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15 INFECTION PREVENTION AND CONTROL

1. Introduction

The primary objective of infection prevention in sexual and reproductive health care facilities, whether free-standing or mobile is:

- To minimize the transmission of infections to clients, service providers and others who may be exposed to disposed contaminated wastes.

As the prevalence of HIV infection and AIDS is increasing, more people are concerned about the possibility of becoming infected. It is of utmost importance that transmission of the HIV virus to clients and service providers be prevented, and they should be reassured that all necessary precautions are taken.

The spread of infection during clinic procedures can be prevented by the use of aseptic techniques, avoidance of cross-infection, proper processing of clinic instruments and equipment, and proper waste disposal.

2 Definitions

- **Micro-organisms** are the causative agents of infection. They include bacteria, viruses, fungi and parasites. Bacteria which produce endospores (e.g., *Clostridium* species causing gangrene and tetanus) are the most difficult to kill due to their protective coating.
- **Asepsis or aseptic technique** are general terms used in health care settings to describe the combination of efforts made to prevent entry of micro-organisms during service delivery procedures into any area of the body where they are likely to cause infection. The goal of asepsis is to eliminate, or reduce to a safe level, the number of micro-organisms on both animate (living) surfaces (e.g., skin, mucous membranes and tissues) and inanimate objects (e.g., surgical instruments).
- **Antisepsis** is the prevention of infection by killing or inhibiting the growth of micro-organisms on skin and mucous membranes prior to a service delivery procedure which involves contact with tissues where micro-organisms may cause infection.
- **Decontamination** is the process that makes inanimate (non-living) objects safer for people to handle. Such objects include large surfaces (e.g., pelvic examination or operating tables) and instruments and gloves contaminated with blood or other body fluids.

- **Cleaning** is the process that physically removes all visible blood, other body fluids, tissues or any foreign material such as dust or soil from skin, mucous membranes or inanimate objects.
- **Disinfection** is the process that eliminates bacteria, viruses, fungi and parasites from inanimate objects, but does not reliably eliminate bacterial endospores. The procedures for **disinfection** have been reviewed during recent years to ensure effectiveness against viruses such as HIV and hepatitis B virus. The revised procedures have been labelled as **High-Level Disinfection (HLD)**. **HLD** is, at the present time, the only acceptable level of disinfection and the only one recommended in these guidelines.
- **Sterilization** is the process that completely eliminates all micro-organisms, including bacterial endospores, from inanimate objects.

3 Antisepsis

Antisepsis involves cleaning of the client's skin or mucous membrane with an antiseptic substance to remove or eliminate as many micro-organisms as possible, prior to any procedure. Care should be taken not to irritate or damage the skin or mucous membrane.

3.1 Indications

- Skin preparation for procedures such as minilaparotomy, laparoscopy, vasectomy, insertion/removal of Norplant implants and injections.
- Cervical and vaginal preparation for IUD insertion/removal and insertion of uterine elevator in surgical sterilization.
- Handscrub prior to putting on gloves for surgical procedures such as minilaparotomy or vasectomy.

3.2 Selection of antiseptics

Antiseptics are made to be used on skin or mucous membranes, as opposed to disinfectants that are stronger solutions used for inanimate objects. Antiseptic solutions should *never* be used to disinfect inanimate (non-living) objects such as instruments and re-usable gloves. *Never* leave items such as pick-up forceps (lifters), surgical scrub brushes, scissors or suture needles soaking in antiseptic solutions.

The following antiseptic solutions are safe and commonly available:

- Centrimonium/cetrimide with ethyl alcohol 70% (Cetavelon).¹
- Cetrimide and chlorhexidine gluconate (CHG), various concentrations (e.g., Savlon).
- Chlorhexidine gluconate 4% (e.g., Hibitane, Hibiscrub).
- Parachlorometaxylenol (PCMX or chloroxylenol), various concentrations 0.5%-3.75% (e.g., Dettol).
- Hexachlorophene 3% (e.g. pHisoHex).
- Iodines 2%-3%, tincture¹ and aqueous (e.g., Lugol's).
- Iodophors, various concentrations 0.5%-10% (e.g., Betadine).
- Alcohols (60%-90%), ethyl, isopropyl or methylated spirit.¹
- Hydrogen peroxide 3%.
- Acridine derivatives (acriflavine and proflavin).

Solutions to avoid:

- *Benzalkonium chloride (Zephiran)*. It has several distinct disadvantages:
 - It takes at least 10 minutes to kill HIV.
 - It has repeatedly been shown to become contaminated by *Pseudomonas* and other common bacteria.
 - It is easily inactivated by cotton gauze and other organic material and is incompatible with soap.
- *Mercury laurel or other mercury-containing compounds*. Although frequently sold for antiseptics, mercury-containing chemicals should be avoided due to their high toxicity.
 - Skin exposure to low levels of mercury causes blister formation and contact dermatitis.
 - Inhalation or ingestion of low levels of mercury causes central nervous system effects (numbness, speech impairment, deafness) and higher levels (200 mg) are fatal.

3.3 Preparation, storage and dispensing of antiseptics

Antiseptics are commercially available either as concentrates from which solutions have to be prepared or as solutions ready for use. Proper

¹ Solutions containing alcohol (e.g., ethyl alcohol, tincture iodine, methylated spirit etc.) should not be used on mucous membrane such as vagina.

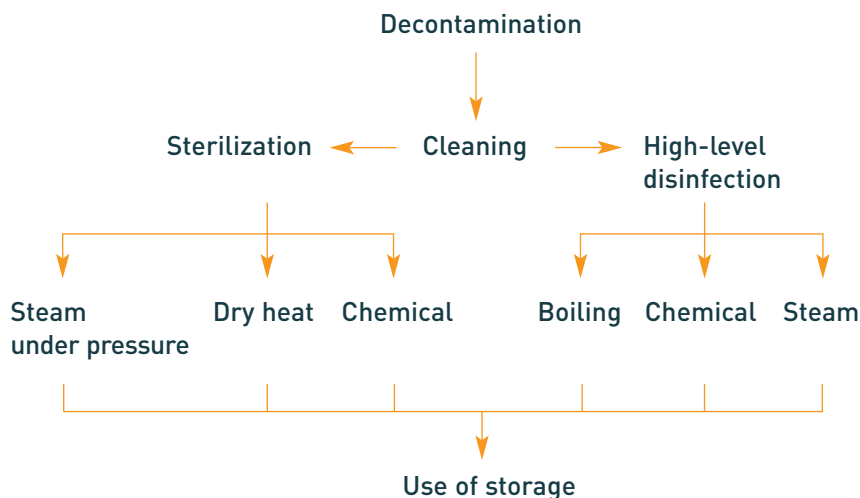
handling of antiseptic solutions is important in order to prevent their contamination. Micro-organisms which can commonly contaminate antiseptic solutions include Gram-negative bacilli, all endospores and rarely *Staphylococcus*. These micro-organisms can cause subsequent infection when contaminated solutions are used for handwashing or on a client's skin or mucous membrane. To prevent contamination of antiseptic solutions:

- Pour the antiseptic, unless supplied commercially in small quantities, into small reusable containers for daily use. This prevents evaporation and contamination, which would occur if the large container were opened too often.
- Establish a routine schedule (e.g., each week) for preparing solutions and cleaning reusable containers. (Solutions are at increased risk of becoming contaminated after one week of being prepared.)
- Do not store gauze or cotton wool in aqueous antiseptics as this promotes contamination.
- Wash the reusable container thoroughly with soap and water and dry before refilling. Label it with the date every time it is washed, dried and refilled.
- Store antiseptics in a cool, dark area. Never store chemicals in direct sunlight or in excessive heat (e.g., upper shelves in a tin-roofed building).
- When using antiseptic solutions, always pour the solution out of the container. Touching the rim or contents of the container with gauze, cotton swab or hand contaminates the entire bottle of antiseptic.

4 Procedures for processing of equipment and instruments

The procedures include decontamination, cleaning, high-level disinfection and sterilization.

Figure 15.1 The steps for processing



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4.1 Decontamination

Decontamination is important for pre-treating instruments and objects that may have come in contact with body fluids, to make them safer to handle by personnel who clean them. It must be understood, however, that chemical disinfectants cannot be 100% relied upon to penetrate blood, mucus etc. on an unwashed item. Therefore, the strictest precautions should be maintained when cleaning instruments and other items, including the use of gloves, even after decontamination (see section 4.2). When performing decontamination, wear rubber (household or utility) gloves. Always use plastic containers because a metal container will accelerate corrosion of stainless steel instruments, which are electroplated.

Decontamination of used instruments and other items

- Provide a fresh plastic bucket containing 0.5% chlorine solution at the beginning of each working session, or more often if the solution becomes dirty.
- Immediately after each procedure, place the used items in 0.5% chlorine solution for 10 minutes. Do not wait too long before starting decontamination because it will allow organic material to dry and become hard to remove.
- Soaking instruments for prolonged periods (or in high concentrations of chlorine) may damage instruments. Rinse instruments with cold water immediately after decontamination to prevent corrosion and to remove gross organic material before being cleaned.

In clinics where numerous procedures are performed during a session, it may not be practical to decontaminate instruments immediately after each procedure. In such situations, an alternative procedure may be followed:

- Pour into a plastic bucket the measured amount of water that is required to prepare a 0.5% chlorine solution. For example, if using bleach which requires 1 part of bleach to 6 parts of water, pour into the bucket the corresponding 6 parts of water.
- Place the used instruments immediately after each procedure in the bucket containing the water, ensuring that the instruments are kept below the water level. Once the maximum number of instruments that can remain below the water level have been placed in the bucket, or at the end of a working session, whichever comes first, pour into the bucket the amount of chlorine required to make a 0.5% solution and stir to mix. Make sure that the bucket containing water is not overloaded with instruments, so that enough space is left for the chlorine to be added without the water overflowing.
- Keep the instruments in the chlorine solution for 10 minutes, and then rinse immediately with cold water.

Decontamination of large surfaces

Decontaminate large surfaces (e.g., the top of the examination table) by wiping them with 0.5% chlorine solution.

Preparation of chlorine solutions

Chlorine solutions can be made from liquid household bleach (sodium hypochlorite) (see Table 15.1) or from other chlorine compounds available in powder (calcium hypochlorite or chlorinated lime) or tablet form (sodium dichloroisocyanurate). The World Health Organization (WHO) recommends that chlorine solutions should be replaced daily, or more often if necessary, because they lose potency rapidly over time or after exposure to light.

Making a chlorine solution from bleach powder:

To prepare a chlorine solution use the following formula:

$$\frac{\% \text{ chlorine desired}}{\% \text{ chlorine in powder}} \times 1000 = \text{grams of powder per litre of water.}$$

Examples:

To make a 0.5% chlorine solution from calcium hypochlorite powder (bleach) that contains 35% available chlorine:

$$\frac{0.5}{35} \times 1000 = 0.0143 \times 1000 = 14.3$$

Thus, dissolve 14.3 grams of calcium hypochlorite powder in 1 litre of water.

To make a 0.1% chlorine solution from calcium hypochlorite powder (bleach) that contains 35% available chlorine:

$$\frac{0.1}{35} \times 1000 = 0.0029 \times 1000 = 2.9$$

Thus, dissolve 2.9 grams of calcium hypochlorite powder in 1 litre of water.

Preparation of a dilute chlorine solution from liquid bleach:

To prepare a dilute chlorine solution, use the following formula to determine the parts of water needed for each part of concentrated chlorine solution (liquid bleach):

$$\frac{\% \text{ chlorine in concentrate}}{\% \text{ chlorine desired}} - 1 = \frac{\text{number parts of water needed}}{\text{per part concentrate}}$$

Example: To make a 0.5% solution from a 3.5% concentrate

$$\frac{3.5}{0.5} - 1 = 7 - 1 = 6$$

Thus, add 6 parts water to 1 part concentrated chlorine solution (see also Table 15.1).

Table 15.1—How to prepare 0.5% chlorine solution from liquid bleach (sodium hypochlorite)

Example of brand of bleach — Country	Chlorine % available	0.5% dilution
ACE—Turkey, Eau de Javel—France (15° chlorum) ¹	5	1 part bleach to 9 parts water
Lejia—Peru	10	1 part bleach to 19 parts water
JIK—Kenya, Robin Bleach—Nepal	3.5	1 part bleach to 6 parts water
Blanqueador Cloro —Mexico	6	1 part bleach to 11 parts water
Lavandina—Bolivia	8	1 part bleach to 15 parts water
Extrait de Javel—France (48° chlorum) ¹	15	1 part bleach to 29 parts water

¹Where concentrations of active chlorine are expressed in chlorum, convert to per cent as follows: 1° chlorum roughly equals 0.3% active chlorine; therefore multiply the degrees of chlorum by 0.3 to give % active chlorine.

4.2 Cleaning

Cleaning instruments and other items before sterilization and disinfection procedures is crucial because it removes organic material which can:

- Entrap micro-organisms in a residue that may protect them against sterilization or disinfection procedures.
- Partially inactivate chemical disinfectants and sterilants, rendering them less effective.

How to clean

Clean instruments and large surfaces with detergent and water. Water alone is not effective in removing proteins, oils and grease. Use a liquid or powdered detergent which can easily dissolve in water. Avoid the use of soap, or detergents which contain soap, as fatty acids contained in soap react with the minerals in hard water and form residue which is difficult to remove. Do not use abrasives (e.g., Vim or Comet) because they may damage instruments.

- Wear rubber (household or utility) gloves and, if possible, eye protection.
- Clean instruments with detergent and water using a brush. This should be done under the surface of the water to prevent infectious material from becoming airborne through splashing. Pay particular attention to instruments with teeth, joints or screws.
- Rinse thoroughly with water to remove detergent residue which can interfere with chemical disinfection or sterilization.
- Dry by air or with a clean towel. (Water from wet instruments will dilute chemicals used for sterilization or disinfection.) Drying is not necessary for instruments which are to be boiled.

4.3 High-level disinfection (HLD)

High-level disinfection (HLD), if carried out properly, destroys bacteria, viruses, fungi and parasites, but does not reliably eliminate bacterial endospores; it makes objects safe to touch broken skin or intact mucous membrane. Sterilization is the preferred processing method for items that will make contact with the bloodstream or tissues beneath the skin. When sterilization is not possible, HLD is the only acceptable alternative. HLD can be achieved by two techniques: *boiling and chemical (cold) disinfection*.

Boiling

- Decontaminate, clean and dry all items to be disinfected (see sections 4.1 and 4.2).
- Use a pot with a lid or an instruments boiler.
- Submerge all the instruments in water so that the water level is above the instruments. Open jointed instruments such as clamps and scissors. Disassemble items composed of more than one part. Make sure that any bowls and containers to be disinfected are full of water. Bowls should not be kept upside down as they may trap air which will not reach the required temperature to kill micro-organisms.
- Close the lid and apply heat.
- Boil for a minimum of 20 minutes; start timing when the water is at a rolling boil.
- Lower heat to keep water at a rolling boil because too vigorous boiling wastes fuel, evaporates the water and may damage equipment.
- Do not add anything to the container, including more water, once timing has begun.
- Immediately after boiling, remove items with sterilized or disinfected forceps. The instruments will air dry better if taken out of the hot water when they are still hot. Do not leave the items in the container with the lid open once the water has stopped boiling because, as the water cools down, the steam condenses and air and dust particles are drawn into the container, which may contaminate the instruments. After removing the instruments from the hot water, place them in a pan or dish which has also been boiled.
- For procedures such as male or female sterilization, insertion or removal of implants and IUD insertion, instruments can be used wet immediately after cooling, or air dried and stored in a covered, disinfected container for use within 24 hours.
- For procedures such as pelvic examination, instruments do not need to be sterile or disinfected at the time of being used. These instruments, however, should be sterilized or disinfected between cases. They should be stored and handled in the conditions required to keep them clean, but not necessarily sterile or disinfected. Air dry these items or dry them with a clean towel before use or storage. If the items are towel dried, the towel should be used only for this purpose and replaced every day, or sooner if necessary.

Use the same water throughout the day, adding only enough to keep the surface at least 1 inch (over 2 cm) above the equipment to be disinfected. Frequent draining and replacing of water increases the risk of mineral deposits.

Chemical disinfection

Selection of disinfectant

- Glutaraldehyde 2% (e.g., Cidex).
- Formaldehyde 8%.
- Chlorine 0.1% solution (boiled water should be used for dilution).

Although alcohols and iodophors are inexpensive and readily available, they should not be used as disinfectants. Alcohols do not kill some viruses and spores, and *Pseudomonas* has been known to multiply in iodophors. Hydrogen peroxide (6%) is a high-level disinfectant, but is highly corrosive and loses potency rapidly when exposed to heat and light.

Precautions

Take precautions while using the following:

- *Formaldehyde*: Do not dilute with chlorinated water because a carcinogen (bischloromethyl ether) can be produced.
- *Formaldehyde and glutaraldehyde*: The vapours of both these chemicals are toxic and cause irritation to the skin, eyes and respiratory tract. Always wear gloves and use them in a well-ventilated area. Formaldehyde is the more toxic.
- *Chlorine solutions*: These solutions can corrode metals. Always rinse promptly to avoid corrosion.

Procedures

- Wear thick household gloves.
- Decontaminate, clean and dry all items to be disinfected (see sections 4.1 and 4.2).

- Use a clean container with a lid. Open jointed instruments, such as scissors and forceps. Disassemble items composed of more than one part. Cover all items completely with the disinfectant solution.
- Soak in a glutaraldehyde, formaldehyde or chlorine 0.1% solution for 20 minutes.
- Remove, using disinfected forceps or gloves.
- Rinse well with sterile or boiled water.
- For procedures such as male or female sterilization, insertion or removal of implants, and IUD insertion, instruments can be used wet immediately after cooling, or air dried and stored in a covered disinfected container for use within 24 hours.
- For procedures such as pelvic examination, instruments do not need to be sterile or disinfected at the time of being used. These instruments, however, should be sterilized or disinfected between cases. They should be stored and handled in the conditions required to keep them clean, but not necessarily sterile or disinfected. Air dry these items or dry them with a clean towel before use or storage. If the items are towel dried, the towel should be used only for this purpose and replaced every day, or sooner if necessary.

Chemical disinfection of needles and syringes should be avoided because they are difficult to rinse effectively and chemical residues may interfere with the action of medications being injected.

Preparation and storage of solutions

- Formaldehyde is commercially available in 35%-40% solutions. One part of this solution should be diluted with 4 parts of boiled water to prepare a final solution which contains about 8% formaldehyde. Do not dilute with chlorinated water as a carcinogen (bischloromethyl ether) can be produced.
- Glutaraldehyde solutions are available as a 2% aqueous solution. Most need to be "activated" before use. Activation involves addition of a powder or a liquid supplied with the solution; this renders the solution alkaline. Instructions provided by the manufacturer should be followed.
- For guidance on the preparation of chlorine solution, please see section 4.1.

Replace chlorine solutions daily and formaldehyde and glutaraldehyde solutions every 2 weeks, or more frequently if they get diluted or become cloudy during use.

4.4 Sterilization

The sterilization process ensures that all micro-organisms, including bacterial endospores, are destroyed. Sterilization can be achieved by using heat (high-pressure steam or dry heat), or by using chemicals (“cold-sterilization”).

Another technique, practised in some countries, is gas sterilization using ethylene oxide (ETO). ETO may produce harmful effects in human beings. It is toxic, mutagenic, possibly carcinogenic, flammable and explosive. It is also an expensive process, and, therefore, its use is impractical for most SRH/family planning programmes.

A new technique using paraformaldehyde has recently been patented. Paraformaldehyde is vaporized by dry heat in an enclosed area to disinfect or sterilize objects. This process has been used for sterilizing laparoscopes. The gas is highly toxic, the heat makes it very expandable and it is difficult to ensure the conditions for safety in a clinical facility. Therefore, this method is not recommended.

Steam sterilization (autoclaving)

High-pressure saturated steam is generally the method of choice for sterilizing instruments and other items used in SRH/family planning and other health-care facilities. Sterilization by steam requires the following conditions:

- Adequate contact of steam with all surfaces of the items to be sterilized.
- Sufficiently high temperatures.
- Proper timing.

The two commonly used steam sterilizers are a gravity displacement autoclave and a pre-vacuum autoclave.

- *Gravity displacement autoclaves.* With this type of autoclave, water at the bottom of the sterilizer is heated and turned into steam. As steam is produced and fills the autoclave chamber, cool air is forced out from the chamber. It is important to remove all the air from the autoclave

chamber to achieve sterilization. There is a pressure cooker type sterilizer that can be used on a kerosene or electric burner. This has been used for immunization programmes, but has been modified for instruments to be used in family planning procedures such as IUD insertion and insertion and removal of implants.

- *Pre-vacuum sterilizers.* These use a vacuum pump system to rapidly remove the air from the autoclave chamber before steam is let in. This reduces the total cycle time and the chances of air pockets forming. Pre-vacuum sterilizers are more expensive and more complex to operate and maintain; they are normally used in large hospitals.

SRH/family planning clinics usually use gravity displacement autoclaves. The following guidelines apply only to gravity displacement autoclaves.

Preparation of items

To ensure correct operation, consult specific operating instructions supplied by the manufacturer.

- Decontaminate, clean and dry all items to be sterilized.
- Wrap the sharp edges and needle points in gauze. Keep instruments such as scissors, haemostats and artery forceps in the opened or unlocked position, and disassemble instruments composed of more than one part or sliding parts.
- Do not tie instruments together with rubber bands or any other means as this will prevent steam contact with all surfaces.

Wrapping

Instruments and other items can be sterilized either unwrapped or wrapped. If sterilizing instruments wrapped:

- Wrap clean instruments and other items in cotton cloth, double-thickness muslin (140 thread count), paper wrapper or newsprint before autoclaving.
- For sterilization the wrapper must:
 - Be large enough to completely enclose the items.
 - Be properly folded to secure the package contents.
 - Be loose enough to allow air removal and steam penetration.
 - Allow safe storage and aseptic presentation at the point of use.

- Place wrapped instrument sets in trays with mesh or perforated bottoms.
- When using drums for autoclaving, ensure that:
 - The drum is not overloaded.
 - Holes are in the open position.

Loading

- Do not overload. Leave sufficient space between items for efficient air removal, steam penetration and steam evacuation.
- Ensure that all items are dry before loading.
- Do not sterilize linens and gloves with hard items. They should be sterilized separately. If this is not possible, place linen and/or gloves on top shelves and hard items below. This prevents linen or gloves from becoming wet due to dripping of condensate (moisture) from hard items.
- Place trays containing packs of instruments in a way that will ensure even distribution of instruments and facilitate proper drainage. If the tray has holes in the bottom, place it flat on the shelf. If the tray does not have holes in the bottom, place it tilted on its side.
- Stand utensils, basins and treatment trays on their sides.
- Place linen packs so that the layers within are perpendicular to the shelf (not sitting flat, one on another) for more efficient air removal, steam penetration and evacuation for drying.
- Do not allow items to touch chamber walls where they could get in contact with condensate and become wet or get too hot and burn.
- Use sterilizable baskets to contain small items on sterilizer shelves/carts.
- Instruments sets should not exceed 8 kg (18 lb). Basin sets should not exceed 3 kg (7 lb). Linen packs should not exceed 30 x 30 x 50 cm (12 x 12 x 20 in) in size and should weigh no more than 5 kg (12 lb) in order to assure steam penetration of the pack.

Sterilization temperature, pressure and timing

- Sterilize at a temperature of 121°C (250°F) and at a pressure of 106 kPa (15 lb/in²) for 20 minutes for unwrapped items and 30 minutes for wrapped items. If using a mixed load, sterilize for 30 minutes. Start timing when required temperature and pressure have been reached.

- When time is complete, turn off heater and release the pressure valve. Wait until the pressure gauge reads zero (approximately 20 to 30 minutes) to prevent steam from escaping abruptly when opening the door and hurting the person performing the procedure.
- Open the door 12-14 cm (5-6 in), soon after the pressure gauge reads zero. Stand behind the door while opening it to prevent burning yourself with escaping steam.

If using a pressure-cooker type of autoclave, bring water to boil over an electric or kerosene burner until steam escapes from the pressure valve; turn down heat just enough to keep steam coming out of the pressure valve. Ensure that steam escapes only from the pressure valve and not from either the safety valve or from under the edge of the lid. Do not allow to boil dry.

Unloading

- Allow items to dry completely before removal, which may take at least 30 minutes after opening the door. Damp packs act like a wick, drawing in bacteria, viruses and fungi from the environment. Wrapped instruments are considered unacceptable if there are water droplets or visible moisture on the package exterior when removed from the autoclave chamber.
- Do not place sterile trays on cold surfaces or stack them one upon another until they are completely cool because condensation may occur beneath or between them. Place them on surfaces padded with paper or fabric.

Wrapped items can be stored for up to 7 days, provided that they are kept dry. Unwrapped items must be used immediately, or placed in a closed sterile container for use within 7 days, but they should be used within 24 hours once the container is opened again.

Dry heat sterilization

A commercial sterilizer with a fan is recommended for carrying out dry heat sterilization, but it can be done in an ordinary household oven using electricity or another fuel source. Dry heat sterilization is ideal for reusable needles and syringes as it does not dull sharp points and edges as much as autoclaving. It is good in humid climates as it eliminates "wet

pack” problems. Dry sterilization can be an option for metal or glass items. It should not be used for linen, plastic or rubber as these can burn or melt.

- Decontaminate, clean and dry all instruments to be sterilized.
- If necessary, wrap instruments in cotton muslin or aluminium foil. Take care that the temperature in the oven does not exceed 204°C (399°F) if you are using cotton muslin. If the temperature cannot be carefully controlled, do not use muslin.
- Sterilize at 170°C (340°F) for 1 hour. Start timing once the oven has reached the temperature of 170°C. (Total cycle-time is 2-21/2 hours, which includes placing instruments in the oven, heating to 170°C, timing for 1 hour and then cooling.)
- Sterilize at 160°C (320°F) for 2 hours (total cycle-time 3-31/2 hours) if sterilizing needles or other instruments with cutting edges, because higher temperatures tend to dull sharp edges.
- Remove packs after cooling and store for up to 7 days in covered sterilized containers (unwrapped items should be removed with sterile forceps/pickups and used immediately) or placed in a closed sterile container for use within 7 days, but they should be used within 24 hours once the container is opened again.

Chemical sterilization

Chemical sterilization is also called “cold sterilization”. Disinfectants such as 2% glutaraldehyde and 8% formaldehyde are used for chemical sterilization. When instruments are soaked for prolonged periods (10-24 hours) endospores are killed. **Warning: The vapours of both these chemicals are irritating to the skin, eyes and respiratory tract. Formaldehyde is more toxic, although less expensive, than glutaraldehyde. Both chemicals should be used in a well-ventilated area.**

Indications

- When steam or dry heat sterilization equipment is not available.
- When steam or dry heat sterilization would damage objects (e.g., laparoscope).

Procedures

- Wear thick household gloves.
- Decontaminate, clean and dry all items to be sterilized.
- Use a clean container with a lid. Open jointed items, such as scissors and forceps, and disassemble items composed of more than one part. Cover the items completely with the solution.
- Soak the items in 2% glutaraldehyde solution for at least 10 hours or in 8% formaldehyde for 24 hours.
- Remove objects from the solution with sterile forceps/pickups.
- Rinse well with sterile water as both chemicals leave a residue on treated instruments. Do not use boiled water, since it does not reliably inactivate endospores and can recontaminate sterile instruments.
- For procedures such as male or female sterilization, insertion or removal of implants and IUD insertion, instruments can be used wet immediately after cooling, or air dried and stored in a covered disinfected container for use within 24 hours.
- For procedures such as pelvic examination, instruments do not need to be sterile or disinfected at the time of being used. These instruments, however, should be sterilized or disinfected between cases. They should be stored and handled in the conditions required to keep them clean, but not necessarily sterile or disinfected. Air dry these items or dry them with a clean towel before use or storage. If the items are towel dried, the towel should be used only for this purpose and replaced every day, or sooner if necessary.

5 Processing of individual items

5.1 Pelvic examination tabletop or other large surface areas

- Wash with detergent and water every day. Make sure that no organic material remains.
- Whenever there is any spill of body fluids (e.g., blood) decontaminate and clean between clients by wiping with a cloth soaked with 0.5% chlorine solution and wash.

5.2 Linens for surgical procedures (caps, masks, gowns and drapes)

- Wear gloves to handle soil linen.
- Decontaminate by soaking all items in a decontaminant solution (see section 4.1).
- Wash with detergent and water.
- Air or machine dry.

No further action is necessary for caps and masks.

- Check surgical gowns and drapes wraps for holes after they are completely dry. If there are holes, the item should be repaired before use or discarded.
- Wrap the linen using two double thickness wraps of muslin cloth (140 thread count) or two wraps of paper (newsprint). **Packs should not exceed 30 x 30 x 50 cm (12 x 12 x 20 in) in size and weigh no more than 5 kg (12 lb) in order to allow proper steam penetration.** Alternatively, linen can be placed unwrapped in an autoclaving drum.
- Sterilize by autoclaving.
- Linen wrapped in muslin or paper, or linen autoclaved inside a drum without a wrapping, can be kept for 1 week. However, once a drum containing unwrapped linen is opened, the material inside should be used within 24 hours. Store sterile linen in a dry place, free from dust and insects, preferably in a cabinet or in a container. In order to protect linen, do not store it near areas that are frequently mopped or near a sink.

If linen becomes wet or has not been used within 1 week, it should be autoclaved again.

5.3 Gloves (rubber or plastic)

For surgical procedures

It is best to use sterile gloves for any invasive procedure (e.g., sterilization or insertion/removal of implants). If sterile gloves are not available, high-level disinfected gloves are the only acceptable alternative.

Do not use powder when putting on sterile or high-level disinfected gloves, as the tiny powder granules (talc) may fall into the insertion/incision site and cause a fibrous reaction.

For non-invasive procedures

Sterile or disinfected gloves are not necessary to perform non-invasive procedures (e.g., pelvic examination or the no-touch technique for IUD insertion or removal). New, non-sterile, single-use (disposable) gloves are adequate. However, **if using reusable gloves, sterilization or HLD is required between clients to prevent cross-infection**. These gloves can then be stored in a way which will keep them clean, but not necessarily sterile or disinfected.

Processing reusable gloves

- Decontaminate by soaking in 0.5% chlorine solution.
- Wash with detergent and water.
- Rinse with clean water and check for holes by filling the gloves with water and looking for leaks.

Sterilization

The most practical way to sterilize gloves is by autoclaving.

- Dry the gloves inside and outside and fold the cuffs out so that sterilized gloves can be put on without contamination. Put gauze inside each glove and under the fold of the cuff to allow steam to contact all surfaces during sterilization and also to prevent surfaces from adhering to each other.
- Pack the gloves in a double-thickness muslin (140 thread count) or paper wrapper, or newsprint. If a drum is used, do not pack too many gloves in it.
- Steam sterilize according to instructions provided in section 4.4.
- Do not use gloves for 24–48 hours after sterilization, to allow them to regain their elasticity before use.

High-level disinfection (HLD)

HLD can be done by boiling.

- After boiling, remove gloves with disinfected forceps and shake off excess water. Never leave boiled gloves in water which has stopped boiling. As water cools down and steam condenses, air and dust particles may be drawn into the container and contaminate the gloves.
- Place the gloves in a disinfected container. Cover and allow to cool before using.
- Use disinfected forceps to remove gloves from the container.
- For invasive procedures, use wet gloves immediately. Do not store them, as it is difficult to avoid contamination while drying.
- Gloves which will be used for non-invasive procedures and do not need to remain disinfected can be dried with a clean towel used only for this purpose and replaced every day, or sooner if necessary. These gloves can be stored in a clean container.

5.4 Instruments for pelvic examination

For pelvic examination, instruments do not need to be sterile or disinfected at the time of being used. These instruments, however, should be sterilized or disinfected between cases.

- Decontaminate and clean (see sections 4.1 and 4.2).
- Sterilize or disinfect (see sections 4.3 and 4.4). If disinfection is used, dry instruments before use or storage.
- Handle and store in the conditions required to keep the instruments clean, but not necessarily sterile or disinfected.

5.5 Instruments for male and female sterilization (except laparoscope), insertion and removal of implants and IUD insertion

- Decontaminate and clean (see sections 4.1 and 4.2).
- Sterilization is recommended (see section 4.4).
- If sterilization is not possible, high-level disinfection by boiling or by a chemical method is the only acceptable alternative (see section 4.3). If instruments are disinfected, use them wet immediately after cooling, or air dry and store them in a covered disinfected container for use within 24 hours.

5.6 Endoscopes (laparoscopes)

Clean endoscopic equipment immediately after use.

- Wearing utility gloves, disassemble and place all the parts in a basin of clean water and mild non-abrasive detergent. Wash all outer surfaces, using a soft cotton cloth. Clean inner channels with a cleaning brush supplied with the laparoscopic kit.
- Rinse thoroughly with water to remove detergent, which can interfere with chemical disinfection/sterilization.
- Dry by air or with a clean towel (water from wet instruments will dilute chemicals used for sterilization or disinfection).

After cleaning, the laparoscope can be either chemically disinfected or chemically sterilized. HLD is normally used between cases performed during the same day or working session. Sterilization is recommended at the end of the day or working session.

- Chemically disinfect by soaking for 20 minutes in 2% glutaraldehyde or 8% formaldehyde.
- Sterilize by soaking for 10 hours in 2% glutaraldehyde or 24 hours in 8% formaldehyde.

If sterilization is not possible at the end of the day, clean the laparoscope and wash the inner channel with alcohol to facilitate drying of the channel. Leave it until the day it will be used again, when it should be chemically disinfected before use.

5.7 Needles and syringes

Ideally, disposable needles and syringes should be used. These needles and syringes should not be reprocessed and used again. They should be properly discarded after a single use (see section 8.5).

However, some programmes may find it difficult to maintain a reliable supply of disposable syringes and needles, and have to rely on reusable ones.

Processing reusable syringes and reusable needles

- Wear utility gloves.
- Decontaminate immediately after use:
 - Fill assembled needles and syringes with 0.5% chlorine solution and soak them in the solution for 10 minutes;
 - Then rinse by flushing them 3 times with clean water.
- Disassemble, then wash with detergent and water, removing all particles.
- Rinse with water.
- Air or towel dry syringes and air dry needles before sterilization. If disinfection will be done by boiling, drying is not required.
- Sterilize glass syringes by dry heat or autoclave (for details see section 4.4).
- If sterilization is not possible, disinfect by boiling (for details see section 4.3).

5.8 Storage containers for instruments

- If a container is contaminated with blood or body fluids, decontaminate it by soaking in a 0.5% chlorine solution for 10 minutes and rinse immediately after decontamination.
- Wash with detergent and water, removing all particles.
- Sterilize by dry heat or autoclave, OR
- Disinfect:
 - Boil container and lid.
 - If container is too large to boil, chemically disinfect by filling it with 0.5% chlorine solution and soak for 20 minutes.
- Re-sterilize or re-disinfect weekly, when empty or contaminated.

5.9 Water

High-level disinfection (HLD)

Disinfected water can be prepared by boiling. It is best to filter water before boiling if the water is obviously dirty. Boiled water could be needed to rinse chemically HLD items.

6 Storage of sterilized or disinfected equipment

Sterilized or disinfected equipment should be stored in enclosed shelves or in covered containers to protect it from moisture, dust and debris. The storage area should be easily accessible, but away from circulation of contaminated material and individuals not related to the preparation or handling of equipment and materials. It should also be separate from the area where contaminated material is cleaned and prepared for sterilization or disinfection.

- Store when packs reach room temperature (usually takes about 1 hour).
- Do not place warm packages in plastic dust covers. Moisture will be trapped and remain there until opened.
- If the pack is dropped, tears or gets wet, consider it contaminated.
- Mark packs and containers used for storing sterile or disinfected items with the expiry date, a list of contents items and the name of the person who sterilized or disinfected the material. Store packs and sterile containers (drums) for up to 1 week.
- Store packs and containers (drums) containing sterile items off the floor.
- Re-process objects which have not been used within 1 week. Linen must be wet before autoclaving again, in order to restore moisture, because dried out fibres decrease the ability of the cloth to form a barrier to micro-organisms.
- If sterile or disinfected articles are dispensed from a central supply department to the service delivery areas of a large facility, or from one service facility to another, or if they are used in mobile clinics, cover all items properly during transport.
- Remove supplies from all shipping cartons and boxes before storing them with other sterile material or bringing them into the procedure room. Cardboard boxes shed dust and debris and may harbour insects.
- Use unwrapped items immediately or place them in a closed sterile/HLD container for use within 1 week. However, once the container is open, all the items in the container should be used within 24 hours or sterilized or given HLD again.

7 Care during procedures

7.1 Handwashing

Handwashing may be the single most important infection prevention procedure.

Indications

- Before and after examining a client, especially when touching mucous membrane.
- Before putting on sterile or high-level disinfected gloves for a surgical procedure (surgical handscrub).
- After removing gloves, as they may have invisible holes or tears.
- After handling contaminated objects, such as used (soiled) instruments (even though gloves should be used).
- When accidentally touching blood or other body fluids (e.g., when collecting laboratory specimens).

Staff giving injections should keep their hands clean, although handwashing between procedures is not always required.

Ensure that the following items are available:

- *Soap*: Use plain soap for routine handwashing. If bar soap is used, provide small bars and soap racks which drain. Micro-organisms multiply in moisture and standing water.
- *Clean running water*: If no running water is available, use a bucket with a tap or a bucket and pitcher. If the available water is not clean, filter the water through a cloth and/or boil it.
- *Drain for disposal of used water*: If a drain is not available, collect used water in a basin and discard in the toilet.
- *Clean, dry towels*.

For surgical handscrub, the following items are also required:

- Sterile towels.
- Stick or brush for cleaning fingernails.
- Soft brush or sponge for cleaning the skin.
- Antiseptic soap.

Technique

For non-surgical procedures (e.g., examination of a client, pelvic examination and insertion/removal of IUD):

- Wash hands briefly with plain soap for about 15-30 seconds; then rinse in a stream of water. Dry hands with a clean towel or air dry. Shared towels easily become contaminated.

For surgical procedures (e.g., laparoscopy, minilaparotomy, vasectomy, or insertion and removal of implants):

- Remove all items of jewellery, including wristwatch.
- Wash hands with an antiseptic soap for 3 to 5 minutes:
 - Clean fingernails with a brush or stick.
 - Scrub hands with a soft brush or sponge. Begin at the fingertips, wash between all fingers and move towards the elbow.
 - Repeat for the second hand.
- Rinse each arm separately, fingertips first, holding hands above the level of the elbows to prevent water running down from the elbow to the hands.
- Dry hands with a sterile towel.
- After handwash has been completed, hold hands above the level of the waist.
- Repeat handwashing if hands touch any unsterile object before gloves are put on. However, if this happens while wearing gloves, just change the glove.

If antiseptic soap is not available, wash hands with plain soap and water, then rub hands for 2 minutes with an alcohol solution containing an emollient. Allow alcohol to dry for antiseptic effect. This procedure is particularly indicated for personnel with allergies to antiseptics or detergents.

The solution can be prepared by adding 2 ml of either glycerine, propylene glycol or sorbitol to 100 ml of 60%-90% alcohol.

Figure 15.2 Steps for non-surgical procedures



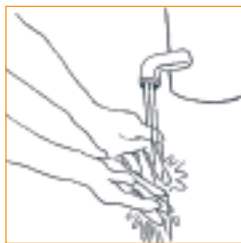
Wet hands with running water.



Rub hands together with soap and lather well. Make sure to rub all parts of your hands.



Vigorously weave fingers and thumbs together and slide them back and forth for 15-30 seconds (longer if hands are visibly soiled).



Rinse hands under a stream of clean, running water until all soap is gone.



Dry hands with a clean towel or allow hands to air-dry.

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7.2 Gloving

Gloves should be worn by all staff prior to contact with blood and body fluids, either when dealing with a client or when handling contaminated equipment and material. Gloves may be made of latex or synthetic material such as vinyl. Vinyl examination gloves are weaker and tear more easily than latex, but are an acceptable alternative for non-invasive procedures when latex gloves are not available.

Indications

Sterile gloves: Sterile gloves are preferable for surgical procedures.

Disinfected gloves: Disinfected gloves can be used wet, soon after disinfection, for surgical procedures when sterile gloves are not available.

Non-sterile gloves: Clean non-sterile gloves are adequate for non-surgical procedures such as:

- IUD insertion (when no-touch technique is used).
- IUD removal.
- Pelvic examination.

Disposable non-sterile examination gloves or reusable gloves can be used. If reusable gloves are used for the above procedures, it is necessary to sterilize/disinfect them between clients to prevent cross-infection, although they do not need to remain sterile/disinfected at the time of use.

For details of disinfection and sterilization procedures see sections 4.3 and 4.4.

Utility gloves

These thick rubber gloves are specially made to resist frequent and rough use. They are normally inexpensive and often used in household duties.

Indications

- Handling used instruments (e.g., during decontamination, transportation and cleaning).
- Cleaning spills of blood or body fluids.
- Handling waste material.

Do not use gloves which are cracked, peeling or have detectable holes or tears.

Figure 15.3 Steps for putting on surgical gloves



Prepare a large, clean, dry area for opening the package of gloves. Either open the outer glove package and then perform a surgical scrub, or perform a surgical scrub and ask someone else to open the package of gloves for you.



Open the inner glove wrapper, exposing the cuffed gloves with the palms up.



Pick up the first glove by the cuff, touching only the inside portion of the cuff (the inside is the side that will be touching your skin when the glove is on).



While holding the cuff in one hand, slip your other hand into the glove. (Pointing the fingers toward the floor will keep the fingers open). Be careful not to touch anything, and hold the gloves above your waist level.



Pick up the second glove by sliding the fingers of the gloved hand under the cuff of the second glove. Be careful not to contaminate the gloved hand with the ungloved hand as the second glove is being put on.



Put the second glove on the ungloved hand by maintaining a steady pull through the cuff. Adjust the fingers and cuffs until the gloves fit comfortably.

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7.3 Injection procedures

- Wash hands thoroughly with soap and water.
- Use a single-use (disposable) needle and syringe as a first choice. If this is not possible, a reusable syringe and needle can be used provided these have been properly sterilized or disinfected by boiling.
- If using a boiled needle and syringe, remove the needle and syringe from the covered container with dry, disinfected forceps/pickups.
- Always change the needle and syringe for each client. Changing only the needle, and not the syringe, between clients can result in transmission of infection (hepatitis B, HIV and others).
- Use a single-dose vial, whenever possible. If using a multi-dose vial:
 - Avoid the practice of leaving one needle inserted in the vial cap for multiple uses. This dangerous practice provides a direct route for micro-organisms to enter the vial and contaminate the fluid between each use.
 - Wipe the top of the vial with a cotton swab soaked in 60%-90% alcohol and allow to dry before extracting each dose.
- Draw the fluid into the syringe. Use the same needle you will use for the injection.

8 Environment

It is important to reduce the level of microbial growth and contamination in the clinic, especially in the following areas:

- *Procedure areas*: where clients are examined, IUDs are inserted/removed, implants are inserted/removed and vasectomies are performed.
- *Surgical areas*: where minilaparotomy, laparoscopy and other ambulatory surgical procedures are performed.
- *Work areas*: where instruments, linen, gloves and other equipment are cleaned, disinfected or sterilized and stored.

This can be accomplished by:

- Keeping these areas clean.
- Minimizing traffic flow.
- Handling and disposing of waste properly.

8.1 Cleaning of activity areas

Detergent and water are required for cleaning most activity areas.

For operating theatres and areas where heavy contamination is expected, such as toilets, and for sites with blood and body fluid spills, a disinfectant cleaning solution is also required.

A disinfectant cleaning solution can be made as follows:

- Add enough liquid detergent to a 0.5% chlorine solution to make a mild soapy solution.

Warning:—Do not use a cleaning solution or detergent which contains an acid (e.g., phosphoric acid), ammonia or ammonium chloride because, when mixed with a chlorine solution, these compounds produce gases which may result in temporary illness in exposed persons.

General guidelines

- Always wear utility gloves, especially for cleaning heavily contaminated areas such as toilets, and spills of blood and body fluids. If gloves are not available, use a plastic bag over the hand or keep hands out of direct contact.
- Frictional cleaning (scrubbing) is the best way to remove dirt and micro-organisms.
- Use a damp or wet cloth or mop for walls, floors and halls. Avoid dry sweeping as this will spread dust and micro-organisms into the air and onto clean surfaces.
- Use separate equipment (brushes, cloths) for surgical areas.
- Also use separate equipment (brushes, cloths) for areas which are likely to be contaminated (e.g., toilets).
- Change cleaning solutions when they are obviously dirty.
- Clean and dry mops and cloths between use.
- Wash from top to bottom, so that debris which falls on the floor will be cleaned up last.

Do not use disinfectant fogging (fumigation with formalin) to reduce microbial contamination of environmental surfaces such as walls, ceilings and floors. Fumigation with formalin or other chemicals is ineffective and results in release of toxic fumes. In addition, this practice is time consuming (it requires 24 hours), making working areas such as

operating theatres or treatment rooms unavailable. Scrubbing with soap and water is a safe, quick and effective way to reduce microbial contamination of these surfaces.

Cleaning of non-surgical areas

Walls, ceiling and furniture/equipment

For areas such as treatment and procedure rooms, laboratories etc., routine wiping of walls and ceiling with a damp cloth at least every month is adequate. Chairs, lamps, tabletops and counters should be wiped daily. Whenever soiled, or visibly dirty, any surface or furniture/equipment item should be cleaned with detergent and water. Use a disinfectant (0.5% chlorine solution) when contamination is expected, such as for blood spills.

Floors

Clean floors at least twice a day as needed with a damp mop, detergent and water. Use a disinfectant (0.5% chlorine solution) when contamination is expected, such as for blood spills.

Sinks

Use a disinfectant cleaning solution. Scrub daily or more often as needed with a separate cloth or brush. Rinse with water.

Toilets and latrines

Wear gloves. Clean daily or more often as needed with a disinfectant cleaning solution. Use a separate cloth or brush.

Waste containers

Wear gloves. Use disinfectant cleaning solutions. Scrub to remove soil and organic matter. Clean contaminated containers after each emptying. Clean non-contaminated waste containers at least once a week or more often if visibly soiled. Use a brush with a handle to prevent hand injury with any sharp materials which may have been left in the container.

Cleaning of operating room/theatre

Daily cleaning

At the beginning of each working day wipe all horizontal surfaces (tables, lights, trolleys etc.) with a damp cloth to remove dust which may have collected overnight.

At the end of each working day scrub all surfaces:

- Wipe any visible soil from walls and ceilings with a damp cloth, detergent and water.
- Wipe lamps, chairs, sinks, tabletops and counters with a damp cloth and disinfectant cleaning solution.
- Decontaminate operating tabletop with 0.5% chlorine solution. Clean sides, base and legs with a damp cloth and disinfectant cleaning solution.
- Clean floors with a damp mop, detergent and water.

Do not dry mop or sweep the operating room. This causes dust, debris and micro-organisms to rise and contaminate clean surfaces.

Between each client:

- Decontaminate operating table, instrument trolley and other potentially contaminated surfaces with cloth dampened with 0.5% chlorine solution and rinse with clean water.
- Clean spills with 0.5% chlorine solution. For large spills, flood area with 0.5% chlorine solution, mop up solution and then clean with detergent and water.

Cleaning of soiled and contaminated cleaning equipment

- Use utility gloves.

8.2 Traffic flow

Procedure areas

- Limit entry to only authorized personnel and clients at all times.
- Close doors and curtains during all procedures.

Surgical areas

- The operating theatre should be located away from areas of the clinic which are frequently passed through by staff and clients.
- Keep all doors closed in the surgical support area and operating theatre.

The operating theatre should be locked when not in use. Never use it as a store room.

- Limit entry to only authorized personnel and clients at all times.
- Whenever possible, arrange space so that personnel entering the surgical area enter via the clothes changing room.
- Personnel should wear surgical gown, cap, shoe covers or shoes not worn outside the surgical area.
- During surgical procedures, permit only those persons who are assisting with the procedure, and limit the number of trainees.
- Keep the number of people and movement to a minimum.

8.3 Processing area for instruments and other items

- Permit only authorized personnel.
- Separate the receiving/clean-up area from the clean work area by either a wall and door or a screen. If this is not possible, the receiving/clean-up area should be well away from the area where sterilization and disinfection are done.
- Dirty/unclean items should never cross paths with clean and fully processed items.

Equipment: Receiving/clean-up area

- A counter for receiving used (dirty/unclean) items.
- Ideally two sinks (one for cleaning and another for rinsing) with adequate water supply.
- A counter for placing cleaned items.

Equipment: Work area for sterilization and disinfection

- Large worktable.
- Shelves for holding clean and packaged items.
- Autoclave or hot air oven, boiler, and/or supplies for chemical disinfection/sterilization.

Note: See section 6 for guidelines on the storage of sterile or disinfected equipment.

8.4 Transport of clean, disinfected, sterile and soiled items

- Keep clean, disinfected and sterile supplies separate from soiled equipment and waste. (Do not transport or store together.)
- Transport disinfected and sterile instruments, equipment and linens to the procedure and operating rooms with a cover to prevent contamination.
 - If supplies are being delivered to the surgical area, the delivering person, standing outside, should pass them through the door to a person on the inside.
- Remove supplies from all shipping cartons and boxes before bringing them into a procedure room, operating theatre, the work area for sterilization and disinfection, or storage room. Shipping boxes shed dust, harbour insects and may contaminate these areas.
- Transport soiled (used) supplies and instruments to the receiving/clean-up area in covered, leak-proof decontamination buckets.

8.5 Waste disposal

Wastes from SRH/family planning and other health care facilities may be contaminated with organic material which may carry organisms potentially infectious to the persons who handle them and to the community at large. These contaminated wastes should be disposed of properly. Members of the community are at risk because disposed wastes may be accessible to the public, children who are playing may pick up wastes from disposal sites, or adults may use them or sell them.

Proper disposal of clinic wastes must be done to:

- Prevent spread of infection to personnel who handle the waste and to the local community.
- Protect those who handle wastes from accidental injury.
- Preserve an aesthetically pleasing environment.

Persons handling wastes should wear heavy-duty gloves.

Transport contaminated waste in covered, leak-proof waste containers to the disposal site. Contaminated clinic wastes should be incinerated (burned) and/or buried.

Incineration provides high temperatures and destroys micro-organisms and therefore, is the best method for disposal of contaminated wastes. Incineration also reduces the bulk of wastes. If incineration is not possible, all contaminated wastes must be buried to prevent scattering.

Do not pile contaminated wastes behind the clinic because this practice puts staff and members of the community at risk.

Handling waste containers

- Use non-corrosive washable containers (plastic or galvanized metal) with covers for contaminated wastes.
- Place waste containers in convenient places for users. Carrying waste from place to place increases the risk of infection for handlers.
- Equipment which is used to hold and transport wastes must not be used for any other purpose in the health care facility.
- Wash all waste containers with a disinfectant cleaning solution (0.5% chlorine solution) and rinse with water. Clean contaminated waste containers each time they are emptied and non-contaminated ones when visibly soiled.
- When possible, use separate containers for combustible and non-combustible waste. This prevents workers from having to handle and separate wastes by hand later.
 - *Combustible (burnable) wastes* include paper, cardboard and contaminated waste such as used dressings and gauze.
 - *Non-combustible (non-burnable) wastes* include glass, metals and plastics.
- Use heavy work gloves when handling wastes.
- Wash hands after handling wastes.

Disposal of sharp objects (needles, razors and scalpel blades)

Sharp objects are the most dangerous type of clinical waste and must be handled and disposed of with strict care.

- Wear thick, household gloves when handling used sharp objects.
- Dispose of all sharp items in a puncture-resistant container. Puncture-resistant containers can be made of easily available objects, such as heavy cardboard boxes, tin cans with lids, or heavy plastic bottles.

Trainers and programme supervisors should assist service providers in identifying suitable, locally available containers.

- Place the container close to the area where it will be used so that workers do not have to carry sharp items any unnecessary distance before disposal.
- Avoid accidental needlestick injuries. Do not recap, bend or break needles prior to disposal. Drop the disposable syringe with uncapped needle attached in the puncture-resistant container. (For guidance on re-processing of reusable syringes and disposal of disposable needles, see section 5.7.) Every effort should be made to provide puncture-resistant containers. However, if that is not possible, then recapping will be necessary. A one-handed recap method should be used as follows:
 - First, place cap horizontally on a hard, flat surface; then remove hand.
 - Next, with one hand, hold the syringe and “scoop-up” the cap with the needle.
 - Finally, when the cap covers the needle completely, press the tip of the cap against a hard surface to secure the cap on the needle.
- When the sharps container is three-quarters full, cap, plug or tape it tightly closed.
- Dispose of container when three-quarters full, ideally by incineration (burning).

When an incinerator is not available, the following method may be used:

- Use a small tin drum (like a bucket) as the puncture-resistant container. When the tin is half full, pour a small amount of fuel over the sharps and burn it. The plastic syringes melt, forming a plastic blob with the needles and other sharps inside. The blob can be easily removed and buried or thrown with precaution.

When plastic syringes are not disposed of inside the container (e.g., when only reusable syringes are used), place pieces of plastic (used bottles, catheters etc.) inside the container on top of the sharps so that a plastic blob can be formed when burning.

- If using plastic or cardboard puncture-resistant containers, place the closed container inside a large tin drum, pour fuel over the container and burn as described above.

Disposal of liquid and semi-solid contaminated wastes (blood, faeces, urine and other body fluids)

- Wear thick household (utility) gloves when handling and transporting wastes.
- Carefully dispose of faeces and urine in a flushable toilet/latrine. Blood and other liquid waste should be poured into a utility sink, a flushable toilet or a latrine. Avoid splashing.
- Decontaminate the sink/toilet with 0.5% chlorine solution.
- Wash the sink/toilet carefully and thoroughly with water to remove residual wastes. Avoid splashing.
- Decontaminate specimen container with an appropriate decontamination solution, such as 0.5% chlorine solution, by soaking for 10 minutes before washing.
- Wash hands after handling liquid wastes; decontaminate and wash gloves.

Disposal of solid wastes (used dressings and other items contaminated with blood and organic materials)

- Wear thick household (utility) gloves when handling and transporting wastes.
- Dispose of solid wastes in non-corrosive washable containers (plastic or galvanized metal) with tight-fitting covers.
- Collect the waste containers on a regular basis and transport the combustible wastes to the incinerator. If incineration is not available, bury. Bury non-combustible wastes.
- Using a disinfectant cleaning solution (see section 8.1), clean waste containers each time they are emptied.
- Wash hands after handling wastes; decontaminate and wash gloves.
- Burn or bury waste immediately before it can spread into the environment. Incineration is the best method to kill organisms.

Disposal of used chemical containers

Glass containers

Rinse glass containers thoroughly with water. Glass containers may be washed with detergent, rinsed and reused.

Plastic containers

Plastic containers which have held substances such as antiseptic or disinfectant solutions can be washed and reused as containers for disposal of sharp items.

Those which have contained irritant substances such as glutaraldehyde (e.g., Cidex or Sporicidin) should be disposed of by burning or burial. If that is not possible, they should be damaged in a way that will prevent them from being reused (e.g., break the bottom).

9 Prophylactic antibiotics

The routine use of prophylactic antibiotics for contraceptive sterilization, IUD insertion or insertion of implants is not necessary when recommended infection prevention practices are conscientiously followed. The inappropriate use of antibiotics increases the prevalence of antibiotic-resistant micro-organisms that can cause infection, and is costly.

However, there are some specific situations in which the use of prophylactic antibiotics may be indicated:

- Clients who are susceptible to infection, such as individuals who have diabetes mellitus or HIV infection, or who are receiving treatment with steroids.
- Clients at risk of bacterial endocarditis, such as individuals with structural heart conditions.

10 Management

Successful infection prevention in SRH/family planning and other health care facilities requires careful planning and efficient management. It includes:

- Administration.
- Provision of guidelines.
- Training.
- Monitoring and supervision.

10.1 Administration

Programme managers should ensure that a system is in place for the prevention of infection by:

- Making decisions about equipment and supplies which are required to maintain acceptable levels of safety. These decisions should take into consideration cost, training needs and logistical implications.
For example:
 - Appropriate selection of gloves, needles and syringes (disposable vs reusable) and provision of facilities for the processing of reusable material.
 - Provision of facilities for sterilization and/or disinfection of equipment and materials based on the type of procedures performed and the workload. Service delivery sites in which invasive procedures are routinely performed should have facilities for the sterilization of equipment, or access to such facilities.
- Ensuring availability of:
 - Clean fresh water.
 - Electricity and/or fuel.
 - Antiseptics and decontaminants.
 - Gloves (examination, surgical and/or utility).
- Ensuring that back-up staff are available and trained to replace staff who are on leave or temporarily incapacitated (e.g., staff in the operating theatre who are suffering from colds or other infections, staff responsible for sterilization procedures who have cuts or sores on their hands or forearms). Assigning other duties to incapacitated staff until they recover from their problem.
- Ensuring that routine procedures for cleaning (and decontamination, when appropriate) of the physical facilities (e.g., operating theatre and examination rooms) are in place and followed.
- Ensuring the proper use and maintenance of equipment, such as autoclaves.
- Ensuring proper disposal of contaminated material by:
 - Providing puncture-resistant containers for used disposable needles and other sharp materials.
 - Ensuring that there is a site and equipment for incineration and/or burial of contaminated material. If that is not possible, ensuring that the material is made safe by decontamination before disposal.

- Ensuring the safe removal/transportation of contaminated material to the disposal site.
- Ensuring that disposable materials (such as gloves, syringes and needles) are not used again.
- Carrying out any necessary repairs in the physical facilities which are necessary for preventing infection (e.g., repairing damp walls).
- Developing good communication with staff at all levels, sharing ideas and listening to their viewpoints.

10.2 Guidelines

Written policies and procedures should be established for infection prevention. These should be presented as guidelines in a language and format that facilitates their understanding by all relevant staff.

- Guidelines should be accessible to all members of the staff, and they should be discussed periodically.
- Relevant extracts of the guidelines can be provided to individuals performing specific tasks. Some of the information can be outlined in posters as reminders and located where the tasks are performed.
- Guidelines should be used or referred to during training and supervision activities.
- Regular reviews should be conducted to ensure the adequacy of the recommended infection prevention practices, and to address any staff concerns about them.

10.3 Training

Training of health care staff is important to help them to understand the risk of infection both to themselves and to clients, and the role that protective barriers and prior infection prevention practices can play in preventing the transmission of infection. It is possible to ensure proper work habits related to infection prevention if staff understand the reason for, and importance of, the procedures.

Training should include pre-service training for new employees and in-service training for current staff.

Pre-service training

The training programme should be developed after identifying the needs of the participants and of the programme. It should include:

- *General aspects of infection prevention for all new clinical staff.* The following topics should be covered:
 - The mechanisms of infection transmission in a clinical environment.
 - The role of each staff member in preventing transmission of infection.
 - Methods to minimize disease transmission. Emphasis should be given to knowledge about the transmission of HIV/HBV infection. Without sufficient information, staff are more likely to take preventable risks (e.g., not adequately decontaminating, cleaning and sterilizing reusable needles and syringes) or excessive precautions (e.g., washing hands after shaking hands with people believed to be HIV-infected).
- *Specific aspects of infection prevention for staff according to job description.* For example, staff who will decontaminate and sterilize equipment should be taught these procedures; staff who will insert IUDs need training in aseptic technique.

At the end of the training period, the trainer should assess the performance of each trainee until he or she achieves the training objective.

In-service training

In-service training should be provided for the following purposes:

- Refresher training to provide general reminders of the importance of and procedures for maintaining an infection-free environment.
- Update training to introduce and discuss changes in policies and practices (e.g., if new equipment is introduced, a training session for those individuals who will be using it is essential).
- Training in response to needs identified during monitoring and supervision.

10.4 Monitoring and supervision

Regular monitoring of infection prevention processes is important to determine areas which need to be improved. To monitor performance:

- Spot check to determine if infection prevention guidelines are being followed. When discrepancies or problems are noted, supervisors should be able to provide guidance or assistance with solving problems.
- Observe the conditions and adequacy of physical facilities, and note whether the necessary equipment and supplies are available and are being used properly.