Pt. B.D SHARMA, PGIMS,

ROHTAK MANUAL INFECTION PREVENTION AND CONTROL IN HEALTH CARE SETTINGS

2024

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Acronyms

AMR	Antimicrobial resistance
BMW	Biomedical waste management
CAUTI	Catheter associated urinary tract infections
CDC	Center for Disease Control and Prevention
CRBSI	Catheter related blood stream infection
CSSD	Central sterile supply department
HCAI	Health care associated infections
HBV	Hepatitis B virus
HCF	Health care facility
HCV	Hepatitis C virus
HCW	Health care worker
HICC	Hospital infection control committee
HIV	Human immunodeficiency virus
HLD	High level disinfectant
ICN	Infection control nurse
ICO	Infection control officer
ICT	Infection control team
ICU	Intensive care unit
MRSA	Methicillin-resistant *Staphylococcus aureus*
NACO	National AIDS Control Organization
NICU	Neonatal ICU
NSI	Needle stick injury
OPA	Orthophthaldehyde
OT	Operation theater
PEP	Post exposure prophylaxis
PPE	Personal protective equipment
SOP	Standard operating procedure
SSI	Surgical site infection
TB	Tuberculosis
VAP	Ventilator-associated pneumonia
WHO	World health organization

1. Introduction to Healthcare-associated infections

1. Heath care associated infections (HCAI) are defined as:

    a) The infection acquired in the hospital by a patient who was admitted for a reason other than the infection in context.

    b) The infection was neither present nor incubating at the time of admission.

    c) The symptoms appear at least after 48 hrs of admission but may appear even after discharge.

    d) Occupational infections amongst staff of health care facility (e.g., needle stick injury transmitted infections).

    e) Infection in a neonate that result while passage through the birth canal.

2. HCAIs are among the major causes of mortality, increased morbidity, and prolonged length of stay among hospitalized patients. They are a significant financial burden both for the patient and for public health.

3. HCAI occur worldwide and affect both developed and resource-poor countries. The endemic burden of HCAI is significantly higher in low- and middle-income than in high- income countries, in particular in-patients admitted to intensive care units (ICU) and in neonates.

4. Of every 100 hospitalized patients, 7 in developed and 10 in developing countries acquire at least one HCAI. Mortality from HCAIs occurs in 10% of affected patients.

5. There are four major types of HCAIs
    a) Catheter associated urinary tract infections (CAUTI)
    b) Catheter related blood stream infections (CRBSI)
    c) Ventilator associated pneumonia (VAP)
    d) Surgical site infections (SSI)

6. Effective infection prevention and control is central to providing high quality health care for patients and a safe working environment for those that work in healthcare settings.

7. The most effective way to prevent HCAI is by introducing a barrier between the susceptible host and the infecting organism. This can be done by following certain preventive measures which would include Standard precautions (hand hygiene, personal protective equipment, (PPE) handling of sharps, biomedical waste

management, environmental disinfection practices etc) and transmission based/specific precautions (contact, droplet and airborne precautions).

8. WHO has proposed eight evidence based core components which need to be implemented at all health care facilities (HCF).

I. Infection prevention and control program with a dedicated, trained Hospital infection control team (HICT), which is the functional unit of Hospital infection control committee (HICC).
II. Infection prevention and control guidelines should be developed and implemented.
III. Infection prevention and control education and training facility should be in place for all HCWs
IV. Facility based HCAI surveillance should be performed to guide infection prevention and control interventions and detect outbreaks with timely feedback of results to HCWs, stakeholders and national networks.
V. Infection control activities should include multimodal strategies, components of which are as follows:
   a) System change (that is, availability of the appropriate infrastructure and supplies).
   b) Education and training of healthcare workers.
   c) Monitoring infrastructures, practices, processes, outcome and providing data feedback.
   d) Reminders in the workplace or visual communication posters.
   e) Cultural change with the establishment and strengthening of a safety climate.
VI. Regular monitoring and audit of healthcare practices should be performed to prevent HCAI and antimicrobial resistance (AMR) at the healthcare facility level.
VII. HCWs staffing level should be adequately assigned according to patient workload.
VIII. Built environment, materials and equipment for infection prevention and control at the facility level.

9. The Hospital is committed to ensure that proper safeguards are instituted to identify and prevent HCAI. Therefore, in order to provide safer environment for its patients and personnel, an “infection control programme” needs to be implemented in all health care settings.

2. INFECTION PREVENTION AND CONTROL PROGRAM

INFECTION CONTROL PROGRAMME

Purpose

The management of PGIMS, Rohtak directs that an "infection control program" be established and that this policy statement be adopted to ensure that organization has a functioning, coordinated process in place to reduce the risks of endemic, epidemic and Hospital acquired infections in patients and health care workers.

All health care providers and each department in partnership with the medical staff are responsible for the safety, health and well-being of all patients, visitors and hospital staff. For these reasons, PGIMS, Rohtak has established an Infection Control Program, which requires the participation and cooperation of all personnel.

Aims and objectives of Infection prevention and control program

1) To establish standards to minimize HCAIs in patients, staff and visitors.

2) To develop strategies for monitoring of HCAIs at the hospital.

3) To establish antibiotic stewardship program with at least yearly updation of evidence based antibiotic policy

Components of Infection prevention and control program:

1) Establishing and regular updating of **hospital infection control manual**. This manual will include guidelines, standard operating procedures (SOPs) and recommendations to reduce HCAIs. It will be reviewed and updated by the HICC of the hospital yearly.

2) To plan, support and implement regular training of healthcare workers regarding infection control and prevention.

3) To identify and reduce risks of healthcare associated infections among patient, staff and visitors and implement risk mitigation strategies for the same.

4) To educate all staff about the importance of standard precautions including appropriate technique of hand hygiene, use of personal protective equipment, spill management and appropriate sharp handling.

5) To define and implement “care bundle approach” for the prevention of various device related infections such as ventilator associated infection (VAP), catheter related blood stream infections (CRBSI), catheter associated urinary tract infections (CAUTI) and surgical site infections (SSI).

6) To ensure proper cleaning and disinfection of hospital environment.

7) To document policies and procedures for sterilization activities and ensure its implementation and monitoring.

8) To define guidelines for monitoring and surveillance of various HCAIs at the hospital.

9) To identify and take appropriate action to control outbreaks of infection in the hospital.

10) To ensure appropriate and safe handling of biomedical waste as per govt. recommendation.

11) Prepare strategy for the proper use of antibiotics, develop antibiotic policies and recommend remedial measures when antibiotic resistant strains are detected.

Requisites of the programme

1) Hospital Infection control committee (HICC)

2) Infection control team (ICT)

The management of the hospital shall ensure that the resources required for the infection control programme are made available in a sustained manner and a separate budget to be demarcated for HIC activities from the annual budget.

HICC: The Committee is an integral component of the patient safety programme of the health care facility, and is responsible for establishing and maintaining infection prevention and control, its monitoring, surveillance, reporting, research and education. This committee includes wide representation from all relevant disciplines or departments in the facility.

Constitution of Hospital Infection Control Committee (HICC)

1) Chairperson- Medical superintendent
2) Infection control officer and Member Secretary: Clinical microbiologist
3) Infection control nurse (ICN)
4) Infection control laboratory technician
5) Data entry operator
6) Other infection control members:
    a. Head of all clinical departments
    b. Officer in-charge, nursing station
    c. Officer in-charge, biomedical waste management
7) Support services: officer in-charges of :
    - Operation theater complex
    - Central sterile supply department
    - Linen and laundry department
    - Housekeeping or sanitary department
    - Kitchen department
    - Pharmacy department
    - Engineering department
    - Store or material department

Functions of HICC:

1) Maintaining surveillance of HCAI.
2) Developing system for identifying, reporting, analyzing, investigating and controlling HCAI.
3) Developing antibiotic policies, monitors the antibiotic usage, advices the Medical Superintendent on matters related to the appropriate use of antibiotics, and also recommends remedial measures to prevent spread of drug resistant nosocomial pathogens.
4) Conducting teaching sessions for HCWs regarding infection control practices.
5) Monitoring employee health activities regarding matters related to needle stick injury prevention, hepatitis B vaccination, etc.
6) Developing strategies to identify infectious outbreaks, their source and implements corrective and preventive measures.
7) Communicating and cooperating with other departments of the hospital with common interests such as – pharmacy, CSSD, linen and laundry department, antimicrobial stewardship committee, and biomedical waste management.
8) Preparing the manual for infection control as well as antimicrobial guideline and reviewingand updating them from time to time.

Meetings of HICC:

1) HICC meetings will be held under the chairmanship of medical superintendent.
2) HICC shall meet on a quarterly basis and as often as required. In an emergency, this committee must be able to meet promptly.
3) Timely circular for the meetings shall be sent to all members.
4) Agenda of the meeting will be prepared and the key problems will be identified and discussed.

Responsibility of various stakeholders:

1) Hospital administration:
   a) Establish a multidisciplinary HICC.
   b) Provide adequate resources, support, and managerial backup to HICC.
   c) Ensure availability of appropriate infrastructure, financial and human resources
   d) Ensure availability of hand hygiene products, PPE, disinfectants.
   e) Approve review policies and guidelines for infection control practices formulated by HICC.
   f) Promote educational and training activities for all categories of HCWs.
   g) Establish antibiotic stewardship program.
   h) Establish HCWs safety programme such as staff immunization, and needle stick injury management including post exposure prophylaxis (PEP).

2) Hospital infection control team (HICT)

   The Infection control team would comprise of an infection control officer and infection control nurse. They will perform the various functions of HICC at ground level and implement the infection control program in the hospital.

Infection control officer (ICO):

a) The ICO coordinates with the chairperson and is involved in meticulous planning and implementation of infection control measures such as hand hygiene, care bundle, appropriate use of PPE, etc.

b) Supervises the surveillance of healthcare associated infections as well as preventive and control programs.

c) Keeps a track of any developing outbreaks.

d) Participates and guides in research activities related to infection control practices and publish them.

e) Developing guidelines for appropriate collection, transport & handling of specimens.

f) Ensuring safe laboratory practices to prevent infection in staff.

g) Performing antimicrobial susceptibly testing following internationally recognized method & providing summary reports of prevalence of resistance.

h) Monitoring sterilization, disinfection of environment where necessary.

i) Initiates and monitor proper immunization for Hepatitis B Virus Immunoglobulin and HBsAg vaccine in case of suspected exposure to any hospital worker.

j) Track the indicators of infection control and present the data to the HICC meetings on regular basis.

Infection control nurse (ICN):

a) ICN is the bridge between the HICC and hospital wards and ICUs.

b) She monitors the compliance of all HCWs to infection control measures in the hospital.

c) She identifies the problems associated with infection control and implements appropriate measures after discussing with ICO.

d) Performs data collection for HCAI surveillance, hand hygiene audit, care bundle audit, PPE audit etc.

e) He/She checks for sterilization and disinfection practices as well as in-use tests of disinfectants.

f) Oversees the implementation of transmission based precautions wherever necessary.

g) Identifies the high risk areas for conducting environmental and water surveillance.

h) Involves in education of HCWs and patients.

3. Practices and Procedures for infection control

A two-tiered approach to precautions is used to interrupt the mode of transmission of infectious agents:

1. **Standard precautions**: A set of infection control practices used to prevent transmission of diseases that can be acquired by contact with blood, body fluids, non-intact skin (including rashes), and mucous membranes. These measures are to be used when providing care to all individuals, whether or not they appear infectious or symptomatic.

2. **Transmission-Based Precautions**: This second tier of infection prevention is used when patients have diseases that can spread through contact, droplet or airborne routes (e.g., skin contact, sneezing, coughing) and are always used in addition to Standard Precautions.

If successfully implemented, standard and transmission based precautions can prevent any infection from being transmitted.

Standard Precautions

According to National guidelines for infection prevention and control in health care settings the key components of Standard Precautions are:

1) Hand hygiene
2) Personal protective equipment
3) Respiratory hygiene and cough etiquette
4) Prevention of injuries from sharps
5) Safe handling of patient care equipment
6) Environment infection control

    a) Patient placement
    b) Environmental cleaning
    c) Linen and laundry
    d) Waste disposal

Hand hygiene

Studies have shown a direct correlation between increase in adherence to hand hygiene with decrease in HCAIs

1. Routine hand hygiene

   a) Hand washing with soap and water is preferred when hands are visibly dirty or soiled with blood or other body fluids or after using toilet.
   b) Hand rubbing with an alcohol-based preparation is the preferred method if hands are not visibly soiled or tap and running water is not available.

2. Surgical hand scrub

- **Routine hand washing with soap and water**

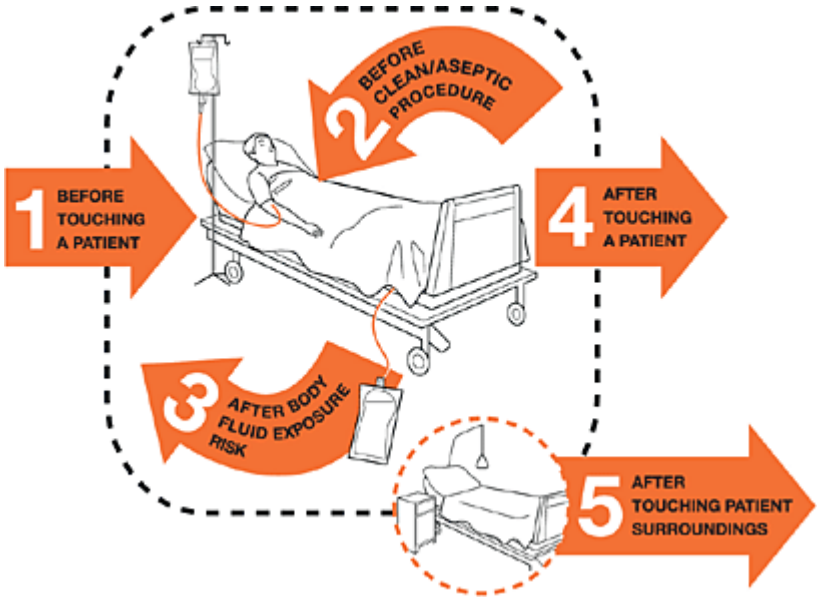
Hand hygiene should be performed before and after contact with a patient, immediately after touching blood, body fluids, non-intact skin, mucous membranes, or contaminated items (even when gloves are worn during contact), immediately after removing gloves, when moving from contaminated body sites to clean body sites during client care, after touching objects and medical equipment in the immediate client-care vicinity, before eating, after using the restroom, and after coughing or sneezing into a tissue as part of respiratory hygiene.

The **"My 5 Moments for Hand Hygiene"** is an approach by WHO, which defines the key moments when the HCW should perform hand hygiene. (Fig. 1)

My 5 Moments of Hand Hygiene

1) Before touching a patient
2) Before clean/ aseptic procedure
3) After body fluid exposure risk
4) After touching a patient
5) After touching patient surroundings

The "My 5 Moments for Hand Hygiene" approach (Fig 1.)



Sequence of events

Wet hands under running water

↓

Dispense one dose of soap into cupped

↓

Hand wash for 40-60 seconds vigorously and thoroughly by following **six steps of hand washing (Fig. 2)**, without

↓

Rinse hands thoroughly under running

↓

Dry hands with single use brown paper

- **Hand rubbing using alcohol based preparation - Aseptic/hygiene hand wash**

Hand disinfection with alcohol based hand rub (e.g., 70% alcohol,sterilium) preferably with chlorhexidine and alcohol are practiced when hands are not visibly soiled or running tap water is not readily available.

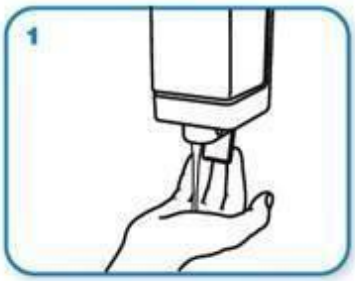
1. Whenever touching any patient esp. in inpatient units and critical care areas.
2. After handling any potentially infectious object
3. Before putting on gloves and after removing them.
4. Prior to invasive procedures
6. In high dependency areas and after attending patients in isolation or with known transmissible condition.

Broken skin, cuts and abrasions in any area of exposed skin, particularly the hands and forearms are covered with a waterproof dressing. Alcohol is an effective decontamination agent but should only be used on visibly clean hands. It is also a valuable agent for use, but should only be used 2-3 times consecutively before a hand wash as build up can occur.

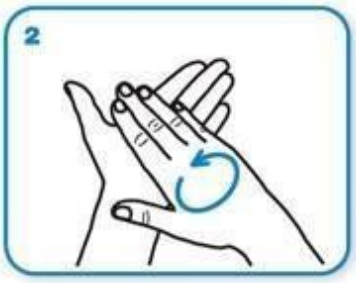
Sequence of events:

1) Dispense the required amount of solution onto the hands.
2) Ensure solution covers all hand surfaces.
3) Rub vigorously, using six steps technique of hand washing, until dry.

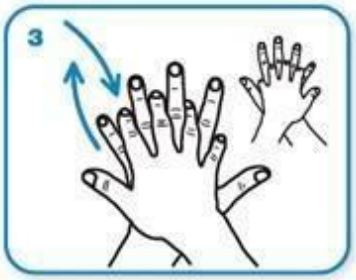
Wet hands with water



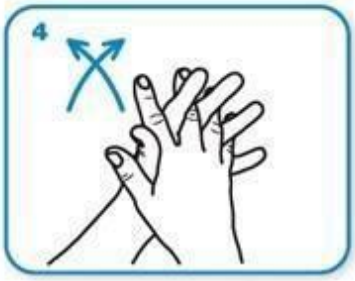
apply enough soap to cover all hand surfaces.



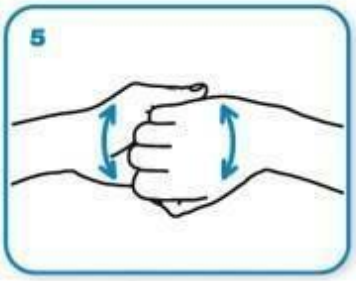
Rub hands palm to palm



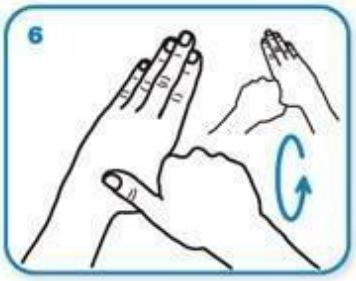
right palm over left dorsum with interlaced fingers and vice versa



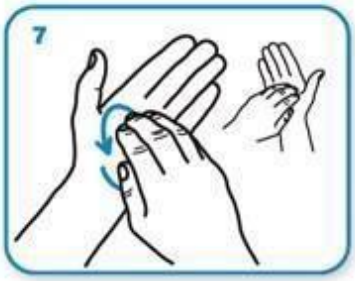
palm to palm with fingers interlaced



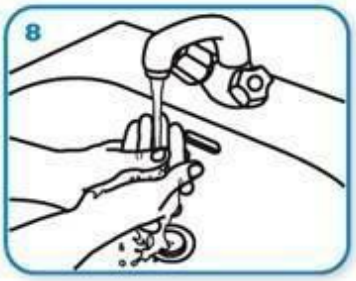
backs of fingers to opposing palms with fingers interlocked



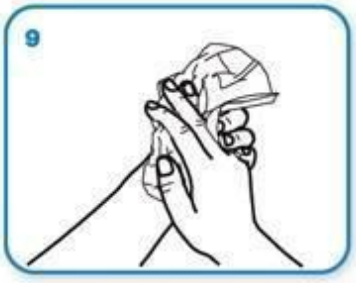
rotational rubbing of left thumb clasped in right palm and vice versa



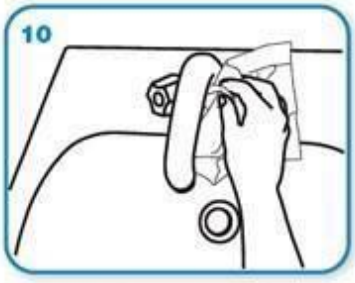
rotational rubbing, backwards and forwards with clasped fingers of right hand in left palm and vice versa.



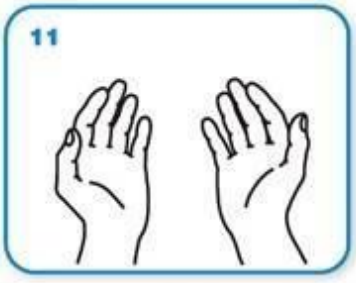
Rinse hands with water



dry thoroughly with a single use towel



use towel to turn off faucet



...and your hands are safe.

Surgical hand scrub

It aims at removing and/or killing transient flora. It also decreases the resident organisms to prevent the risk of wound contamination.

Indication: Before all surgical invasive procedures.

Steps in Surgical hand washing:

1) Jewelry including watches should be removed before washing hands. Nail polishes should also be removed before scrubbing for surgery and nails should be kept short and clean.
2) As a preliminary step to surgical hand wash, hands should be washed with soap and water.
3) Remove debris from underneath finger nails using a nail cleaner under running water.
4) Surgical hand wash/scrub can be performed using either an antimicrobial soap solution (e.g. 2% chlorhexidine) or an alcohol based hand rub (0.5% chlorhexidine with alcohol).
5) When performing hand scrub using antimicrobial soap solution, scrub forearms till just above the elbow for a period of 2-6 minutes. Dry hands and arms using towel. Then don the gloves

When using an alcohol based surgical hand scrub solution see manufacturer's recommendations before applying this solution, wash hands and forearms with soap and water and dry them completely, application of the solution for 2-3 minutes, allow hands and forearms to dry before donning gloves.

Technique for the application of surgical hand preparation using alcohol-based handrub (Fig.3)

The handrubbing technique for surgical hand preparation must be performed on perfectly clean, dry hands.
On arrival in the operating theatre and after having donned theatre clothing (cap/hat/bonnet and mask), hands must be washed with soap and water.
After the operation when removing gloves, hands must be rubbed with an alcohol-based formulation or washed with soap and water if any residual talc or biological fluids are present (e.g. the glove is punctured).

Surgical procedures may be carried out one after the other without the need for handwashing, provided that the handrubbing technique for surgical hand preparation is followed (Images 1 to 17).

1

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your left hand, using the elbow of your other arm to operate the dispenser

2

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

3

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

4

See legend for Image 3

5

See legend for Image 3

6

See legend for Image 3

7

See legend for Image 3

8

Put approximately 5ml (3 doses) of alcohol-based handrub in the palm of your right hand, using the elbow of your other arm to operate the dispenser

9

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

Use of Personal Protective Equipment (PPE)

PPE includes items such as gloves, gowns, masks, respirators, hair cover and eyewear used to create barriers that protect skin, clothing, mucous membranes, and the respiratory tract from infectious agents.

1. Gloves

Gloves can protect both patients and HCWs from exposure to microorganisms that may be carried on hands. It is used as part of standard, contact and droplet precautions.

Indications for glove use:

1) Before a sterile procedure
2) Anticipation of a contact with blood or body fluid, regardless of the existence of sterile conditions and including contact with non-intact skin and mucous membrane.
3) Contact with a patient (and his or her immediate surroundings) during contact precautions.

Indications for glove removal

1) As soon as gloves are damaged (or non integrity suspected).
2) After contact with blood or body fluid, non-intact skin and mucous membrane.
3) After contact with a patient and their surroundings or a contaminated body site.
4) When there is indication for hand hygiene.

Clinical situations when use of glove is not indicated:

1) For routine patient care activities, e.g. measuring blood pressure, temperature and pulse and while giving injections and during maintenance of I.V cannula, provided there is no blood leakage.
2) Giving oral medications and serving food.
3) Bathing and dressing the patient; transporting patient.
4) Writing in patient chart; collecting patients dietary trays.
5) Removing and replacing linen for patient beds.
6) Placing non-invasive ventilation equipment and oxygen cannula.

Hand Hygiene and Glove Use:

1) **Glove is not a substitute for hand hygiene.**
2) Appropriate hand hygiene (hand rub or hand wash) should be performed before wearing the gloves.
3) Hands must be washed immediately after removal of gloves.
4) Gloved hands should neither be wiped with any form of hand rub nor washed with soap and water.
5) Gloves must be changed between patient contacts and between separate procedures on the same patient.
6) When removed, discard and dispose the gloves in an appropriate bin (red bag).

Technique of donning gloves: (Fig:4)

Technique of doffing gloves: (Fig.5)

Types of gloves according to their use, with clinical situation:

Types of gloves	Indication of use	Examples
Nonsterile/ clean gloves	Used when there is risk of transmission of infection from patient to HCW	• Venipuncture • Vaginal examination • Dental examination • Emptying a urinary catheter bag • Nasogastric aspiration • Management or minor cuts and abrasions
Sterile gloves	Used when sterile environment is required (all surgical and aseptic procedures) Used when there is risk of transmission of infection from patient to HCW and vice versa	Surgical aseptic technique procedure: • Urinary catheter site dressings • Central venous line insertion site dressing • Lumbar puncture • Clinical care of surgical wounds or drainage sites • Dental procedures requiring a sterile field
Reusable utility gloves	Indicated for non patient care activities	• Handling/cleaning contaminated equipment or surfaces • Housekeeping duties • Instrument cleaning in CSSD unit

2 . Aprons/Gowns:

1. Protective clothing like aprons are used when entering the room of a patient requiring contact precautions and during sterile aseptic procedures. They are worn when
2. Gowns are used to protect the HCWs exposed body areas and to prevent contamination of clothing with blood, body substances, and other potentially infectious material.

Technique of wearing Gowns (Fig 5):

1. DRY HANDS.

2. PICK UP GOWN.

3. LET GOWN UNFOLD.

4. OPEN TO LOCATE SLEEVE / ARMHOLES.

5. SLIP ARMS INTO SLEEVES.

6. HOLD ARMS OUT AND SLIGHTLY UP.

7. CIRCULATOR PULLS GOWN ON.

3. Eye Protection

Protective eye wear (glasses, goggles or face shields) are used to protect the mucous membranes of eyes, nose, and mouth.

- ✓ Prevents exposure to blood/ body fluid that may be splashed, sprayed, or splattered into the face during clinical procedure.
- ✓ They must be worn during procedures that are likely to generate droplets or aerosols of blood and/or high risk body fluids.

4. Face Masks

They may offer protection against potential splashing of the mouth and face during certain procedures such as minor operations, physical decontamination or cleaning instruments with a brush.The type of mask best suited to a particular situation depends on the body substances likely to beencountered and the nature of the activity.
There are two main types of masks used in health care:

a) Surgical masks—They are loose fitting, single-use item that cover the nose and mouth
- ✓ They are used as part of standard precautions to keep splashes or sprays from the person wearing them.
- ✓ They also provide protection from respiratory secretions and are worn when caring for patients on droplet precautions.

b) Respirators:

A respirator is a device used to protect the wearer from inhaling particulate matter, including airborne microorganisms, fumes, vapors and gases. They are close fitting masks capable of filtering 0.3-µm particles and worn when:
- ✓ By care providers of patients with obligate and preferentially airborne-transmitted diseases such as T.B
- ✓ While performing aerosol-generating procedures that have been consistently associated with increased risk of pathogen transmission.
- ✓ If an aerosol- generating procedure such as bronchoscopy is performed on a patient with active TB.

5.Head cap:

Head cap covers the hair of the health care provider and prevents the contamination of the sterilehigh risk areas by falling hair.

Sequence of donning and doffing PPE:

Donning sequence	Doffing sequence
Hand hygiene Gown Mask/Respirat or Goggles or face shield Gloves	Gloves Goggles or face shield Gown Mask/Respirat or Hand hygiene

Respiratory hygiene / cough etiquette

These are the measures taken by a person having sign and symptoms of respiratory infection to contain respiratory secretions and prevent the transmission of infection to other persons.

1) Whenever coughing or sneezing, cover the nose/mouth with a tissue or use the crook of the elbow (if tissue not available) to contain respiratory droplets.
2) Use tissues to contain respiratory secretions and discarding in the nearest waste receptacle after use.
3) Perform hand hygiene (hand washing with non-antimicrobial soap and water, alcohol-based hand rub, or antiseptic hand wash) immediately after contact with respiratory secretions and contaminated objects/materials.

Prevention of injuries from sharps

Sharps should be handled with extreme caution to avoid injuries during use, disposal or reprocessing.

1) Avoid unnecessary use of sharps and needles
2) Use single use disposable needles
3) Use of vacutainers for sample collection.
4) Never pass used sharps from one person to another directly
5) Used needles must not be recapped by hands
6) Used needles should not be bent or broken after use
7) Used sharps/needles should be disposed off immediately in designated white translucent puncture proof, and leak proof containers.

8) Locate disposal containers close to work sites, avoid over filling disposal containers.

Safe handling of patient care equipment

1) Equipment that has been soiled with blood and body fluid should be decontaminated and cleaned
2) Equipment that has been in contact with a patient should be disinfected or sterilized before use for another patient
3) New equipment or serviced or repaired equipment should be cleaned and disinfected before patient use.
4) Safe injection practices:
   a) Use of a new needle and syringe every time a medication vial or IV bag is accessed
   b) Use of a new needle and syringe with each injection of a patient
   c) Whenever possible, use single dose vial for each patient.
   d) In case of multi-dose vials:

      ✓ If possible, keep one multi-dose vial for each patient and store with patient name on it
      ✓ Do not store these vials in open ward or general patient care area, where they could be inadvertently contaminated
      ✓ Discard the multi-dose vial if sterility has been compromised or if expiry date or 28 days from the date of opening have passed.

5) Injections should be prepared in a designated clean, decontaminated (with 70% alcohol) area where contamination by blood and body fluids is unlikely
6) The top of the vial should be wiped with 70% isopropyl alcohol before ….

Environmental infection control

1) Space between beds should be 1-2 meters to reduce risk of cross-contamination/infection.
2) Single rooms used for isolation purposes must have hand washing facility, toilet & bathroom facility as well as an anteroom to support the use of PPE.
3) The room must be thoroughly cleaned before admission and after discharge of a patient.
4) All patient care items used by the previous patient should be removed and replaced with clean items e.g., bed linen, oxygen humidifiers, facemask etc. as per housekeeping policy. (Chapter 8)
5) Patient care equipment and articles should be cleaned, disinfected or sterilized according to disinfection policy. (Chapter 5)

6) During transportation of a patient, surgical mask on face of patient with pulmonary Tuberculosis should be used.
7) Care should be taken of drainage and shunts and IV lines during transit as these are potential sources for contamination of environment, trolleys etc. closed sterile drainage should be maintained all times.

Transmission based precautions

Also called as specific precaution, are applied in addition to standard precautions. TBPs are set of infection control practices which should be followed for the patients who are infected or likely to be infected with infectious agents having specific mode of transmission.

They are of three types:

- Airborne precautions
- Droplet precautions
- Contact precautions

Airborne precautions

The airborne route of infection occurs through droplet nuclei of 1–5 micron that are disseminated through the air. These droplet nuclei can remain suspended in the air for varying periods of time and can travel long distances (>1 metre) and from room to room. Droplet nuclei arise from the drying of suspended droplets carrying the infectious agent.

Airborne precautions are indicated for -

- ✓ Mycocterium tuberculosis
- ✓ Measles
- ✓ Varicella (chicken pox and zoster)
- ✓ pulmonary plague
- ✓ Severe acute respiratory syndrome associated coronavirus (SARS-CoV)
- ✓ Middle East respiratory syndrome coronavivus (MERS-CoV)
- ✓ Pandemic influenza
- ✓ Bacillus antracis
- ✓ Aspergillus
- ✓ Haemorrhagic fever withpneumonia
- ✓ Novel or emerging pathogens

Airborne precautions includes

- **Respiratory protection:** persons entering the airborne infection isolation room should wear a particulate respirator, e.g. a N95 mask with a proper fit.
- **Restricted entry:** susceptible healthcare personnel should be restricted from entering the room of patients known or suspected to have airborne infections.
- **Immunize susceptible persons:** susceptible persons should be immunized as soon as possible following unprotected contact with vaccine-preventable infections.
- **Protection during aerosol-generating procedures:** for aerosol-generating procedures like V endotracheal suction and bronchoscopy, appropriate PPE should be used in an airborne infection isolation room.

Droplet precautions

Droplet transmission occurs through large respiratory droplets >5 microns in size. Transmission occurs by coughing, sneezing or talking

Droplet precautions are indicated for –

- ✓ Diphtheria
- ✓ Haemophilus influenzae type B(epiglottitis, pneumonia, meningitis)
- ✓ Neisseria meningitidis
- ✓ Pertussis
- ✓ Pneumonic plague
- ✓ Mycoplasma pneumonia
- ✓ Streptococcal (group A) diseases
- ✓ Influenza viruses
- ✓ Viral hemorrhagic

fever Droplet precautions

include:

- **Patient placement:** keep a minimum of 1–2 metre inter-bed distance.
- **Cough etiquette:** explain the importance of respiratory hygiene and cough etiquette to patients.
- **Personal protective equipment:** wear a triple-layered surgical mask within 1–2 metres of the patient. For practical purposes, it is advisable to use the mask when entering the patient's room. For aerosol-generating procedures, N95 masks should be used.

- **Patient transport:** the patient should wear a triple-layered surgical mask.

Contact precautions

Contact transmission of microorganisms during patient care is responsible for the majority of HAIs in patients and healthcare staff. Contact transmission can be direct or indirect.

Direct transmission This occurs when infectious agents are transferred from one person to another without a contaminated intermediate object or person. For example, blood or other body substances from an infectious person may come into contact with a mucous membrane or breaks in the skin of another person.

Indirect transmission This involves the transfer of an infectious agent through a contaminated intermediate object (fomite) or person.

Contact precautions are indicated for –

- ✓ Methicillin resistant Staphylococcus aureus(MRSA)
- ✓ Carbapenem-resistant Enterobacteriaceae (CRE)
- ✓ Vancomycin-resistant enterococci
- ✓ Multidrug-resistant(MDR) non-fermenting gram negative bacilli
- ✓ Agents of conjunctivitis (adenovirus, gonococcus, Chlamydia)
- ✓ Highly contagious skin lesions
- ✓ Agents of diarrhea (rotavirus, cholera, Clostridium difficile

Contact precautions include:

- Hand Hygiene
- Personal protective Equipment (PPE)
- Single use patient- dedicated equipment – blood pressure cuff, stethoscope, thermometer, nebulizers
- Patient placement – Single isolation room, cohorting
- Transfer of patients – should be limited only to medically-necessary purposes.
- Disinfection of the rooms – rooms of patient must be frequently cleaned and adequately disinfected

Combination of contact, droplet and airborne precautions

Contact, droplet and airborne precautions may be combined for diseases that have multiple routes of transmission or in case of epidemiologically important organisms, risk group 4 organisms or where transmission routes are unknown.

4. Infection control in special situation

Infection Control in Operation Theaters (OT)

The operation theater complex is regarded as the most sterile zone of any healthcare facility (HCF). Therefore maintenance of highest standard of infection control measures is essential to ensure that patients who undergo any surgical procedure within the OT receive safe and effective care.

Aseptic Protocols to be followed in OT:

1) Surgical Hand preparation: It should be performed with an antimicrobial soap (4% CHG) and water or hand rubbing with an alcohol based hand rub for an effective contact period (2-5 minutes) (discussed in Chapter…)
2) After surgical scrub, hands should be kept up and away from the body so that the water runs from the tips of fingers towards the elbows.
3) All jewellery should be removed, and artificial nails must not be worn.
4) Surgical site preparation needs to be done using alcohol based chlorhexidine antiseptic solution.
5) Sterile surgical drapes are placed surrounding the surgical site covering a larger area to prevent contact with unprepared surfaces and to maintain the sterility of immediate surroundings of the surgical field.
6) Meticulous operative techniques such as obliteration of dead spaces, gentle tissue handling, limited use of electrocautery and removal of all devitalized tissues before closure should be done.
7) Antimicrobial coated surgical sutures such as triclosan may be used to reduce microbial colonization of the suture site.
8) Appropriate surgical attire including gloves, gowns, caps, mask, eye protection, waterproofaprons and footwear must be worn.

OT discipline

1) Zoning of OT area to be done by marking red line
2) There should be restricted entry- Only assigned persons
3) Maximum occupancy of 5-8 persons at one time
4) Minimal movements in and out of theatres- to reduce bacterial count

Patient related factors in OT:

1) Surgical antimicrobial prophylaxis (SAP) should be administered within 120 minutes before incision along with due consideration to half life and protein binding of the antibiotic.
2) Perioperative oxygenation of FiO2 (80%) should be maintained for patients undergoing general anaesthesia with endotracheal intubation.
3) Perioperative normothermia should be maintained for surgical patients having anaesthesia duration of more than 60 minutes.
4) Perioperative blood glucose control (140-200 mg/dl) is essential for both diabetics and nondiabetics.
5) Perioperative normovolemia must be maintained by goal directed fluid therapy (colloid or crystalloid) to prevent tissue hypoxia.
6) Hair should either not be removed or if necessary, it should be removed only with a clipper. Shaving by razor is strongly discouraged.
7) Incisional wound irrigation can be performed with an aqueous povidone iodine solution for clean and contaminated wounds. Irrigation with saline or antibiotics is not recommended.
8) To reduce the stay in hospital, patient should be discharged before incision has healed and he/ she should be educated about care of incision site and sign and symptoms of infection.

Environmental cleaning:

1) First cleaning of the day should be performed every morning irrespective of whether the O.T will be used or not.
    a) Cleaning should be done with detergent to remove any foreign and organic matter.
    b) Daily cleaning includes cleaning of the furniture, lights, equipments, windowsills, ledges, scrub rooms and sinks.
    c) For floors wet vaccuming is the preferred method or else wet mopping can be done.
2) After cleaning, disinfection of all horizontal surfaces should be done with a high level disinfectant and O.T should be kept closed for 10-15 min with ventilation equipment on after cleaning.
3) Cleaning in between cases:
    a) All soiled towels, drapes and gowns should be placed in a clean laundry bag and send to laundry.

b) Soiled instruments must be placed in disinfectant and then send to cleaning area.
c) Wipe all used equipment, furniture and lights.
d) Move operating table to one side and wet vaccum or wet mop a 3-4 feet area around the operating site.
e) Empty suction bottle and wash the suction bottle and tubing with detergent disinfectant.

4) Terminal cleaning of OT should be performed after scheduled cases are over.
   a) Remove all portable equipment from the room.
   b) Wipe windowsills, overhead lights, equipments, furniture and waste containers with a cloth soaked in detergent disinfectant solution.
   c) Wet vaccum or wet mop the entire floor area.
   d) Clean and disinfect the wheels/ castors.
   e) Restock unsterile supplies.
   f) Check levels and dates of all sterile supplies and restock.
   g) Clean the air-conditioning grills.
   h) Clean scrub sinks with detergent powder.
   i) Empty all shelves, wipe with detergent-disinfectant and dry them before replacing the supplies.
5) Detailed wash-down of the O-T complex should be done at least once a week.
6) Cleaning and disinfection of new O.T and after any civil work includes general cleaning procedures as mentioned above, along with fogging using high level disinfectant (glutaraldehyde based). After the fogger is removed, the OT should be closed for atleast one hour with air handling units switched off, following which post fogging swabs can be taken for culture to ensure the efficacy of the fogging process.

Microbiological air and surface sampling:

1) Routine, random and undirected sampling is not recommended.
2) CDC recommends targeted air/surface surveillance which should be carried out for following specific indications:
   a) Investigation of an outbreak
   b) For research purposes
   c) After reconstruction or newly constructed buildings
   d) For short term evaluation of a change in infection-control practices

Infection control in ICU

Patients in ICU are at five to ten times higher risk of developing HAI, hence strict adherence to infection control practices is mandatory.

Standard precautions and Transmission based precautions (when route of transmission is known) must be applied to all patients in the ICU. Since, device associated infections are most commonly encountered infections in the ICU, care bundle practice policy should be completely adhered to reduce mortality and morbidity in these patients.

A “care bundle” is a structured way to improve patient care and outcomes by following well- defined, checklist based set of evidence based practices.

Care bundle for Catheter-associated urinary tract infections (CAUTI)

Insertion bundle:

1) Catheter should be inserted only when indicated
    a) Urinary output monitoring in critically ill patients.
    b) Acute urinary retention or urinary obstruction.
    c) Perioperative use for urological or other genitourinary tract related surgeries.
    d) Anticipated prolonged duration of surgery.
    e) Patients anticipated toreceive large-volume infusions or diuretics during surgery.
    f) Assist in healing of pressure ulcers in incontinent patients.
    g) Patient requiring prolonged immobilization (e.g. trauma).
    h) Improve comfort for end of life care.
2) Thoroughly wash hands or use ABHR before inserting the catheter.
3) Sterile gloves, drapes, sponges, an appropriate antiseptic solution for periuretheral cleansing, and a single use packet of lubricant jelly should be used for insertion.
4) Catheter must be inserted by nontouch technique (operator should have no contact with the sterile shaft of the catheter) with strict asepsis.
5) Continuous closed drainage system must be used and maintained.
6) Catheter of appropriate size must be used.
7) Catheter must be properly secured after placement (plaster-tube-plaster technique).
8) Remove gloves and wash hands after insertion.

Maintenance bundle:

1) Daily catheter care (meatalcleansing) should be performed with soap and water (not antiseptics) at intervals of two to three times a day by strict aseptic measures.
2) Catheter must be properly secured all the time.
3) Drainage bag must be always above the floor and below the bladder level.
4) Closed drainage system is maintained all the time.

5) The drainage bag should be emptied regularly; 8 hourly or when 3/4th full whichever is earlier or prior to transport of patient. Bag should be completely emptied.
6) While collection of urine from bag, hand hygiene and change of gloves between patients; separate jug for each bag must be used.
7) Before sample collection, site should be disinfected with alcohol and then allow to dry before collection. Urine sample should be collected from the sampling port, and not the bag.
8) Catheter should be left in place for as long as necessary. It should not be changed at routine/fixed intervals.
9) Daily assessment for readiness of removal of the catheter must be documented.

Care bundle for catheter related blood stream infections (CRBSI)

Insertion bundle for central line (CL):

1) Hand hygiene should be performed prior to insertion of central line.
2) Use maximum sterile barrier precaution: gloves, gowns, drapes, caps and masks.
3) Avoid femoral vein for central venous access in adult patients; use subclavian rather than juglar vein.
4) Skin cleaning should be done with antiseptics such as chlorhexidine (CHG). Povidone iodine may be used if allergic to CHG or age < 2 months. Let skin dry before insertion.
5) Secure the catheter with sutures or clips and apply sterile, clear and semipermeable dressing.
6) Document date and time of

insertion. Maintenance bundle for

central line:

1) Daily review the necessity of CL and promptly remove unnecessary lines.
2) Disinfect catheter hubs, ports, connectors,etc. before using the catheter.
3) Dressings should be replaced when it becomes damp, loosened or soiled or when the site needs to be inspected. Otherwise gauze dressings should be changed in every 2 days and semi-permeable dressings should be changed at least every 7 days.
4) CHG is the recommended disinfectant used for dressing except for neonates where povidone-iodine is used.
5) Replace administration sets within 96 hours (immediately) if used for blood products or lipids.

6) Daily assessment of readiness of removal of central line must be documented.

Bundle care for Ventilator associated pneumonia (VAP)

1) Adherence to hand hygiene should be followed.
2) Gloves should be worn before contact with respiratory secretions and has to be removed immediately after the use or should be changed between patients or different care activities of the same patient.
3) Elevation of the head of the bed between 30 and 45 degrees.
4) Daily oral care with CHG 2% solution should be performed.
5) Need of peptic ulcer disease (PUD) prophylaxis should be assessed daily; if needed only sucralfate should be used.
6) DVT (deep vein thrombosis) prophylaxis should be provided if needed.
7) Daily assessment of readiness to remove mechanical ventilator must be documented.

Prevention of Bedsores:

1. Change positions frequently (e.g. turning lateral)
2. Skin should be kept clean and hydrated.
3. Pillows should be used in between body parts that press against each other.
4. Few range of motion exercises (e.g. arm lifting) should be performed.
5. Good nutrition is essential.
6. Pressure redistributing mattresses to redistribute pressure and to provide comfort should be used**.**

Infection control in maternal and neonatal units

Prevention of infections during delivery

1. Prevention of infection during vaginal examination
    1) Digital vaginal examination at intervals of four hours is recommended for routine assessment of active stage of labour in low-risk women.
    2) Clean (not necessarily sterile) pair of gloves should be used for each examination.
    3) The tip of examining finger should not enter the cervical os unless the decision has been made to induce labour.
2. Prevention of infection before delivery
    1) Clean examination gloves should be used to wash the perineal area (vulva, perineum and anal region) with soap and clean water.
    2) Use downward and backward motion while cleaning so that faecal organisms are not introduced into the vagina.

3) The anal area should be cleaned last and the wash towel and gloves should be discarded in a yellow-coded container. Perineal/pubic hair shaving is not recommended. If required, hair clipper should be used.
4) Routine vaginal cleansing with chlorhexidine during labour for the purpose of preventing infectious morbidities is not recommended.

3. Prevention of infection during delivery
    1) Proper hand hygiene (up to the elbows) using soap and water or alcohol based hand rub should be done.
    2) Appropriate PPE must be worn including gloves, sterile water resistant gown, rubber/ plastic apron and mask with eye shield.
    3) All instruments used during delivery should be sterile.
    4) Baby should be received in a clean towel and the HCW receiving the baby must follow hand hygiene and wear clean gloves.
    5) Resuscitation if required should be done by mechanical suction. If mouth suction is done a trap should be placed in line.
    6) For manual removal of placenta fresh pair of sterile gloves should be worn augmented by a sterile sleeve up the elbow.
4. Prevention of infection after delivery
    1) All blood- stained waste including placenta should be placed in yellow colour coded container.
    2) Suture needles after use should be placed in puncture proof sharp containers.
    3) Discard gloves in yellow colour coded container and wash hands with soap and water.
5. In case of caesarean section
    1) If there has been premature rupture of membranes or the caesarean section is non-elective, a single shot of first generation cephalosporin or penicillin should be given prior to incision.
    2) if there is prolonged rupture of membranes or chorio-amnionitis:
    a) Avoid spillage of amniotic fluid into the abdominal cavity.
    b) Place sterile moistened pads in the paracolic gutters to absorb as much of the amniotic fluid as possible.
    c) If there is large amount of amniotic fluid spillage in the abdomen, lavage the cavity with sterile isotonic saline solution.
    d) Avoid exploring the uterine cavity unless absolutely necessary and only after closing the uterine incision.

6. Postpartum care of the mother
    1) Wear gloves while handling perineal pads, touching vaginal discharge or touching the episiotomy.
    2) Check whether the mother is voiding urine without difficulty.
    3) Educate the mother on how to wash the perineal are with boiled water after changing the pad or passing the stool.
    4) Educate the mother about care of breasts and nipples to avoid mastitis.
    5) Encourage mother to move about frequently in bed and to walk within 12 hours.
    6) If indwelling urinary catheter is inserted, precautions to prevent urinary infection should be followed and remove the catheter as soon as possible.

7. Routine antimicrobial prophylaxis

Recommended	Not recommended
For women with GBS colonization (for prevention of early neonatal GBS infection).	For women in preterm labourwith intact amniotic membranes.
For women with pre-term pre-labour rupture of membranes.	For women with pre-labour rupture of membranes at or near term.
For women undergoing manual removal of placenta.	For women with meconium stained amniotic fluid.
For women with a 3rd or 4th degree perineal tear.	For women with episiotomy.
For women undergoing elective/emergency caesarean section, prophylactic antibiotics should be given prior to skin inscision.	For women with uncomplicated vaginal birth

8. Postnatal care of the neonate:
    1) Hand hygiene should be performed before handling the neonate.
    2) Gloves/ plastic apron should be worn while handling the neonate until, blood, meconium or amniotic fluid has been removed from the neonate's skin.
    3) Blood, meconium, fluids should be removed using cotton swabs soaked in boiled warm water, followed by drying the skin.
    4) Bathing or washing the neonate should be done once the temperature of the neonate has stabilized (usually by 6 hrs of birth)
    5) The perineal area and buttocks should be kept clean by washing with soft cloth, cotton swabs soaked in warm water after every diaper change.
    6) Fresh swabs and separate bowl should be used for each occasion.

7) Cord care:
    a) Hand hygiene before and after cord care should be performed.
    b) Keep cord stumps clean and dry.
    c) Do not cover the cord stump with dressings or bandage.
    d) Educate the mother to examine the stump for redness or presence of pus/blood.

Prevention of infection during procedures in neonatal unit

1. Preparation of IV fluids:

Intravenous (IV) administration of fluids and drugs are a potent source of infection for the vulnerable neonate. Strict attention to aseptic technique is essential in the preparation and administration of IV fluids.

i. Base solutions such as IV glucose, saline solutions must be procured in paediatric packings/ small amounts rather than using adult packaging and transferring into smaller aliquots.
ii. Avoid multi-dose vials; single use ampoules/vials are preferred.
iii. Have a designated area to prepare IV infusions. Clean area with a disinfectant before a procedure.
iv. Gather the necessary materials (IV fluids, drugs, syringes, needles, swabs, 70% alcohol etc.).
v. Examine the IV fluid containers, ampoules and vials for expiry date, cracks, leaks, cloudy consistency, flakes etc.
vi. Perform hand hygiene either by hand washing using medicated soap followed by drying with a single-use towel or ABHR (it is important that hands are dry before starting the procedure).
vii. Disinfect the port of IV bottles/ bags with 70% alcohol immediately before removing/ adding fluids.
viii. Wear sterile gloves.
ix. Use sterile needle/ syringe for each IV fluid bottle and ampoule/ vial using the no-touch technique during mixing of IV fluids and medications.
x. Never enter IV fluids and bottles with a needle except through a designated port.
xi. Label the prepared bottle with patient's name, registration number, date and time of preparation.
xii. If need to be stored in fridge, do not refrigerate for more than 24 hours. Discard after 24 hours in fridge and after 8 hours at room temperature.

xiii. The improper use of multi-dose vials can be a cause and source of infection in the neonate.

xiv. Strict aseptic technique to be followed during administration of IV fluids, and a closed system to be maintained at all times.

9) IV therapy and umbilical catheter care

Umbilical vessel catheters are frJequently used in the initial management of the sick neonate. There is increased potential of bacterial colonization as this site is non-sterile and there is presence of devitalized cord tissue. Umbilical catheters should be replaced by per-cutaneous peripheral or central venous catheters in neonates requiring long-term access.

1) Umbilical catheters should be inserted using sterile techniques.
2) Umbilical catheters should only be replaced if catheter site is infected or catheter malfunctions.
3) Do not replace umbilical catheter if there are signs of CRBSI or thrombosis. In addition, for the umbilical artery catheter, do not replace if there are signs of vascular insuffi ciency.
4) Clean umbilical site before insertion with appropriate disinfectant avoiding tincture of iodine due to its potential effect on neonatal thyroid. Povidone-iodine can be used.
5) Do not use topical antibiotic or creams due to potential for fungal infection and AMR.
6) Low-dose heparin can be added to the fl uid infused through umbilical arterial catheter
7) Umbilical arterial catheters should be removed as soon as possible and not be left in place for more than 5 days. Remove the catheter if there are signs of vascular insufficiency in the lower limbs.
8) Umbilical venous catheters should be removed as soon as possible and left in place for not more than 14 days.

Infection control in Dental procedures

Transmission of infectious agents among patients and dental health care personnel (DHCP) in dental settings is rare. However, from 2003 to 2015, transmissions in dental settings, including patientto-patient transmissions, have been documented. Although no specific lapse in IPC practice with a particular transmission has been proved but reported breakdowns in basic infection prevention procedures includes unsafe injection practices, failure to heat sterilize dental handpieces between patients and failure to monitor autoclaves. These reports highlight the need for comprehensive training to improve understanding of underlying principles, recommended practices and their implementation for infection control.

The general routes for transmission of microbial agents in dental practices includes-

a) the direct contact with infectious lesions or infected saliva, blood or other infected materials

b) the indirect contact with contaminated objects, such as instruments,environmental surfaces or equipment

c) inhalation of airborne microorganisms that can remain suspended as aerosols in the air for long periods

d) contact of conjunctival, nasal or oral mucosa with droplets such as spatter of blood, saliva or nasopharyngeal secretions containing microbes from an infected person spread by coughing, sneezing or talking.

Standard Precautions that should be followed-
Standard Precautions are the minimum infection prevention practices that apply to all patient care, regardless of suspected or confirmed infection status of the patient in any setting where health care is delivered. These practices are designed to both protect Dental health care professionals (DHCP) and prevent DHCP from spreading infections among patients.
These Standard Precautions include—
1. Hand hygiene
2. Use of personal protective equipment (e.g., gloves, masks, eyewear).
3. Respiratory hygiene/cough etiquette
4. Sharps safety (work practice controls)
5. Safe injection practices (i.e., aseptic technique for parenteral medications)
6. Sterile instruments and devices
7. Clean and disinfected environmental surfaces.

Key Recommendations for HAND HYGIENE in Dental Settings

1. Perform hand hygiene— a. When hands are visibly soiled. b. After barehanded touching of instruments, equipment, materials, and other objects likely to be contaminated by blood, saliva, or respiratory secretions. c. Before and after treating each patient. d. Before putting on gloves and again immediately after removing gloves.

2. Use soap and water when hands are visibly soiled (e.g., blood, body fluids); otherwise, an alcohol-based hand rub may be used

Key Recommendations for RESPIRATORY HYGIENE/COUGH ETIQUETTE in Dental Settings

1. Post signs at entrances with instructions to patients with symptoms of respiratory infection to— i. Cover their mouths/noses when coughing or sneezing. ii. Use and dispose of tissues. iii. Perform hand hygiene after hands have been in contact with respiratory secretions.iv. Offer masks to coughing patients and other symptomatic persons when they enter the dental setting.

2. Educate DHCP on the importance of infection prevention measures to contain respiratory secretions to prevent the spread of respiratory pathogens when examining and caring for patients with signs and symptoms of a respiratory infection.

Key Recommendations for DENTAL UNIT WATER QUALITY in Dental Settings

1. Use water that meets EPA regulatory standards for drinking water (i.e., ≤ 500 CFU/mL of heterotrophic water bacteria) for routine dental treatment output water.
2. Follow recommendations for monitoring water quality provided by the manufacturer of the unit or waterline treatment product.
3. Use sterile saline or sterile water as a coolant/irrigant when performing surgical procedures.

EQUIPMENT STERILIZATION

Equipment sterilization is vital in dental office infection control. Various equipment is usually handled differently, depending on how it is used. Some equipment makes contact with teeth, gums, or broken skin.

Generally, speaking equipments should be sterilised using either of the following:

- Steam under pressure
- Chemical vapor
- Dry heat

In addition to sterilizing and disinfecting,equipments should be stored properly. Keep dental instruments in a clean area where they can't become contaminated during procedures or other activities. Control the temperature and humidity in the storage room.

CLEANING AND DISINFECTION PRACTICES

Cleaning and disinfecting environmental surfaces is an excellent way to ensure good hygiene. The appropriate staff should clean before disinfecting.Use low-level or intermediate-level disinfectants to clean clinical contact surfaces.

PROTECTIVE GEAR

Dental care providers come in contact with a variety of bacteria and viruses. Taking proper precautions helps prevent the transfer of these harmful agents. One of the precautions involves wearing personal protective equipment (PPE). They prevent the spread of microorganisms. There are different personal protective equipment that dental care providers should use to keep themselves and their patients healthy.

Examples are face shields, eyewear, face masks, and gloves. Protective clothing like lab coats and disposable gowns are also PPE. Use the appropriate PPE based on standard precautions to protect yourself and your patients.

DENTAL STAFF TRAINING

Dental healthcare personnel should receive training on infection prevention. Facilities should offer training on hygiene to new staff members. They should also train everyone annually, making sure to follow government regulations such as the bloodborne pathogen standard.

DENTAL STAFF IMMUNIZATION

Dental healthcare personnel deal with many patients daily. Some patients, who are carriers of infectious diseases, place healthcare providers at risk.It's advisable to receive vaccinations against certain diseases which include hepatitis B, tetanus, diphtheria, and pertussis. Staff should also receive immunizations for measles, mumps, rubella, chickenpox and annual influenza vaccination.Dental care facilities should screen new hires for tuberculosis.

INFECTIONCONTROLINOUTPATIENTSETTINGS

Preventing infections is a top priority in all healthcare settings.To ensure good infection control practices, we must ensure the availability of suitable equipment and supplies required for consistently adhering to Standard Precautions, such as hand hygiene products, injection equipment, and personal protective gear like gloves, gowns, and face and eye protection.

Educate andTrainHealthcareWorkers

Infection prevention education and training should be provided to all HCWs for preventing the transmission of infections. This training should cover HCP safety, including compliance with OSHA blood-borne pathogens standards, as well as patient safety, with an emphasis on job-specific or task-specific requirements..

AdheretoStandardPrecautions

HCWs must follow the standard precautions all the time, which are the minimum infection prevention practices that apply to all patient care, regardlessofsuspectedorconfirmedinfectionstatusofthepatient,inany setting where healthcare is delivered.

Hand hygiene: Measures to improve compliance include product availability, visual displays such as posters in all important places, dedicated staff to encourage and educate patient and their caregivers about hand hygiene, educating HCWs on the indications of hand hygiene(WHO's five moment), and hand hygiene technique, conducting hand hygiene audits regularly and providing feedback to the HCWs.

Provide dispensers of alcohol-based hand rub, or sinks with soap and disposable towels for hand washing.

Personal protective equipment: Measures include product availability, educatingHWsaboutindications,techniqueofPPEuseandthesequence of PPE donning and doffing.

Injection safety: Includes practices intended to prevent transmission of infectious diseases between one patient administration of parenteral medications.

Environmentalcleaning: Cleaningofsurfaces,floor,ceiling,windowsand doors should be carried out according into the standard housekeeping policy of the hospital.

Disinfectionofmedicaldevices: Thedisinfectionofmedicaldevicesand instruments must be carried out according to Spaulding's classification. Critical, semi-critical and noncritical items should be disinfected by using appropriate disinfectants such as high-level, intermediate-level and low- level disinfectant respectively.

Respiratory hygiene/cough etiquette:refers to infection control measures implemented at the first point of contact of patients with respiratory symptoms. Visual sign boards should be placed at OPD entrancesregardingawarenessofself-reportingofrespiratorysymptoms

and signs describing respiratory hygiene/cough etiquette like covering mouth and nose while coughing/sneezing, using tissues etc.

Patient triage and placement: Triage policy refers to separation of infectious patients from others when they arrive at the facility.

Respiratory triage: Separating the patients with common respiratory symptoms at the entrance, and making them sit in a separate waiting areas, separate queue, and examination room.

Triagingrashandfeverpatientsimmediatelytoa"rashroom"andkeeping them confined there until the clinical diagnosis is clarified.

Respiratory OPD: In a consultation room with natural ventilation, the seating arrangement for patient and doctor should be made in such that doctorshouldsitawayfromthedirectionofnaturalairflow,thushaslesser riskofexposure. SputumcollectioninrespiratoryOPDshouldbedonein open well-ventilated area or in sputum collection booth.

Laundry: AnytypeoflinengeneratedinOPDafteruseisconsideredas contaminated and should be processed appropriately.

Waste management: Waste segregation and disposal should be according to BMW 2016.

Transmission-basedPrecautions

Certain syndromes, such as diarrhea, febrile respiratory illness, and febrilerash,oftenpresentdiagnosticchallengesinoutpatientsettingsand requirecarefultriage.Thesesyndromesmaylaterbediagnosedasspecific diseases,suchastuberculosisforrespiratoryillnessormeaslesforrashes. Asaresult,it'sessentialtorecognizethesesyndromesearlyand implement appropriatetransmission-basedprecautions whennecessary. However, most outpatient settings lack the infrastructure to fully implement all practices associated with transmission-based precautions, suchashavingisolationroomsfordropletprecautionsornegative pressure rooms for airborne precautions.

Facilities should establish and enforce protocols for promptly identifying potentially infectious patients upon their initial arrival at the facility. This allowsfortheimmediateinitiationofimplementabletransmission-based

precautions,suchasprovidingappropriatepersonalprotectiveequipment (PPE),including N95masks,aswellasplanningforpatient placement in isolation rooms following inpatient admission.

StaffHealth

All staff, especially those regularly interacting with patients with specific infections like tuberculosis, should promptly seek medical evaluation if they develop symptoms consistent with those infections. Additionally, staff should adhere to vaccination policies set by the institution, whichtypicallyincludereceivingvaccinationsagainsthepatitis B,annualinfluenza,measles,rubella,andvaricellatominimizetheriskof infection transmission.

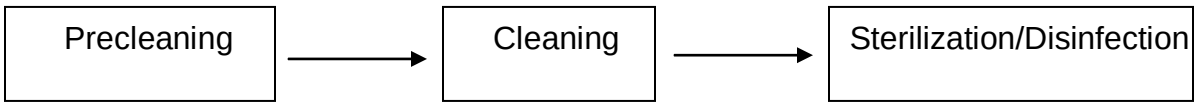
5 Cleaning, Sterilization and Disinfection

The decontamination of hospital environment and medical care items is of paramount importance in preventing transmission of HCAI. Disinfection and sterilization are essential for ensuring that medical and surgical instruments do not transmit infectious pathogens to patients.

Cleaning: It is the removal of contaminates e.g. soil, organic matter and large number of micro**o**rganisms. Cleaning is a useful and essential prerequisite to any sterilization or disinfection procedure.

Disinfection: It is the destruction of most forms of micro-organisms but not usually of bacterial spores thus reducing them to a level that is not harmful to health.

Sterilization: A (closely monitored) validated process used to render a product free of all forms of viable organisms including all bacterial endospores. Prior to any reprocessing (sterilization/disinfection), all instruments and equipment MUST be thoroughly cleaned.



Instrument/ medical device cleaning process:

It involves

1) Precleaning of the device at the point of use

2) Cleaning in Central sterile and supply department(CSSD)

Precleaning of the device:

It is carried out at the source where the device is used. It involves:

a) Removing of gross soil from instrument by wiping with a damp clean dry cloth

b) Soaking the instrument in enzymatic solution. Disinfectant solution (e.g. chlorine) should not be used as it may damage the instrument or may not be active in the presence of organic material such as blood present on instrument surfaces.

c) The instrument should be covered with a moist towel with water (not saline) or foam, spray or gel specifically intended for this purpose.

d) The containers with instruments should not be transported with water as it may cause splash.

e)

f) Cleaning of the device:

g) It refers to the removal of visible soil, organic and inorganic material from objects and surfaces. It is done in CSSD. 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. Physical cleaning reduces microbial load sufficiently to allow the process of sterilization or HLD to be effective. There are four main methods used for cleaning of instruments and equipment:

h)

i) Manual cleaning

j) 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:

k) Wear personal protective equipment (plastic apron, thick rubber gloves, eye protection, surgical mask and/or face shield)

l) Take instruments apart and fully immerse instruments in sink or basin containing warm water with appropriate dilution of detergent (biodegradable, non-corrosive, nonabrasive, low foaming).

m)

n) Use soft bristle brushes to clean the lumen of instruments. Thermally disinfect and dry the brushes at the end of the day.

o) Immerse the instrument again in another sink or basin in clean purified water to rinse thoroughly.

p) Devices can then be dried mechanically or air dried or hand dried using a disposable clean, non-lint cloth. Drying is important to prevent microbial growth and dilution of chemical disinfectant, which may otherwise render them ineffective,

q) Inspect to ensure the instrument is clean r)

s)

t) Enzymatic cleaners

u) Used for fibreoptic instruments and accessories and other items those are difficult to clean. Enzymatic cleaners are not disinfectants, but they only break down proteinaceous matter present on the equipment. These products are hazardous and care should be taken when in contact with them. Rubber or nitrile gloves are recommended when handling enzymatic solutions as they degrade latex gloves.

v)

w) Ultrasonic cleaners and automated washers

x) Ultrasonic cleaners and automated washers are recommended for cleaning hard to reach parts of surgical instruments such as boxlocks, serrations, hinges, joints, crevices and lumens. Using an automated washer will cut down on the handling of the contaminated instruments. But for ultrasonic cleaners, precleaning is mandatory. These cleaners must be compliant with national guidelines and standards and must be used according to the manufacturers' instructions. They do not disinfect the instruments. By causing high frequency, high-energy soundwaves to hit the instrument/equipment the soiling matter drops off the instrument or becomes easy to remove during the rinsing process. Validation of the machines has to be done every year.

The items after decontamination/cleaning are collected at the IAP (inspection, assembly, packaging) area where they are thoroughly inspected, assembled and wrapped in appropriate packaging material so that they can be sent for sterilization.

STERILISATION

Sterilization is defined as a process where all microbes are removed from a defined object, inclusive of bacterial endospores**.**

Methods:

1) **Heat Sterilization:**

a) **Moist Heat:** Exposure to saturated steam at 121ºC for 15-20 min OR 134ºC for 4 min in any autoclave.

b) **Dry Heat:** Exposure to dry heat at 160ºC for 120 min.

2) **Chemical Sterilization: Ethylene oxide (ETO):**

a) Use to sterilize items that are moisture or heat sensitive.

b) Essential parameters of ETO sterilization includes:

- ✓ Temperature – Should be 37-63°C
- ✓ Exposure time – 1-6 hours
- ✓ Relative humidity- 40-80%
- ✓ Gas concentration- 450-1,2000 mg/L

3) **Low temperature Sterilization**

- ➢ Plasma sterilizer using per acetic acid or hydrogen peroxide. It is used for sterilization of materials and devices that cannot tolerate high temperature and humidity. Such as plastics, electrical devices and corrosion-susceptible metal alloys

Packing & Loading

All items must be dried before packing. For effective sterilization, selection of packaging material plays important role. The following are keys in selecting a suitable packaging material.

1) The packaging material must be permeable to sterilizing agent.
2) The packaging material must be impermeable to bacteria and other contaminants.
3) The packaging material must resist tears and punctures.
4) It should facilitate aseptic presentation of packaged content.

Precautions during loading:

Proper loading of material inside sterilizer is very critical for efficient sterilization.

1) When loading sterilizer there should be space between item to facilitate circulation and penetration of sterilant.
2) There should be no contact between items and chamber wall.
3) In mixed load linen should be kept on top racks and metal on bottom.
4) Lighter items should be placed on top and heavier items on bottom shelf.

5) Surgical instrument trays should be placed flat on the sterilizer shelf.
6) Overloading of sterilizer should be avoided.
7) Textile packs should be positioned with the layers perpendicular to the shelf
8) Al the packs should be labeled properly:
   a) Date of sterilization and expiry date
   b) Name of product, wrapper and sterilizer
   c) Load number and operator name
   d) Package contents
   e) Initials of employee who prepared package

Monitoring of Autoclaves and ETO:

1) Biological indicators: Spores of *Geobacillus stearothermophilus* and spores of *Bacillus atrophaeus* for autoclave/ plasma sterilizer and ETO respectively. These should be used weekly to monitor the effectiveness of sterilization.
2) Chemical indicators: Bowie Dick tapes may be used.
3) Physical indicators: Digital displays on the equipment displaying temperature, time and pressure.

Disinfection

Disinfection is a process where most microbes are removed from defined object or surface except bacterial spores**.**High level disinfectionis that which kills all micro-oganisms and high number of bacterial spores as well. Disinfection is used to destroy organisms present on delicate or heat-sensitive instruments which cannot be sterilized or when single use items are not available.
Disinfection is not a sterilizing process and must not be used as a convenient substitute for sterilization.

Classification of Disinfectants

1) Chemical sterilant: They destroy all microorganisms including vegetative bacteria, bacterial spores, fungi and viruses including enteroviruses and mycobacterium tuberculosis.
Examples:

a) ≥2.4% glutaraldehyde based formulation
b) 0.95% glutaraldehyde with 1.64% phenol/phenate
c) 7.5%stabilized H_2O_2, 7.35% H_2O_2 with 0.23% peracetic acid
d) 0.2% peracetic acid and 0.08% peracetic acid with1.0% H_2O_2

2) High Level Disinfectants (HLD):
They destroy all microorganisms including vegetative bacteria, most bacterial spores, fungi and viruses including enteroviruses and mycobacterium tuberculosis except some bacterial
spores.
Example
s:

a) 2% Glutaraldehyde, orthophthaldehyde
b) Ethylene Oxide
c) Hydrogen peroxide

3) Intermediate Level Disinfectants:
They destroy vegetative bacteria, Mycobacterium tuberculosis, most viruses e.g. entero viruses and fungi but not bacterial spores.
Examples:

a) Ethyl/Isopropyl alcohol (70%-90%)
b) Sodium hypochlorite (5.25%-6.15%)
c) Chlorhexidine
d) Iodophores, phenolic solutions

4) Low Level Disinfectents:
They destroy most vegetative bacteria, fungi and enveloped virus e.g. HIV but will not kill bacterial spores, Mycobacteria and non enveloped viruses like enterovirus.
Examples:

a) Quaternary ammonium compounds like benzylkonium chloride

The major disinfectants that are available and guidelines for their use are given

below: Table:

Name of Disinfectant	Method of Dilution	Contact Time	In Use Span/ Use
Aldehyde Solutions:			
a. Glutaraldehyde (2%)	Add activator powder / liquid to the liquid in 5 liter jar and use undiluted	Disinfection:20- 30mins Sterilization: 10 hours	14 days used for heat sensitive instruments e.g. Endoscopes
b. OPA (orthophthalyl aldehyde)	Same as above	Same as above	Long acting (28 days)

c. Glutaraldehyde + Formaldehyde + Benzylchloride	water 1 part : 49parts (20 ml + 980ml)	Disinfection: 15 min Sterilization: 5 hours , 30min	24 hours Used as surface disinfectant or 2% solution in operation theaters and 0.5% in wards, dressing room. Can be used in a low pressure sprayer.

(Glutaraldehyde +formaldehyde)	water 1 part : 9 parts (10 ml + 990 ml)	Disinfection: 1 5 min Sterilization: 5 hour, 30 min	14 days (used for instrument sterilization)
6% Hydrogen Peroxide (Available as 30% stabilizedsolution)	20 ml H_2O_2 + 80 ml normal saline =6% H_2O_2(use freshly prepared)	6-8 minutes	Use immediately after preparation for surgical dressings.
1% Sodium Hypochlorite Ex. : Polar Bleach 5% Polar Bleach 10%	**5%:** 80 ml water + 20 ml bleach to make it 1% solution. **10%:**90mlwater+ 10 ml bleach	20-30 minutes	8 hours Used for blood spills and laboratory decontamination
Calcium hypochlorite Ex. : Bleaching powder (70 % available chlorine)	1.4 gms / liter of water for visibly contaminated articles	20-30 min.	24 hours Disinfection of toilets, bathrooms and may be used if liquid bleach not available
Formaldehyde (40%) Ex. :Formalin	Ready to use	30 minutes Then open the area after 6 hours	No longer Recommended for fumigation.
70% Alcohol	Do not dilute	2-5 minutes	24 hours used for surface disinfection
Chlorhexidine(2%)w/v 4% Chlorhexidine w/v	Ready to use	2-3 minutes	2%:Upto 6-8 hours for disinfection of hands 4%: Used before a procedure.
Povidine Iodine 10%	Ready to use	Allowed to dry	For skin preparation before surgery

1% Triclosan	Ready to use	Antiseptic soap or bathing liquid	For MRSA (Methicillin resistant Staphylococcus aureus)
2 propanol -1 propanol, macetroniumethyl sulfate	Ready to use	30 seconds	Hand rub
Stabilized H_2O_2 11%	10 % w/v solution	60minutes	Surface disinfection

w/v with 0.01% w/v diluted silver nitrate solution	20% w/v solution	60minutes	For fogging*

General Guidelines for selection of disinfectants

The approach to disinfection or sterilization is based on the classification which categorizes instruments or items into critical, semi-critical or non critical based on the intended use and the potential for risk of transmission of infection if the instrument was microbiologically contaminated before use.

Spaulding's classification of medical devices

Medical device	**Definition**	**Examples**	**Recommended sterilization/ disinfection**
Critical device (high risk)	Items that are involved with a break in skin/ penetrating skin or mucous membrane or enter sterile tissue or vascular system	Surgical instruments, cardiac and urinary catheters, implants, eye and dental instruments, invasive rigid endoscopes, ultrasound probes used in sterile body cavities	**Sterilization Physical/ Chemical steriliant**
Semi-critical device (intermediate risk)	Items that are in contact with mucous membrane without penetration or skin that is not intact or body fluids	Respiratory therapy equipment, anaesthesia equipment, noninvasive flexible endoscopes, laryngoscope, rectal/vaginal/oesophageal probes, cystoscopes, diaphragm fitting rings	**High level disinfectant**
Non-critical device (low risk)	Items in contact with intact skin	**Noncritical patient items:** BP cuff, ECG electrodes, bedpans, crutches, stethoscope, thermometer. **Noncritical environmental surfaces** of medical equipments, computer bed rails, some food utensils, bedside tables,	**Low level disinfectant**

		patient furniture and floors.	

Decontaminaton/Disinfection/Sterilization for individual items or equipments

Items	Standard procedure	Comments
Airways and endotracheal tubes.	Clean with soap and water and Steam sterilization (CSSD) or use disposable.	For heat sensitive tubes use manufactuer's instructions.
Ambu –masks	Single use – disposable or High Level Disinfection.	
Ambubag	Should be cleaned with detergent and water, dried and sterilized.	
Ampoules/vials	Neck of vial or rubber top should be wiped with 70% isopropyl alcohol and allowed to dry before opening or piercing	Do not immerse ampoules/vials in disinfectant solution
Auroscope tip	Use single use disposable tips. If reusable tipsare used then clean with an alcohol swab or send to CSSD for sterilization Remove wax if any by cleaning with detergent and warm water	
Arterial catheters	Sterile, single use only, must be discarded after use.	
Baby's feeding bottles & teats	1. Disposable – single use. 2. Re-usable – should be returned to CSSD for heat treatment or washed in hot detergent and water, rinsed and immersed in hypochlorite solution freshly made up from tablets according to manufacturer's instructions.	Chemical disinfectants must be used only when other methods unavailable

Baby weighing scales	A fresh liner should be used for each baby. Clean tray as necessary with detergent and water.	If contaminated should be wiped with hypochlorite 1000ppm after washing.
Baby chair/Shower chair	Should be cleaned after each use with detergent and	If disinfection is required, nonabrasive hypochlorite or

	water.	detergent cream can be used
Bowls (surgical)	Primary wash and return to CSSD	
Bowls (Washing)	Wash with detergent and water and decontaminate with 1% Hypochlorite solution/ bleaching solution, rinse and dry after each use. Store inverted and separated.	For colonized/infected patients: heat disinfect in a washer/disinfector (80: C for I min)
Breast pump	Should be washed with detergent and water, immersed in sodium hypochlorite, freshly made up from tablets according to manufacturer's instructions. Heat sterilize before use by subsequent patients	
Cardiac and urinary catheter	Use sterile singe use disposable items only	
Cardiac monitors , defibrillators, and ECG	Use single use, disposable ECG pads. Clean and disinfect ECG leads and machines with 70% alcohol	
Carpets	Vaccum daily	Should be shampooed or steam cleaned in isolation rooms as part of terminal cleans.
Cheatle foreceps	If used, autoclave daily and store in sterile container. Use separate dressing packs for dressing	
Curtains	Should be changed as part of a rolling program by domestic services.	Should be changed as part of terminal clean

Endotracheal tubes	Single use only or heat sterilize in CSSD	
Endoscopes	Refer to endoscopy reprocessing session	

Hemodialysis machine	Thoroughly clean between patients and disinfect at the end of the day	For colonized or infected patients: after cleaning with detergent, disinfect with hypochlorite solution. Peracetic acid and glutaraldehyde may also be used.
Humidifiers	Should be cleaned and sterilized at low temp. (ETO) • Drain atleast once each day, clean with detergent and water • Refill with sterile water and label the humidifiers • Humidifiers which are not in use must be cleaned and kept dry.	
Infant incubators	Daily wash with water and detergent and dry with disposable wipes	Colonized patients or infected patients: after cleaning, wipe with 70% isopropyl alcohol. When baby is discharged, dismantle incubator and wash all removable parts and clean with detergent and then disinfect with hypochlorite solution and allowed to dry
Laryngoscope blade	Clean the blade thoroughly with detergent and water. Dry and , wipe with 70% isopropyl alcohol	Colonized/ infected patients/ visible blood contamination: send to CSD for further sterilization
Medicine trays	To be cleaned with detergent and water weekly	
Nebulizer	Clean and sterilize between patients or use high level disinfectants	
Oxygen tubings and masks	Single use only	

Proctoscope	Disposable- singl e use.reusable to be rinsed in hypochlorite and return to CSSD	

Pulse oximeter	Clean with detergent wipe. If thorough cleaning required, follow manufacturer s instructions	Do not use alcohol based products on the probe
Razor (electronic)	Detach head, clean thoroughly and immerse in 70% isopropyl alcohol for 10 min, remove and allow to dry between each patient	
Rubber or polyethylene tubing and catheters, lensed or hinged instruments	For sterilization: heat sterilization (steam or hot air) or ethylene oxide or hydrogen oxide gas plasma, peracetic acid For high level disinfection: Glutraldehyde (≥2%) or OPA (0.55%) or hydrogen peroxide (7.5%).	
Scissors	Surface disinfect with a 70% alcohol impregnated wipe before use. If visibly soiled, clean first with a detergent solution.	
Soap dispensers	Should be cleaned weekly with detergent and water and dried	
Sphygmomanometer cuffs	Use dedicated items in high risk areas (e.g. ICUs) or patients known to be infected or colonized. Wash sleeves with soap and water once a week. In between patients: Disinfect tubing and inflation bladder with 70% isopropyl alcohol	

Stethoscopes	Use dedicated stethoscopes in high risk areas. Wipe the bell and chest piece with 70% alcohol between patients	
Suction bottles	Disposable: seal when 75% full and place in yellow plastic	If filters used, then must be replaced between each

	bags. Tubings should always be single use. Reusable (jar and tubings) should be cleaned with 1% sodium hypochlorite and dried.	patient use.
Surgical instruments	Soak in an enzymatic solution. Transport safely in a closed rigid container to CSSD for sterilization.	
Thermometers	Oral single patient use: clean with 70% isopropyl alcohol after each use and store dry. In between patient use: wash in cold neutral detergent, rinse, dry and immerse in 70% isopropyl alcohol for 10 min and store dry	
Tonometer prisms	Immerse in 0.5% hypochlorite for 10 min. Alternatively 70% alcohol wipes can be used. Rinse thoroughly and dry before use.	
Trolleys (Dressing)	Clean and wipe with 70% isopropyl alcohol. If contaminated, clean with detergent and then disinfect with 70%isopropyl alcohol.	
Ultrasound machine	Damp dust with detergent solution and allow surface to dry before use. If contaminated, clean with detergent and then disinfect with 70%isopropyl alcohol	
Vaginal specula and vaginal dilators	After use, immerse in hypochlorite for 15- 30 min and then sterilize	

Ventilator breathing circuit	Single use is preferred or sterilization in CSSD For infected patients, use disposable tubings. Never use glutaraldehyde to disinfect	

	respiratory equipment	
Ventilators	After every patient, clean and disinfect with high level disinfectant	
Wheel chair	Clean between patients with detergent and water, rinse and dry	

Processing of Endoscopes:

Endoscopes belong to the semi critical category of medical devices. They are heat sensitive, therefore cannot be processed by steam sterilization, but by chemical disinfection. HLD/ steriliant approved by FDA for endoscopes include 2% glutaraldehyde, ortho-phthaldehyde, 7.5% hydrogen peroxide. 0.2% peracetic acid and ethylene oxide,

1) Precleaning:
    a) Flush the air/water channel with enzymatic detergent.
    b) Remove all reusable and removable components from the scope and soak in enzymatic detergent.
    c) Fully immerse endoscope in enzymatic detergent in dedicated basin and clean exterior with soft lint free cloth.
    d) Fully immerse endoscope and its components in clean water and rinse all channels with clean tap water.
    e) Purge all endoscopes with air to ensure removal of water.
2) High-level disinfection:
    a) Fully immerse endoscope in HLD or steriliant in dedicated basin.
    b) Fill all channels with HLD or steriliant and wipe the endoscope with a soft lint- free cloth to remove any bubbles on the surface of the endoscope.
    c) Purge all channels with air to ensure removal of all HLD or steriliant from the endoscope.
3) Drying and storing:
    a) Fully immerse the endoscope in dedicated basin filled with water.
    b) Rinse all channels with rinse water.
    c) Remove endoscope from water and purge all channels with air.
    d) Wipe the exterior surfaces with alcohol moistened soft lint free cloth.
    e) Store uncoiled endoscope in hanging vertical position and all detachable and reusable parts separately.

Disinfection of HBV, HCV, HIV or TB contaminated devices

CDC recommends use of high-level disinfectant (HLD) for HBV, HCV, HIV or T.B contaminated devices.

6. SPILLAGE MANAGEMENT

Spills include blood, body fluids, chemicals and mercury spillage. It is vital that any spillage must be attended to as soon as possible. Blood spills pose risk of infection (e.g. HIV, HBV, HCV) to the staff, visitors and patients. Chemical and mercury spills are associated with various chemical hazards and neurotoxicity respectively.

Spill management of blood:

Spill kit: Must be readily available in high risk areas like laboratory, sample collection room, wards, labor rooms, OT and ICU. It must be immediately replenished and stored at the original location after every use. It consists of:

1) PPE: gloves, apron, mask, shoe-cover and eye-protector.
2) Absorbent material like newspaper/ blotting paper.
3) Waste collection plastic bag.
4) Disposable foreceps/ plastic scoop/ two cardboard pieces.
5) Mops for spills.
6) Signage board for no entry.





In case if spillage comes in contact with skin, mucous membrane, eyes or open wounds; first step is to irrigate continuously and then to follow appropriate first aid measures as described in Chapter 7

Do not pick up sharps even with gloved hands. Management depends on the size of spillage:

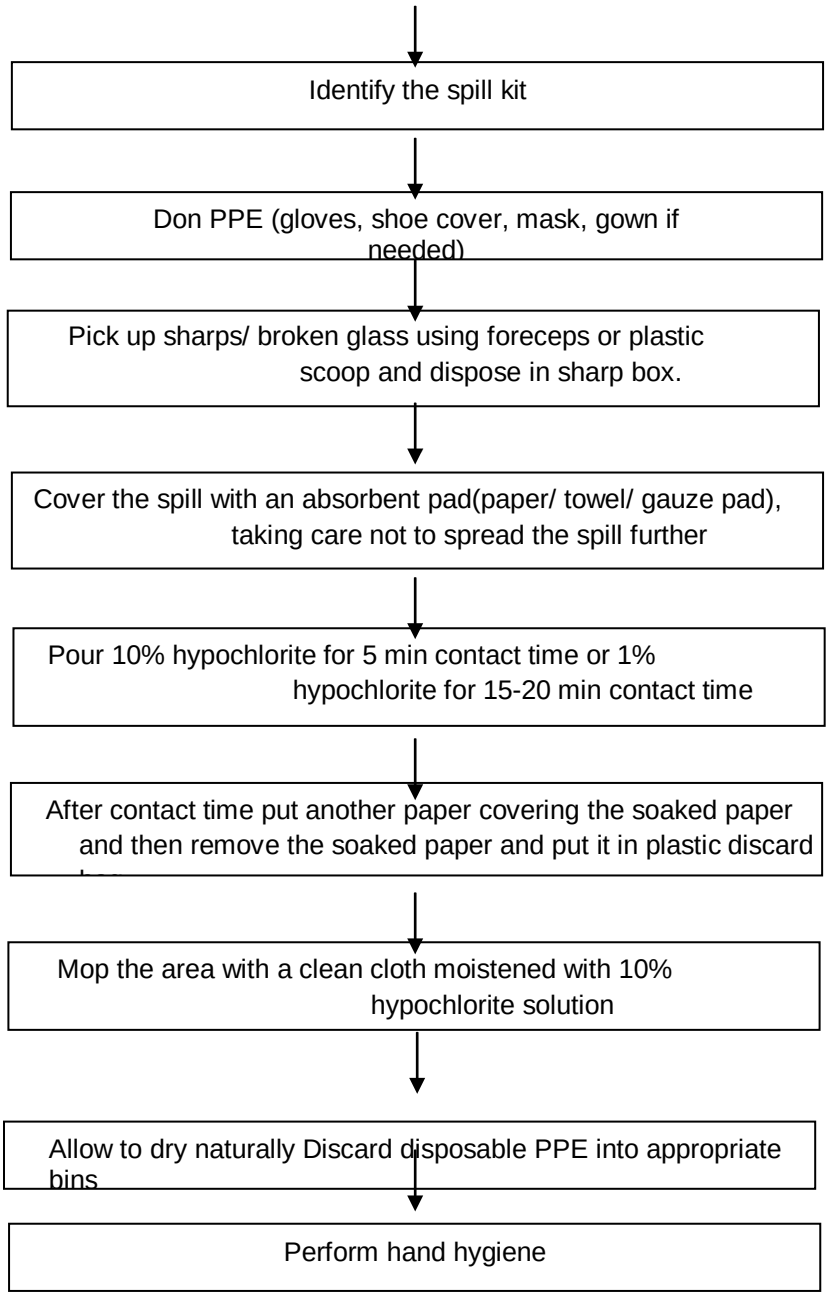
Small volumes (up to 10 cm/ few drops/ spot) of blood spill: Flowchart 1

Cordon off the area

Identify the spill kit

Large volumes (>10cm) of blood spill: Flowchart 2

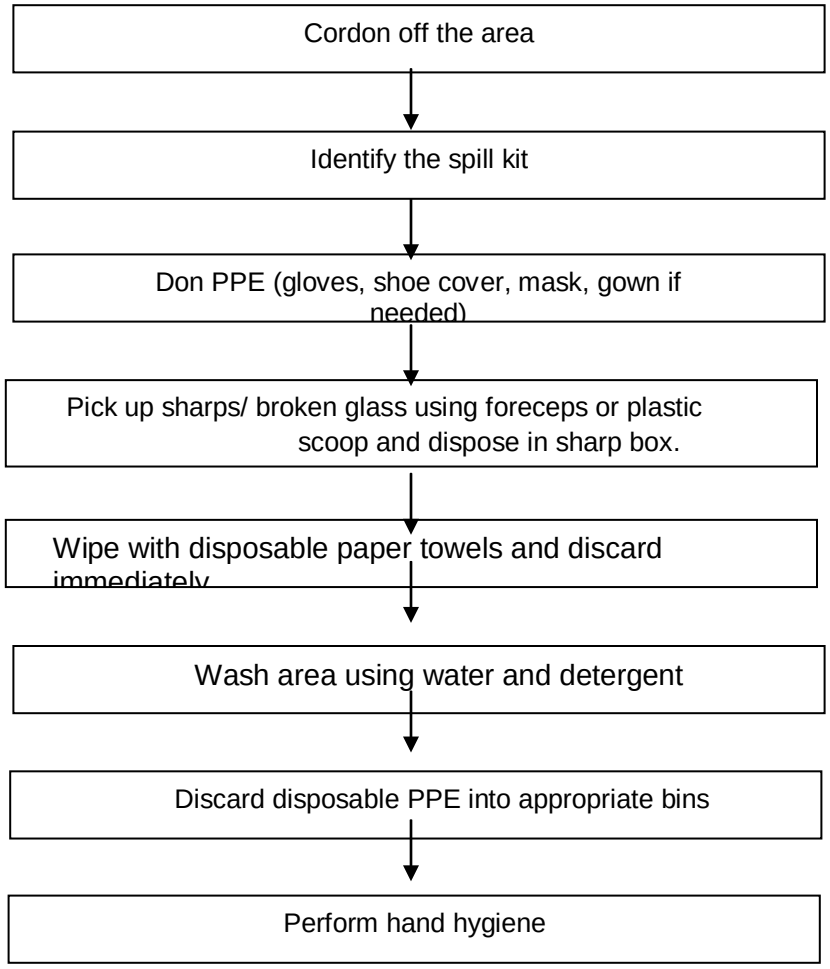
Cordon off the area



Spill management of body fluids (feces/ vomitus/pus/sputum) contaminated with blood:

Same protocol as for blood management is to be followed except that when organic matter (feces) is present, first absorb the spillage using paper towels, and then clean with the detergent and water before applying disinfectant (sodium hypochlorite).

Spill management of Body Fluids not visibly contaminated with Blood: Flowchart 3

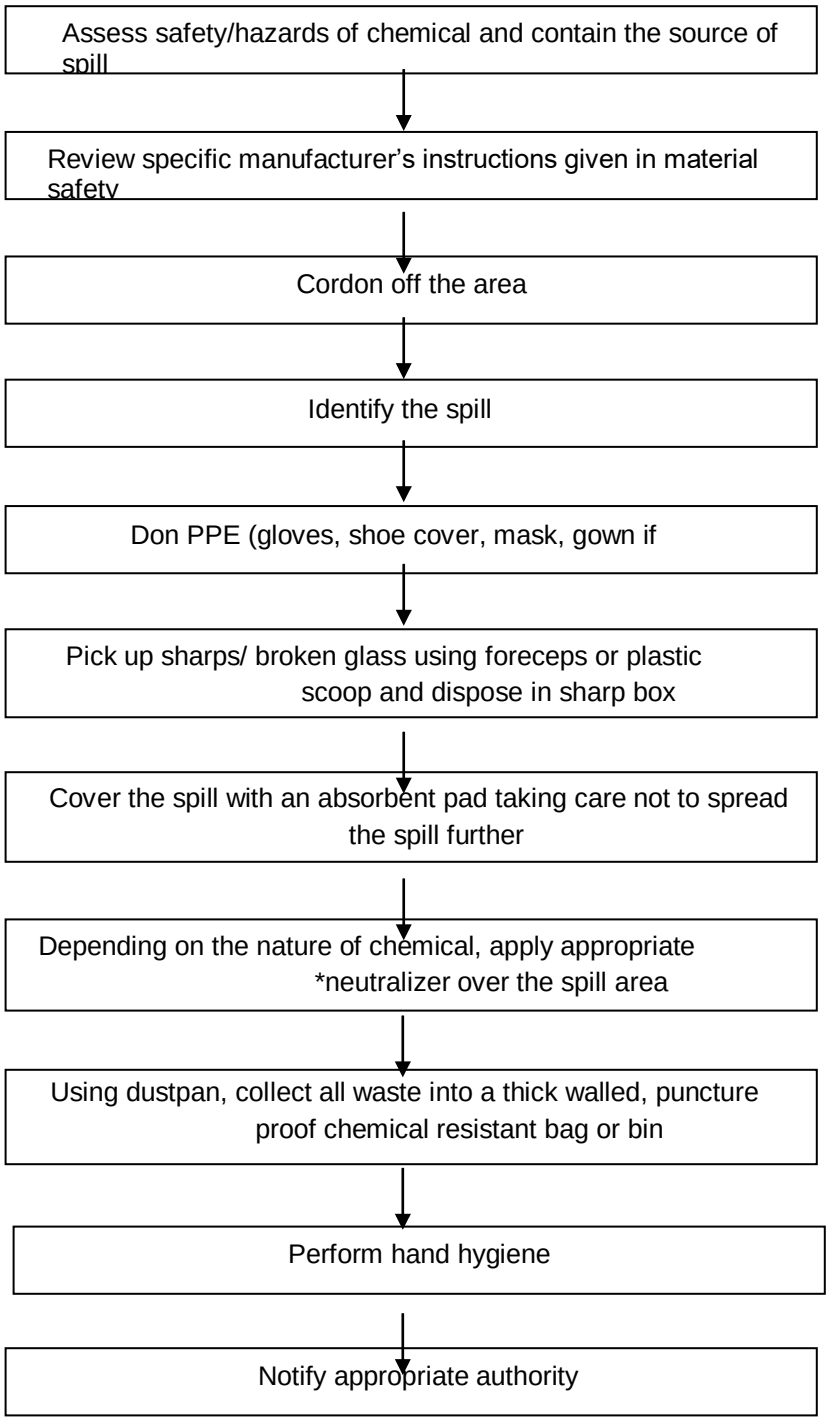


Spillage management of chemicals:

Spill kit for chemicals: it should be readily accessible in relevant locations at the hospital. It consists of:

1. Absorbant pads
2. Chemical neutralizers for various chemicals
3. PPEs: chemical resistant safety gloves (i.e, nitrite gloves), safety goggles, apron, footwear, shoecovers, dust masks, respirators.
4. Clean-up material for spills:
   a) Brooms, plastic dustpans, plastic tongs or scoops

b) Chemical resistant bin with a close fitting lid
c) Heavy duty plastic bags for wrapping contaminated PPE.

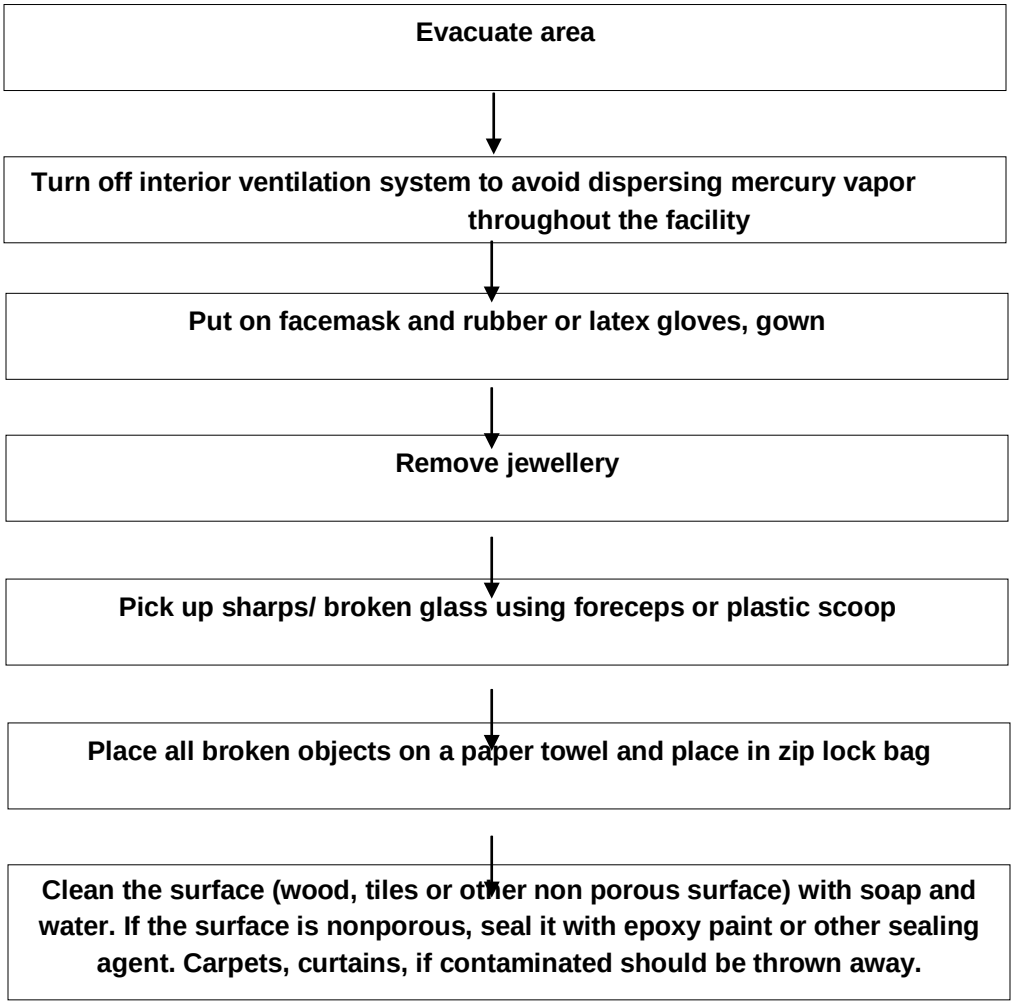


***Neutralizers for various chemicals:**

Depending upon the nature of the chemical, the appropriate neutralizer can be appliedover the spill area to neutralize the chemical.

1) **Universal spill absorbent: [1:1:1 mixture of Flor-Dri(or unscented kitty litter), sodium bicarbonate and sand]. This all-purpose absorbent is good for most chemical spills including solvents, bases and acids (with the exception of hydrofluoric acid)**
2) **Acid spill neutralizer: Sodium bicarbonate, sodium carbonate or calcium carbonate**
3) **Alkali spill neutralizer: Sodium bisulfate, boric acid or oxalic acid**
4) **Solvent or organic liquid absorbent: Inert absorbant such as clay and sand**

Spillage management of mercury:



7. Needle stick Injury management

1. A **needle stick injury (NSI)** is the penetration of skin by a needle or other sharp object, which was in contact with blood, tissue, or other body fluid before the exposure, commonly encountered by people handling needles in the medical setting.
2. The most common blood borne pathogens transmitted with NSIs are hepatitis B virus (HBV), hepatitis C virus (HCV) and HIV. The risk of transmission following NSI is highest for HBV (9-30%) followed by HCV (1-1.8%) & HIV (0.3%).
3. In addition to blood and visibly bloody body fluids, the following fluids are also considered potentially infectious: semen, vaginal secretions, cerebrospinal fluid, synovial fluid, pleural fluid, peritoneal fluid, pericardial fluid, and amniotic fluid. Faeces, nasal secretions, saliva, sputum, sweat, tears, urine, and vomitus are not considered potentially infectious unless they are visibly bloody.
4. CDC estimates that blood/blood products are involved in 79% of NSIs whereas other body fluids are involved in 21% of NSIs.In India, incidence of NSI in HCW ranges from 40% to80% and is mostly seen among nurses and doctors.

Steps to prevent NSI

1) Handwashing before and after performing all medical procedures.
2) Sharp disposal:
    a. Use of special containers for sharp segregation.
    b. Use of needle cutter/destroyers.
3) Use of forceps instead of fingers for guiding sutures.
4) Use of vacutainers for sample collection.
5) Safe decontamination of instruments.
6) Work surfaces must be disinfected with 1% sodium hypochlorite solution.
7) Use of PPE whenever indicated, to prevent direct contact with blood ad body fluids such as gloves, masks, goggles, aprons and boots.
8) Any wound (cut/abrasion) if present, must be covered before providing care to the patient.
9) HCWs must be immunized against hepatitis B and be checked for anti-HBs antibody titre (>10mIU is considered protective).
10) Spillage of blood and other body fluids must be promptly cleaned and surface disinfected with 10% sodium hypochlorite solution.
11) Single use disposable needles should be used.
12) Needles should never be recapped.

13) Needles must be disposed into the sharp box immediately after use. They should never be left on trolleys and bedside tables.

Steps of Post-exposure prophylaxis:

Step 1: Management to exposure site – first aid

- Do not panic
- Remove gloves
- Do not place the pricked finger into the mouth reflexively
- Do not squeeze blood from wound
- Wash the injured area with soap and water for 40- 60 seconds
- Do not use bleach, alcohol, iodine, antiseptic, detergent, etc.
- In case of mucosal exposure, wash the exposed site copiously with water or normal saline for 5 minutes.
- For eye, immediately irrigate the exposed eye thoroughly with water or normal saline. If wearing contact lenses, leave them in place while irrigating.
- Once the eye is cleaned, remove the contact lens and clean them in a normal manner.
- For mouth splash, spit fluid out immediately, if gone into mouth then rinse the mouth several times using water or saline.

Step 2: Immediate reporting to your supervisor

Prompt reporting of injuries is necessary so that a risk assessment can be carried out urgently by anappropriately trained individual who is familiar with the local management protocol.

Step 3: Take first dose of PEP for HIV

Effect is maximum if taken less than 2 hrs and minimum if taken in more than 72 hrs. NACO recommends single tablet of TL (Tenofovir 300mg plus Lamuvidine 300mg)

If source HIV report is documented negative, then the first dose is not recommended. If HIV report of source is not available, then first dose should not be delayed.

Step 4: Laboratory Evaluation of both exposed person and source patient (Done at Room No 323,329 at Deptt. Of Microbiology)

For Source patient:

- Combined HIV antigen and antibody (HIV Ag/Ab)
- Hepatitis B surface antigen (HBs Ag)
- Hepatitis C antibody (Anti-HCV)
- Testing for HCV RNA or antigen should also be considered if source patient is at high risk for HCV.

This is because anti-HCV may be negative during acute infection and may remain negative for more than 12 months in immunocompromised patients.

For exposed HCW:

If the hepatitis B virus immunity status of the exposed is not already known, a baseline sample should be tested for anti-hepatitis B surface antibody (Anti-HBs) to guide further immunization against hepatitis B virus (HBV).

Exposed person should also be tested for

HBs Ag, Hepatitis B core IgG antibody (Anti-

HBc IgG),

Anti-HCV and HIV Ag/Ab on baseline sample prior to prescribing PEP

Step 5: Start PEP (ART centre ward 26)

7.2.1 PEP for HIV

PEP drugs recommended by NACO 2015: Fixed dose combination of Tenofovir (TDF) 300 mg plus Lamivudine (3TC) 300 mg plus Efavirenz (EFV) 600 mg once daily for 4 weeks.

There are two types of regimens:

- Basic regimen: 2-drug combination
- Expanded regimen: 3-drug combination

The decision to initiate the type of regimen depends on the type of exposure and HIV sera status of the source person.

MILD	Exposure to mucous membrane/non-intact skin with small volumes E.g. a superficial wound (erosion of the epidermis) with a plain or low calibre needle, or contact with the eyes or mucous membranes, subcutaneous injections following small-bore needles.
MODERATE	Exposure to mucous membrane/ non-intact skin with large volumes OR percutaneous superficial exposure with solid needle. E.g. a cut or needle stick injury penetrating gloves.
SEVERE	Percutaneous exposure with large volume E.g. an accident with a high calibre needle (>18 G) visibly contaminated with blood a deep wound (haemorrhagic wound and/or very painful); transmission of a significant volume of blood an accident with material that has previously been used intravenously or intra-arterially

EXPOSURE	STATUS OF SOURCE		
	HIV + and ASYMPTOMATIC	HIV + and Clinically symptomatic	HIV status unknown
Mild	Consider 2-drug PEP	Start 2-drug PEP	Usually no PEP or consider 2-drug PEP
Moderate	Start 2-drug PEP	Start 3-drug PEP	Usually no PEP or consider 2-drug PEP
Severe	Start 3-drug PEP	Start 3-drug PEP	Usually no PEP or consider 2-drug PEP

Medication	2-drug regimen	3-drug regimen
Zidovudine (AZT)	300mg twice a day	300mg twice a day
Stavudine (d4T)	30 mg twice a day	30mg twice a day
Lamivudine (3TC)	150 mg twice a day	150 mg twice a day
Protease Inhibitors		1st choice: Lopinavir/ritonavir (LPV/r) 400/100mg twice a day or 800/200 mg once daily with Meals 2nd choice: Nelfinavir (NLF) 1250mg twice a day or 750 mg three times a day with empty stomach 3rd choice: Indinavir(IND) 800mg every 8 hours and drink 8-10 glasses (≥ 1.5 litres) of water daily

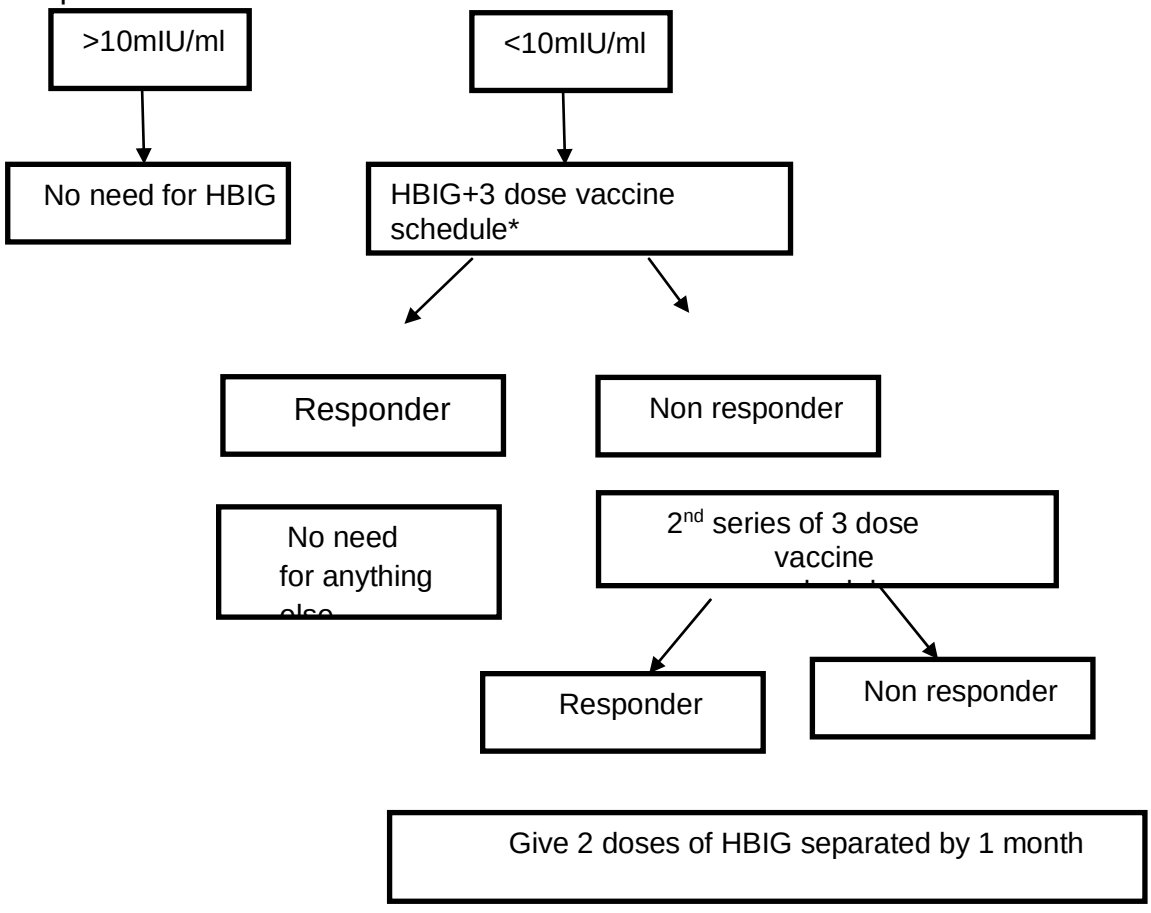
	Preferred	Alternative
2-drug regimen (basic PEP regimen)	1st choice: Zidovudine (AZT) + Lamivudine (3TC)	2nd choice: Stavudine (d4T)+ Lamivudine (3TC)
3- drug regimen (expanded PEP regimen)-consult expert opinion for starting 3rd drug eg LPV/r, NLF or IND		
Not recommended	ddI+d4T combination NNRTI such as Nevirapine should not be used in PEP	

PEP for HBV

If the source is positive/ unknown for

HBs Ag Evaluate for anti-HBs Ab in

exposed person



If the exposed person was previously also a documented non-responder, he/she should straightaway be given two doses of HBIG separated by 1 month. Anti-HBs Ab titres

should be determined after 1-2 months of completion of 3 doses of vaccine schedule. Those who have

responded to the vaccine need no treatment further. Those who are still with < 10mIU/ml, should be evaluated for HBs Ag positivity. If HBs Ag is positive after exposure, the person has to be counselled regarding the modes of prevention of HBV transmission to others and to seek treatment for HBV.

HBV vaccine dose: All health staff should be vaccinated against hepatitis B. The vaccination for Hepatitis B consists of 3 doses:initial, 1 month, and 6 months. Sero-conversion after completing the full course is 99%.

If the exposed person is unvaccinated or unclear vaccination status give complete hepatitis B vaccine series 3 doses 1 ml each0,1,6 months I/M, deltoid muscle.Optimal immunity only after third dose. Test for anti HBs titres should be done 1-2 months after the completion of 3 dose vaccine schedule. A sero-protective level of anti-HBs is defined as > 10mIU/ml. If levels are below 10mIU/ml, repeat the 3 dose vaccine series or be evaluated for HBs Ag. If HCW does not respond to the second series, he/she should be labelled as non-responder.

PEP for Hepatitis C virus (HCV):

- There is no post-exposure prophylaxis currently available/approved for HCV prevention but seroconversion must be documented.
- If source is HCV positive or has potential HCV risk factors, exposed should be tested for:
  - ❑ HCV RNA after 3 weeks
  - ❑ Anti-HCV at 3 and 6 months
- Clinical signs and symptoms as well as liver enzymes should be monitored.

Follow-up of exposed person

Testing for at least 6 months after exposure (6weeks, 12 weeks and 6 months) for HIV, Anti- HCV

and HBsAg. If PEP is used: drug toxicity monitoring at base line and after 2 weeks.

Documentation and Recording of Exposure

Management of HCWs who are infected with HIV/HBV/HCV

HIV infected HCWs: All HIV infected HCWs should get their viral load count tested via real-time PCR followed by proper monitoring and verification .They should be further treated and followed- up like normal patients.

8. HOUSE KEEPING

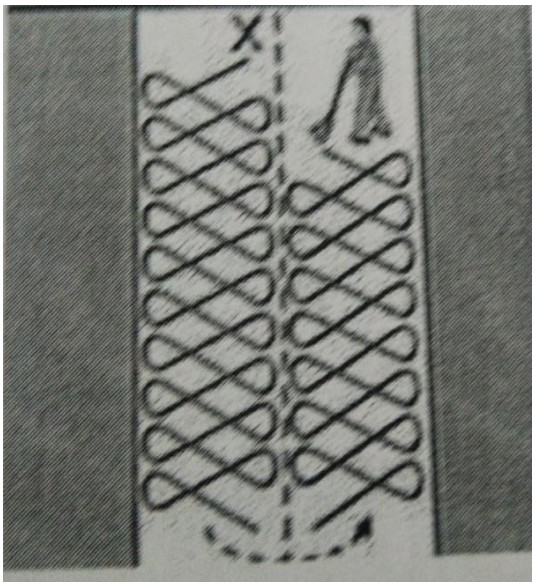
A patient admitted to the hospital can develop infection due to bacteria that survive in the environment. Therefore, it is important to clean the environment thoroughly on a regular basis. This will reduce the bacterial load and make the environment unsuitable for growth of micro-organisms.

General instructions:

1) Lint-free dusters/mops should be used; and washed with soap and water after every use.
2) Brooms are not to be used in the hospital.
3) Three bucket technique should be used on every floor to facilitate hygienic cleaning of environment.

   Three bucket technique:

   a) The first bucket should contain water and detergent to be used.
   b) The mop is then rinsed in the second bucket and dipped in the third bucket which can also contain a disinfectant and then the mopping is done again.
4) Methods of Floor cleaning:
   a) Cleaning staff should always move from clean to unclean areas and never vice versa.
   b) If three bucket technique not available, wash the mop under running water before doing wet mopping.
   c) Do not “double dip” clothes (dip the mop only once in the cleaning solution, as dipping it multiple times may re-contaminate it).
   d) An area of 120 square feet to be mopped before re-dipping the mop in the solution.
   e) Cleaning solution can be changed after cleaning an area of 240 square feet
   f) Follow the figure of eight stroke technique for mopping.



g) Mops, buckets and trolleys should be washed with soap and water and mops should be laundered in hot water or soaked in clean water with bleaching powder 0.5% for 30 minutes after each cleaning session. They should be dried in in a ventilated area.

Environment Cleaning

Daily cleaning:

1) The floor is to be cleaned at least twice in 24 hours using detergent and water.
2) All work surfaces are to be cleaned with detergent and water twice a day and then disinfected by wiping with appropriate disinfectant.
3) The floor of bathrooms is to be cleaned with a broom and detergent once a day and then disinfected.
4) Toilets are cleaned with a brush using a detergent twice a day (in the morning and evening). Disinfection and stain removal solution may be used.
5) Wash basins are to be cleaned every morning.
6) Store rooms are to be mopped once a day and high dusted once a week.

Weekly cleaning:

1) Doormats, fridge, mattress must be cleaned must be cleaned weekly.
2) Cupboards, shelves, beds, lockers, IV stands, stools and other fixtures are to be cleaned with detergent and water.
3) Patient's cot is to be cleaned every week with detergent and water. 1% hypochlorite to be used when soiled with blood or body fluids. In the isolation ward, cleaning is done daily.

Monthly cleaning:

1) High dusting/Ceiling is to be done with a wet mop monthly.
2) The walls, windows and doors are to be washed with a brush, using detergent and water
3) Fans and lights are cleaned with soap and water once a month.
4) Curtains are to be changed once a month or whenever soiled. These curtains are to be sent for regular laundering. In certain areas, eg. Transplant units and ICUs, more frequent changes are required.
5) Regular AC maintenance is required.

Patient linen care

1) Bed linen is to be changed daily and whenever soiled with blood or body fluids.
2) Patient's gown is to be changed every day and whenever soiled with blood or body fluids.
3) Dry dirty linen is to be sent to the laundry for regular wash.

Risk categorization of hospital areas

High risk areas	Moderate risk areas	Low risk areas
Operation theatre ICUs and HDUs Emergency department Postoperative units, surgical wards Labour room Haemodialysis unit CSSD	Medical wards Laboratory area Blood bank Pharmacies Dietary services Laundry services Mortuary Nurses/doctors rest room	Administrative area Seminar rooms Store Staff rooms Non-sterile supply area Offices

Method of cleaning and cleaning frequency

Risk category	Frequency of cleaning	Method of cleaning
High risk area	Once in two hours and spot cleaning as required	Cleaning with soap and detergent plus disinfection with aldehyde based compound
Moderate risk area	Once in four hours and spot cleaning as required	Cleaning with soap and detergent plus disinfection

		with aldehyde compound
Low risk area	Twice a day	Cleaning with water and detergent

9. BIOMEDICAL WASTE MANAGEMENT

BIO-MEDICAL WASTE RULES

Bio-Medical Waste management Rules, 1998 The first rule of Bio-Medical Waste was introduced in 1998 by Ministry of Environment & Forests. According to this rule, the bio-medical wastes generated in hospitals were categorized into 10 categories. The items included under each category had a specific color coded bag/container for waste segregation and a specific method for waste disposal.

Bio-Medical Waste management Rules 2011 (Draft) The Ministry of Environment and Forests (MoEF) had proposed a revised draft of Bio-Medical Waste Rules 2011. It is much simpler, containing 8 categories of wastes, each has to be segregated by a single color bag, thus clears the confusion over the color coding of the containers used for disposal of biomedical waste under 1998 Rule. However, this rule was never enforced.

Bio-Medical Waste management Rules 2016- Under the Environmental Protection Act, the Bio- Medical Waste Management Rules were notified on 28th March 2016 by The Ministry of Environment and Forests(MOEF). These Rules are directly relevant to the health sector. The salient features of these Rules are as follows:

a. Bio-medical waste means waste that is generated during the diagnosis, treatment or immunization of human beings or animals or in research activities pertaining thereto or in the production or testing of biological or in health camps

b. Applicaton : These rules are applicable to all the persons who generate, collect, receive, store, transport, treat, dispose or handle bio medical waste in any form including hospitals, nursing homes, clinics, dispensaries, veterinary institutions, animal houses, pathological laboratories, blood banks, Ayush hospitals, clinical establishments, research or educational institutes, health camps, medical or surgical camps, vaccination camps, blood donation camps, first aid rooms of schools, forensic laboratories and research labs.

c. These BMW Rules 2016 shall NOT apply to

- Radioactive waste
- Hazardous Chemicals
- Solid Wastes
- Lead acid batteries
- Hazardous waste
- E waste

- Hazardous microorganisms, genetically engineered microorganisms.

d. Authorisation : refers to permission granted by prescribed authorityto generate, collect, receive , store, transport, treat, process, dispose or handle biomedical waste in accordance with these rules and the guidelines issued by the central government or Central Pollution Control Board as the case may be

e. Occupier: refers to a person having administrative control over the institution and the premisesgenerating bio-medical waste, which includes a hospital, nursing home, clinic, dispensary, veterinary institution, animal house, pathological laboratory, blood bank, health care facility and clinical establishment

Objectives

1. To prevent infection by maintaining good hygiene and sanitation.
2. To protect the patient, patient attendants and all health care personnel from avoidable exposure to infection.
3. To prevent injuries and other health hazards from biomedical waste
4. To prevent environmental pollution.
5. To manage waste in a clean, healthy, economical and safe manner.
6. To minimize waste

Steps in BMW are:

1. Segregation
2. Pretreatment
3. Collection
4. Transportation
5. Storage.
6. Final disposal

Segregation:

- Segregation is done at the source.
- Bio-Medical waste shall not be mixed with other wastes.
- A colour code is followed and appropriately coded waste bags areplaced in bins in all patient care areas.
- Labelling of all the bags with predesigned labels withinformation including hospital name, patient care unit name and date is done before usage of bags.

Pretreatment

- Liquid chemical waste shall be segregated at source and shall be pretreated or neutralised prior to mixing with other effluent generated from the hospital.
- Dead Fetus below the viability period (as per MTP Act 1971 and amendments) can be considered as anatomical waste. Such may be handed over to CBWTF in yellow bag with a copy of official MTP Certificate from the Obstretician or Medical Superintendant of hospital.
- Microbiology waste & other clinical laboratory waste, blood samples & blood bags shall be pretreated through non-chlorinated disinfection or sterilisation (autoclaving) on-site, as per the WHO or NACO guidelines.
- Syringes shall be mutilated and needles shall be cut and then stored in tamper proof, leakproof and puncture resistant sharp container

Collection

- Bags are packed when ¾ full
- Waste bags are tightly closed or sealed at neck when removed from the containers for safe and easy handling by waste handlers.

Transportation:

- The transportation of the coded bags are done once a day
- The bags are transported to the central waste receiving terminal in colour coded covered trolleys with biohazard signage
- Bags are transported in moving cart by house keeping staff allotted for this purpose
- The house keeping staff should wear the appropriate personal protective equipments (heavy duty gloves, facemasks, gown and gumboots)
- Waste shall be weighed and handed over under supervision of a designated hoslpital staff.
- The trolleys should be leakproof, without any sharp edges, easily washable with provision for drainage of washing water and wheels & handles for easy transportation by waste handler

Storage:

- A Biomedical waste storage location is designated inside the health care establishment, away from patient care area & kitchen.
- This temporary storage site shall be secured & locked, well ventilated, have a biohazard sign visible from a distance
- The storage room shall have a pucca floor with its level above the ground level.

- The waste bags should not be stored on the floor. There should be either trolleys or shelves for this purpose.
- Red and Yellow bags should be stored separately.
- There shall be provision of washing in the storage area and the waste trolleys to be washed after each emptying.
- Drainage of Storage area to be connected with ETP / STP
- Untreated human anatomical waste, animal waste, soiled waste, Biotechnology waste shall not be stored for more than 48 hours.

Final Treatment & Disposal

- No final treatment or disposal of biomedical waste is done within the hospital premises.
- This is undertaken by an outsourcing agency (Common bio-medical waste treatment facility -CBWTF) authorised by DPCC in accordance with schedule I of BMWM rules 2016
- In case of non collection of BMWM for final treatment & disposal by the operator within the intended time, Prescribed authority shall be informed immediately.
- Treatment and disposal of liquid waste shall be done in accordance with water treatment & disposal of liquid waste as per Water Act, 1974
- For liquid chemical waste, occupier should ensure a separate collection system leading to Effluent Treatment Plant.
- If liquid chemical waste can not be connected to ETP, then it should be handed over to CBWTF operator
- Residual or discarded chemical wastes, used or discarded disinfectants, chemical sludge to be sent to Hazardous Waste treatment, storage & disposal facility shall be sent through CBWTF only.

Biomedical waste rules 2016 with amendment 2018

Type of waste	Type of bag/container	Treatment /disposal option
Yellow category		
Human anatomical waste (human tissues, organs, body parts and fetus)	Yellow coloured nonchlorinated plastic bags	Incineration/plasma pyrolysis/deep burial
Animal anatomical waste generated from animals used in experiments or testing in veterinary hospitals, colleges or animal houses	Yellow coloured nonchlorinated plastic bags	Incineration/plasma pyrolysis/deep burial
Soiled waste Items contaminated with blood, body fluids like dressing, plaster casts, cotton swabs, bags containing residual or discarded blood and blood components	Yellow coloured nonchlorinated plastic bags	Incineration/plasma pyrolysis/deep burial/autoclaving or hydroclaving+shredding/mutilation
Expired or discarded medicines Antibiotics or drugs Cytotoxic drugs along with its container(broken or intact) such as glass or plastic ampoules, vials, etc.	Yellow coloured nonchlorinated plastic bags Yellow coloured containers with cytotoxic label	Sent back to manufacturer or disposed of by incineration by CBMWTF for incineration Expired cytotoxic drugs to be returned back to the manufactureror supplier or CBMWTF for incineration >1200°C or encapsulation or plasma pyrolysis at >1200°C
Chemical solid waste Solid discarded chemicals	Yellow coloured containers or nonchlorinated plastic bags	Incineration or plasma pyrolysis or encapsulation at CBMWTF

Chemical liquid waste Liquid waste generated due to use of chemicals in production of biological and used or discardeddisinfectants, Silver X-ray film developing liquid,discarded Formalin,infected secretions, aspirated bodyfluids**,** liquid from laboratories and floor washings, cleaning,	To be discharged into separate collection system, leading to effluent treatment system Not to be discarded into	Pretreatment before mixing with other waste water

house-keeping anddisinfecting activities etc.	yellow bag	
Discarded linen waste Discarded linen, mattresses, beddings contaminated with blood or body fluids or routine mask and gown	Yellow coloured nonchlorinated plastic bags	Non- chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or PlasmaPyrolysis.
Microbiology, Biotechnology and other clinical laboratory waste Blood bags, Laboratory cultures, stocks or specimens ofmicroorganisms, live or attenuated vaccines, human and animal cell cultures used in research, industriallaboratories, production of biological, residual toxins,dishes and devices usedforcultures.	Autoclave or microwave or hydroclave safe plastic bags or containers	Pre-treat to sterilize with nonchlorinated chemicalson-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.
Red category		
Contaminated waste(Recyclable) Disposable items such as tubing, bottles, intravenous tubes andsets, catheters, urine bags, syringes (without needles and *fixed needlesyringes*) and vacutainers with their needles cut) gloves and plastic apron.	Red coloured nonchlorinated Plastic bags or containers	Autoclaving or microwaving/ hydroclaving followed byshredding or mutilation or combination of sterilizationand shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White/Translucent category		

Waste sharps including metal sharp Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other	Puncture-proof, leak-proof, tamper- proof container	Autoclaving or dry heat sterilization followed by 1.Shredding or mutilation or encapsulation in metal container

contaminated sharp object that maycause puncture and cuts.This includes both used,discarded andcontaminated metal Sharps		or cement concrete or combination ofshredding cum autoclaving; and sent for final disposal to iron foundries (havingconsent to operate from the State Pollution Control Boards or Pollution Control Committees) 2.Sanitary landfill 3. Designatedconcrete waste sharp pit.
Blue category		
Glassware Broken or discarded and contaminated glass including medicine vialsand ampoules except those contaminated with cytotoxic wastes Glass syrup bottles without liquid Microscope slides **Metallic body implants** Dental implants, other body implants and plates	Puncture proof and leak proof boxes or containers with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent andSodium Hypochlorite treatment) or through autoclaving or microwavingor hydroclaving and then sent for recycling. Note: The residual chemical in glass bottle should be collected as chemical waste in yellow container/bags as yellow waste Glass vials with positive controls(eg in widal test kit) should be pretreated and disposed in yellow waste

10.Visitor's policy

1) The ward sisters and the doctors concerned shall have the responsibility of informing the patients' relatives of the measures to be taken and the importance of restriction
of visitors. This is done at admission of the patient.

2) The patient and the relatives must be given health education about the cause, spread and prevention of the infection. The need for isolation andrestriction of visitors are discussed with them.

3) No more than one adult visitor are allowed at a time during the hospital visiting hours and the length of stay are governed by the needs of the patient. For ICUs, no visitors are allowed, except under exceptional circumstances as a part of end of life care.

4) Limit visitors to persons necessary for patient's emotional well-being and care.
5) Visitors should not sit on patient's bed or put their feet on beds.
6) Visitors should clean their hands with hand rub before entering and when leaving the room. For this, an alcohol based hand rub should be available at the entrance of the facility.
7) Visitors' bags and other belongings must be left outside the patient area.
8) Visitors must wear gown and mask whenever indicated.
9) Flowers/bouquet should not be allowed in patient room.
10) Children below 12 years should not be allowed into isolation rooms.

11. Investigation of outbreak

A disease outbreak/epidemic is the occurrence of cases of disease in excess of what would normally be expected in a defined community, geographical area or season. Investigating an outbreak**/**epidemic is a set of procedures used to identify the cause responsible for the disease, the people affected, the circumstances and mode of spread of the disease, and other relevant factors involved in propagating the epidemic, and to take effective actions to contain and prevent the spread of the disease. Single case of a communicable disease long absent from a population, or caused by an agent not previously recognized in that community or area, or the emergence of a previously unknown disease, may also constitute an outbreak and should be reported and investigated.

Detection of outbreaks of HCAIs

Alert from an effective surveillance system

Alert from

- ✓ the physician
- ✓ the nurse
- ✓ the hospital microbiologist
- ✓ the hospital epidemiologist

Clusters that suggest healthcare transmission

- ✓ Similar cases on one unit
- ✓ Similar cases among similar patients
- ✓ Similar cases on a short time interval
- ✓ HCW and patients with same infection

Outbreak identification &investigation

Step 1: Verify the diagnosis & establish the existence of an

outbreak Step 2: Report the outbreak & search for information

Step 3: Study the event & first control measures

- ✓ Define and identify cases (case definition, identify and count cases)
- ✓ Perform descriptive epidemiology
- ✓ Develop hypotheses
- ✓ Evaluate hypotheses
- ✓ As necessary, reconsider/refine hypotheses and execute additional studies
- ✓ Additional epidemiologic studies
- ✓ Other types of studies – laboratory, environmental

Step 4: Implement control and prevention measures and communicate findings

Immediate Control Measures

Control measures are initiated during the process of investigation. An intensive review of infection control measures is made and general control measures initiated at once. General measures include:

i. Strict hand washing

ii. Intensification of environmental cleaning and hygiene.

iii. Adherence to aseptic protocols, and

iv. Strengthening of disinfection and sterilization

What should not be done?

1. Generalized microbiological screening with no prior hypothesis of the infection source
2. Aspecific and generalized antimicrobial prophylaxis
3. Not allow visitors and relatives entrance, if not strictly necessary
4. Close the ward or hospital admission (except than if necessary to assure patient safety

Specific Control Measures

Specific control measures are instituted on the basis of nature of agent and characteristics of the high-risk group and the possible sources. These measures may include:

i. Identification and elimination of the contaminated product

ii. Modification of nursing procedures

iii. Identification and treatment of carriers, and

iv. Rectification of lapse in technique or procedure

Evaluation of efficacy of control measures

i. The efficacy of control measures are evaluated by a continued followed-up of cases after the outbreak clinically as well as microbiologically. Control measures are effective if cases cease to occur or return to the endemic level.

ii. The outbreak should be documented.