8.1.3. QIM- Documents pertaining to quality of care and patient safety practices followed by the teaching hospital

Shri Vithalrao Joshi Charities Trust's
SAMARTH NURSING COLLEGE
(NAAC ACCREDITED GRADE 'B')
Kasarwadi, Post Sawarde, Tal. - Chiplun, Dist. - Ratnagiri 415 606
Phone : 02355-264149 / 137, 8379972264 Fax : 02355-264181
Email : sncdervan@gmail.com
Website : www.svjctsamarthnursing.com
(Recognised by Indian Nursing Council, Maharashtra Nursing Council & Maharashtra University of Health Sciences, Nashik and MSBNPE Board, Mumbai

I. PURPOSE:

1. To maintain the standards in infection control measures and to minimize hospital acquired infections in patients as well as the hospital staff by:
   - Removal of source /s of infections.
   - Prevention of transfer of infectious agents.
   - Enhancement of patient's resistance to infections.
2. To define the policy and procedure regarding prevention of hospital acquired infections in the hospital.

II. SCOPE:

Applicable to the Hospital.

III. HOSPITAL INFECTION CONTROL COMMITTEE (HICC)

1. Members of the Committee –

1. Medical director	Dr. Suvarna N. Patil
2. Principal	Dr. Mansingrao Ghatage
3. Professor & Head, Microbiology	Dr. Prasanna Nakate
4. Representatives from	
1. Department of Medicine	Dr. Amol Hartalkar
2. Department of Pediatrics	Dr. Suryakant Ingale
3. Department of Surgery	Dr. Raghuveer Bhosale
4. Department of Orthopedics	Dr. Shrirang Joshi
5. Department of OBGY	Dr. Anagha Modak
6. Department of Ophthalmology	Dr. Ranjitsingh Sulyan
7. Department of ENT	Dr. Shital Dhavangutte
8. Department of Anesthesia	Dr. Vaishali Bapat

5.	Infection control nurse	Sister Amruta Shinde
6.	CSSD Incharge	Sister Amruta More
7.	Operation theatre Incharge	Sister Manali Jagushte
8.	Housekeeping Incharge	Mr. Shreekant Sagvekar

2. Objectives of HICC committee –

- To minimize the risk of infection to patients, staff and visitors.
- To identify the roles and responsibilities of key personnel involved in the prevention and control of infection
- To maintain Surveillance over hospital acquired infections.
- To develop a system for identifying, reporting, analyzing, investigating and controlling hospital acquired infections.
- To develop and implement preventive and corrective programmes in specific situations where infection hazards exist.
- To Advice the medical staff on matters related to the proper use of antibiotics, develop antibiotic policies and recommend remedial measures when antibiotic resistant strains are detected.
- To review and update hospital infection control policies and procedures from time to time.
- To help to provide employee health education regarding matters related to hospital acquired infections.

3. Meetings of HIC Committee –

- The infection control team meets once in 3 months and otherwise as necessary.
- Documentation of meetings and recommendations are kept by the Infection control nurse (ICN).
- The infection control nurse, ICU Incharge and the Microbiologist conduct inspection rounds once a month.
- Registers are maintained by the ICN.

4. **Infection Control Team** – It includes ,
    1. Microbiologist
    2. ICU Incharge
    3. Infection Control Nurse

5. **Responsibilities of the Infection Control Team –**

- To advise the hospital staff on all aspects of infection control and maintain a safe environment for patients and staff.
- Advise management of at risk patients.
- Carry out the surveillance of hospital acquired infections such as VAP, catheter related UTI's, SSI's and wound infections etc.
- Implementation of corrective steps.
- To formulate the policies and procedures for aseptic, isolation and antiseptic techniques.
- Investigate outbreaks of infection and take corrective measures.
- Provide relevant information on the infection problems to management.
- Assist in training of all new employees as to the importance of infection control and the relevant policies and procedures.
- To formulate the procedures for maintenance of cleanliness.
- To supervise the Hospital waste management.
- Monitors employee health programme.

6. **Review and revision of Infection control Manual –**

- Written policies and procedures shall be reviewed at least every year by the Infection Control Committee.

7. **Health education for para-medical staff –**

- Periodic classes are conducted for paramedical staff by the HICC members.
- All employees are instructed in universal precautions, isolation policies, hand washing protocols and waste management.
- All infections including cutaneous and or other diagnosed communicable diseases e.g hepatitis, mumps, rubella, measles, chicken pox, diarrhoea, productive cough more than three weeks, rashes etc., are to be reported by staff to their immediate supervisor so that appropriate action to protect the patients in the hospital will be taken.
- All staff is informed that they should report exposure to potentially infectious body fluid to their immediate supervisor who in turn informs the Infection Control Nurse or concerned person in absence of ICN. Action is taken after assessment of risk at each situation.
- Vaccination for Hepatitis B is provided to all staff members who are not vaccinated.

IV. SURVEILLANCE AND REPORTING OF HAI

Surveillance of healthcare associated infections can be active or passive.

Active Surveillance of high risk areas:

High risk areas of the hospital are identified as,

- Operation Theatres
- Intensive care units
- Central Sterilization & Supply Department
- Kitchen area

Operation Theatres:

i. Every month after fumigation, culture swabs and air sampling plates are sent from each operation theatre to the Microbiology laboratory.

ii. Swabs are taken from –

1. OT table-tops
2. Spot-lights

3. Anaesthesia trolley / Boyle's machine
4. Instrument trolley
5. Nozzles / handles of taps
6. Any other relevant site

iii. Swabs are not taken from the floor and walls.

iv. The culture swabs and air sampling plates are processed in the microbiology laboratory. The report is sent to OT after 48 hrs.

v. If the results of culture swabs and air sampling plates are not found satisfactory, the OT is again cleaned, fumigated and again culture swabs and air sampling plates are taken.

vi. **Sampling of in use disinfectants:** 1ml of sample of in-use disinfectants, hand rubs are sent to microbiology laboratory in a sterile container once in 3 months for sterility check.

vii. Records are kept with infection control nurse.

viii. In case of unacceptable results, the decision on corrective measures is taken by HICC.

Intensive care units (ICU's):

i. **Surveillance samples:**
- Central line tips / blood culture
- ET tube secretions from patients on mechanical ventilation
- Urine samples from catheterized patients
- Pus from surgical site infection, wound infections, bedsores etc.

ii. The samples are sent from patients who are suspected to have a healthcare associated infection on device to Microbiology laboratory. Analyses of data are presented at the subsequent HICC meeting.

iii. Records are maintained by the infection control nurse. These include registers for surveillance of VAP, CA-UTI, CRBSI and SSI/wound infection.

iv. Routine fumigation of ICU's is not indicated.

v. Regular cleaning and mopping with disinfectant (Bacillocid – as per manufacturer's instructions or 1% Sodium hypochlorite or 5% phenyl) is done at 8-12 hrs interval.

ix. **Samples of disinfectant in use:** 1ml of sample of in-use disinfectants, hand rub agents are sent to microbiology laboratory in a sterile container once in 3 months for sterility check.

vi. Air settle plates and culture swabs may be collected from ICU's once in 3 months for microbiological surveillance.

vii. Records are maintained by the respective ICUs, supervised by the infection control nurse.

Central Sterilization and Supply Department:

i. Regular cleaning of the CSSD unit is done using 2% Bacillocid or 1% Sodium hypochlorite at 8-12 hrs intervals.

ii. Proper functioning of the autoclaves is monitored by appropriate sterilization controls (Autoclave tapes and biological indicators).

iii. Autoclave tape is used at the time of each cycle for each autoclave.

iv. Biological indicator is used once in a week for each autoclave.

v. Autoclaved drums are used within 48 hrs.

vi. Unused drums or drums which are not opened are again autoclaved after 48 hrs.

vii. Records of autoclaving are maintained by the CSSD staff.

V. STANDARD AND ISOLATION PRECAUTIONS

- What? Certain protective measures
- Where? In the Hospital
- When? At all times while providing professional services.
- By Whom? All healthcare workers.
- Why? To minimize the risk of transmission of pathogens.

Elements of standard precautions –

- Hand washing and antisepsis (hand hygiene)
- Use of personal protective equipment when handling blood, body substances, excretions and secretions
- Appropriate handling of patient care equipment and soiled linen
- Prevention of needle-stick/sharp injuries
- Appropriate handling of waste
- Patient placement and transportation
- Safe injection and infusion practices

Hand washing and antisepsis (Hand hygiene)

- Appropriate hand washing can minimize micro-organisms acquired on the hands by contact with body fluids and contaminated surfaces.
- Hand washing breaks the chain of infection transmission and reduces person-to-person transmission.
- Hand washing is the simplest and most cost effective way of preventing the transmission of infection and thus reducing the incidence of health-care associated infections.

Purpose

- Hand washing helps to remove micro-organisms that might cause transmission of infectious agents.
- Washing with soap and water kills many transient micro-organisms and allows them to be mechanically removed by rinsing.
- Washing with antimicrobial products kills or inhibits the growth of micro-organisms in deep layers of the skin.

Hand washing

- Hand washing is usually limited to hands and wrists; the hands are washed for a minimum of 10 – 15 seconds with soap (plain or antimicrobial) and water.

Hand antisepsis/decontamination

- Hand antisepsis removes or destroys transient micro-organisms and confers a prolonged effect. It may be carried out in one of the following two ways:
  1. Wash hands and forearms with antimicrobial soap and water, for 15-30 seconds (following manufacturer's instructions).
  2. Decontaminate hands with a waterless, alcohol-based hand gel or hand rub for 15-30 seconds. This is appropriate for hands that are not soiled with protein matter or fat.
- Immersion of hands in bowls of antiseptics is not recommended.

Surgical hand antisepsis

- Surgical hand antisepsis removes or destroys transient micro-organisms and confers a prolonged effect.
- The hands and forearms are washed thoroughly with an antiseptic soap for a minimum of 2-3 minutes.
- The hands are dried using a sterile towel.
- Surgical hand antisepsis is required before performing invasive procedures.

Facilities and materials required for hand washing

Running water

- Access to clean water is essential. It is preferable to have running water: large washbasins with hand-free controls, which require little maintenance.
- When no running water is available use either a bucket with a tap, which can be turned on and off, a bucket and pitcher, or 60%-90 % alcohol hand rub.

Materials used for hand washing/hand antisepsis

- **Soap** – Plain or antimicrobial soap depending on the procedure.
  1. **Plain soap:** Used for routine hand washing, available in bar, powder or liquid form.
  2. **Antimicrobial soap:** Used for hand washing as well as hand antisepsis.
- If bar soaps are used, use small bars and soap racks, which drain.
- Do not allow bar soap to sit in a pool of water as it encourages the growth of some micro-organisms such as pseudomonas.
- Clean dispensers of liquid soap thoroughly every day.
- When liquid soap containers are empty they must be discarded, not refilled with soap solution.

Specific antiseptics – recommended for hand antisepsis:

- 2% - 4% chlorhexidine,
- 5% - 7.5% povidone iodine,
- 1% triclosan, or
- 70% alcoholic hand rubs.

- Waterless, alcohol-based hand rubs with antiseptic and emollient gel and alcohol swabs, which can be applied to clean hands.
- Dispensers should be placed outside each patient room.

Alcohol hand-rubs are appropriate for rapid hand decontamination between patient contacts. They are not a substitute for hand washing if hands are soiled.

Facilities for drying hands

- Disposable towels, reusable single use towels or roller towels, which are suitably maintained, should be available.
- Autoclaved napkins or sterile paper towels can also be used.
- If there is no clean dry towel, it is best to air-dry hands.

Common towels must not be used as they facilitate transmission of infection.

Steps in hand washing

Preparing for hand washing:

- Remove jewellery (rings, bracelets) and watches before washing hands.
- Ensure that the nails are clipped short (do not wear artificial nails).
- Roll the sleeves up to the elbow.

Procedure:

- Wet the hands and wrists, keeping hands and wrists lower than the elbows (permits the water to flow to the fingertips, avoiding arm contamination).
- Apply soap (plain or antimicrobial) and lather thoroughly.
- Use firm, circular motions to wash the hands and arms up to the wrists, covering all areas including palms, back of the hands, fingers, between fingers and lateral side of fifth finger, knuckles, and wrists.
- Rub for minimum of 10-15 seconds.
- Repeat the process if the hands are very soiled.
- Clean under the fingernails.
- Rinse hands thoroughly, keeping the hands lower than the forearms.
- If running water is not available, use a bucket and pitcher.

- Do no dip your hands into a bowl to rinse, as this re contaminates them.
- Collect used water in a basin and discard in a sink, drain or toilet.
- Dry hands thoroughly with disposable paper towel or napkins, clean dry towel, or air-dry them.
- Discard the towel if used, in an appropriate container without touching the bin lids with hand.
- Use a paper towel, clean towel or your elbow/foot to turn off the faucet to prevent recontamination.

Using antiseptics, hand rubs, gels or alcohol swabs for hand antisepsis

- Apply the product to the palm of one hand. The volume needed to apply varies by product.
- Rub hands together, covering all surfaces of hands and fingers, until hands are dry.
- Do not rinse.

Note: When there is visible soiling of hands, they should first be washed with soap and water before using waterless hand rubs, gels or alcohol swabs.

- If soap and water are unavailable, hands should first be cleansed with detergent-containing towellettes, before using the alcohol-based hand rub, gel or swab.

Appropriate technique of hand washing in hospitals

Duration of the handwash (steps 2-7): 15-20 seconds

Duration of the entire procedure: 40-60 seconds

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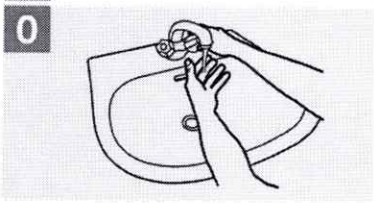
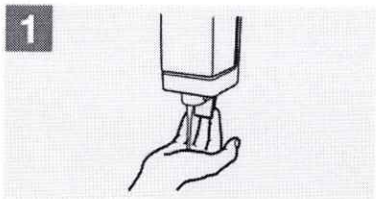


Wet hands with water;

1



Apply enough soap to cover all hand surfaces;

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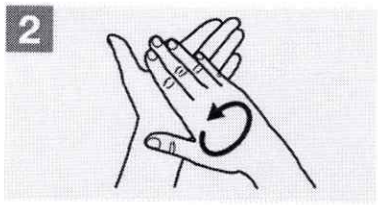

Rub hands palm to palm;

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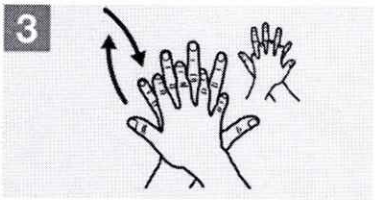

Right palm over left dorsum with interlaced fingers and vice versa;

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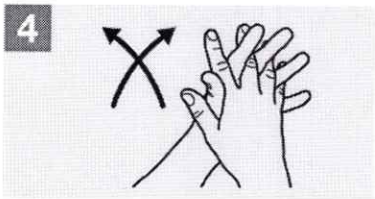

Palm to palm with fingers interlaced;

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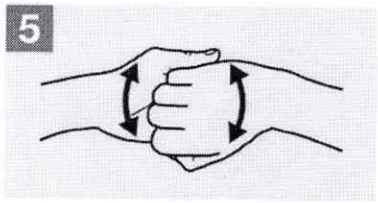

Backs of fingers to opposing palms with fingers interlocked;

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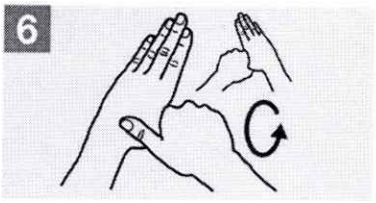
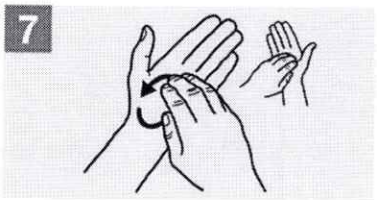


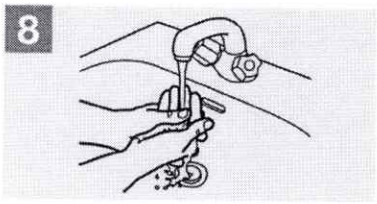
Rotational rubbing of left thumb clasped in right palm and vice versa;

7



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

8



Rinse hands with water;

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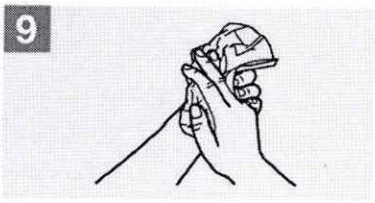

Dry hands thoroughly with a single use towel;

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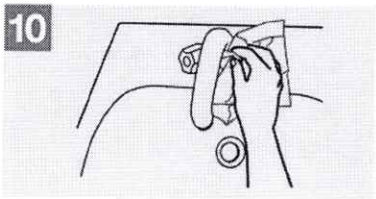
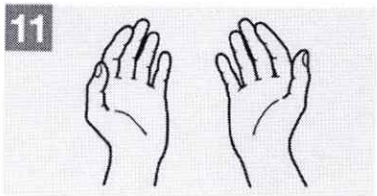


Use towel to turn off faucet;

11



Your hands are now safe.

Personal Protective equipment

- Using personal protective equipment provides a physical barrier between micro-organisms and the wearer.
- It offers protection by helping to prevent micro-organisms from –
  - Contaminating hands, eyes, clothing, hair and shoes
  - Being transmitted to other patients and staff

- **Personal protective equipment should be used by –**
  - Health care workers who provide direct care to patients and who work in situations where they may have contact with blood, body fluids, excretions or secretions.
  - Support staff including medical aides, cleaners, and laundry staff in situations where they may have contact with blood, body fluids, secretions and excretions;
  - Laboratory staff, who handle patient specimens; and
  - Family members who provide care to patients and are in a situation where they may have contact with blood, body fluids, secretions and excretions.

Principles for use of personal protective equipment

- Personal protective equipment reduces but does not completely eliminate the risk of acquiring an infection.
- It is important that it is used effectively, correctly, and at all times where contact with blood and body fluids of patients may occur.
- Staff must also be aware that use of personal protective equipment does not replace the need to follow basic infection control measures such as hand hygiene.
- Personal protective equipment should be chosen according to the risk of exposure. The health care worker should assess whether they are at risk of exposure to blood, body fluids, excretions or secretions and choose their items of personal protective equipment according to this risk.
- Avoid any contact between contaminated (used) personal protective equipment and surfaces, clothing or people outside the patient care area.
- Discard the used personal protective equipment in appropriate disposal bags, and dispose of as per the policy of the hospital.

- Do not share personal protective equipment.
- Change personal protective equipment completely and thoroughly wash hands each time you leave a patient to attend to another patient or another duty.

PPE consists of –

- Shoe covers
- Caps
- Masks
- Gowns
- Aprons
- Protective eyewear / goggles
- Gloves

The order for putting on personal protective equipment is not important, however, for practicality, the following sequence can be adopted is full PPE is needs to be worn.

- Wash hands.
- Wear scrub suit or old set of thin clothes before entering the designated changing room or area.
- Wear boots /or shoe covers with trousers tucked inside.
- Wash hands.
- Wear cap.
- Wear the mask.
- Wear the gown.
- Wear an impermeable apron if splashes of blood or body fluids are expected.
- Wear protective eye wear/ goggles.
- Wash hands and dry them.
- Wear gloves with gown sleeve cuff tucked into glove.

Removing personal protective equipment when leaving the patient care area

- It is important to note that when removing personal protective equipment the wearer should avoid contact with blood, body fluids, secretions, excretions and other contaminants.
- When hands become contaminated they should be washedor decontaminated with 70% alcohol solution.

The following sequence can be adopted to remove personal protective equipment –

- Using gloved hands, untie the gown string if tied in front and remove shoe covers.
- Remove gloves (fingers under cuff of second glove to avoid contact between skin and outside of gloves) and discard in an appropriate manner.
- Wash hands.
- Remove gown and apron, without contaminating clothing underneath. Touch only inside of gown and apron while removing. Place inappropriate disposal bag.
- Remove goggles, mask, and cap and place in an appropriate container. Dispose according to the health care facility protocol. Remove boots (if worn) and place in appropriate container.
- Wash hands up to wrists thoroughly with soap and water, dry and decontaminate hands using 70% alcoholic hand-rub before leaving facility.

Boots/shoe covers

- Boots/shoe covers are used to protect the wearer from splashes of blood, body fluids, secretions and excretions.
- Waterproof boots should be worn for heavily contaminated, wet flooring and floor cleaning.
- Shoe covers should be disposable and waterproof. Waterproof boots should be washable.
- Wear waterproof boots if needed, or wear shoe covers over your personal shoes so as to cover your shoes adequately.

Removing boots/ shoe covers

- Remove shoe covers first with gloved hands and discard.
- Remove boots last, before leaving the room and disinfect.
- Wash hands thoroughly.

Caps

- Caps that completely cover the hair are used when splashes of blood and body fluids are expected.
- They should protect the hair from aerosols that may otherwise lodge on the hair and be transferred to other parts of the health care worker such as face or clothing by the hands or onto inanimate objects.
- **Selecting cap**

  Use a disposable, waterproof cap of an appropriate size which completely covers the hair.
- **Wearing cap**

  Place or tie cap over the head so as to cover hair completely.
- **Removing cap**

  Remove by holding inside of the cap lifting it straight off head and folding inside out. Discard in proper container. Wash hands immediately.

Masks

- Wear a mask to protect mucous membranes of the mouth and nose when undertaking procedures that are likely to generate splashes of blood, body fluids, secretions or excretions.
- Wear surgical masks rather than cotton material or gauze masks. Surgical masks have been designed to resist fluids to varying degrees depending on the design of the material in the mask.
- A surgical mask protects health care providers from inhaling respiratory pathogens transmitted by the droplet route.
- It prevents the spread of infectious diseases such as varicella (chickenpox) and meningococcal diseases (meningococcal meningitis).
- An N95 mask protects health care providers from inhaling respiratory pathogens that are transmitted via the airborne route. This helps to prevent the spread of infectious diseases such as TB, MDR-TB.
- In order to prevent the spread of infection, the appropriate mask should be worn by health care providers and visitors when attending to a patient suffering from a communicable disease that is spread via the airborne or droplet route.

- The patient with a communicable disease spread via the droplet or airborne route should wear a surgical mask when being transferred to other departments or hospitals.
- Disposable masks are for single use only and should be discarded after 4-6 hours use. They should not be stored in bags and re-used, shared or hung around neck, etc.
- If a mask is splashed wet, it should be changed using clean gloves and strict hand washing.

Selecting a mask

- A surgical mask should be worn in circumstances where there are likely to be splashes of blood, body fluids, secretions and excretions or when the patient has a communicable disease that is spread via the droplet route.
- An N95 respirator mask needs to be chosen for those circumstances when a patient has a communicable disease that is spread via the airborne route. E. g. TB
- A mask with a higher level of filtration may be required when dealing with highly transmissible diseases such as viral haemorrhagic fever.

Wearing the mask

- Wash hands and dry.
- Remove the clean mask from the container with clean hands.
- Ensure the mask is fitted properly. Health care workers must ensure they know how to properly fit a respirator according to the manufacturers' instructions.
- If glasses are worn, fit the upper edge of the mask under the glasses. This will help to prevent them from clouding over.
- A secure fit will prevent both the escape and the inhalation of micro-organisms around the edges of the mask and fogging of the eyeglasses.

Precautions

- Avoid talking, sneezing, or coughing if possible.
- Masks cannot be worn with beards/unshaven faces.
- The mask should completely seal the face at all times to ensure effective filtering of micro-organisms

Removing the mask

- Wash hands and remove mask - handle only the strings.

- Discard in an appropriate bag/container and seal the bag.
- Wash hands.

Gown

- Gowns made of impervious material are worn to protect the wearer's clothing/uniform from possible contamination with micro-organisms and exposure to blood, body fluids secretions and excretions.
- The gown should be used only once for one patient and discarded or sent for laundering.
- Health care workers should remove gowns before leaving the unit.

Selecting a gown

- Gowns should be clean and non-sterile.
- The gown should be impervious and water repellent. It should be long enough to cover the clothing of the wearer and should have long sleeves and high neck.
- Disposable gowns are preferable. If they are not available, cotton reusable gowns can be used with a plastic apron underneath.

Wearing the gown

- Wash hands, and dry.
- Hold the gown at the neck on the inside permitting to unfold.
- Slide hands and arms down the sleeves.
- Fasten the ties at the neck.
- Overlap the gown at the back as much as possible and secure the waistband. Request assistance to fasten the waist ties.

Removing the gown

- Remove the gown after removing gloves.
- Untie the waist-band with a gloved hand if it is tied in front before removing the gloves.
- Remove gloves and wash hands.
- Untie the neck-ties (be sure not to touch outside of the gown).
- Slide the gown down the arms and over the hands by holding in inside of the sleeves.
- Hold the gown with both the hands (inside the shoulders) at the shoulder seams.

- Turn the gown inside out (contaminated side in).
- The hands are then brought together and the gown is rolled and discarded in the container provided.
- Discard appropriately
- If reusable - discard if visibly contaminated.
- If there is shortage of gowns they may be reused during one shift for the same patient.
- Hang gown with outside facing in when not in use.
- Discard at the end of each shift.
- Wash hands thoroughly before touching anything else.

Remove a soiled gown as promptly as possible and wash hands immediately to avoid transfer of microorganisms to other patients or environments.

Apron

- An apron protects the wearer and the uniform from contact with the contaminated body fluids.
- Plastic aprons are used over the gown when caring for patients where possible splashes with blood and body substances may occur.

Selecting the apron

- Select water repellent, plastic aprons, which are disposable.
- If disposable ones are not available then reusable plastic aprons can be used.
- Size: long enough to protect the uniform and the gown but should not touch the ground.
- Should cover the front and sides.
- It should open in the back.
- A tie around the waist keeps the apron in place.

Wearing the apron

- Wash hands.
- Ensure that the sleeves are rolled above the elbows before putting on the apron.
- Wear the apron over the uniform and tie around the waist at the back.

Removing the apron

- Wash hands and dry.

- Remove, touching only the inside part of apron.
- Discard, folding the outside part in.
- Decontaminate or dispose according to the health care facility guidelines.
- Wash hands thoroughly before touching anything else.

The inside of the apron is considered clean, the outside is considered contaminated. The neck of the apron is considered clean because that part is not touched with contaminated hands.

Protective eyewear/goggles

- Protective eyewear/goggles should be worn at all times during patient contact when there is a possibility that a patient's body fluids may splash or spray onto the caregiver's face/eyes (e.g. during throat, endotracheal and tracheostomy suctioning, removal of in dwelling catheter etc).
- The amount of exposure can be reduced through the use of protective eyewear.
- Full face shields may also be used to protect the eyes and mouth of the health care worker in such high-risk situations.
- Ordinary spectacles do not provide adequate protection, although caregivers may wear their own glasses with extra protection added at the sides.
- Goggles that fit over glasses are available.
- Protective eyewear should be changed after each shift.
- Protective eyewear should be washed and decontaminated after removal and in between use.

Selecting protective eyewear

- Goggles should be made of clear polycarbonate plastic with side and forehead shields. These should be optically clear, antifog and distortion-free.
- Goggles that fit over glasses are also available. Disposable goggles are preferred but reusable ones can be used after cleaning and decontamination.

Wearing protective eye wear

- Wear the eyewear by securing it over the bridge of the nose and also over the mask.

Removing protective eye wear

- Remove and place in appropriate container for cleaning and decontamination prior to reuse by next person.

Gloves

- Use gloves when there is potential exposure to blood, body fluid, excretions or secretions.
- Change gloves between patients, between tasks and procedures on the same patient, and when they become soiled.
- Remove gloves promptly after touching contaminated items and environmental surfaces and before moving to another patient.
- Remove gloves before leaving the patient's bedside and decontaminate hands immediately.
- After glove removal and hand washing, ensure that hands do not touch potentially contaminated environmental surfaces or items in the patient's room.
- Discard gloves after attending to each patient.

The reuse of single-use gloves is not recommended as they are contaminated or do not provide adequate protection after reprocessing.

Selecting gloves

- Use disposable gloves that are:
  - Clean/non-sterile for routine care of the infectious patients;
  - Sterile for invasive procedures.
- Use heavy-duty rubber gloves for cleaning instruments, handling soiled linen or dealing with spills of blood and body fluids. They can be washed and reused.
- Choose gloves that fit properly.
- Check there is no puncture in gloves.
- Do not use gloves if they are torn, as punctured gloves do not provide protection.

Clean, non-sterile, disposable, single use gloves are recommended for routine care of patients with highly transmissible infections.

Wearing gloves

- Wash hands and dry them.
- Pick up the first glove by its cuff.
- Wear the first glove.
- Bunch the glove up and then pull it onto the hand; ease fingers into the glove.
- Repeat for the other hand.

Removing gloves

- When removing personal protective equipment, remove gloves first.
- Grasp the outside of one glove, near the cuff, with the thumb and forefinger of the other hand. Pull the glove off, turning it inside out while pulling and holding it in the hand that is still gloved.
- Hook the bare thumb or finger inside the remaining glove and pull it off by turning it inside out and over the already removed glove to prevent contamination of the ungloved hand.
- Roll the two gloves together taking care not to contaminate the hands.
- Discard appropriately.
- Wash hands and decontaminate with 70% alcohol hand rub/solution.

Patient care equipment

- Handle patient care equipment soiled with blood, body fluids secretions or excretions with care in order to prevent exposure to skin and mucous membranes, clothing and the environment.
- Ensure all reusable equipment is cleaned and reprocessed appropriately before being used on another patient.

Linen

- Handle, transport and process used linen that is soiled with blood, body fluids, secretions or excretions with care to ensure that there is no leaking of fluid.

Prevention of needle stick/sharps injuries

- Take care to prevent injuries when using needles, scalpels and other sharp instruments or equipment.

- Place used disposable syringes and needles, scalpel blades and other sharp items in a puncture-resistant container with a lid that closes and is located close to the area in which the item is used.
- Take extra care when cleaning sharp reusable instruments or equipment.
- Never recap or bend needles.
- Sharps must be appropriately disinfected and/or destroyed as per the national standards or guidelines.

Management of health-care waste

- Uncollected, long stored waste or waste routing within the premises must be avoided.
- See the section on Biomedical Waste Management for details.

Patient placement and transportation of patients

Patient placement

- Appropriate or selective placement of patients is important in preventing the transmission of infections in the hospital setting.
- General principles in relation to the placement of patients include the following –

Spacing between beds

- In open plan wards there should be adequate spacing between each bed to reduce the risk of cross contamination/infection occurring from direct or indirect contact or droplet transmission.
- Optimum spacing between beds is 1-2 meters.

Single rooms

- Single rooms reduce the risk of transmission of infection from the source patient to others by reducing direct or indirect contact transmission.
- Where possible, single rooms should have the following facilities –
  - Hand washing facilities;
  - Toilet and bathroom facilities.

Anterooms

- Single rooms used for isolation purposes may include an anteroom to support the use of personal protective equipment.

Cohorting

- For infection control purposes, if single rooms are not available, or if there is a shortage of single rooms, patients infected or colonized by the same organism can be cohorted (sharing of room/s).
- When cohorting is used during outbreaks these room/s should be in a well-defined area (a designated room or designated ward), which can be clearly segregated from other patient care areas in the health care facility used for non-infected/colonized patients.

VI. BIOMEDICAL WASTE DISPOSAL

- The objective of hospital waste disposal is to minimize the spread of infections and to render all waste non-infectious before it leaves the hospital premises.
- Since this is not possible due to absence of intra-site waste treatment technology, waste should be appropriately segregated, collected and transported for further treatment.

- **Waste is segregated into 3 categories,**
  1) Sharps
  2) Non-sharp biomedical waste (Infective)
     - Plastic
     - Non-plastic
  3) Non infective house hold waste

Sharps –

- Contains items like needles, scalpels, blades, iv line tips, etc.
- These are discarded in a **puncture proof container** containing 1% Sodium hypochlorite.
- The sharp disposal cans should be $3/4^{th}$ full and capped and put in blue bag.
- If there is provision for a needle cutter or burner, use the same.

Non-sharp Biomedical waste –

Plastic –

- Contains items like used blood bags, plastics like catheters, urine bags, Ryle's tube i.v. infusion sets, syringes (without needles) etc.
- These are discarded in **Red plastic bags.**

Non-plastic –

- Contains items like soiled linen, cotton, gauze, swabs
- Microbiology & pathology laboratory waste
- Human anatomical waste and animal waste, organs, tissues
- Used and expired drugs
- These are discarded in **Yellow plastic bags.**

Non-infective waste –

- Contains items like kitchen / pantry waste, newspapers, discarded food, vegetables, fruits, packing material like plastic sheets or bags, office waste
- These are discarded in **Black plastic bag.**
    - **Do not try to correct mistakes of segregation.** If infectious waste is put in black bag by mistake, treat the whole as infectious and place the black bag in a yellow bag.
    - These bags (yellow, blue and black) therefore will be made available to the various operation theatres, wards, ICU's and the laboratory.
    - Appropriate sized buckets should be lined with the colour coded bags.
    - All Sisters Incharge are requested to indent the required colour coded bags of appropriate sizes which will fit the buckets/drums as the material for tying.

- Sister in charge should supervise segregation of waste and tying of all the bags.
- Segregation of the waste is the responsibility of the person generating it and is best done at the time it is generated and not at the end of work.
- All the bags should be tagged with ward number written on it.
- When the bags or puncture proof container is $3/4^{th}$ full, it is tied and sent for disposal.
- They should also maintain a record of the number of bags and cans being sent for final treatment.
- After proper segregation, tying, labelling and recording these bags and puncture proof containers are sent for disposal. (Bio-clean systems)

Waste category	Contents	Container
Non infective household waste	Kitchen / pantry waste, newspapers, discarded food, vegetables, fruits, office waste, plastic sheets etc.	**Black plastic bags** to be tied when 3/4ths full.
Sharps	Needles, scalpels, blades, IV line tips, etc.	**Puncture proof sharp containers** with lids, fill only till $3/4^{th}$ its capacity, and close the mouth.
Infective Waste (Non-plastic)	Soiled linen, cotton, gauze, swabs, human anatomical waste and animal waste, organs, tissues, used and expired drugs	**Yellow plastic bags** to be tied when 3/4ths full
Broken glassware, metallic body implants	Used ampoules, discarded metallic implants	**Puncture proof container with blue coloured marking**
Infective Waste (Plastic)	Used blood bags, plastics like catheters, urine bags, Ryle's tube IV infusion sets, syringes (without needles) etc.	**Red plastic bags** to be tied when 3/4ths full

VII. REPROCESSING OF INSTRUMENTS AND EQUIPMENT

- The risk of transferring infection from instruments and equipment depends on the following factors:
  1. The presence of micro-organisms, the number and virulence of these organisms
  2. The type of procedure that is going to be performed (invasive or non-invasive), and

3. The body site where the instrument/and or equipment will be used (penetrating the mucosal or skin tissue or used on intact skin).

- Any instrument or equipment entering into a sterile part of the body must be sterilized.
- Where the instrument or equipment will be in contact with mucous membranes or non-intact skin, it must have undergone disinfection, and where there will be contact with intact skin, disinfection or cleaning should be used.
- The classification of risk of transmission of infection by instruments and equipment has been called the "Spaulding Classification".

Level of disinfection/cleaning required for patient care equipment

Application	**Spaulding-Classification**	**Level of risk**	**Level of reprocessing Required**	**Examples**	**Storage of reprocessed instrument**
Entry or penetration into sterile tissue, cavity or bloodstream E.g. Into vascular system, into sterile cavity, into sterile tissue	Critical	High	Sterile Sterilization by steam under pressure or an automated low-temp chemical sterilant system, other liquid chemical sterilant or ethylene oxide sterilization.	Surgical procedure, entry into sterile tissue, arthroscopy, biopsies, intravascular cannulation	- Sterility must be maintained. - Packaged items must be allowed to dry before removal from the sterilizer. - The integrity of the wrap must be maintained. - Wraps should act as effective bio-barrier during storage. - Store away from potential environmental contaminants. - Unpackaged sterile items must be used immediately.
Contact with intact nonsterile mucosa or non-intact skin,	Semi-critical	Medium	Disinfection Heat tolerant items - Steam sterilize where possible - if unable to steam sterilize – use thermal disinfection Heat-sensitive items - Low temperature automated chemical sterilant systems - Chemical disinfectant	Respiratory therapy, gastroscopy	- Store to protect from environmental contaminants.
Intact skin, no contact with the patient	Non-critical	Low	Items must be cleaned - Clean after each use with detergent and water. - If disinfection is required follow with appropriate disinfectant e.g. 70% alcohol.	Beds, sinks, etc.	- Store in a clean dry place

Reprocessing of instruments and equipment in an effective way includes –

1. Cleaning instruments and equipment immediately after use to remove all organic matter, chemicals and
2. Disinfection (by heat and water or chemical disinfectants) or
3. Sterilization.

Staff Training

- Staffs who work in the sterilizing service department and are responsible for the reprocessing of instruments and equipment must have undergone formal training in how to clean, disinfect and sterilize instruments and equipment.

Appropriate Level of Reprocessing

- It is essential that the correct level of reprocessing of an instrument/equipment is chosen according to its intended use.
- Steam sterilization is recommended as the most effective method to achieve sterility. However, this may not always be possible as some instruments may not be able to withstand the temperature or moisture required for sterilization using steam.
- Other methods may be used to achieve sterility such as ethylene oxide or automated low temperature chemical sterilant systems, provided the manufacturer of the instrument / equipment agrees that this is an effective means to sterilize them.

Servicing of instruments and equipment

- Prior to sending medical devices for service they should be reprocessed appropriately.
- If however they are unable to be reprocessed before being repaired, they should be placed in a fluid resistant plastic bag or container and labelled appropriately before being sent for repair.

Selected items that require special reprocessing

- Items that require special treatment include:
  - Endoscopes,
  - Respiratory and anaesthetic apparatus,
  - Diagnostic ultrasonic transducers.

- Instruments and equipment like these may not be able to withstand the heat or the moisture of steam or thermal disinfection or even some chemical agents. They therefore may require very delicate measures to reprocess them.

Storage

- Storage of instruments and equipment is an essential component in ensuring the product maintains its level of sterilization or disinfection.
- Most instruments and equipment are dry and packaged once they have been sterilized. They should be stored in a clean, dry environment and protected from any damage. Correct storage of sterile instruments and equipment is a critical component in keeping them sterile.

Patient care equipment

- Any equipment that is used for a patient, and touches only their intact skin, such as bedpans, urinals, commode chairs, blood pressure cuffs etc. should be cleaned or cleaned and disinfected – usually in hot water (at least 70°C).

Cleaning, disinfection and sterilization

Cleaning

- Prior to any reprocessing to achieve disinfection or sterility all instruments and equipment must be cleaned. If not cleaned properly, organic matter may prevent the disinfectant or sterilant from having contact with the instrument/equipment and may also bind and inactivate the chemical activity of the disinfectant.
- If an instrument/equipment is unable to be cleaned then it is unable to be sterilized or disinfected.
- After an instrument has been used, prior to drying, it should be washed to remove any gross soiling. At this stage, detergent and water is appropriate to use.

Method used for cleaning of instruments and equipment

- All surfaces of the instrument/equipment must be cleaned taking care to reach all channels and bores of the instrument.
- If instruments are being washed manually the following procedure should be followed –
  - Wear personal protective equipment (plastic apron, thick rubber gloves, eye protection, surgical mask and/or face shield),
  - Remove any gross soiling on the instrument by rinsing in tepid water (15-18 degrees),
  - Take instrument apart – fully and immerse all parts in warm water with a biodegradable, non-corrosive, nonabrasive, low foaming and free rinsing detergent or use an enzymatic cleaner if necessary.
  - Ensure all visible soil is removed from the instrument – follow manufacturers' instructions,
  - Rinse in hot water (unless contraindicated)
  - Dry the instrument either in a drying cabinet, or hand dry with clean lint-free cloth.
  - Inspect to ensure the instrument is clean.

Disinfection

- Disinfection removes micro-organisms without complete sterilization.
- Disinfection is used to destroy organisms present on delicate or heat-sensitive instruments which cannot be sterilized or when single use items are notavailable.
- Disinfection is not a sterilizing process and must not be used as a convenient substitute for sterilization.
- Thermal disinfection is not appropriate for instruments that will be used in critical sites as these instruments must be sterile.
- Levels of disinfection are classified as –
  1. High-level disinfection: Destroys all micro-organisms except some bacterial spores (especially if there is heavy contamination).
  2. Intermediate disinfection: Inactivates Mycobacterium tuberculosis vegetative bacteria, most viruses and most fungi, but does not always kill bacterial spores.
  3. Low-level disinfection: Can kill most bacteria, some viruses and some fungi, but cannot be relied on to kill more resistant bacteria such as M. tuberculosis or bacterial spores.
- The two methods of achieving disinfection are thermal and chemical disinfection.

Thermal disinfection

- If an instrument is able to withstand the process of heat and moisture and is not required to be sterile, then thermal disinfection is appropriate. By using heat and water at temperatures that destroy pathogenic, vegetative agents, this is a very efficient method of disinfection.
- The level of disinfection depends on the water temperature and the duration the instrument is exposed to that temperature.

Minimum surface temperature and time required for thermal disinfection

Surface Temperature (°C)	Minimum disinfection time required (minutes)
90	1
80	10
75	30
70	100

Chemical disinfection

- The performance of chemical disinfectants is dependent on a number of factors including temperature, contact time, concentration, pH, presence of organic or inorganic matter and the numbers and resistance of the initial bioburden on a surface.3
- Instrument grade disinfectants are classified as high, intermediate or low level. When used according to the manufacturers' guidelines, disinfectants will fall into one of these levels –

Level of Disinfection	Activity against microbes
High level chemical Disinfectant	Inactivates all microbial pathogens except where there are large numbers of bacterial spores
Intermediate level disinfectant	Inactivates all microbial pathogens except bacterial spores
Low level disinfectant	Rapidly inactivate most vegetative bacteria as well as medium sized lipid-containing viruses, but may not destroy bacterial spores, mycobacteria, fungi or small nonlipid viruses

Selection of disinfectant

- There is no single ideal disinfectant. Different grades of disinfectants are used for different purposes.
- Only instrument grade disinfectants are suitable to use on medical instruments and equipment.
- Hospital grade or household grade disinfectants must not be used on instruments, they are only suitable for environmental purposes.
- Monitoring of the disinfectant is important if it is a multi-use solution. It is important that it is stored correctly and according to the manufacturer's instructions. Be sure not to contaminate the solution when pouring out for use.
- Glutaraldehyde is generally the most appropriate chemical disinfectant that will provide high-level disinfection. This chemical must be used under very strict controlled conditions and in a safe working environment.
- Glutaraldehyde 2% is an appropriate high level disinfectant for endoscopes, respiratory therapy equipment and for material that is destroyed by heat. An immersion time of > 20 min is required. Flexible endoscopes are very easy to damage and particularly difficult to disinfect. It is extremely important that meticulous mechanical cleaning must always precede sterilization or disinfection procedures.

Common disinfectants, their recommended Concentration and Effectivity

Disinfectant	Concentration	Effectivity against				
		Bacteria	**Spores**	**Mycobacteria**	**Viruses**	**Fungi**
Alcohols	60 – 90% in water	YES	NO	YES	Variable	YES
Aldehydes	Gluteraldehyde - 2% Shelf life – 14 days	YES	YES	YES	YES	YES
Hydrogen peroxide	7.5% or 13.4% for rapid action	YES	YES	YES	YES	YES
Peracetic acid	0.3%	YES	YES	YES	YES	YES
Sodium hypochlorite	1% available Cl 10% for spills	YES	Variable	Variable	YES	YES
Phenols	0.5 – 5%	YES	NO	YES	Poor	YES
Iodine &Iodophores	0.5 – 10% iodine	YES	NO	Variable	YES	YES
Quaternary ammonium compounds	---------	YES	NO	NO	Variable	Variable
Chlorhexidine	4%	Variable	NO	NO	Variable	Variable

- Minimum contact time of 30 minutes of complete immersion is recommended for all disinfectants.
- For mycobacterium, 2% Gluteraldehyde is recommended, contact time is 1 hour.

Common disinfectants & their suggested use

DISINFECTANTS	SUGGESTED USE
Alcohol (70%)	- Skin antiseptic - Smooth metal surfaces, table tops and other surfaces on which bleach cannot be used. - Disinfection of rubber stoppers of vials, thermometers, stethoscopes, scissors, manual ventilation bags, ultrasound instrument, external surface of ventilators, electrical equipment which cannot be immersed in disinfectant, medication preparation areas
Hydrogen peroxide	- For semi-critical/critical medical & dental equipment - 3-7.5% for disinfecting soft contact lenses, ventilators, fabrics, endoscopes, foot-care equipment
Peracetic acid	- For endoscopes, dental equipment - In combination with H_2O_2 for disinfection of hemodilyser
Chlorhexidine with Cetrimide	- Skin decontamination
Carbolic acid / Phenol (2%)	- Surface and environmental disinfection - Bedside tables, bed rails, laboratory surfaces, floors, furnishings, non-critical medical devices
Sodium hypochlorite (1%)	- Environmental and surface disinfection - Disinfection of soiled linen
Sodium hypochlorite (10%)	- Blood / body fluid spills
Formaldehyde (280 ml for 1000 cubic ft.)	- Fumigation of operation theatres
Bacillocid (0.25 – 2 %)	- OT/ICU/Wards as per manufacturer's instructions
Gluteraldehyde (activated 2%)	- For instruments and endoscopes
Iodine (0.5 – 10%)	- Thermometers, hydrotherapy tanks - Non-critical areas – IV stands, wheel chairs, beds, call bells

Quaternary ammonium compounds	- For environmental sanitation of non-critical surfaces (floors, furniture, walls, food preparation areas, keyboards)
Lysol	- For instruments (sharps) before autoclaving

Standard procedure for cleaning and disinfection of reusable equipment

Used personal protective equipment

Equipment	Standard procedure	Comment
N 95 or standard surgical mask Use disposable only		Discard in appropriate waste bag according to the health care facility guidelines
HEPA (P100) mask Use disposable filters only	Separate the filters from the mask and discard the filter. Clean the mask with detergent and water, dry and disinfect with 70% alcohol before reuse.	Discard the filters in appropriate bag according to the health care facility guidelines.
Eye protector/goggles/face shield Use of disposable is recommended	If reusable: clean with detergent and water, dry, and disinfect with 70 % alcohol or soak in 1% hypochlorite solution for 20 minutes and rinse and dry.	If disposable: discard in appropriate waste bag according to the health care facility guidelines.
Gown Use of disposable is recommended	If reusable: launder as per the health care facility guidelines for soiled linen. For example: launder in hot water (70° - 80° C) if possible. OR Soak in clean water with bleaching powder 0.5% for 30 minutes. Wash again with detergent and water to remove the bleach	If disposable: discard in appropriate waste bag according to the health care facility guidelines If reusable: ideally dry in a clothes drier or in the sun
Apron Use of disposable is recommended	If reusable Clean with detergent and water, dry, disinfect with 70% alcohol	If disposable: discard in appropriate waste bag according to the health care facility guidelines
Cap and shoe covers Use of disposable is recommended	If reusable: launder as per the health care facility guidelines for soiled linen. For example: launder in hot water (70° - 80° C) if possible. OR Soak in clean water with bleaching powder 0.5% for 30 minutes Wash again with detergent and water to remove the bleach.	If disposable: discard in appropriate waste bag according to the health care facility guidelines If reusable: ideally dry in a clothes drier or in the sun.
Gloves Use disposable only		Discard in the appropriate waste bag according to the health care facility guidelines
Reusable boots	Clean with detergent and water, dry, disinfect with 70% alcohol	
Linen	If reusable: launder as per the institutional guidelines for soiled	Ideally dry in a clothes drier or in the sun.

	linen. For example: launder in hot water (70° - 80° C) if possible. OR Soak in clean water with bleaching powder 0.5% for 30 minutes. Wash again with detergent and water to remove the bleach.	
Mops Wash mops separately from other cloth or linen	If reusable: launder as per the institutional guidelines for soiled linen. For example: launder in hot water (70° - 80° C) if possible. OR Soak in clean water with bleaching powder 0.5% for 30 minutes. Wash with detergent and water to remove the bleach	Mops should not be left wet. Mops should be changed routinely and immediately following the cleaning of blood, body fluids secretions and excretions, after cleaning a contaminated area, operating rooms or isolation rooms. Store dry.

Used patient care equipment (needles, syringes, surgical instruments etc)

Equipment	Standard procedure	Comment
Needles and syringes Use disposable only	Discard in puncture proof container with international biohazard symbol	When puncture proof container is two thirds full, seal it and send for disposal. Needle destroyer are not recommended (contaminated aerosols may arise while destroying the needles). Syringe cutter are not recommended as they can cause splashes.
Soiled patient care equipment, e.g. stethoscope, blood pressure apparatus	Clean with detergent and water and dry. May be wiped with sodium hypochlorite 1-2% or 70% alcohol and dried after cleaning.	Always clean between patient use.
Cuffs of blood pressure apparatus	Clean with soap and water followed by appropriate disinfectant. For example, wash in hot water with detergent If material is not washable, wipe with sodium hypochlorite 1-2% or 70% alcohol and dry after cleaning.	Ideally dry in sun after washing. If set aside for isolation room: should remain in the isolation room until discharge of the patient when it must be decontaminated appropriately.
Instruments	Remove all protein, organic, inorganic matter at point of generation (e.g. blood and body secretions) by cleaning with soap and water. Return to the sterilizing service department for appropriate reprocessing.	
AMBU bag and mask	Clean with detergent, dry and send to the sterilizing service department	Change mask after each patient.

Sterilization

- Sterilization is the destruction of all micro-organisms and can be achieved by either physical or chemical methods. Sterilization is necessary for medical devices penetrating sterile body sites.
- Cleaning to remove visible soiling in reusable equipment should always precede sterilization.
- All materials must be wrapped before sterilization. Only wrapped/packed sterilized materials should be described as sterile.
- Before any instrument or equipment goes under the process of steam sterilization, the following should be checked:
    1. Ensure that the instrument can withstand the process (e.g. steam under pressure)
    2. Ensure that the instrument has been adequately cleaned.
    3. Ensure that the instrument does not require any special treatment.
    4. Ensure that records of the sterilisation process and for the traceability of instruments are kept.
- Instruments and equipment will only be sterile if one of the following sterilizing processes is used –
    1. Steam under pressure (moist heat)
    2. Dry heat
    3. Ethylene oxide,
    4. Automated environmentally sealed low-temperature peracetic acid, hydrogen peroxide plasma and other chemical sterilant systems or sterilants, or
    5. Irradiation.
- The above sterilizing methods are designed to give a sterility assurance level of at least one in a million or 10^6 as long as the process is validated and is according to the manufacturers' guidelines.
- Ultraviolet light units, incubators, microwave ovens and domestic ovens must not be used for sterilizing.

Steam under pressure (moist heat) sterilization

- This is the most efficient and reliable method to achieve sterility of instruments and equipment.
- This method sterilizes and dries the sterile package as part of the cycle. This is recommended in office-based practice.
- There are several types of steam under pressure sterilizers (also called autoclaves) –
  1. Downward (gravity) displacement sterilizers (jacketed and non-jacketed) – These are designed for the sterilisation of waste, solutions and instruments.
  2. Self-contained (benchtop) sterilizers – These are recommended for office based practice as they are able to do small quantities or fairly simple items. Benchtop sterilizers do not take wrapped items and therefore items must be used immediately after they are removed from the sterilizer. There will be differences in the models and types of features that are offered may vary. These variations may include: drying stage, ability to take packaged and unwrapped items, systems to monitor temperature, pressure and holding time.
  3. Prevacuum (porous load) sterilizers – These are not suited for liquid sterilisation but are optimised for sterilisation of clean instruments, gowns, drapes, towelling and other dry materials required for surgery.

Dry heat sterilization

- Dry heat sterilisation is caused by hot air that destroys pathogens by the process of oxidation.
- Dry heat sterilizes have had limited value because it is difficult to maintain the same temperature throughout the load, while the high temperatures and long time required to achieve sterility makes this method undesirable for many situations.
- The manufacturers' instructions must be followed, the door to the unit must not be opened while in sterilizing cycle.

Ethylene Oxide (ETO)

- Ethylene oxide gas is appropriate to use for sterilization of instruments/equipment made from heat labile materials or those devices that contain electronic components.
- The time required to process the instrument is dependent on the temperature, humidity and concentration level of the gas.
- The gas must penetrate the packaging and reach all surfaces of the instrument/equipment requiring sterilization.
- The time for such a process is between 12 hours to over 24 hours.
- Because EO is toxic, this gas is restricted in health care facilities and must be used according to strict guidelines to ensure staff safety.
- The manufacturer's instructions must be followed for the packaging, sterilization process, validation and aeration process.

Automated chemical (low temperature) systems

- Hydrogen peroxide plasma in a fully automated cycle can achieve low temperature, low moisture sterilization within a 45-80 minute cycle depending on the model of sterilizer used.
- The packaging used must be nonwoven/non-cellulose polypropylene wraps.
- Peracetic acid is a low-temperature sterilization method. Peracetic acid 0.2% is placed in an environmentally sealed chamber and fully automated processing system. The process achieves moist, low temperature sterilization within 25-30 minutes.

Irradiation

- Gamma radiation if available can be used for sterilisation.
- Only those instruments and equipment that have undergone the entire sterilizing process can be regarded as sterile. Items must be wrapped or packaged appropriately to be considered sterile.
- Materials for packaging include -
  - Paper - this prevents contamination if it remains intact. It maintains sterility for a long period, can act as a sterile field and can also be used to wrap dirty devices after the procedure.
  - Non-woven disposable textiles.

- Containers - these can be used only if they contain material intended for a single treatment procedure for a single patient.
- The end-user must check the physical integrity of the package before use.

- Quality control parameters for the sterilization process which also serve as a check list for the Sterilization Department include –
    1. Load number
    2. Load content
    3. Temperature and time exposure record chart
    4. Physical/chemical testing
    5. Biological indicator
- Regular engineering maintenance on sterilization equipment must be performed and documented.