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1. INTRODUCTION

Hospital acquired infection is a serious health hazard as it leads to increased patients’ morbidity and mortality, length of hospital stay and cost associated with hospital stay. It is important to minimize the risk of spread of infection to patients and staff in hospital by implementing good infection control programme.

This document outlines the broad principles and practices of infection Control that are essential for the prevention and management of infection.

The following Hospital Infection Control Policies are needed to be framed and practiced and monitored by the Hospital Infection Control Team (HICT) and Hospital Infection Control Committee (HICC).

1. Guidelines for prevention & control of infections
2. Antimicrobial policy
3. Surveillance policy
4. Disinfection policy
5. Isolation policy
6. Policy for investigation of an outbreak of infection

The overall aim of this document is to provide evidence based information in the prevention and control of infection. It is relevant to all staff including doctors, nurses, other clinical professionals and managers working in the hospital.
2. HOSPITAL INFECTION CONTROL COMMITTEE

The role of the hospital infection control committee (HICC) is to implement the annual infection control programme and policies.

• Commitment towards Maintenance of Surveillance over hospital acquired infections.
• Develop a system for identifying, reporting, analyzing, investigating and controlling hospital acquired infections.
• Develop and implement preventive and corrective programs in specific situations where infection hazards exist.
• Advice the Medical Superintendent on matters related to the proper use of antibiotics, develop antibiotic policies and recommend remedial measures when antibiotic resistant strains are detected.
• Review and update hospital infection control policies and procedures from time to time.
• Help to provide employee health education regarding matters related to hospital acquired infections.

HICC shall meet regularly - once a month and as often as required. The Committee is responsible for establishing and maintaining infection prevention and control, its monitoring, surveillance, reporting, research and education.

2.1 Infection Control Committee

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 should include wide representation from all relevant disciplines or departments in the facility. The committee has one elected chairperson who is the hospital administrator or a person who has direct access to the head of the hospital.
Structure

i. **Chairperson**: Head of the Institute (preferably)

ii. **Member Secretary**: Senior Microbiologist

iii. **Members**: Representation from Management/Administration (Dean/Director of Hospital; Nursing Services; Medical Services; Operations)

iv. **Relevant Medical Faculties**

v. **Support Services**: (OT/CSSD, Housekeeping/Sanitation, Engineering, Pharmacologist, Store Officer / Materials Department)

vi. **Infection Control Nurse (s)**

vii. **Infection Control–officer**

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**2.2 Infection Control Team**

The Infection control team should comprise of at minimum an infection control officer, a microbiologist (if ICO is not a microbiologist), and infection control nurse. ICT takes daily measures for the prevention and control of infection in hospital.

**Responsibilities of the Infection Control Team**

- Develop a manual of policies and procedures for aseptic, isolation and antiseptic techniques.
- Carry out targeted surveillance of HAIs, data analysis for presentation in HICC meeting and take corrective steps
- Advise staff on all aspects of infection control and maintain a safe environment for patients and staff.
- Supervise and monitor cleanliness and hygienic practices
- Oversee sterilization and disinfection and monitor the use and quality control of disinfectants
- Advise management of at risk patients and supervision of isolation procedures.
- Investigate outbreaks of infection and take corrective measures for control and prevention of outbreak.
- Waste management
– Provide relevant information on infection problems to management.
– Assist in training of all new employees as to the importance of infection control and the relevant policies and procedures.
– Organize regular training programme for the staff to ensure implementation of infection control practices
– Audit infection control procedures and antimicrobial usage
– Monitors Health care workers safety Programme.
3. SURVEILLANCE OF HEALTHCARE ASSOCIATED INFECTIONS

3.1 Introduction

Surveillance is one of the most important components of an effective infection control program. It is defined as the systematic collection, analysis, interpretation, and dissemination of data about the occurrence of HCAIs in a definite patient population.

3.2 Purpose of Surveillance

1. To establish and maintain a database describing endemic rates of HCAIs. Once endemic rates are known then the occurrence of an epidemic can be detected when infection rates exceed baseline values.
2. To identify trends manifested over a finite period, such as shifts in microbial pathogen spectrum, infection rates, etc.
3. To provide continuous observation of HCAIs cases for the purpose of prevention and control.
4. To obtain useful information for establishing priorities for infection control activities.

3.3 Main components of Surveillance system

1. Definition of HCAI

Infections that occur more than 48 hours after admission (It must be taken into account that different infections have different incubation periods, so that each occurrence must be evaluated individually to determine the relationship between its occurrence and hospitalization)

2. Case Definition

Each case definition must be standardized and consistent.

3.4 ACTIVE SURVEILLANCE

Active surveillance of Healthcare associated Infections (HCAI)
Active surveillance shall be done at least for high risk areas.
High risk areas under various setting include:

- Intensive care units (Neonatal ICU, Pediatric ICU, ICUs – Cardio-Thoracic Vascular Surgery, Respiratory infections (H1N1) units).
- Operation Theatres
- Dialysis Unit
- Burns Unit
- Transfusion services unit
- Food handlers
- Drinking water
- Central Sterile Services Department

3.4.1 Operation Theatres

No routine fogging is recommended. Any civil or engineering works should invite fogging of OTs. If Culture swabs and air sampling plates are sent from Operation Theatres for investigating surface contamination and air quality, fogging of OTs may be done on the basis of these reports and/or clinical procedures carried out in the operating areas.

3.4.2 Intensive care units

Monitoring of device associated infections needs to be done on regular basis. The basic indicators required to be monitored are ventilator associated pneumonia (VAP), Catheter linked blood stream infections (CLBSI) and catheter associated urinary tract infections (CAUTI).

Regular active surveillance is recommended through the emergence /clustering of positive cultures cases or similar clinical case clustering.

In case of surveillance following surveillance specimens must be collected:

**Surveillance samples:**

- **Clinical Material**
  - Central line tips with blood culture
- ET tube secretions for microscopy and culture
- Urine samples from catheterized patients
  - Others
- **Environmental Sampling**
  - Water samples from humidifiers
  - Sampling of drugs prepared for patients on Ventilators
  - Walls
  - Floors
  - Suction tubing
  - Disinfectants on dressing trolleys
  - Others

Surveillance clinical samples should be sent to microbiology lab on basis of clinical data or microbiological reports. Analyses of data may be presented at the subsequent HICC meeting.

### 3.4.3 Transfusion services unit

Environmental sampling shall be done periodically. Blood component bags – FFP and platelets shall be screened for contamination, as and when required. The record shall be maintained and presented in HICC meetings.

### 3.4.4 Wards

No active surveillance is required for routine non-ICU patient care units. Active surveillance is recommended whenever clustering of positive cultures from cases are seen in the laboratory.

### 3.4.5 Food handlers

Screening of food handlers is recommended every four month. Samples include stool samples for ova, cyst and cultures for typhoid carriers. Records to be maintained by the dietician and infection control nurse (ICN).
3.4.6 Drinking Water
Bacteriological surveillance shall be done monthly. Potable water testing shall be carried out routinely for bacterial cultures in laboratory from all patient care units, hospital kitchen, canteens and hostels – preferably once in a month.

3.4.7 Central Sterile Supplies Department (CSSD)
Air and surface sterility should be monitored from sterile zone. Bowie Dick test and preferably use of biological indicators for steam sterilization to be carried out. Records to be kept by CSSD.

3.5 PASSIVE SURVEILLANCE

Reporting of hospital acquired infections-

Passive Clinical Reporting
Clinicians may fill the prescribed form for every admitted patient and the form may be sent to Infection Control Nurse (ICN).

Passive Microbiological Reporting
In an event of clustering of cases passive surveillance may be initiated. Respective clinicians should be informed about the suspected clustering and surveillance specimens may be collected.
4. INFECTION CONTROL PROCESSES

4.1 Standard Precautions

**Standard Precautions** are designed to reduce the risk of transmission of micro-organisms from both recognized and unrecognized sources of infection in the hospital. **Standard Precautions applies to all patients regardless of their diagnosis.** Standard Precautions shall be implemented when contact with any of the following are anticipated:

- Blood
- All body fluids, secretions and excretions, with the exception of sweat regardless of whether or not they contain visible blood.
- Non-intact skin (this includes rashes)
- Mucous membranes

4.2 Standard Precautions Requirements

**A. Hand hygiene:**

Pathogenic organisms from colonized and infected patients (and sometimes from the environment) transiently contaminate the hands of staff during normal clinical activities and can then be transferred to other patients. Hand transmission is one of the most important methods of spread of infectious agents in health care facilities. Proper hand hygiene is an effective method for preventing the transfer of microbes between staff and patients. Increasing hand-washing compliance by 1.5 – 2 folds would result in a 25-50-% decrease in the incidence of healthcare associated infections.

Wash hands with plain or antimicrobial soap and water or rub hands with an alcohol-based formulation before handling medication or preparing food (steps shown in figure1)

**Five (5) Moments in Hand Hygiene-**

**Hand hygiene** must be practiced (Figures 2) –

1. Before and after having direct contact with patients
2. Before handling an invasive device for patient care, regardless of whether or not gloves are used.
3. Promptly after contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings regardless of whether or not gloves are used.
4. If moving from a contaminated body site to a clean body site during patient.
5. After contact with inanimate objects (including medical equipment) in the immediate vicinity of the patient.

Perform hand wash when hands are visibly dirty.

Surgical scrub

1. Remove rings, wrist-watch, and bracelets before beginning the surgical hand preparation
2. When performing surgical hand antisepsis using an antimicrobial soap, long scrub times are not necessary. Recommended duration is 2-3 minutes but not exceeding 5 minutes and should include wrists and forearms.
3. If hands are visibly soiled, wash hands with plain soap before surgical hand scrub.

• Training and compliance needs to be monitored. Availability of hand rubs, Soaps hand towels and water should be ensured. Foot operated and wall mounted dispensing stations are required. Hand hygiene training programme for doctors, nursing staff, and housekeeping staff needs to be done regularly for each category of staff. Hand hygiene compliance need to be monitored.

B. Personal protective equipment-

1. Use of Gloves:
   Clean gloves must be worn when touching blood, body fluids, excretions, secretions and contaminated items and when performing venipuncture.

2. Face Mask, eye protection & face shield:
   Face Mask must be worn during procedures or patient care activities that are expected to generate splashes or sprays of blood, body fluids,
secretions and excretions. For example, suctioning, irrigating a wound, performing certain laboratory tests, etc.

3. **Gown or Apron:**
Gown/apron must be worn to protect skin and to prevent soiling of clothing during procedures or patient care activities that are expected to generate splashes or sprays of blood, body fluid, secretions and excretions.

**Respiratory hygiene/cough etiquette:**

Instruct symptomatic persons and health care workers to cover their mouths/noses when coughing or sneezing, use and dispose of tissues, perform hand hygiene after hands have been in contact with respiratory secretions and wear surgical mask if tolerated or maintain spatial separation, >3 feet if possible.
Figure 1 shows steps of handwashing/rubbing
Figure 2 shows five moments of hand hygiene when hands should be washed.
5 PREVENTION OF HEALTHCARE ASSOCIATED INFECTIONS

5.1 The four major HCAIs are:

1. Catheter associated Urinary tract infection (CAUTI)
2. Surgical site Infection (SSI)
3. Catheter related blood stream infection (CRBSI)
4. Ventilator Associated Pneumonia (VAP)

a. CATHETER ASSOCIATED URINARY TRACT INFECTION

Introduction

Urinary tract infections (UTIs) are one of the commonest types of HCAIs. One of the common reasons is the use of urinary catheters.

Indications for Catheterization-

Placement of an indwelling catheter should be performed only when indicated. It should be removed as soon as possible.

The accepted indications for catheterization are:
1. For short-term (days) management of incontinence (the inability to control urination) or retention (the inability to pass urine) not helped by other methods.
2. To measure urine output over several days in critically ill patients
3. To instill medications
4. For treatment of bladder outlet obstruction
5. For post-operative management of surgical patients with impaired bladder function.

Recommendations to Prevent Catheter-associated UTI-

1. Personnel
• Only persons who know the correct technique of aseptic insertion and maintenance of the catheter should handle catheters.

2. Catheter Use
• Urinary catheters should be inserted only when necessary and left in place only for as long as it is required. They should not be used solely for the convenience of patient-care personnel.
• For selected patients, other methods of urinary drainage such as condom catheter drainage, suprapubic catheterization, and intermittent urethral catheterization may be more appropriate.

3. Hand hygiene
• Hand hygiene should be done immediately before and after any manipulation of the catheter site or apparatus.

6 Catheter Insertion
• Catheters should be inserted using aseptic technique and sterile equipment.
• Gloves, drapes, sponges, an appropriate antiseptic solution for peri-urethral cleaning, and a single-use packet of lubricant jelly should be used for insertion.
• As small a catheter as possible, consistent with good drainage, should be used to minimize urethral trauma.
• Indwelling catheters should be properly secured after insertion.

7 Closed Sterile Drainage
• The catheter collection system should remain closed and not be opened unless absolutely necessary for diagnostic or therapeutic reasons eg irrigation.
• If breaks in aseptic technique, disconnection, or leakage occur, the collecting system should be replaced using aseptic technique after disinfecting the catheter tubing junction.

8 Irrigation
Continuous irrigation should be avoided unless indicated (e.g. after prostatic or bladder surgery).
• Continuous irrigation of the bladder with antimicrobials has not proven to be useful and should not be performed as a routine infection prevention measure.

• The catheter-tubing junction should be disinfected before disconnection.

• If the catheter becomes obstructed, the catheter should be changed.

**Specimen Collection**
- If small volumes of fresh urine are needed for examination, the distal end of the catheter, or preferably the sampling port if present, should be cleansed with a disinfectant, and urine then aspirated with a sterile needle and syringe.
- Larger volumes of urine for special analysis should be obtained aseptically from the drainage bag.

8. **Urinary Flow**
- Unobstructed flow should be maintained.
- Urine flow through the catheter should be checked several times a day to ensure that the catheter is not blocked.
- Collecting bags should always be kept below the level of the bladder.

9. **Meatal Care**
- Clean the urethral meatal area after each bowel movement or when soiled.

10. **Catheter Change Interval**
- Indwelling catheters should not be changed at arbitrary fixed intervals. To avoid encrustation, the maximum duration for silicone-coated latex catheter is 14 days.
b. SURGICAL SITE INFECTIONS (SSI)

The common source of pathogens is the endogenous flora of the patient’s skin, mucous membranes, or hollow viscera. Therefore, the pathogens isolated from infection differ, primarily depending on the type of surgical procedure. In clean surgical procedures, in which the gastrointestinal, gynaecologic, and respiratory tracts have not been entered; *Staphylococcus aureus* from the exogenous environment or patient’s skin flora is the usual cause of infection. In other categories of surgical procedures, including clean contaminated, contaminated, and dirty, the polymicrobial aerobic and anaerobic flora closely resembling the normal endogenous microflora of the surgically excised organ are the most frequently isolated pathogens.

Other sources of SSI pathogens are from distance focus such as in patients with prosthesis or implant place during the surgery, surgical personnel, operating environment, surgical tools, instruments, and materials brought to the field during an operation.

Surgical site infection prevention

**Preparation of the patient:**

1. Whenever possible, identify and treat all infections remote to the surgical site before elective operation and postpone elective surgeries on patients with remote site infections until the infection has resolved.
2. As for as possible, shorten the pre-operation hospital stays.
3. Do not remove hair preoperatively unless the hair at or around the incision site will interfere with the operation.
4. If hair needs to be removed, it is done immediately before operation, preferably using electric clippers and not razor blade.
5. Adequate control of blood glucose levels in all diabetic patients.
6. Encourage nonsmoking/use of cigarettes, cigars, pipes, or any other form of tobacco consumption (minimum at least 30 days prior to the surgery).

Do not withhold necessary blood products transfusion. Encourage patients to shower or bathe at least the night before the operative day.
**Antimicrobial prophylaxis**

1. Administer a prophylactic antibiotic agent only when indicated, and select it based on its efficacy against the most common pathogens causing SSI for a specific operation.
2. Administer by IV route the initial dose of prophylactic antibiotic agent, timed such that a bactericidal concentration of the drug is established in serum and tissues when the incision is made. Maintain therapeutic levels of the agent in serum and tissues throughout the operation and until at most a few hours after the incision is closed in the operating room.

Routine environment sampling of the Operation Room (OR) is not required. Perform microbiologic sampling of OR environment surfaces or air as part of an epidemiologic investigation, or when there is gross violation of the OR sterility, or when there is an increased in SSIs.

**Cleaning and disinfection of environmental surfaces**

1. When visible soiling or contamination with blood or other body fluids of surfaces or equipment occurs during an operation, use approved hospital disinfectant to clean the affected areas before the next operation.
2. Do no perform special cleaning or closing of OR after contaminated or dirty operation.

**Asepsis and surgical technique**
Adhere to principles of asepsis when placing instruments or devices.

**Develop a good surveillance system to study the incidence of SSI.**
c. VENTILATOR-ASSOCIATED PNEUMONIA

Pneumonia is one of the three most common HCAIs. Patients who are mechanically ventilated are at risk for ventilator-associated pneumonia (VAP).

Most bacterial nosocomial pneumonias occur by aspiration of bacteria colonizing the oropharynx or upper gastrointestinal tract of the patient. Intubation and mechanical ventilation greatly increase the risk of nosocomial bacterial pneumonia because they alter first-line patient defenses.

Prevention

1. Wear gloves when in contact with mucous membranes, handling respiratory secretions or objects contaminated with respiratory secretions. Hand hygiene should be performed after removal of gloves.
2. Change gloves and decontaminate hands between contacts with different patients.
3. Change gloves between contacts with a contaminated body site and the respiratory tract or respiratory device on the same patient.
4. Wear a mask and an apron or gown when anticipate soiling of respiratory secretions from a patient (e.g. intubation, tracheal suctioning, tracheostomy, and bronchoscopy) and change it after the procedure and before providing care to another patient.
5. Use a sterile, single-use catheter, if the open-method suction system is employed.
6. Use only sterile fluid to remove secretions from suction catheter if the catheter is to be used for re-entry into the patient’s lower respiratory tract.
7. Elevate the head of the bed 30 – 45 degrees of a patient on mechanical ventilation or at high risk for aspiration (e.g. on oro or nasoenteral tube).
8. Remove devices such as endotracheal, tracheostomy, oro/ nasogastric tubes from patients as soon as they are not indicated.
d. CATHETER-RELATED BLOOD STREAM INFECTIONS

Hand hygiene

1. Observe proper hand hygiene.
2. Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.

Aseptic technique during catheter insertion and care

1. Maintain aseptic technique for the insertion and care of intravascular catheters. Wearing clean gloves rather than sterile gloves is acceptable for the insertion of peripheral intravascular catheters if the access site is not touched after the application of skin antiseptics.
2. Sterile gloves should be worn for the insertion of arterial and central catheters.
3. Change the dressing on intravascular catheters using aseptic technique.

Maximal sterile barrier precautions during catheter insertion

1. Use aseptic technique including the use of a cap, masks, sterile gown, sterile gloves, and a large sterile sheet for the insertion of Central venous catheter (CVCs, including peripherally inserted central catheter-PICC) or guidewire exchange.

Surveillance

Monitor the catheter sites visually or by palpation through the intact dressing on a regular basis, depending on the clinical situation of individual patients. If patients have tenderness at the insertion site, fever without obvious reasons, or other manifestations suggesting local or BSI (Blood Stream infections), the dressing should be removed to allow thorough examination of the site.
Prevention-
1. Select the catheter, insertion technique, and insertion site with the lowest risk for complications (infectious and noninfectious) for the anticipated type and duration of IV therapy.
2. In adults, use an upper-extremity site for catheter insertion. In pediatric patients, the hand, the dorsum of the foot, or the scalp can be used as the catheter insertion site.
3. Promptly remove any intravascular catheter that is no longer essential. Do not routinely replace central venous or arterial catheters solely for the purposes of reducing the incidence of infection.
4. Replace peripheral venous catheters at least every 72—96 hours in adults to prevent phlebitis. Leave peripheral venous catheters in place in children until IV therapy is completed, unless complications (e.g: phlebitis and infiltration) occur.
6. DISINFECTION POLICY

6.1 DISINFECTION
Disinfection is a process where most microbes are removed from defined object or surface, except spores.

6.2 Disinfectants can be classified according to their ability to destroy different categories of micro-organisms:

- High Level disinfectants: Glutaraldehyde 2%, Ethylene Oxide
- Intermediate Level disinfectant: Alcohols, chlorine compounds, hydrogen Peroxide, chlorhexidene,
- Low level disinfectants: Benzalkonium chloride, some soaps

GENERAL GUIDELINES FOR DISINFECTION:
Critical instruments/equipment (that are those penetrating skin or mucous membrane) should undergo sterilization before and after use. e.g. surgical instruments.

Semi-critical instruments /equipments (that are those in contact with intact mucous membrane without penetration) should undergo high level disinfection before use and intermediate level disinfection after use. e.g. endotracheal tubes

Non-critical instruments /equipments (that are those in contact with intact skin and no contact with mucous membrane) require only intermediate or low level disinfection before and after use. e.g. ECG electrodes

6.3 Disinfectants that are commonly in use:

Glutaraldehyde:
Can be used up to 14 days after activation,
Contact time - For disinfection 15-30 minutes
- For sterilization 8-10 hours

**Sterilium**:
Contains 2-propanol, 1-propanol, macetronium ethyl sulphate
Contact time for patient care hand wash: 1.5 ml for 30 seconds
Contact time for surgical hand wash: 9 ml for 3 minutes

**Ecoshield**:
Contains stabilized hydrogen peroxide 11% w/v with 0.01% w/v, diluted silver nitrate solution.
For surface disinfection: 10% v/v solution in de-ionized water with contact time of 60 minutes.
For fumigation: 1 litre of 20% v/v solution /1000 cu ft of space in 60 minutes.

**Bacillocid**:
Contains chemically bound formaldehyde, glutaraldehyde and benzalkonium chloride.
Used as surface disinfectant at 2% solution in operation theatres and at 0.5% in wards and dressing rooms.
Sprayed onto wet surfaces with a low pressure sprayer and allowed to dry slowly.

**Betadine**:
Iodophor. This is a high level disinfectant. Used for surgical hand scrub, skin disinfection.

**Tincture Iodine**:
For part preparation in operation theatres and blood specimen collection.

**Sodium Hypochlorite**:
Used for containing blood spills at 10%, disinfecting counter tops and other hard surfaces at 1%.
Used in laboratory for decontamination of waste from equipment and glassware at 5%.

**Alcohol (70%)**:

Used for disinfection of non-disposable patient care items in/out-patient departments and also in laboratory for cleaning of microscope lenses and surfaces of critical work surfaces.

**ALDEHYDE**

Glutaraldehyde may be used in places like the endoscopy unit, cardiac catheterization labs. Formaldehyde is used for fumigation.

### 6.4 Endoscopes - cleaning and disinfection

1. Mechanical cleaning: This is the most important step. Flush the air/water channel for 10-15 seconds to eject any blood or mucus. Aspirate detergent through the biopsy/suction channel to remove gross debris. Use a cleaning brush suitable for the instrument and channel size to brush through the suction channel.

2. Disinfection: The endoscope and all internal channels should be soaked in 2% glutaraldehyde for 20 minutes.

3. Rinsing: Following disinfection, rinse the instrument internally and externally to remove all traces of disinfectant.

4. Drying: Dry the endoscope externally. Flush air through each channel.

### 6.5 STEAM STERILIZATION

Biological indicators: namely spores of *Bacillus stearothermophilus* for steam sterilizers and *Bacillus subtilis* for dry heat and ethylene oxide sterilization should be used.

### 6.6 FOGGING:

In patient care areas regular fogging is not recommended. Necessary decision is taken by in charge of concerned patient care area.
6.7 FLOOR MOPPING
General cleaning by plain soap and water in non-critical care areas. In critical care areas carry out generous mopping using wet cloth dipped in 0.5% Sodium Hypochlorite solution.

6.8 BEDDING AND BLANKET
Impermeable covers, mattresses should be mopped with 0.1% Sodium hypochlorite solution or spirit. Blanket may be sent for laundry or dry cleaning.

6.9 Monitoring of biomedical waste management practices
Infection control Nurse (ICN) may take daily rounds in pre-formatted round sheet and monitor the biomedical waste management of various hospital areas.

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7. ISOLATION PRECAUTIONS

7.1 Introduction

Isolation precautions are needed to prevent the transmission of pathogenic microorganisms within the healthcare setting.

The patients of following disease categories should be treated under isolation.

- Severe influenza cases, Subacute respiratory Syndrome (SARS), Open case of tuberculosis, Anthrax, diphtheria, Pertussis, Pneumonic plague, Chicken pox, and patients infected with multidrug resistant bacterial pathogens.

7.2 Patient placement

- Appropriate patient placement is a significant component of isolation precautions.

Determine patient placement based on the following principles:

- Route(s) of transmission of the infectious agent
- Risk factors for transmission in the infected patient
- Risk factors for adverse outcomes resulting from healthcare-associated infection in other patients in the area.
- Availability of single-patient rooms

The isolation of the patient should be done taking following into consideration:

(1) Separate ward/room/area to be designated for keeping the patient.
(2) Isolation wards/area should have double door entry with a separate changing room with availability of Personal Protective Equipment (PPE) and disinfectants and a hand washing area providing negative pressure with adequate air changes (6-12/hour) and HEPA filtered air in case of patients suffering from respiratory pathogens.
(3) Central air conditioning and use of desert air coolers is not permitted.
(4) Adequate distancing between patient beds (3-6 feet) to be ensured.
(5) Overcrowding to be avoided in isolation ward/area.
(6) Unauthorized Visitor’s entry is to be prohibited.
(7) Nobody is allowed to enter the ward without donning adequate PPE.
(8) As far as possible dedicated health care staff to be posted for isolation ward.
(9) Regular daily cleaning and proper disinfection of isolation wards to be done at least twice a day. In addition, special attention should be given to cleaning and disinfecting frequently touched surfaces to prevent aerosolisation. Damp sweeping/wet mopping to be performed. Upon discharge of the patient, isolation rooms should receive terminal cleaning.
(10) Standard precautions which include barrier nursing to be followed with special stress on hand hygiene using soap water and alcoholic hand rubs (Preferably foot operated) and the procedures should be adequately displayed for the same.
(11) Appropriate use of PPE should be strictly adhered to e.g. use of masks, N95 masks, gloves, gowns, aprons, shoe covers, head covers etc as per the requirement. For airborne/droplet transmission, patients to wear surgical mask and ensure room is well ventilated.

(12) **Patient care equipment:** Sharing of equipments among the patients to be avoided, if unavoidable, ensure that reusable equipments are disinfected before use on other subjects (Equipments like Thermometer, Nebulisers, Stethoscopes, and BP apparatus cuff to be dedicated for each patient). If used, must be cleaned with disinfectant before being used for another patient. All the equipments coming in contact with the patient should be disinfected.

(13) Use of mobile phones by healthcare staff to be avoided inside
the isolation area.

(14) Appropriate waste disposal facilities to be available in the isolation area, all waste to be treated as infectious and should be segregated and disinfected before removal from the isolation area.

(15) All paper work/record keeping should be done outside the isolation area.

(16) Sample collection to be done using appropriate PPE, following standard work precautions. Sample to be packaged/transported in triple packaging.

(17) Used Linen: Place contaminated linen directly into a laundry bag in the isolation room/area with minimal manipulation or agitation to avoid contamination of air, surfaces, and persons.

(18) Regular training on PPE, standard precautions and other infection control for the healthcare workers and providers shall be under taken.
8. HOSPITAL OUTBREAK MANAGEMENT

8.1 Introduction

The occurrence of two or more similar cases relating to place and time is identified as a cluster or an outbreak and needs investigation to discover the route of transmission of infection, and possible sources of infection in order to apply measures to prevent further spread. If the cases occur in steadily increasing numbers and are separated by an interval approximating the incubation period, the spread of the disease is probably due to person to person spread. On the other hand if a large number of cases occur following a shared exposure e.g. an operation, it is termed a common source outbreak, implying a common source for the occurrence of the disease.

8.2 Epidemiological methods

The investigation of an outbreak may require expert epidemiological advice on procedures. Formulation of a hypothesis regarding source and spread is made before undertaking microbiological investigations in order that the most appropriate specimens are collected.

8.3 Steps to be taken to investigate an outbreak

Step 1
- Recognition of the outbreak. Is there an increase in the number of cases of a particular infection or a rise in prevalence of an organism? Such findings indicate a possible outbreak.
- Preliminary investigation must begin by developing a case definition, identifying the site, pathogen and affected population. Define the outbreak in time, person and place.
- Determination of the magnitude of the problem and if immediate control measures are required. If so general control measures such
as isolation or cohorting of infected cases; strict hand washing and asepsis should be immediately applied.

- Verification of the diagnosis. Each case should be reviewed to meet the definition.
- Confirmation that an outbreak exists by comparing the present rate of occurrence with the endemic rate should be made.

**Step 2**
- The appropriate departments, personnel and the hospital administration should be notified and involved.

**Step 3**
- Additional cases must be searched for by examining the clinical and microbiological records.
- Line listing for every case, patient details, place and time of occurrence and infection details should be developed.
- An epidemic curve based on place and time of occurrence should be developed, the date analyzed, the common features of the cases e.g. age, sex, exposure to various risk factors, underlying diseases etc. should be identified.
- A hypothesis based on literature search and the features common to the cases; should be formulated about suspected causes of the outbreak.
- Microbiological investigations depending upon the suspected epidemiology of the causative organism should be carried out. This will include (a) microbial culture of cases, carriers and environments (b) epidemiological typing of the isolates to identify clonal relatedness.
- The hypothesis should be tested by reviewing additional cases in a case control study, cohort study, and microbiological study.

**Step 4**
- Specific control measures should be implemented as soon as the cause of outbreak is identified.
- Monitoring for further cases and effectiveness of control measures should be done.
- A report should be prepared for presentation to the HICC, departments involved in the outbreak and administration.
Immediate control measures
Control measures should be initiated during the process of investigation. An intensive review of infection control measures should be made and general control measures initiated at once. General measures include:

- Strict hand washing
- Intensification of environmental cleaning and hygiene
- Adherence to aseptic protocols
- Strengthening of disinfection and sterilization

Microbiological Study
The study to be carried out to identify possible sources and routes of transmission.
The investigation may include cultures from other body sites of the patient, other patients, staff and environment. Careful selection of specimens to be cultured is essential to obtain meaningful data.

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

- Identification and elimination of the contaminated product
- Modification of nursing procedures
- Identification and treatment of carriers
- Rectification of lapse in clinical technique or procedure

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

The outbreak should be documented and the records should be kept with HICC and should be presented in HICC meeting.
9. ANTIMICROBIAL POLICY

9.1 Introduction

The annual antibiogram should be prepared by microbiology department. Antibiotic susceptibility profile may be is analyzed regularly and the common resistance patterns of the bacterial isolates to be reported and discussed in the HICC meetings and the antibiotic policy to be reviewed accordingly.

Antibiotic policy need to be prepared in consultation with respective clinical departments.

9.2 Antibiotic policy shall be prepared using following general principles:

1. Data is analyzed on a quarterly basis as per hospital records)
   (a) Common etiological agents as per
      (i) site of infection
      (ii) age groups
      (iii) patient location – outdoor (OPD), indoor (wards & critical care areas)
   (b) Antibiogram data as per
      (i) site of infection
      (ii) age groups
      (iii) patient location – outdoor (OPD), indoor (wards & critical care areas)
   (c) Unusually resistant organisms to be confirmed and submitted for further characterization to National Centre for Disease Control (NCDC) for

2. Standard treatment guidelines [categorization of patients as per age and Community acquired infections (CAI) / Health care associated infections (HCAI)]
   (a) Guidelines for empirical antimicrobial therapy as per common
clinical syndrome
(i) Adults & older children
   1. Blood Stream Infections (BSI)
   2. Meningitis
   3. UTI
   4. Pneumonia
      (a) Community Acquired Pneumonia (CAP)
      (b) Ventilator Associated Pneumonia (VAP)
   5. GIT Infections
   6. Conjunctivitis
   7. Otitis Media
   8. Tonsillitis / Pharyngitis
   9. Skin and Soft Tissue Infection (SSTI)
 10. Genital Infections
 11. Osteomyelitis
(ii) Neonates (special conditions)
   1. Sepsis
   2. Meningitis
(iii) Infants & Small Children (special conditions)
   1. Meningitis
   2. Sepsis
   3. Pneumonia
(b) Classification of Antimicrobials into first line, second line and reserve group of drugs
(c) Chemoprophylaxis
   (i) Pre-operative antimicrobials
   (ii) Other invasive procedures
      (iii) Special high risk groups e.g. Prophylaxis for rheumatic fever, splenectomy patients, and immuno-compromised patients
   (d) Special clinical syndromes (e.g. STIs)
4. Prescription auditing
5. Review of surveillance data generated from antibiograms &
prescription auditing.

6. Education and training for all infection control activities in collaboration with the Hospital Infection Control Committee.
10. BIOMEDICAL WASTE MANAGEMENT

10.1 INTRODUCTION

The Ministry of Environment and Forests, Govt. of India notified the Bio-Medical Waste (Management and Handling) Rules on 27th July, 1998; under the provisions of Environment Act 1986. These rules have been framed to regulate the disposal of various categories of Bio-Medical Waste as envisaged therein; so as to ensure the safety of the staff, patients, public and the environment. There have been some amendments to the rules from time to time, presently the rules are being revised.

10.2 OBJECTIVES

The Bio-Medical Waste Management policy of the hospitals shall meet the following broad objectives:-

(i) Provide a system of management of potentially infectious and hazardous waste as per guidelines and recommendations of Biomedical Wastes (Management and Handling Rules) 1998.

(ii) Identifying, defining & classifying the various categories of waste being generated in the hospitals. Use of separate color coded containers for Segregation of various categories of waste at point of generation.

(iii) Segregation of various categories of waste in separate color coded containers at the site of generation, so that each category is treated in a suitable manner to render it harmless.

(iv) Disinfection/decontamination of infected items at the site of generation immediately after use.

(v) Onsite appropriate “treatment technology” to be used depending upon the category of waste.

(vi) Creating a system where all categories and personnel are responsible as well as accountable for proper waste management.
(vii) Environment and patient friendly safety norms.

10.3 Practices in the patient-care areas/clinical areas:

10.3.1 POLICY ON SEGREGATION OF WASTE:
The hospital should ensure that clinical and general wastes is segregated at source and placed in color coded plastic bags and containers prior to collection and disposal at the site generation in all patient care areas/clinical areas. There should be no mixing of waste. Colored coded bags are used for segregation. Red bags contain Cadmium which gives toxic emissions if incinerated.

Segregation is the responsibility of the generator of wastes i.e. the doctors, nurses or paramedical personnel.

Segregation for each of the following:

- Infectious non-sharps
- Infectious sharp
- Disposable plastic items
- Glass
- General waste
- Paper/ cardboards
- Cytotoxic/radiological/radioactive
- Microbiological/pathological wastes
<table>
<thead>
<tr>
<th>Option</th>
<th>Waste category</th>
<th>Treatment and disposal</th>
</tr>
</thead>
<tbody>
<tr>
<td>Category 1</td>
<td>Human Anatomical waste</td>
<td>Incineration/deep burial</td>
</tr>
<tr>
<td>Category 2</td>
<td>Animal waste</td>
<td>Incineration/deep burial</td>
</tr>
<tr>
<td>Category 3</td>
<td>Microbiology and Biotechnology waste</td>
<td>Local autoclaving or microwaving</td>
</tr>
<tr>
<td>Category 4</td>
<td>Waste sharps</td>
<td>Chemical disinfection/autoclaving and mutilation and shredding</td>
</tr>
<tr>
<td>Category 5</td>
<td>Discarded medicines and cytotoxic drugs</td>
<td>Incineration/disposal in secured landfills.</td>
</tr>
<tr>
<td>Category 6</td>
<td>Solid waste (contaminated with body fluids)</td>
<td>Incineration/autoclaving</td>
</tr>
<tr>
<td>Category 7</td>
<td>Solid waste (disposable items)</td>
<td>Chemical disinfection/microwaving</td>
</tr>
<tr>
<td>Category 8</td>
<td>Liquid waste</td>
<td>Chemical disinfection and discharge into drains</td>
</tr>
<tr>
<td>Category 9</td>
<td>Incineration ash</td>
<td>Disposal in municipal landfills.</td>
</tr>
<tr>
<td>Category 10</td>
<td>Chemical waste</td>
<td>Chemical treatment, drains/secured landfill</td>
</tr>
</tbody>
</table>
Table 2. Color-coded bags & Category wise Treatment

<table>
<thead>
<tr>
<th>Color Coding</th>
<th>Waste Category</th>
<th>Treatment option as per Schedule 1</th>
</tr>
</thead>
<tbody>
<tr>
<td>Yellow (Plastic bag)</td>
<td>Cat. 1, 2, 3, 6</td>
<td>Incineration/deep burial</td>
</tr>
<tr>
<td>Blue (plastic bag/puncture proof container)</td>
<td>Cat. 4,7.</td>
<td>Autoclaving/Chemical Treatment/Microwaving and Shredding</td>
</tr>
<tr>
<td>Black (Plastic bag)</td>
<td>Cat. 5, 9 and 10 (solid)</td>
<td>Disposal in secured landfill</td>
</tr>
</tbody>
</table>

NB: Categories 8 and 10 (liquid) do not require containers/bags. No PVC material should be placed in yellow bag. Any material treated with hypo-chlorite solution should never be sent for incineration.

BINS AND LINERS:
The container comprises of an inner bag of color depending on the type of waste, and should match the chosen outer container is a plastic bin.
with handles, and of a size which will depend on the amount of waste generated. The inner polythene bag should be leak proof, and should fit into the container with one-fourth of the polythene bag turned over the rim.

LINERS/PLASTIC BAGS: MATERIALS USED:
Biodegradable colored plastic bags to line the same colored bins with the specifications and guidelines of BMW Rules.

BINS:
Containment of waste: An optimum number of easy to use, Standard, uniform, covered, foot-operated bins of appropriate size shall be placed at identified places in all clinical areas.

DISINFECTION OF BINS:
Chemical disinfection of the waste bins using hypochlorite solution should be done frequently at a separate washing facility in the hospital.

DISINFECTION AND MUTILATION OF SHARPS:
In order to render them harmless to waste handlers a Pre-Treatment of the infectious waste generated in the patient-care areas is required, prior to transportation for onsite treatment and disposal. It is required for the following infectious items;
- Syringes
- Needles
- Catheters, I/V sets, gloves

10.3.2 COLLECTION STORAGE, LABELING, AND RECORDING OF WASTE
All the biomedical waste to be labeled as waste type, site of generation, date of generation before transportation from the generation site. Waste should be stored in the areas of generation at an identified safe area, for an interim period after which it is transported for onsite treatment and final disposal. No untreated bio-medical waste shall be kept stored beyond a period of 48 hours.
All the staff is required to duly fill in the waste book color wise
mentioning the number and size of bags handed over and sign the slip for further record.

10.4 LIQUID AND CHEMICAL WASTES MANAGEMENT:
Chemical disinfection of the liquid waste, at the areas of generation e.g., Labor rooms, OTs, labs etc is done. These liquid wastes should be disinfected by chemical treatment using at least 1% sodium hypochlorite solution for a contact period of 30 Minutes and then discharged into drains/sewers where it is taken care of by the principle of dilution and dispersal.

10.5 DISCARDED MEDICINES AND CYTOTOXIC DRUGS:
• The discarded medicines and cytotoxic drugs, which need to be disposed, should be certified by Head of the concerned department, put in a relevant bag, tied and sealed and labelled as with ‘Cytotoxic’
10.6 Different labels for Bio-medical waste containers and bags shall be required for identification and safe handling of this waste. These labels for storage/transportation of Biomedical waste are as under:

**LABEL FOR BIO-MEDICAL WASTE CONTAINERS/BAGS**

![Biohazard and Cytotoxic Symbols](image-url)
11. OCCUPATIONAL HEALTH AND SAFETY

11.1 Introduction

Occupational health and safety includes the prevention, reporting and management of sharps injuries, needle stick injuries and other percutaneous exposures to blood and body fluids which may potentially expose an employee to the risk of blood-borne viruses.

Definitions of sharp injury

**Sharps injury** can be defined as injury from needle or other sharp device contaminated with blood or a body fluid and penetrates the skin percutaneously mucosal/ cutaneous exposure.

**Blood borne pathogens** are viruses that some people carry in their blood and which may cause severe disease in certain people and few or no symptoms in others. The virus can spread to another person even if the carrier is asymptomatic.

The main blood borne viruses of concern are:
- Hepatitis B virus (HBV)
- Hepatitis C virus (HCV)
- Human Immunodeficiency Virus (HIV)

**Source patient** is the person whose blood is present on the item that caused the sharps injury.

11.2 PPE & VACCINATION OF THE HEALTH CARE WORKERS:

All waste handlers should be provided with Masks, Caps, Gum Boots, Gloves, and Disposable apron which they are expected to wear while dealing with the waste. All health care workers should be vaccinated against Hepatitis B and tetanus.
11.3 DEALING WITH SPILLAGE:

11.3.1 LIQUID SPILL MANAGEMENT:

For small volume spills:
- Cover spills of infected or potentially infected material on the floor with paper towel/ blotting paper/newspaper. Pour 5% Phenol or freshly prepared 5% hypochlorite solution.
- Leave for 30 minutes for contact
- Then it wipe with gauze or cloth with gloved hands.
- The gauze or cloth used to wipe is to be considered as noninfectious waste and discarded in general waste.

For large volume spills:
- Wear gloves.
- Mop with absorbent cotton/gauze and discard it to infectious waste bin
- Cover spills of infected or potentially infected material on the floor with paper towel/ blotting paper/newspaper. Pour 5% Phenol or freshly prepared 5% hypochlorite solution.
- Allow it for 30 min contact period.
- Wipe thoroughly with gloved hands using cotton or gauze and treat the gauze as soon infectious waste and dispose accordingly.

NB : Any material treated with hypo-chlorite solution should never be sent for incineration

11.3.2 MERCURY SPILL MANAGEMENT:
If accidental spill of mercury occurs it is to be collected in a special manner as follows:
- Spilled mercury should be collected with a “mercury spill kit”- containing nitrile gloves, N-95 face mask, 2 pieces of
cardboards, 2 plastic containers, cello tape, and flashlight.

- Do not touch mercury.
- Remove all jewelry, wear gloves, masks.
- Use flashlight to locate and cardboards to bring mercury beads together.
- Collect with an eyedropper of a syringe and carefully place it or ‘contain’ in a bottle containing water.
- Any remaining beads of mercury should be picked up with a sticky tape and place in the plastic bag, properly labeled.
- The bottle should be sealed with a tape, labeled as hazardous waste and securely stored inside another plastic container; awaiting final disposal to Govt. nominated or authorized mercury dealers.
- After mercury has been recovered the spill area should be covered with calcium sulfide or sodium thiosulfate to neutralize it.
- Reporting formats will be used to report and register any mercury spills/leakages.

11.4 SHARPS INJURY MANAGEMENT

The commonest cause of injury while handling the waste is inappropriate segregation wherein sharp waste is deposited in containers meant for non-sharp waste. When sharp injury occurs following procedures is to be followed.

(i) Stop the procedure immediately and wash the wound with soap and water, encourage bleeding the apply antiseptic.

(ii) Immediately report to Nodal officer in Casualty for First aid and emergency treatment or any other action and follow-up advice, if required. ‘PEP’ is provided is casualty round the clock as per MOHFW guidelines.

(iii) Retention, if possible of the item and details of its source for identification of possible infection.

(iv) Investigation, determination and implementation of remedial
measures.

(v) **Recording of Sharp injury:** Needle Sticks/ Sharp injury should be recorded.

11.5 **TRAINING OF ALL THE STAFF:**
A regular training of the staff CME’s, Workshops, are the essential part to maintain the Hospital Waste Management (HWM) at the best. It is necessary to conduct the regular refresher training of all the staff members of the hospital.
### Table 3. RECOMMENDED POSTEXPOSURE PROPHYLAXIS FOR EXPOSURE TO HEPATITIS B VIRUS

<table>
<thead>
<tr>
<th>Vaccination status of exposed workers</th>
<th>TREATMENT</th>
<th>TREATMENT</th>
<th>TREATMENT</th>
</tr>
</thead>
<tbody>
<tr>
<td></td>
<td>Source Hbs Ag Positive</td>
<td>Source HBsAg negative</td>
<td>Source</td>
</tr>
<tr>
<td>1. Unvaccinated</td>
<td>HBIGx1 and Initiate vaccine Hep B series</td>
<td>Initiate HB vaccine series</td>
<td>Initiate HB vaccine</td>
</tr>
<tr>
<td>2 Previously vaccinated</td>
<td>No treatment</td>
<td>No treatment</td>
<td>No treatment</td>
</tr>
<tr>
<td>- Serum anti-body titre known &gt; body miu</td>
<td>HBIG + 1 dose of Hep.B</td>
<td>No treatment</td>
<td>1 dose of HB vaccine</td>
</tr>
<tr>
<td>- Serum anti-body titre unknown or &lt; 10 miu</td>
<td>HBIG + vaccination</td>
<td>Initiate vaccination</td>
<td>Initiate vaccination</td>
</tr>
<tr>
<td>3 Incomplete vaccination¹</td>
<td></td>
<td></td>
<td></td>
</tr>
</tbody>
</table>

¹ Received only 1 or 2 doses of Hepatitis B vaccine
² If source High risk treat as HbsAG positive.
* Persons who have previously been infected with HBV are immune to reinfection and do not require postexposure prophylaxis
* HBsAg-Hepatitis B surface antigen
* HBIG- Hepatitis B immune globulin; dose 0.06 ml/kg intramuscularly.

### RECOMMENDED POSTEXPOSURE PROPHYLAXIS FOR EXPOSURE TO HIV

Tablet Zidovudine 300mg + Lamivudine 150 mg 1 Tab. BD + Tablet. Indinavir 800mg. 1 Tab.BD
Please see NACO Guidelines for Post Exposure Prophylaxis for Occupational Exposure (PEP) to HIV/AIDS

Flowchart- THREE STEPS TO HIV POST-EXPOSURE PROPHYLAXIS (PEP) AFTER OCCUPATIONAL EXPOSURE

Step-I : Determine the exposure code (EC)

Is source material blood – bloody fluid, semen/vaginal fluid or other normally sterile fluid or tissue ?

Yes

What type of exposure occurred ?

Mucous members or skin integrity compromised (e.g. Dermatitis, open wound)

Volume

Small : Few Drops

Large : Major splash & / or long duration

No PEP

No

Intact Skin

Percutaneous exposure : Severity

No PEP

Severity

Less severe : Solid needle, scratch

More severe : Large bore hollow needle, deep puncture, visible blood, needle used in blood vessel

EC 1
Of source

EC 2
EC 2
EC 3

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Step II: Determine the HIV STATUS Code (HIV SC)

What is the HIV status of the exposure source?

- **HIV Negative**
  - No PEP

- **HIV Positive**
  - Low titre exposure:
    - Asymptomatic and High CD<sub>4</sub> count
  - High titre exposure:
    - Advanced AIDS, primary HIV, high viral load or low CD<sub>4</sub>

- **Status unknown**
  - Status unknown

- **Status unknown**
  - Status unknown

Step III: Determine Post-Exposure Prophylaxis (PEP) Recommendation

<table>
<thead>
<tr>
<th>EC</th>
<th>HIV SC</th>
<th>PEP</th>
</tr>
</thead>
<tbody>
<tr>
<td>1</td>
<td>1</td>
<td>Consider basic</td>
</tr>
<tr>
<td>1</td>
<td>2</td>
<td>Recommend basic regimen</td>
</tr>
<tr>
<td>2</td>
<td>1</td>
<td>Recommend expanded regimen</td>
</tr>
<tr>
<td>3</td>
<td>1 or 2</td>
<td>Recommend expanded regimen</td>
</tr>
<tr>
<td>1,2,3, Unknown</td>
<td>If exposure setting suggests risks of HIV Exposure, consider basic regimen</td>
<td></td>
</tr>
</tbody>
</table>

**Basic Regimen:** Zidovucine (AZT)-600 in divided doses (300 mg) twice a day or 200 mg (thrice a day) for 4 weeks + Lamiondine (3TC)- 150 mg twice a day for 4 weeks.

**Expanded Regimen:** Basic regimen + Indinavir-800 mg thrice a day, or any other protease inhibitor.
Pregnancy and PEP

Based on limited information, anti-retroviral therapy taken during 2\textsuperscript{nd} and 3\textsuperscript{rd} trimester of pregnancy has not caused serious side effects in mother and infants. There is very little information on the safety in the 1\textsuperscript{st} trimester. If the HCW is pregnant a time of exposure to HIV, the designated authority or physician must be consulted about the use of the drugs and PEP.