng.pdf, accessed 22 August 2017).
6. Global guidelines on the prevention of surgical site infection. Geneva: World Health Organization; 2016 (<http://www.who.int/gpsc/ssi-prevention-guidelines/en/>, accessed 22 August 2017).
7. WHO guideline on the use of safety-engineered syringes for intramuscular, intradermal and subcutaneous injections in health-care settings. Geneva: World Health Organization; 2015 (<http://apps.who.int/iris/handle/10665/170470>, accessed 22 August 2017).
8. What do do if you can't find a sharps disposal container. Silver Spring, Maryland: U.S. Food and Drug Administration; 2014 (<https://www.fda.gov/MedicalDevices/ProductsandMedicalProcedures/HomeHealthandConsumer/ConsumerProducts/Sharps/ucm263259.htm>, accessed 19 January 2018.)
9. Morbidity and mortality weekly report. Centers for Disease Control and Prevention; 2008 (<https://www.cdc.gov/mmwr/PDF/wk/mm5719.pdf>, accessed 16 October 2017).
10. Insights from field introduction of “smart” syringes for enhanced safety in voluntary medical male circumcision. Jhpiego; 2017 (<https://project-iq-resources.jhpiego.org/resource/insights-field-introduction-smart-syringes-enhanced-safety-voluntary-medical-male-circumcision-programs/>, accessed 16 October 2017).
11. Decontamination and reprocessing manual for health-care facilities. Geneva: World Health Organization; 2016 (<http://apps.who.int/iris/bitstream/10665/250232/1/9789241549851-eng.pdf>, accessed 22 August 2017).
12. Spaulding EH. Chemical disinfection of medical and surgical materials. In: Lawrence CA, Block SS, editors. *Disinfection, sterilization and preservation*. Philadelphia (PA): Lea & Febiger. 1968:517–531.
13. Safe management of wastes from health-care activities (second edition). Geneva: World Health Organization; 2014 (http://www.healthcare-waste.org/fileadmin/user_upload/resources/Safe-Management-of-Wastes-from-Health-Care-Activities-2.pdf, accessed 22 August 2017).
14. United Nations Environment Programme. Technical guidelines on the environmentally sound management of biomedical and healthcare wastes (Y1; Y3). Switzerland: Secretariat of the Basel Convention; 2003 (<http://archive.basel.int/pub/techguid/tech-biomedical.pdf>, accessed 16 October 2017).
15. Guidelines for the prevention, care and treatment of persons with chronic hepatitis B infection. Geneva: World Health Organization; 2015 (<http://www.who.int/hepatitis/publications/hepatitis-b-guidelines/en/>, accessed 22 August 2017).

16. Guidelines for the screening, care and treatment of persons with hepatitis C infection. Geneva: World Health Organization; 2014 (<http://www.who.int/hepatitis/publications/hepatitis-c-guidelines/en/>, accessed 22 August 2017).
17. Guidelines on post-exposure prophylaxis for HIV and the use of co-trimoxazole prophylaxis for HIV-related infections among adults, adolescents and children: recommendations for a public health approach: December 2014 supplement to the 2013 Consolidated guidelines on the use of antiretroviral drugs for treating and preventing HIV infection. Geneva: World Health Organization; 2014 (<http://apps.who.int/iris/handle/10665/145719>, accessed 22 August 2017).

BIBLIOGRAPHY

- Management of waste from injection activities at district level. Geneva: World Health Organization; 2006 (http://www.who.int/water_sanitation_health/publications/waste-from-injections/en/, accessed 22 August 2017).
- Infection prevention and control. In: World Health Organization [website]. (<http://www.who.int/infection-prevention/en/>, accessed 31 October 2017).

