HOSPITAL INFECTION CONTROL MANUAL

2024

Version-2.0

अखिल भारतीय आयुर्विज्ञान संस्थान
सर्वे संतु निरामयाः
ALL INDIA INSTITUTE OF MEDICAL SCIENCES
JODHPUR

HOSPITAL INFECTION CONTROL COMMITTEE

All India Institute of Medical Sciences, Jodhpur.

Version-2.0

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Chapters-INDEX

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HIC Manual Version 2.0 (2024)

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CHAPTER-1

Organization of Hospital Infection control Programme at AIIMS Jodhpur.

1) INTRODUCTION

Infection prevention and control (IPC) is a practical, evidence-based approach preventing patients and health workers from being harmed by avoidable infections. Effective IPC requires constant action at all levels of the health system, including policymakers, facility managers, health workers and those who access health services. IPC is unique in the field of patient safety and quality of care, as it is universally relevant to every health worker and patient, at every health care interaction. Defective IPC causes harm and can kill. Without effective IPC it is impossible to achieve quality health care delivery.

Infection prevention and control (IPC) is a scientific approach and practical solution designed to prevent harm caused by infection to patients and health workers. This approach is grounded in infectious diseases, epidemiology, social science and health system strengthening. IPC occupies a unique position in the field of patient safety and quality universal health coverage since it is relevant to health workers and patients at every single health-care encounter.

According to India's Strategic action plan 3, with effective IPC we can reduce AMR which is global threat in medical field.

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

The overall aim of this document is to provide evidence based information in the prevention and control of infection at AIIMS, JODHPUR to fulfill this aim hospital infection control committee has been formed that looks after the infection control needs of the hospital.

1. HOSPITAL INFECTION CONTROL COMMITTEE AT AIIMS Jodhpur.

A Hospital Infection Control Committee (HICC) was constituted by the Hon'ble Director of AIIMS, Jodhpur, which is integral component of the healthcare facility, responsible for establishing and maintaining infection prevention and control, its monitoring, surveillance, reporting, research, and education related activities.

Objectives of HICC

- To curtail healthcare associated infections (HAIs) among patients, staff and visitors.
- To reduce the development of antimicrobial resistance and promote rational use of antimicrobials by antimicrobial stewardship program.
- The organization performs surveillance to capture and monitor infection prevention and control data.

Roles and Responsibilities of HICC

- Establish a multidisciplinary HICC & Provide adequate resource, support, and management bac-up to HICC.
- Develop a system for identifying, reporting, analyzing, investigating, and controlling hospital-acquired infections.
- Promote, implement and monitor optimum infection control practice at all levels ofthe health facilities.
- Monitor employee health activities regarding matter related to needle stick injury prevention, hepatitis B vaccination, etc.
- Review epidemiological surveillance data and identify the areas for interventions.
- Conduct the teaching sessions for HCWS in infection control and prevention.
- Developing an effective and practical Antimicrobial Stewardship Program (AMSP) forthe institute.
- To review risks associated with new technologies and monitor infectious risks of newdevices and products.
- Assist in the analysis and leadership in outbreak investigation and Control.
- Research for Infection Control (IC).
- To communicate and cooperate with other committees of the hospital with common interest such as Biomedical Waste Management Committee, Antibiotic Policy Committee etc.

Meetings of HICC

a. The Hospital Infection Control Committee meets every quarterly or more if required in case of any outbreak. Documentation of meetings and recommendations are keptby the secretary.

b. Minimum Quorum required: Chairperson, member-Secretary, Infection Control Team and 50% of other members.

2. INFECTION CONTROL TEAM AT AIIMS Jodhpur.

Under the HICC, there is an Infection Control Team (ICT) which is responsiblefor day-to-day activities of infection control.

Members of the Hospital Infection Control Team (ICT) of AIIMS, Jodhpur.

1.	Dr. Vibhor Tak	Addl. prof. & Member Secretary HICC
2.	Any Senior SR as per Posting	Co-coordinator.
3.	Mr. Patel Tapankuma	HIC Asst. Nursing Superintendent
4.	Mr. Murlidhar Rankawat	Infection Control Nursing Officer
5.	Mr. Satishkumar Jakhar	Infection Control Nursing Officer
6.	Mr. Jaiprakash	Infection Control Nursing Officer
7.	Ms. Megha Sharma	Infection Control Nursing Officer

Roles and Responsibilities of ICT

ICT is the functional unit of HICC, who actually performs various function of HICC at ground level. They are responsible for day to day functioning of the IPC program, and also for setting priorities, applying evidence-base practice, and advising hospital administrator on issues relating to infection control.

- Assist in training of all new employees as to the importance of infection control and the relevantpolicies and procedures.

- Have written procedures for maintenance of cleanliness.
- Surveillance of infection, data analyses, and implementation of corrective steps. This is based on reviews of lab reports, reports from nursing in charge etc.
- Surveillance of Biomedical Waste management
- Supervision of isolation procedures.
- Monitors employee health program.
- Addresses all requirements of infection control and employee health as specified by Central laws,State laws and NABH.

Roles and Responsibilities of ICO

- Co-ordinate with the chairperson and HICC in planning infection control program and measures.
  Keeps a track of any developing outbreaks.
- Participate, guides in research activities related to infection control practices and publish them.
- Ensuring laboratory practices meet appropriate standards.
- Ensuring safe laboratory practices to prevent infection in staff.
- Performing antimicrobial susceptibly testing following internationally recognized method &providing summary reports of prevalence of resistance.
- Monitoring sterilization, disinfection & the environment where necessary.
- Developing guidelines for appropriate collection, transport & handling of specimens.
- Advise management of at risk patients.

Roles and Responsibilities of IC ANS

- Supervises the surveillance of healthcare associated infections as well as preventiveand control programs.
- Co-ordinate activities and keep record of all data of HIC.
- Monitor/Audit the standard precautions as practiced by all cadres of HCWs while conducting Infection control rounds.
- Periodical training of all category of healthcare workers about Infection ControlProtocols and Policies.
- Monitor the quality of in-use and newly purchased disinfectants.

- Doing HIC round in hospital premises and submit round report to CNO office periodically.
- Immediate attention in Needle Stick Injuries (NSIs) and other occupational exposures and facilitates post-exposure measures. Maintains registers and data of Sharps/NSIsand Post–exposure prophylaxis.
- Initiates and ensure proper immunization for Hepatitis B Virus Immunoglobulin and HBsAg vaccine, in consultation with microbiologist (Member HICC) in case of suspected exposure to any hospital worker.
- Issuance of HBIG from Pharmacy store in coordination with Dept. of General Medicine.
- Track the indicators of infection control and present the data to the HICC meetings on regular basis.
- Regular monitoring of engineering department and water supply.
- Monitor the ongoing methods of sterilization and disinfection in coordination with CSSD.
- Participate in research activities related to infection control practices.
- Making final documentation for "kayakalp Inspection" and "NABH Inspection" for HIC & BMW sections.

Roles and Responsibilities of ICN (NO&SNO)

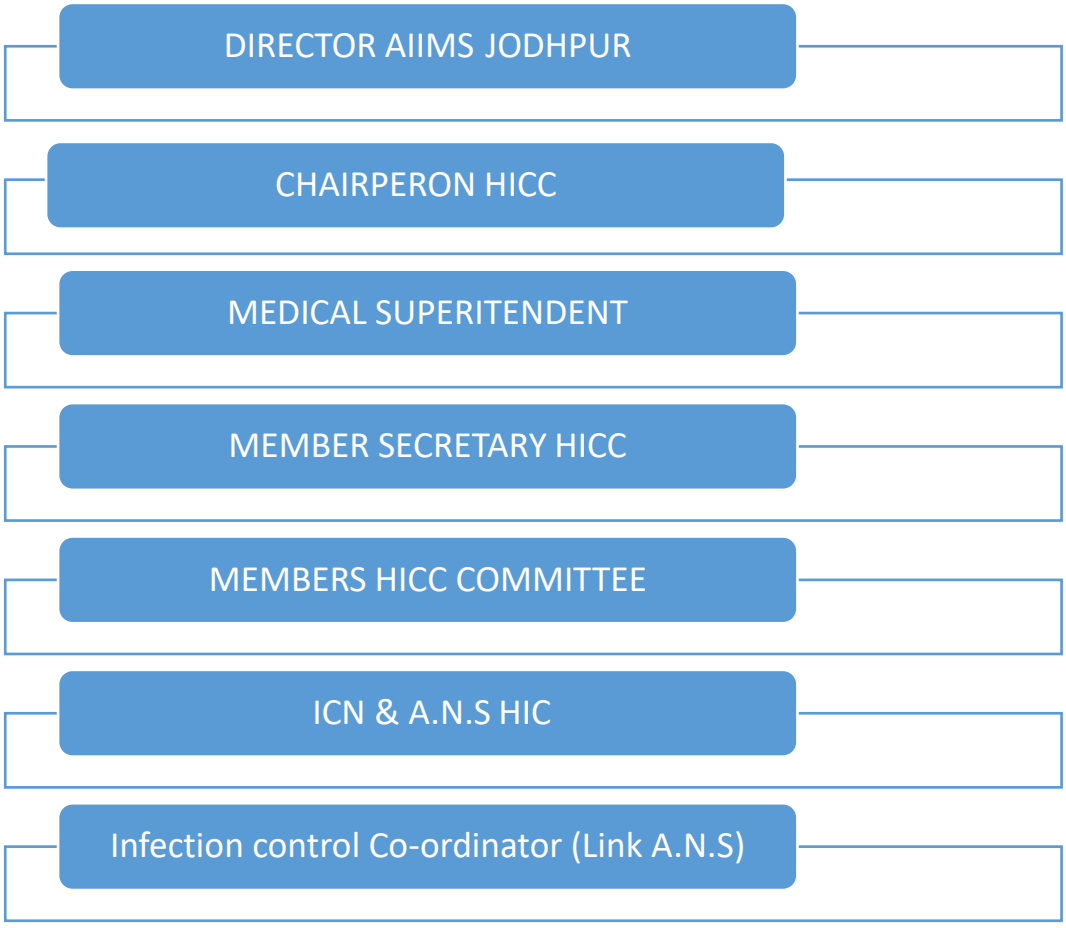
The duties of the ICN are primarily associated with **ensuring the practice of infection control measures by healthcare workers.** Thus the ICN is the link between the HICC and the wards/ICUs etc. in identifying problems and implementing solutions.

- The ICN conducts Infection control rounds daily and maintains the registers.
- The ICN is involved in education of practices minimizing healthcare associated infections and hand hygiene among Healthcare workers.
- Work as a clinical supervisor by ensuring all the established policies and protocols are practiced like hand washing procedures, use of hand rubs, isolation policies, care of IV and vascular access, urinary catheters, universal precautions, housekeeping, cleaning and disinfection, PPE, equipment cleaning, etc.
- Ensures that all positive culture cases are been tracked and for each positive culture from inpatient unit a hospital infection information sheet or surgical site infection Sheet is filled and keep record for each positive culture case. All probable cases of healthcare associated infections and

anomalous/irrational use of antibiotics must be discussed in HICC meetings.

- During the infection control rounds he/she does active surveillance for the four common HAIs namely, CLABSI (Central Line Associated Blood Stream Infection), CAUTI (Catheter Associated Urinary Tract Infection), VAP (Ventilator Associated Pneumonia) and SSI (Surgical Site Infection).
- Performs on-site auditing of various Infection control practices especially, universal precautions like hand hygiene audit, use of PPE etc.
- Conducts special tasks given to him/her as per components and objectives of the hospitalinfection prevention and control.
- Inform anomalous/irrational use of antibiotics to ICO that must be discussed in HICC meetings.
- Swabbing of OT, ICUs, for culture to access environmental cleaning & disinfection.
- Collect hand swab/Nose swab/ fingertip culture to ensure proper hand hygiene of HCWs.

Organogram HICC AIIMS Jodhpur



CHAPTER-2

Surveillance and reporting of Hospital acquired Infections (HAIS)

1. HAI SURVEILLANCE

Hospital Acquired Infection (HAI) surveillance is a system that monitors the HAIs in a hospital with primary aim of reducing the HAI risk within hospitals. The HAI surveillance cycle consists of 'data collection—data analysis—data interpretation—data dissemination'.

2. OBJECTIVES OF HAI SURVEILLANCE

- To obtain endemic/ baseline HAI rate and information on type of HAI.
- To compare HAI rates within different wards/ areas of the hospital and among other hospitals.
- To identify the problem area, based on which root cause analysis is conducted to find out the breakdowns in infection control measures followed by which correctivemeasures will be implemented.
- To identify impending outbreaks and to prevent them.
- To monitor and evaluate the effect of infection control interventions.
- To provides timely feedback to the clinicians; thus reinforcing them to adopt best practices.
- Fulfilling the accreditation agency criteria, National accreditation board for hospitals (NABH)

3. HEALTHCARE ASSOCIATED INFECTIONS TARGETED FOR SURVEILLANCE

Surveillance is done for following major HAIs at our institute.

1. Catheter Associated Urinary Tract Infections (CAUTI)
2. Central Line Associated Blood Stream Infections (CLABSI)
3. Ventilator Associated Pneumonia (VAP)
4. Surgical Site Infections (SSI)

4. AREAS OF SURVEILLANCE

The surveillance is currently being conducted in the following areas of the hospital and will be expanded further to cover newly developed areas of similar nature with support of more manpower.

1) Adult ICU
2) Neonatal ICU
3) Pediatric ICU
4) Neuro ICU
5) CTVS ICU
6) SSI of LSCS
7) Ward Surveillance

5. PROCEDURE FOR HAI SURVEILLANCE

The surveillance is currently done by *Active surveillance/ Laboratory based Ward liaison surveillance method* which is considered as the best method for surveillance. In this, patients/ cases admitted in the above targeted areas are prospectively monitored by the trained ICNs on daily basis. The ICNs collect information on all new admissions and existing admissions with device (urinary catheter, central line, and ventilator) and/or those who underwent surgeries. They also prospectively check the laboratory investigations to confirm a diagnosis.

The definitions related to HAI surveillance and the protocol for data collection and analysis (including proformas for surveillance) are adopted from the National Health Safety Network (NHSN)-CDC guidelines for HAI surveillance (refer to Annexure 1 for case definitions of major HAIs).

The data is collected on monthly basis from each area of surveillance under following heads:

a. Data collection for Identification of HAI
b. Data collection for calculation of denominator values

6. DATA ANALYSIS, DISSEMINATION AND PRESENTATION

The data is analyzed using Microsoft Excel to generate a monthly report of HAI rate of
AIIMS Jodhpur. Monthly HAI Surveillance report is used for:

- Comparison between two consecutive months, or
- Between different ICUs for the same month, or
- To observe the trend of HAIs over a specified period of time.

The monthly HAI surveillance report is shared with all clinical departments as well as with the
Nursing Supervisors of area via email.

The rates are presented in HICC meetings and discussed among the concerned members.The interventions are planned for each ICU/ward on the basis of the HAI rates. Further monitoring for any changes in the rates is done by ICT followed by feedback to the respective department.

a) Passive Surveillance

Passive surveillance shall be done laboratory based-ward surveillance in conjunction with "Alert organism/Alert condition" surveillance. The system is managed by the Infection Control Team and detailsare reported back to the Infection Control Committee.

Laboratory-Based Ward Liaison Surveillance (Alert Organisms).

All positive microbiology reports from in patient will be screened and may result in a case review, a search for other carriers or infected patients and ward visits by the Infection Control Nurse. Approximately 70% of infections and alert organisms can be detected in this way. A patient may be placed in source isolation if considered to be a source of infection to other patients.

Ward Based Surveillance (Alert Conditions)

Alert conditions are medical syndromes such as *Acinetobacter* bacteremia or *Pseudomonas* pneumonia which immediately suspected healthcare associated infection. It is the responsibility of the ward staff to notify the infection control team if they suspect an infection which may be a risk to others. Appropriate specimens must be taken and sent promptly, properly labeled, to the laboratory. Source isolation precautions must be instituted immediately that infection is suspected.

Action Plan

When organism/s is/are detected by the laboratory based surveillance or ward based surveillance, microbiologist and the treating clinician will discuss the possibility of healthcare associated infections and action will be recorded in Hospital acquired infection assessment form. Every effort will be made to evaluate critically each and every positive culture report from the in-patient units including critical care areas. The record will be maintained by ICN and the data will be presented at least once a month at HICC meeting to review the case critically for possible HAI infections and the feedback will be provided to the concerned unit head.

Response

Appropriate measures will be taken in case of suspected outbreak or sudden increase in rates of suspected healthcare associated infections. Control measures to prevent spread of infection and decrease the incidence of healthcare associated infections may be suggested in feedback report to the concern units. The report will be prepared at least biannually and will be submitted to the unit heads. In case urgent intervention is required the response may be communicated more frequently.

"Clinicians must tell the Infection Control Team about any Alert Conditions."

List of ALERT ORGANISMS (suggested list but NOT limited to)

BACTERIA

1. Methicillin-resistant *Staphylococcus aureus*
2. Other (Vancomycin) resistant *Staphylococcus aureus*
3. Penicillin-resistant *Streptococcus pneumoniae*
4. *Haemophilus influenzae*
5. *Legionella* spp.
6. Glycopeptide-resistant enterococci
7. *Neisseria meningitidis*
8. Pan-resistant Gram negative bacilli
9. *Mycobacterium tuberculosis*
10. Any unusual bacteria

VIRUSES

1. Hepatitis B
2. Hepatitis C
3. HIV
4. Rotavirus
5. Small round structured virus (Norovirus)
6. Respiratory syncytial virus
7. Varicella zoster
8. Influenza virus
9. Parvo Virus
10. Measles
11. Novel H1N1
12. Dengue

Examples of **ALERT CONDITIONS**

1. Post-surgical sepsis
2. Exanthemata (acute rash illness)
3. Chicken pox or shingles
4. Mumps, measles, rubella, parvovirus
5. Whooping cough
6. Poliomyelitis
7. Diphtheria
8. Meningococcal Meningitis
9. Hepatitis B and Hepatitis C Viral Infection)
10. Pyrexia of unknown origin
11. Typhoid and paratyphoid fevers
12. Viral hemorrhagic fever
13. Swine flu

b) TARGETED SURVEILLANCE

Detailed targeted surveillance in specific areas is performed. An example would be surgical site infection(SSI) surveillance in LSCCS Mothers.

c) Active Surveillance

Collection of data in field, correlated with clinical result.

High risk areas of hospital include:

- Operation theatres
- Intensive care units
- HDU
- Dialysis unit
- CSSD
- Blood bank
- Drinking water facilities

Operation Theatres

As per guidelines for Environmental Infection Control in health care facilities recommended by the Centers for Disease Control (CDC) and the Healthcare Infection Control Practices Advisory Committee (HICPAC), 2003, Microbial Sampling of Air and inanimate surfaces (i.e. Environmental Sampling including surface swabs) is not recommended.

The air quality testing shall be done only under following conditions:-

- To support an investigation of an outbreak of disease orinfections.
- For the purpose of research.
- After any major construction periods to qualitatively detect breaks in environmental infectioncontrol measures.

Records are kept with nursing in charge OT and the results must be produced in HICC meetings biannuallyor more frequently. In case of unacceptable results decision on corrective measures are taken by HICC.

Intensive care unit

Compared to patients in wards, ICU patients are always at increased risk of acquiring infection, which may be attributed to several factors.

- Acuity of illness
- Increase device use (such as Central line, urinary catheter, ventilator etc.)
- Response to physiological stressors (such as pain, anxiety & isolation)
- Age & associated comorbidity
- Indiscriminate use of antibiotics.
- Prophylaxis of stress ulcer (Increase in gastric PH may attenuate the bactericidal effect of an acidic PH)
- Sleep deprivation
- Malnutrition
- Understaffing

Monitoring of disinfectants (Glutaraldehyde 2%)

The efficacy of the Glutaraldehyde shall be tested by surprise check at least once in a month and records are to be kept with ICN. The data shall be presented in HICC meeting at least once in 3 months.

Environmental Surface Sampling

Contaminated environmental surfaces can contribute to the transmission of various HAIs like *Vancomycin- resistant enterococci* (VRE), *methicillin-resistant S. aureus* (MRSA), and *Clostridium difficile*.

Surveillance samples to be taken when

- There is suspected outbreak or same isolate in the blood culture of multiple patients found in same area.
- As a part of comprehensive approach for specific quality assurance purposes.
- Monitoring of disinfection/sterilization practices (e.g. Equipments/Surface disinfection)

Method- Moistened swab with direct plating (most commonly used)

Air surveillance

Microorganisms are released into the air when environmental reservoirs (i.e Soil, water, dust, & decaying organic matter) are disturbed. They can be brought into hospital by a number of vehicles (e.g. People, air currents, water, construction materials, & equipment)

Subsequently, these airborne organisms can proliferate in various indoor ecological niches and, if subsequently disbursed into the air, serve as a source for airborne HAIs.

Surveillance samples to be taken when

- Investigation of an outbreak
- After reconstruction or newly constructed buildings.
- For short term evaluation of a change in infection-control practice.

Routine air sampling (i.e. random & undirected sampling) is not recommended because

(i) HAI rates are not related with level of general microbial contamination of air or environmental surfaces,

(ii) There are no standard guideline mentioning the permissible levels of microbial contamination of air

Water surveillance

Hospital water and water-containing devices as well as moist environment may serve as a reservoir of health care associated waterborne pathogens.

There are variety of water reservoirs which have been linked to hospital outbreaks of waterborne diseases; including potable water, sinks, showers, faucets, respiratory therapy, quipment, room air humidifiers, tub immersion, toilet, dialysis water, ice and ice machines, flower vases, eye wash station, Humidifier water, suctioning machine, distilled water, tap water and dental unit water station.

Common water borne pathogen.

Pseudomonas, Burkholderia cepacia, sphingomonas, Ralstonia pickettii, Acinetobacter species, Enterobacter species, cryptosporidium species, norovirus, fungal pathogen, legionella pneumophila.

Water culture processed from various site of AIIMS Premises in 2023.

Month	Water Culture
January	15
February	8
March	90
April	124
May	29
June	32
July	12
August	12
September	9
October	12
November	7
December	0

Total 350 Water Culture

CHAPTER-3

INFECTION CONTROL PROCEDURES AND PRACTICES

Since it is impossible to identify some infectious patients (especially those infected with HIV, Hepatitis B or C) a system of standard precautions MUST be adopted in all health care work.

According to HICPAC and the CDC, "Standard Precautions combine the major features of Universal Precautions and Body Substance Isolation and are based on the principle that all blood, body fluids, secretions, excretions except sweat, non-intact skin, and mucous membranes may contain transmissible infectious agents." Standard Precautions are a group of infection prevention practices that apply to all patients and residents, regardless of suspected or confirmed infection status, in any setting in which healthcare is delivered and include:

1) Hand hygiene
2) Use of personal protective equipment (e.g., gloves, gowns, facemasks), depending on theanticipated exposure
3) Respiratory hygiene and cough etiquette
4) Management of spillage
5) Safe injection practices

HAND HYGIENE

1. OBJECTIVE

To promote and practice hand hygiene by all the healthcare providers while providing patientcare at various levels.

2. SCOPE

This document applies to healthcare professionals of all the cadres at AIIMS Jodhpur.

3. WHEN TO PERFORM HAND HYGIENE?

Perform hand hygiene while caring for patients using 'Five Moments Approach' recommended by WHO and as mentioned below:

a. Before touching the patient
b. Before any clean/aseptic procedures
c. After body fluid exposure risk
d. After touching the patient
e. After touching the patient surroundings

4. HOW TO PERFORM HAND HYGIENE?

Hand hygiene may be performed by following methods depending upon the indications.

a. Hand washing with plain/antimicrobial soap
b. Hand rubbing with alcohol based hand rubs
c. Surgical hand antisepsis

Hand Washing with Soap and Water

Use plain or preferably antimicrobial soap for hand washing.

Perform hand washing during following instances. Hand rubbing is not recommended duringthese procedures.

Indications for Hand Washing

- If there is visible contamination of hands with blood or body fluids.
- If there is visible contamination with dirt or organic material.
- If exposure to potential spore-forming pathogens is strongly suspected or proven,
  Including outbreaks of **C. difficile.**
- After using toilets/washrooms.
- Before and after having meals.

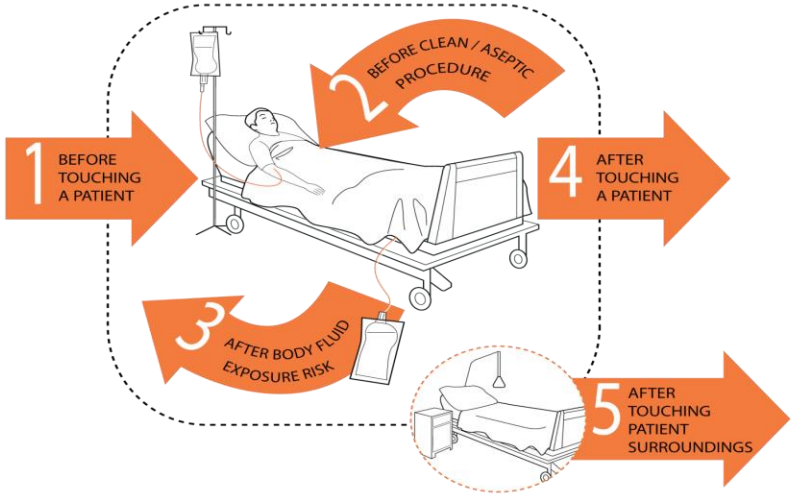


Figure 1: The "My 5 Moments for Hand Hygiene" Approach (WHO)

Procedure for Hand Washing

Time: 40–60 Seconds.

Followingprecautions should be undertaken while performing hand washing.

- When washing hands with soap and water, wet hands with water and apply theamount of product necessary to cover all surfaces.
- Rinse hands with water and dry thoroughly with a single-use towel.
- Use clean, running water whenever possible. Avoid using hot water, as repeated
  exposure to hot water may increase the risk of dermatitis.
- Use a towel to turn off tap/faucet.
- Dry hands thoroughly using a method that does not recontaminate hands.
- Make sure towels are not used multiple times or by multiple people.
- Liquid, bar, leaf or powdered forms of soap are acceptable.
- When bar soap is used, small bars of soap in racks that facilitate drainage should beused to allow the bars to dry.

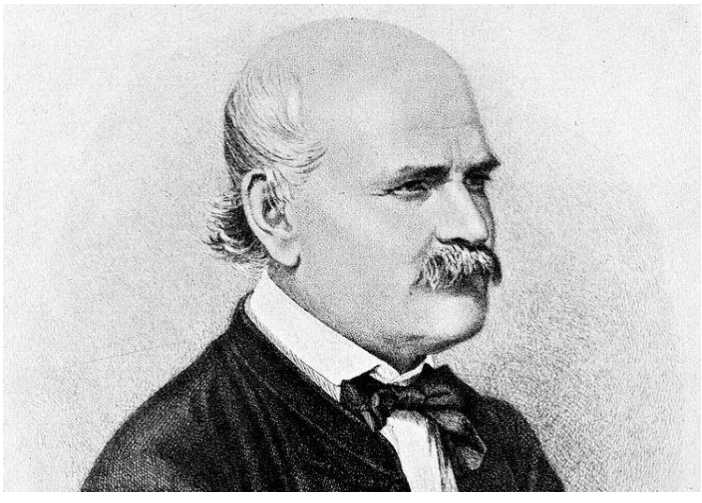
Hand Rubbing with Alcohol Based Hand Rubs (ABHR)

Indications for Hand Rubbing

- Before and after touching the patient
- Before handling an invasive device for patient care, regardless of whether or notgloves are used
- After contact with body fluids or excretions, mucous membranes, non-intact skin, or wound dressings
- If moving from a contaminated body site to another body site during care of the samepatient
- After contact with inanimate surfaces and objects (including medical equipment) inthe immediate vicinity of the patient
- After removing sterile or non-sterile gloves
- Before handling medication or preparing food.
- ***NOTE: The hand rub preparations should be available within reach, preferably closer to the point of care within 3 feet or should be carried by healthcare professional for personal use, while caring for patient.***

Hindi Menemonics for this (SUMAN KI KALAYI)

1. Palm to palm (S – सीधा)
2. Palm over dorsum (U - उल्टा)
3. Palm to palm, fingers interlaced (U- उंगलियों के बीच में)
4. Back to fingers to opposing palms (M- मुट्ठी)
5. Rotate thumbs in palm (A- अंगूठा)
6. Rotate fingers in palm (N- नाखून)
7. Wrist movement (K' – **कलाई)**
8. Rinse



FATHER OF HAND HYGIENE

(Ignaz Semmelweis)

5th May is celebrated as world Hand Hygiene Day each year. The **SAVE LIVES: Clean Your Hands** campaign aims to progress the goal of maintaining a global profile on the importance of hand hygiene in health care and to 'bring people together' in support of hand hygiene improvement globally.

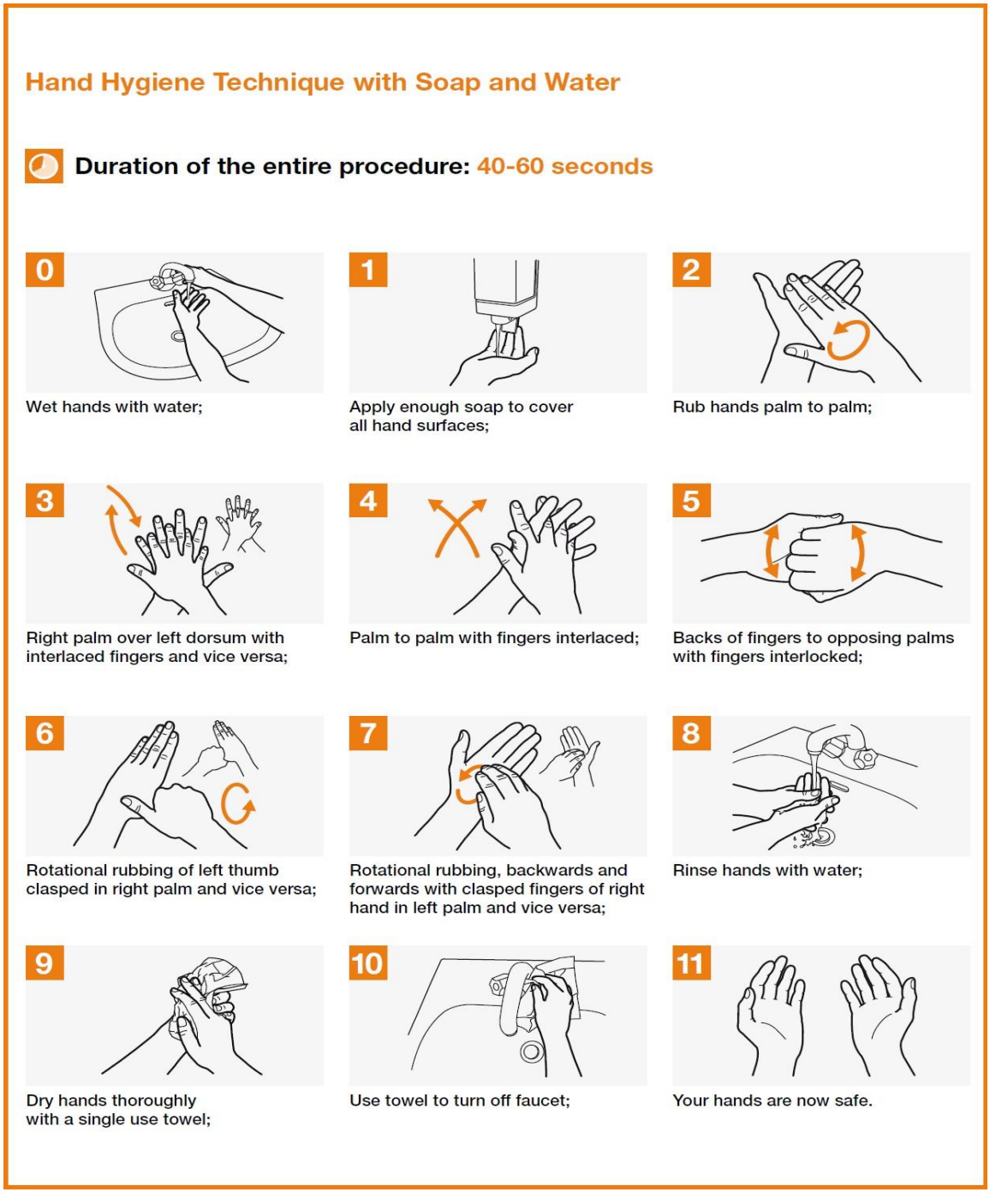


Figure 2: Procedure for Hand Washing with Soap and Water

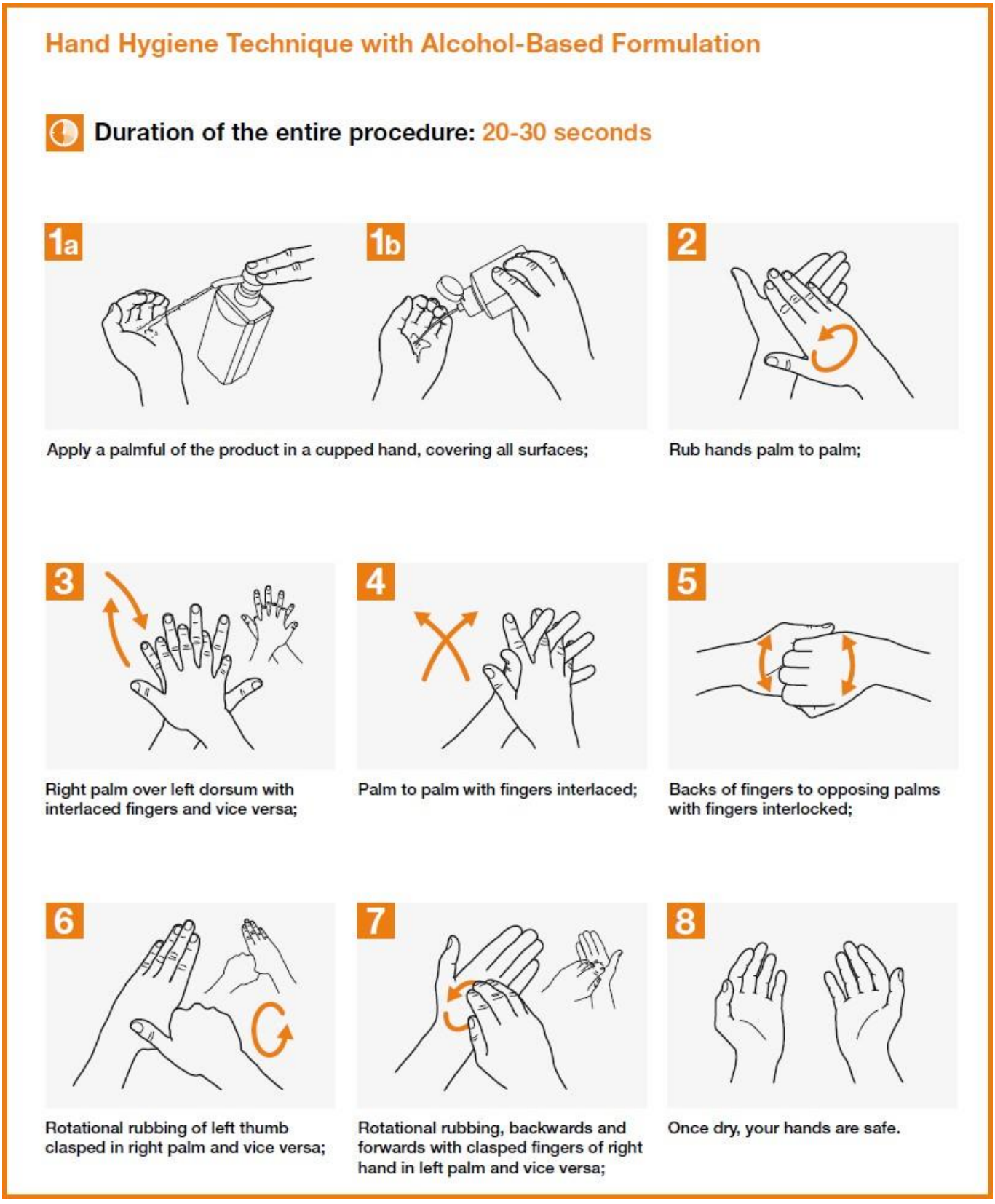


Figure 3: Procedure for Hand Rubbing with Alcohol based Formulations

Procedure for Hand Rubbing

Time: 20–30 seconds

To effectively reduce the growth of germs on hands, handrubbing must be performed byfollowing all the steps illustrated in Fig. 3.

Apply a palm ful of alcohol based hand rub and cover all surfaces of hand. Rub hands until dry.

Surgical Hand Preparation

Objectives

- To eliminate the transient and to reduce the resident skin flora in contrast to thehygienic hand wash or hand rub.
- To reduce the release of skin bacteria from the hands of the surgical team for theduration of the procedure in case of an unnoticed puncture of the surgical glove.
- To inhibit growth of bacteria under the gloved hand.

Preparations before Surgical Hand Antisepsis

- Keep nails short and pay attention to them when washing your hands—most microbeson hands reside beneath the fingernails.
- Do not wear artificial nails or nail polish.
- Remove all personal ornaments (rings, wrist-watch, bangles and bracelets) beforeentering the operation theatre.
- Wash hands and arms with a non-medicated soap before entering the operatingtheatre area or if hands are visibly soiled.
- Remove debris from underneath fingernails using a nail cleaner, preferably underrunning water.
- Nail Brushes are not recommended for surgical hand preparation as they may damage
  the skin and encourage shedding of cells.
- Sinks should be designed to reduce the risk of splashes.
- Surgical hand antisepsis should be performed using either a suitable antimicrobial soap or suitable alcohol-based hand rub, preferably with a product ensuring sustained activity, before donning sterile gloves.
- If quality of water is not **assured** in the operating theatre, surgical hand antisepsis using an alcohol-based hand rub is recommended before donning sterile gloves when performing surgical procedures.

- When performing surgical hand antisepsis using an antimicrobial soap, scrub hands and forearms for the length of time recommended by the manufacturer, typically 2–5 minutes. Long scrub times (e.g. 10 minutes) are not necessary.
- When using an alcohol-based surgical hand rub product with sustained activity, follow the manufacturer's instructions for application times. Apply the product to dry hands only.
- Do not combine surgical hand scrub and surgical hand rub with alcohol-based products sequentially.
- When using an alcohol-based hand rub, use sufficient product to keep hands and forearms wet with the hand rub throughout the surgical hand preparation procedure.
- After application of the alcohol-based hand rub as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.

Procedural steps
• Start timing. Scrub each side of each finger, between the fingers, and the back and front of the hand for 2 minutes.
• Proceed to scrub the arms, keeping the hand higher than the arm at all times. This helps to avoid recontamination of the hands by water from the elbows and prevents bacteria-laden soap and water from contaminating the hands.
• Wash each side of the arm from wrist to the elbow for 1 minute.
• Repeat the process on the other hand and arm, keeping hands above elbows at all times. If the hand touches anything at any time, the scrub must be lengthened by 1 minute for the area that has been contaminated.
• Rinse hands and arms by passing them through the water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
• Proceed to the operating theatre holding hands above elbows.
• At all times during the scrub procedure, care should be taken not to splash water onto surgical attire.
• Once in the operating theatre, hands and arms should be dried using a sterile towel and aseptic technique before donning gown and gloves.

Recommended alcohol based products for surgical hand preparation:

- Use alcohol based hand rub formulations mentioned earlier in this document.
- While using WHO formulations as above, minimum three applications for the periodof 3–5 minutes must be ensured.
- Alternatively alcohol based hand rubs containing 50–90% of alcohol with additional long acting compounds like Chlorhexidine Gluconate or Quaternary Ammonium compounds may be used.

Precautions before surgical hand preparation using alcohol based hand rubs:

- Ensure that the hands are visibly clean before application of alcohol hand rub
- Ensure that the hands are well dried before application of alcohol hand rub
- Follow the manufacturer's instructions for application times
- Use sufficient product to keep hands and forearms wet with the hand rub throughout the surgical hand preparation procedure
- Repeat hand rubbing is sufficient before switching to the next procedure without need for hand scrubbing or washing
- Surgical procedures of more than two hours duration, surgeon should practice a second hand rub of one minute duration
- Use hand rubs after removing gloves when operation is over OR wash with soap andwater in case of glove puncture or if any residual talc or biological fluids are present.

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)

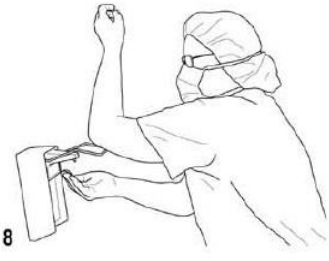
3
Images 3–7: Smear the handrub on the right forearm up to the elbow. Ensure that the whole skin area is covered by using circular movements around the forearm until the handrub has fully evaporated (10-15 seconds)

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

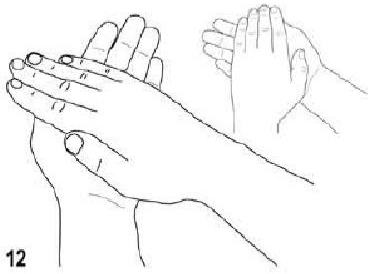
9
Dip the fingertips of your left hand in the handrub to decontaminate under the nails (5 seconds)

10

Smear the handrub on the left 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)

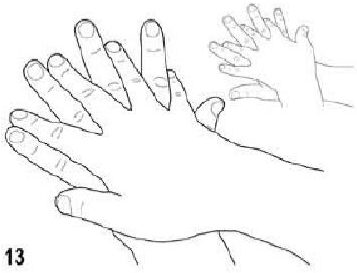
11

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 distributor. Rub both hands at the same time up to the wrists, and ensure that all the steps represented in Images 12-17 are followed (20-30 seconds)



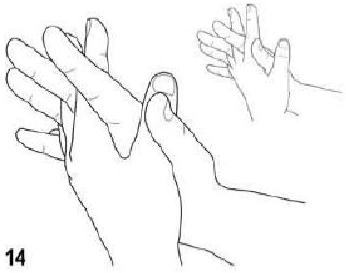
12

Cover the whole surface of the hands up to the wrist with alcohol-based handrub, rubbing palm against palm with a rotating movement



13

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

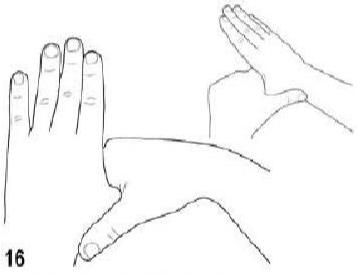


14

Rub palm against palm back and forth with fingers interlinked

15

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



16

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

17

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

Repeat the above-illustrated sequence (average duration, 60 sec) according to the number of times corresponding to the total duration recommended by the manufacturer for surgical hand preparation with an alcohol-based handrub.

All clinical areas including consultation chambers, each floor & critical care areas should have:

- Hand washing facilities appropriate to the area.
- Clear unobstructed access to the hand washing sink
- Hand washing sinks for that purpose only and clear of inappropriate items.
- Liquid soap and alcohol hand rubs available at every sink.
- Hand washing posters are placed by each sink.

Hand Hygiene Audit

- To ensure that the hand washing protocols are followed in the AIIMS, JODHPUR Hospital.
- A monthly report is generated and analyzed and corrective actions taken by training.
- The audits are done in the prescribed format.

Patient Hand Hygiene

Hand hygiene for patients must be encouraged as it is equally as important in the prevention and control of infection. Staff must ensure that patients are afforded an opportunity to hand wash prior to meals, after having used a bedpan/urinal or toilet or when hands are otherwise soiled.

Quality Assurance

- Completion of mandatory training on Hand Hygiene by all Healthcare Doctors, paramedical,housekeeping and Nurses.
- Monitor and record adherence to hand hygiene.
- Provide feedback to healthcare workers about their performance.

CHAPTER 3-A

Personal Protective Equipment (PPE)

1. OBJECTIVE

To promote and practice use of personal protective equipment appropriate for the taskwhile providing patient care by all the healthcare providers.

2. SCOPE

This document applies to healthcare professionals of all the cadres at AIIMS Jodhpur.

3. DEFINITION

Specialized clothing or equipment worn by an employee for protection against infectious materials.

4. TYPES OF PPE USED IN HEALTHCARE

- Gloves—protect hands
- Gowns/aprons—protect skin and/or clothing
- Masks—protect mouth/nose
- Respirators—protect respiratory tract from airborne infectious agents
- Goggles—protect eyes
- Face shields—protect face, mouth, nose, and eyes.
- Cap/hair cover—to protect hairs
- Boots/shoe cover—to protect feet

5. HOW TO CHOOSE APPROPRIATE PPE

Selection of PPE is based on the type of patient interaction, known or possible infectiousagents, and/ or likely mode(s) of transmission.

Following factors may be considered while choosing PPE:

- Probability of exposure to blood or body substances
- Type of body substance involved
- Probable type and probable route of transmission of infectious agents

6. DO's AND DON'Ts WHILE USING PPE

- Always use PPE whenever contact with blood or body fluids of patients is expected.
- Always use PPE most '**appropriate**' for the task.
- Use of PPE should not replace the basic procedures of infection control like hand hygiene.
- Do not share the PPE.
- Avoid contact with contaminated (used) PPE and surfaces.
- Change the PPE completely and wash your hands each time you leave a patient toattend another patient or another duty.
- Discard the used PPE in appropriate disposal bags.

7. GUIDELINES FOR USE OF PPE

Gloves

Objective

To protect both patients and healthcare workers from exposure to infectious agents that may be carried on hands.

Do's and Don'ts while using gloves

- Wear gloves when touching blood, body fluids, secretions, excretions or mucous membranes.
- Don't touch your face or adjust PPE with contaminated gloves.
- Don't touch environmental surfaces except as necessary during patient care.
- Change gloves:
  - During use if torn and when heavily soiled
  - Between contacts with different patients to prevent transmission of infectiousmaterial
  - Between tasks/ procedures on the same patient to prevent cross contaminationbetween different body sites
  - If the patient interaction involves touching portable computer keyboards or othermobile equipment that is transported from room to room.
- Remove gloves immediately after use and before attending to another patient.
- Discard used/ contaminated gloves in red colored waste bin.
- Perform hand hygiene either by hand washing with soap and water or by alcohol based hand rubs (refer to Chapter 4 of this manual) before putting gloves and after removing gloves.

Choosing Appropriate Glove type

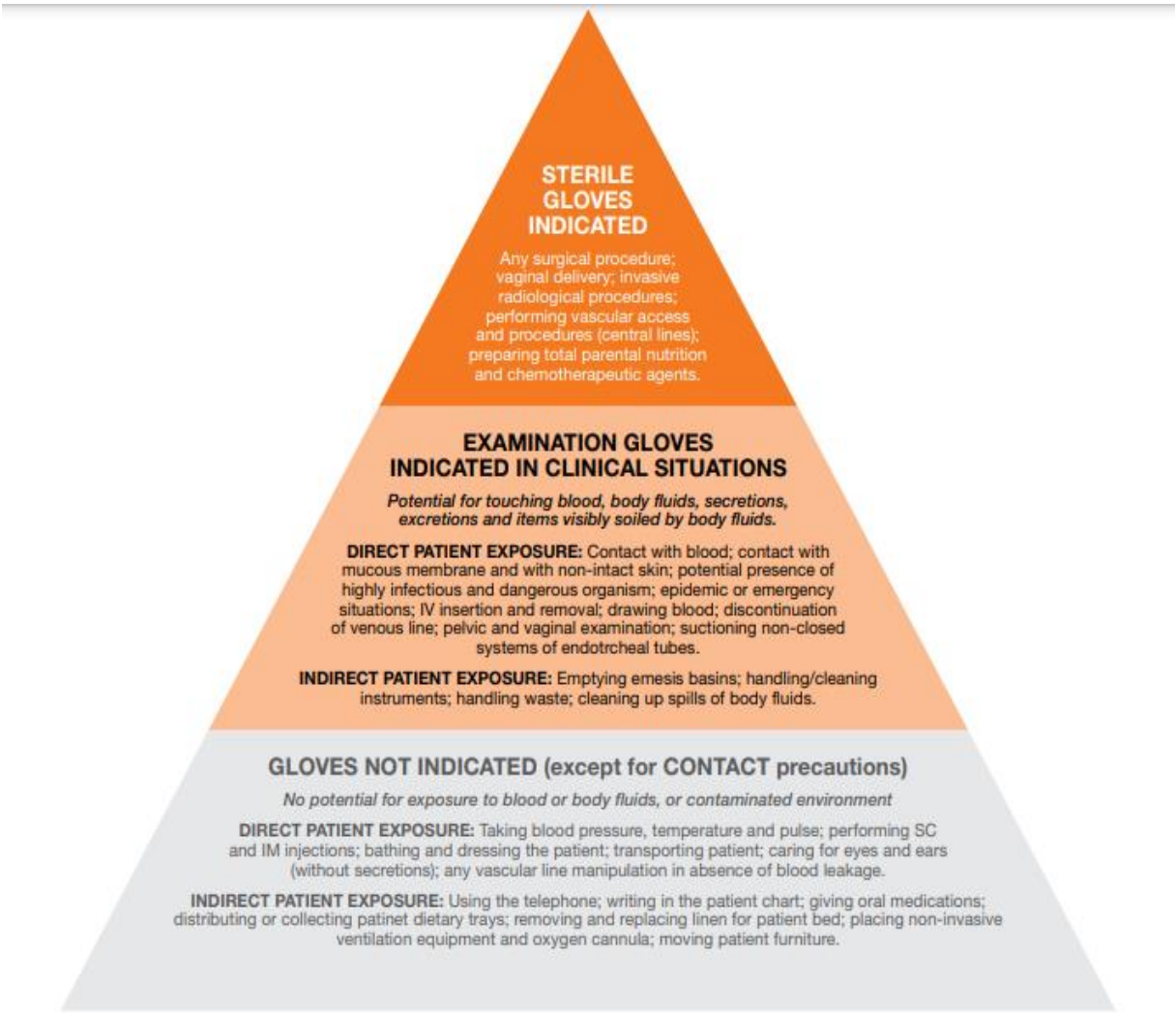
Gloves should be chosen according to following factors:

- Who is at risk?—Choose sterile gloves if patient and healthcare worker both are at risk, while if safety of only healthcare worker is required, unsterile gloves may beused.
- Whether single use (disposable) or reusable gloves are required for the task.

- Material of glove—synthetic materials like Nitrile remains the material of choice unless contraindicated due to its efficacy in protecting against blood borne viruses and properties that enable to maintain dexterity.
- **One** or two pairs—requirement should be assessed based on risk of exposure involved.

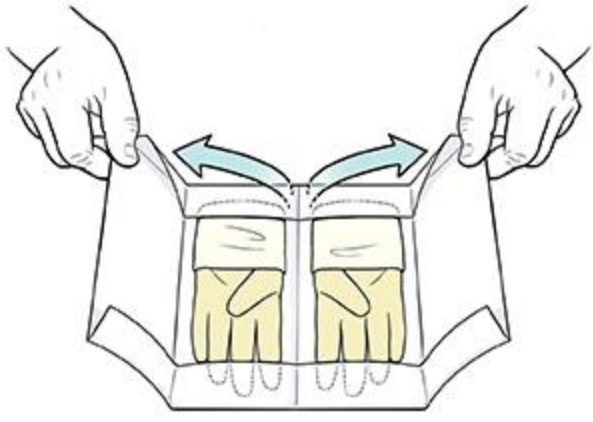
The Glove Pyramid – to aid decision making on when to wear (and not wear) gloves.

Gloves must be worn according to STANDARD and CONTACT PRECAUTIONS. The pyramid details some clinical examples in which gloves are not indicated, and others in which examination or sterile gloves are indicated. Hand hygiene should be performed when appropriate regardless of indications for glove use.



How to Don and Doff sterile Gloves (Fig-5)

- # Step-1 Open the outer packaging (The gloves will be inside another inner wrapper.)



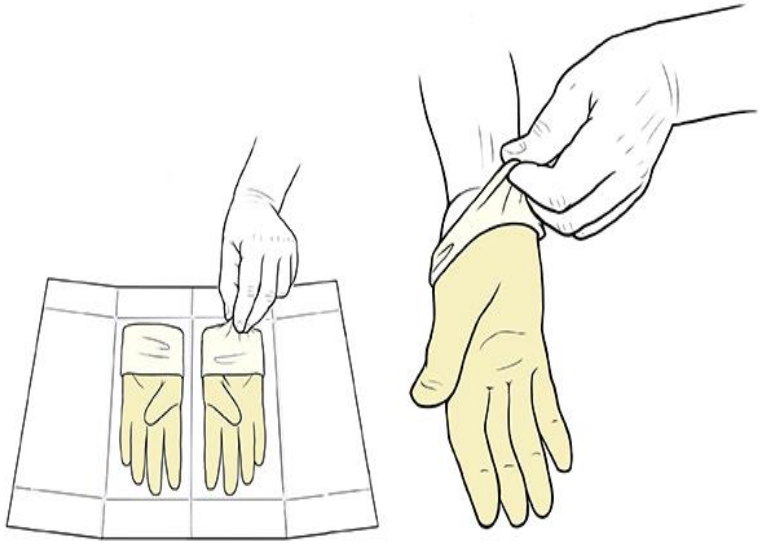
- Do Hand rub/Wash your hand.
- Open the inner wrapper.
- Touching only the outside of the wrapper, put the wrapped sterile gloves on your clean, dry work surface.
- Don't put the wrapped gloves on the outer packaging.
- Touching only the edges, open the inner wrapper so that you can see both gloves.

- # Step-2 Wash Hand

- Wet your hands and wrists.
- Use liquid soap from a pump dispenser. Work up a lather.
- Scrub your hands well for at least 20 seconds. This is about the time it takes to sing the Happy Birthday song twice.
- Rinse your hands with your fingers pointing down toward the drain.
- Dry your hands with a paper towel. Use this towel to turn off the faucet.
- Once you have washed your hands, don't touch anything but your supplies. You must wash your hands again if you touch anything else, such as furniture or your clothes.

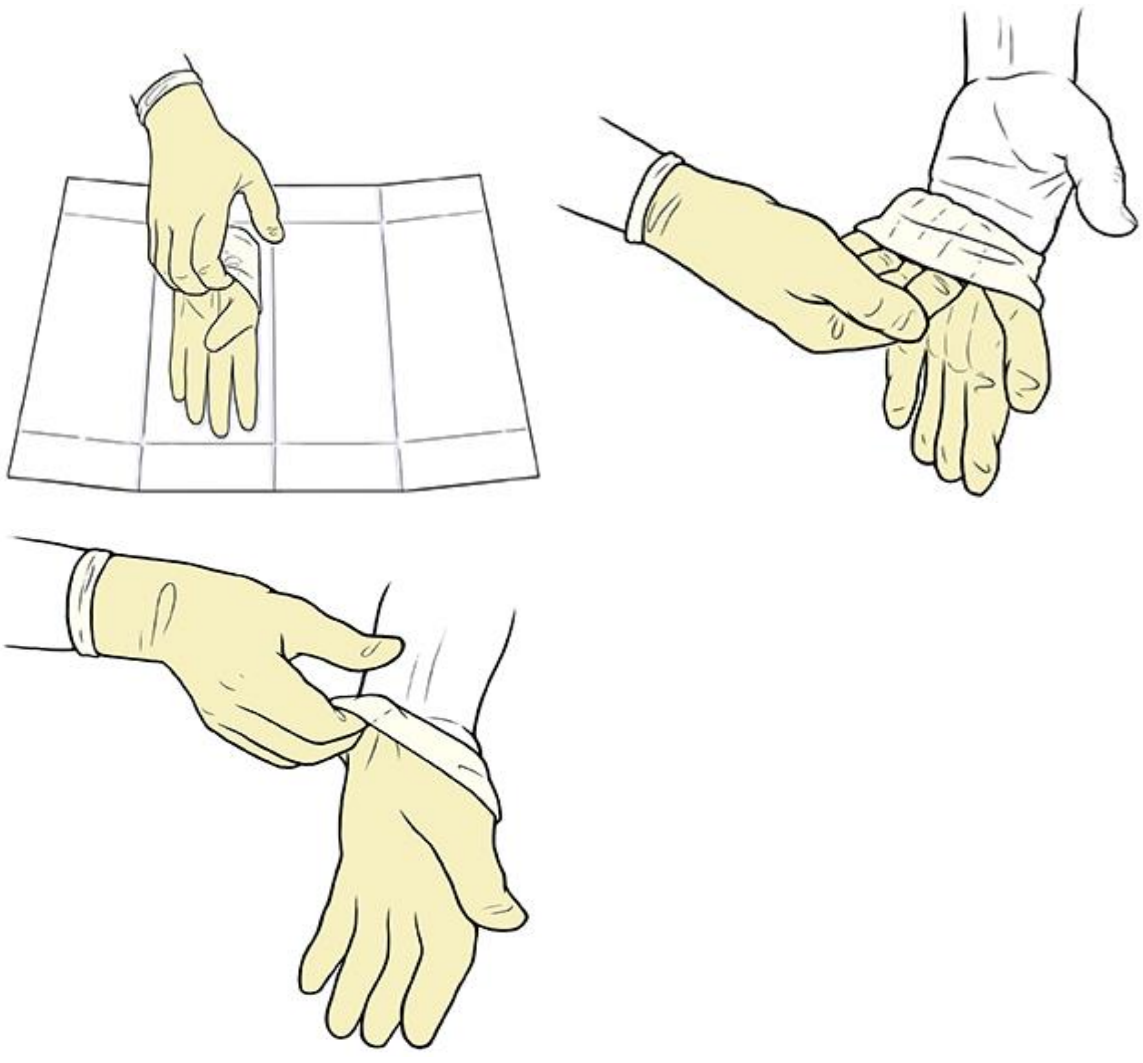
Step 3. Put on the first glove

- Take the hand you write with and grasp the glove for your other hand at the folded edge of the cuff.
- Pick up the glove by the folded edge.
- Put your hand inside the glove. Keep your hand flat and your thumb tucked in.
- Pull the glove on.
- Be careful not to touch the outside of the glove. Touch only the part of the glove that will be next to your skin.
- Leave the cuff on the glove folded.



Step 4. Put on the second glove

- Now, slip the fingers of your gloved hand into the folded cuff of the other glove.
- Lift up the second glove.
- Put the glove over your fingers. The hand that you are putting the glove on should stay flat. Keep the gloved thumb up and back to keep from touching your bare palm or wrist.
- Pull the glove over your hand.
- Adjust each glove to get a snug fit. Adjust the fingers after both hands are gloved.
- Reach under the cuffed part to pull up or adjust.



Step 5. After the gloves are on

- Keep your hands in front of you and above your waist. Don't touch anything outside the sterile field.
- If you break sterile procedure, remove the gloves, get a new package, and start again.

Procedure to Wear and Remove Sterile Gloves

Procedure to donning non-Sterile gloves (Fig 6)

Technique for donning and removing non-sterile examination gloves

When the hand hygiene indication occurs before a contact requiring glove use, perform hand hygiene by rubbing with an alcohol-based handrub or by washing with soap and water.

I. HOW TO DON GLOVES:

1. Take out a glove from its original box

2. Touch only a restricted surface of the glove corresponding to the wrist (at the top edge of the cuff)

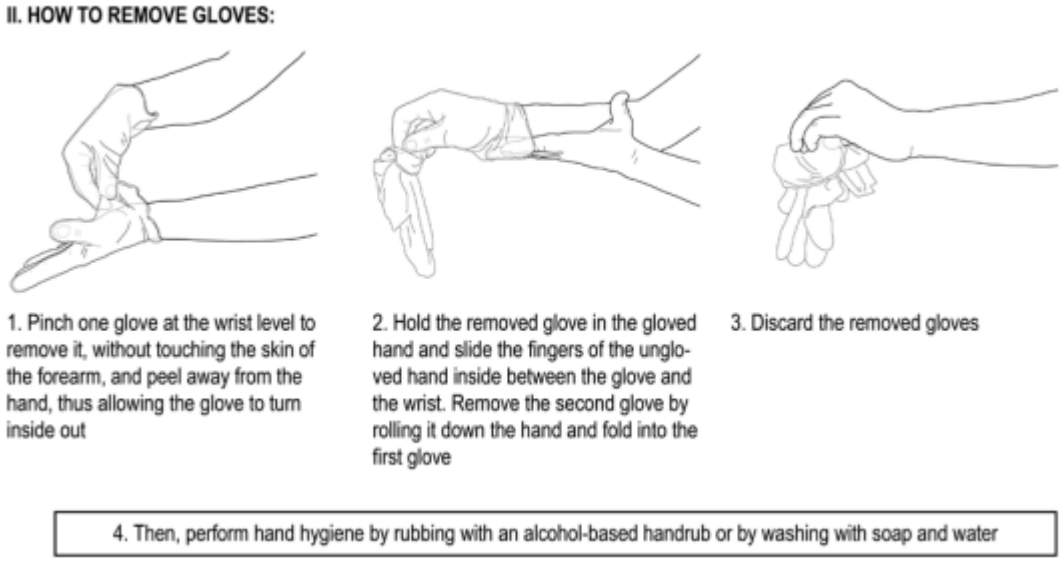
3. Don the first glove

4. Take the second glove with the bare hand and touch only a restricted surface of glove corresponding to the wrist

5. To avoid touching the skin of the forearm with the gloved hand, turn the external surface of the glove to be donned on the folded fingers of the gloved hand, thus permitting to glove the second hand

6. Once gloved, hands should not touch anything else that is not defined by indications and conditions for glove use

Procedure to doffing non-Sterile gloves (Fig 7)



Follow the procedures as illustrated in Fig. 5 (for non-sterile gloves) and Fig. 6 & 7 (for sterile gloves) of this document.

NOTE:

The use of gloves should never replace the need for hand hygiene by eitherhand rubbing or handwashing.

Gowns

Objective

To protect the healthcare workers' arms and exposed body areas and prevent contamination
of clothing with blood, body fluids and other potentially infectious material.

Do's and Don'ts while using Gowns

- Wear isolation gown when contact with blood or body fluid is expected while

Following standard precautions.

- While following contact precautions wear both gowns and gloves while entering theisolation room.
- Wear gowns as a first piece of PPE followed by all others.
- Choose a gown with appropriate fitting.
- A clean non-sterile apron/gown is generally adequate to protect skin and prevent soiling of clothing during procedures and patient care activities that are likely to generate splashes/ sprays of blood or body fluids.
- Use fluid resistant apron gown (made of plastic) when there is a risk that clothing may become contaminated with blood, body fluids, excretions or secretions (Except sweat).
- Fluid resistant gowns are always to be used along with gloves and other PPE when indicated.
- Ensure that the gown provides full coverage of the arms and body front, from neck to mid-thigh or below.
- Removal of gown: The outer contaminated side of the gown should be turned inward and rolled into a bundle and then discarded into a designated container.
- Perform hand hygiene after removal of gown.

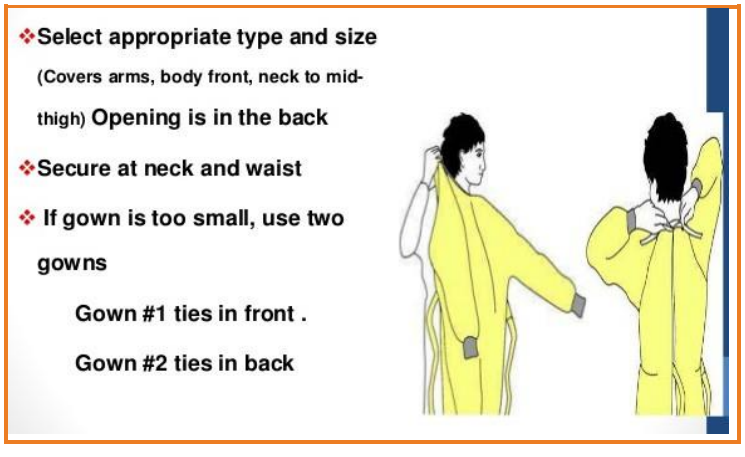


Figure 8: Wearing a gown

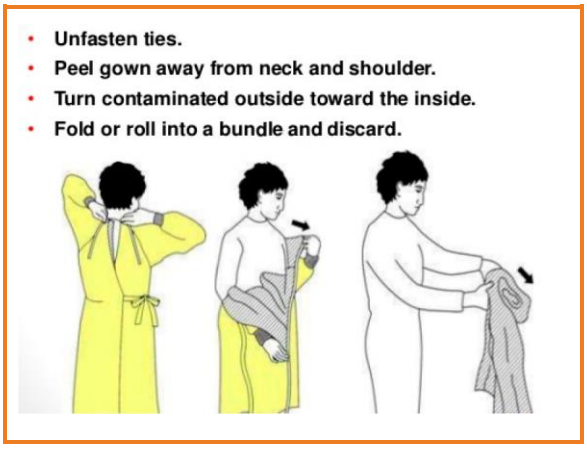


Figure 9: Removing a Gown

Masks

Objective

To protect patients from respiratory secretions of healthcare workers as well as to protect healthcare staff while caring for patients with airborne infections, or when performing any procedures with anticipated splashes of blood or body fluids.

Do's and Don'ts for Wearing a Mask

- Surgical masks are preferred over cotton or gauze masks.
- Do not reuse disposable masks
- Change masks whenever they are soiled or wet
- Do not reapply the same mask after they have been removed
- Masks should not be left dangling around the neck
- Do not touch the mask from front while wearing it
- Use specifically designed masks for children and their oxygen saturation should be monitored.

When to Use Surgical Mask

- Use surgical masks on coughing patients to limit potential dissemination of respiratory pathogens.
- Use surgical masks as a part of standard precautions to keep splashes or sprays from reaching the mouth and nose of person exposed.
- While caring for patients on droplet precautions.

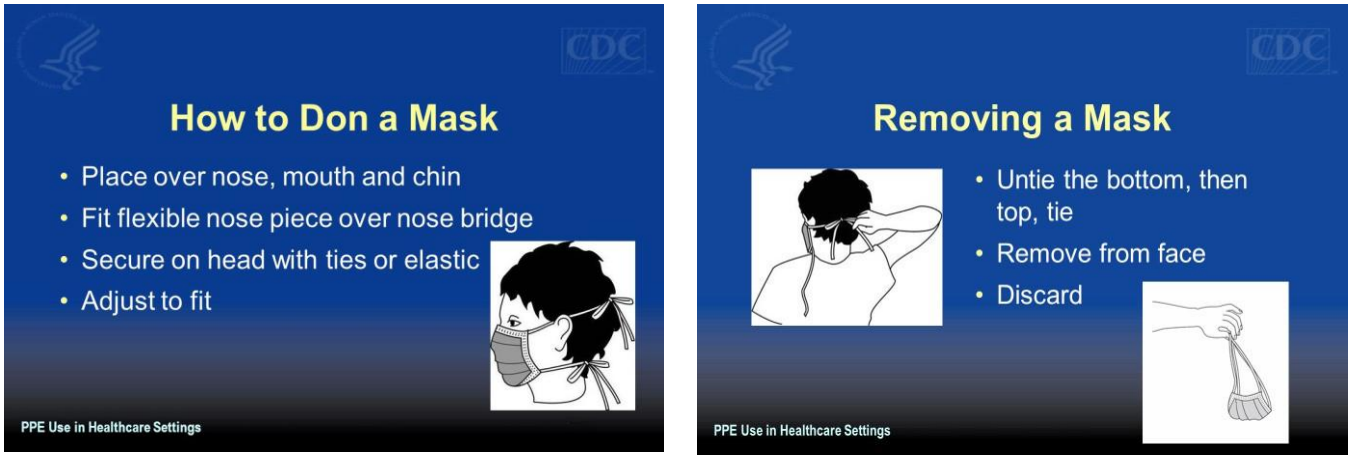


Figure 10: How to Put on and Remove the Mask

Using N95 Respirator/ any Particulate Respirator

An **N95 respirator** is a respiratory protective device designed to achieve a very close facial fit and very efficient filtration of airborne particles. Note that the edges of the respirator are designed to form a seal around the nose and mouth.

Indication for Use

- People with chronic respiratory, cardiac, or other medical conditions that make breathing difficult should check with their health care provider before using an N95 respirator because the N95 respirator can make it more difficult for the wearer to breathe.
  - Some models have exhalation valves that can make breathing out easier and help reduce heat build-up. Note that N95 respirators with exhalation valves should not be used when sterile conditions are needed.
  - N95 respirators are not designed for children or people with facial hair. Because a proper fit cannot be achieved on children and people with facial hair, the N95 respirator may not provide full protection.

When dealing with patients infected with highly transmissible respiratory pathogens whilefollowing droplet precautions (e.g. HCW dealing with open tuberculosis cases/ influenza patients)

Wearing the Respirator

- Select a fit tested respirator
- Place over nose, mouth and chin
- Fit flexible nose piece over nose bridge
- Secure on head with elastics
- Adjust to fit
- Perform a fit check
  - Inhale—respirator should collapse
  - Exhale—check for leakage around face

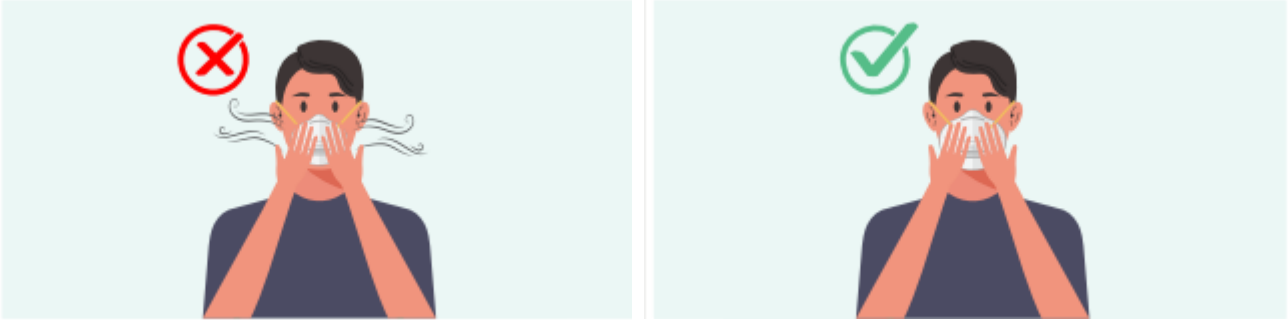
Removing the Respirator

- Always remove it just outside the patient room.
- Lift the bottom elastic over your head first

- Then lift off the top elastic
- Discard and perform hand hygiene.

Keep Your N95 Snug

Your N95 must form a seal to your face to work properly. Your breath must pass through the N95 and not around its edges. Jewellery, glasses, and facial hair can cause gaps between your face and the edge of the mask. The N95 works better if you are clean shaven. Gaps can also occur if your N95 is too big, too small, or it was not put on correctly.



When to Replace Your N95

Do not wash your N95 or put it in the oven or microwave to try to sterilize it.
Replace the N95 when the straps are stretched out and it no longer fits snugly against your face or when it becomes wet, dirty, or damaged.
Throw it in the trash.

Cloth masks have been used in healthcare and community settings to protect the wearer from respiratory infections. The filtration effectiveness of cloth masks is generally lower than that of medical masks and respirators; however, cloth masks may provide some protection if well designed and used correctly.

Some studies also examined the filtration ability of cloth masks by reviewing. We found that the filtration effectiveness of cloth masks is generally lower than that of medical masks and respirators. Filtration effectiveness of cloth masks varies widely; some materials filter better than others. Filtration effectiveness of cloth masks depends on many factors, such as thread count, number of layers, type of fabric, and water resistance.

Despite common use of cloth masks in many countries in Asia, existing infection control guidelines do not mention their use

Protective Eye Wear and Face Shield

Objective

To protect the mucous membranes of the eyes when conducting procedures that are likely to generate splashes of blood, body fluids, secretions or excretions.

Types and Uses

Goggles—Used to protect eyes only

Face shields—Used protect face, nose, mouth, and eyes

Do's and Don'ts

Goggle

- Should fit snuggly over and around eyes
- Personal glasses not a substitute for goggles
- Antifog feature improves clarity

Face Shields

- Should cover forehead, extend below chin and wrap around side of face.
- Single use/reusable face shields may be used in addition to surgical masks as an alternative to protective eye wear.

Removing Face and Eye Protection

- Should be removed after gloves have been removed and hand hygiene performed.
- The ties, earpieces and /or headband used to secure the equipment to the head areconsidered 'clean' and therefore safe to touch with bare hands.
- The front of a mask, protective eyewear or face shield is considered contaminated.

Cleaning Reusable Face and Eye Protection

- Reusable face shields and protective eyewear should be cleaned according to the manufacturer's instructions, generally with detergent solution, and be completely dry before being stored.
- Disinfection may be done by any low level disinfectant solution.

Caps and Boots/Shoe Covers

Objective

To protect against exposure to patient's blood, body fluids, secretions or excretions, which may splash onto hairs or shoes.

Do's and Don'ts

- Launder caps and shoe covers appropriately if they are reusable, followed by disinfection.
- Do not reuse disposable caps/ shoe covers. Discard them after each use in appropriate container.

Sequence of Wearing and Removing the PPE

Following sequence should be followed while wearing and removing the full PPE as per the situation.

Sequence of Wearing

1. Gown first (wear shoe covers prior if required)
2. Cap/ head cover
3. Mask or respirator
4. Goggles or face shield
5. Gloves

Sequence of Removing

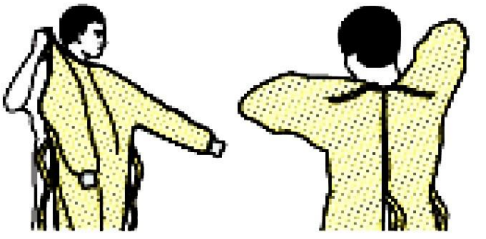
1. Gloves
2. Face shield or goggles
3. Gown
4. Mask or respirator
5. Cap/ head cover
6. Shoe cover

SEQUENCE FOR PUTTING ON PERSONAL PROTECTIVE EQUIPMENT (PPE)

The type of PPE used will vary based on the level of precautions required, such as standard and contact, droplet or airborne infection precautions. The procedure for putting on and removing PPE should be tailored to the specific type of PPE.

1. GOWN

- Fully cover torso from neck to knees, arms to end of wrists, and wrap around the back
- Fasten in back of neck and waist



2. MASK OR RESPIRATOR

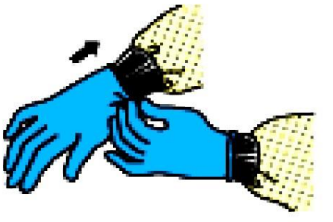
- Secure ties or elastic bands at middle of head and neck
- Fit Flexible band to nose bridge
- Fit snug to face and below chin
- Fit check respirator

3. GOGGLES OR FACE SHIELD

- Place over face and eyes and adjust to fit

4. GLOVES

- Extend to cover wrist of isolation gown



USE SAFE WORK PRACTICES TO PROTECT YOURSELF AND LIMIT THE SPREAD OF CONTAMINATION

- Keep hands away from face
- Limit surfaces touched
- Change gloves when torn or heavily contaminated
- Perform hand hygiene

Figure 11: Sequence for Putting on PPE

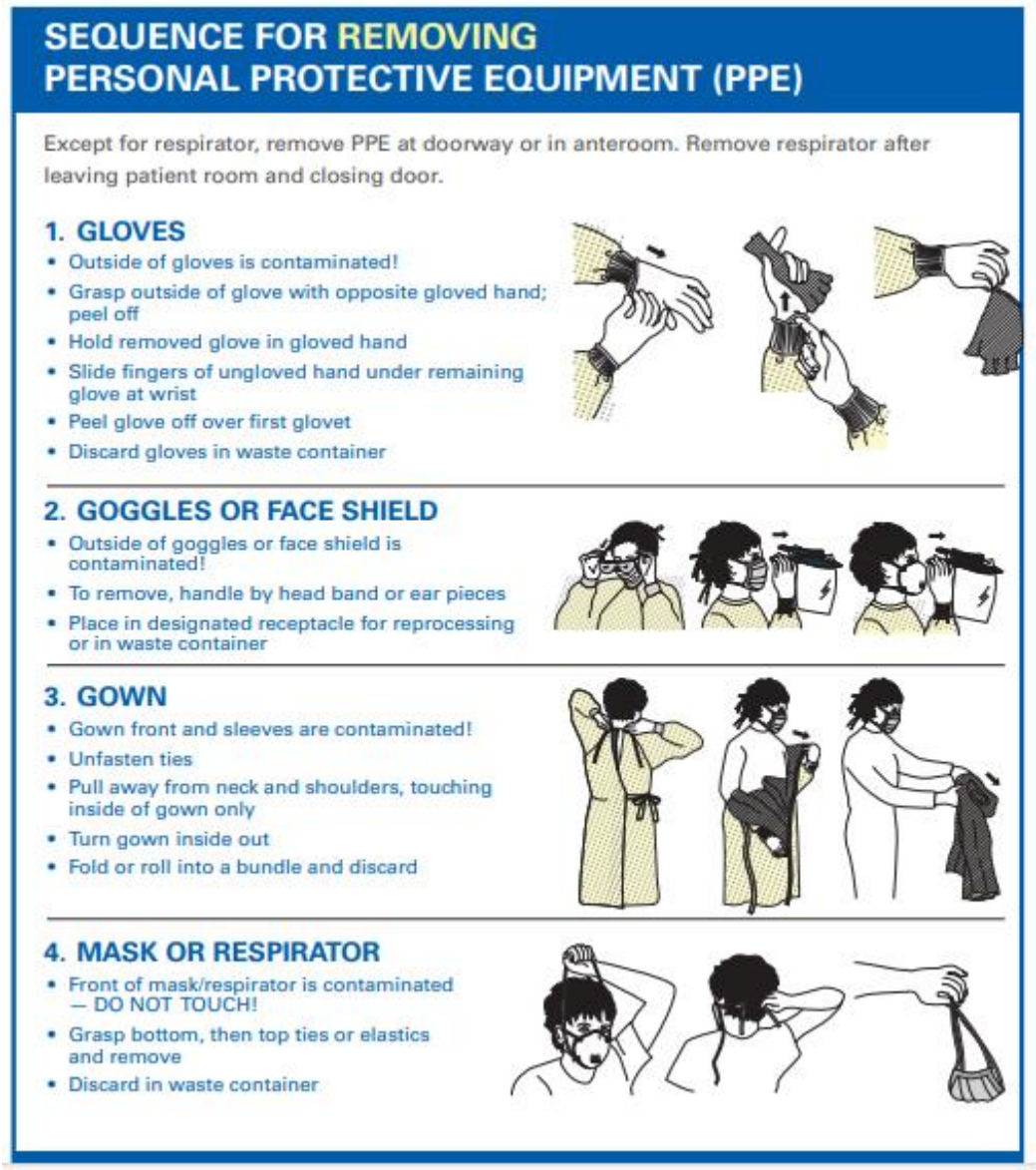


Figure 12: Sequence for Removing on PPE

REFERENCES

1) WHO guidelines for hand hygiene in Healthcare. First global patient safety challenge, Clean care is safercare. World Health Organization, 2009.
2) Guidance for the Selection and Use of Personal Protective Equipment (PPE) in Healthcare Settings. CDCAtlanta. Accessed from https://www.cdc.gov/hai/prevent/ppe.html

Chapter -4

Disinfection Policy

The decontamination of hospital environment and medical care items is of paramount importance in preventing transmission of HAIs. Cleaning, asepsis, disinfection, and sterilization are the four separate terminologies all aiming at removing or destroying the microorganisms from materials or from surfaces.

Disinfection and sterilization are essential for ensuring that medical and surgical instruments do not transmit infectious pathogens to patients. Since, all patient-care items do not necessitate sterilization, therefore health-care policies must identify, primarily on the basis of the items' intended use, whether cleaning, disinfection, or sterilization is indicated.

Cleaning or decontamination	Disinfection	Asepsis	Sterilization
Refers to the reduction of pathogenic microbial population to a level at which items are considered as safe to handle without protective attire	A process that destroys or removes most if not all pathogenic organisms but not bacterial spores.	A process in which a chemical agent is applied to body surface (Skin), resulting in destruction or inhibition of skin pathogens and commensals	A process by which all living microorganisms including viable spores, are either destroyed or removed from an article, body surface or medium.
Result in reduction of ≥1 log colony forming units (CFU) of most of the microorganism, but not spores.	Result in reduction of $\geq 10^3$ log (CFU) of most of the microorganism, but not spores.	Result in preventing the entry of pathogens into sterile tissues.	Result in reduction of $\geq 10^6$ log (CFU) of most of the microorganism, and their spores.
Achieved by manual or mechanical cleaning by soap and detergents to eliminate debris or organic matter from the medical devices.	Achieved by a physical agent or a chemical agent (Disinfectant) and are normally used only on inanimate objects, not on body surfaces.	Achieved by a specific group of chemical agents called antiseptics.	Achieved by a physical agent or a chemical agent.

Guidelines for Selection of Disinfectants:-

There is no ideal disinfectant. Each application requires careful view of following:

- Type and number of organisms.
- Type and amount of organic matter
- Contact time
- Type of surface (Rough / Corrugated)
- Type of water (hard / soft)
- Manufacturers data on efficacy
- Safety and environmental aspects (chlorine is not free from toxicity)
- Cost, shelf life and convenience of use
- Residual activity.

Two Approaches for Selection of Disinfectants:

1) Accept the manufacturers data
2) Validate yourself

❖ Properties of an ideal disinfectant

- Broad spectrum: should have a wide antimicrobial spectrum
- Fast acting: should produce a rapid kill
- Not affected by environmental factors: should be active in the presence of organic matter (e.g., blood, sputum, feces) and compatible with soaps, detergents, and other chemicals encountered in use
- Nontoxic: should not be harmful to the user or patient
- Surface compatibility: should not corrode instruments and metallic surfaces and should not cause the deterioration of cloth, rubber, plastics, and other materials
- Residual effect on treated surfaces: should leave an antimicrobial film on the treated surface
- Easy to use with clear label directions
- Odorless: should have a pleasant odor or no odor to facilitate its routine use
- Economical: should not be prohibitively high in cost
- Solubility: should be soluble in water
- Stability: should be stable in concentrate and use-dilution

- Cleaner: should have good cleaning properties
- Environmentally friendly: should not damage the environment on disposal

❖ Factor influencing efficacy of sterilant or Disinfectant

Organism load: As the bioburden increases, the amount of time that disinfectant needs to act also increase. Therefore, it is essential to carry out a scrupulous cleaning of all the surfaces of instruments.

Nature of Organisms: Organism vary greatly in their resistance to chemical disinfectants and physical sterilization processes.

Concentration: Efficacy of a disinfectant is greatly dependent upon its optimal concentration that is required to produce the expected antimicrobial action. Lower concentration with more dilution will not yield desire effect and higher concentration may have deleterious effects on material (corrosion).

Duration of exposure: Each disinfectant requires a specific amount of contact time that is necessary to achieve the desire result.

Relative humidity: It is single most important factor that influences the activity of gaseous disinfection such as ethylene oxide (ETO).

Biofilm: Biofilms are microbial communities embedded in glycocalyax substance, secreted by the organism that are tightly attached to surfaces (of medical devices etc.) and cannot be easily removed. **Bacteria within biofilms are up to 1,000 times more resistance to disinfectants than in suspension.** Biofilms have been found in whirlpools 440, dental unit waterlines441, and numerous medical devices (e.g., contact lenses, pacemakers, hemodialysis systems, urinary catheters, central venous catheters, endoscopes) Their presence can have serious implications for immunocompromised patients and patients who have indwelling medical devices.

Interference by organic matter: such as pus, serum, blod, stol or other lubricant material.

Other factors: Temperature, Local Ph, stability of Disinfectant, water hardness may interfere with disinfection.

The decreasing order of resistance of microorganisms to disinfectant or sterilizing agents is as follows:

Prions (Highest-resistant) > bacterial spores > coccidian oocytes > mycobacteria > other parasites cysts (Giardia) > small nonenveloped viruses > trophozoites > gram-negative bacteria > fungi > large nonenveloped viruses > gram- positive bacteria > enveloped viruses.

(HIV, HBV, HCV are enveloped virus)

Key points

- Disinfection removes micro-organisms without complete sterilization.
- Disinfection is used to destroy organisms present on delicate or heat-sensitive instruments which cannot be sterilized or when single use items are not available.
- Disinfection is not a sterilizing process and must not be used as a convenient substitute for sterilization.

❖ CLASSIFICATION OF PATIENT CARE ITEMS

Contact sites for patient care reused medical devices (RMDs) may be classified as **critical, semi-critical or non-critical** according to "Spaulding Classification" as given below.

Class & Risk	Definition	Level of Disinfection Required	Examples
Critical (High Risk)	Item that are involved with a break in the skin or mucous membrane or entering a sterile body cavity.	Sterilization • Physical • Chemical sterilant or High level disinfection	Surgical instruments, cardiac and urinary catheters, implants, invasive rigid endoscopes, ultrasound probes used in sterile body cavity.
Semi-critical (Intermediate risk)	Items in contact with mucous membrane, non-intact skin.	High level disinfection	Respiratory therapy equipment, anesthesia equipment, laryngoscope, rectal, vaginal, esophageal probes, non-invasive flexible endoscopes.
Non-critical (Low Risk)	Item in contact with intact skin	Intermediatelevel Disinfection	BP Cuff, ECG electrode, bedpans, crutches, stethoscope, thermometer.
	Item contact with environmental surface	Low level Disinfection	Bedside table, food utensils, patient furniture, bed rails, computers.

❖ **Comparison of the characteristics of chemicals used as high level disinfectants or Chemical sterilant.**

Properties	Glutaraldehyde (≥2.0%)	OPA (0.55%)	Peracetic Acid (0.2%)	Hydrogen Peroxide (7.5%)	Hydrogen Peroxide / Peracetic Acid (7.35%/0.23%)
High-level disinfectant claim	20-90 minutes@ 20₀-25°C	12 minutes @ 20°C, 5 minutes @ 25°C in AER	Not Applicable	30 minutes@ 20°C	15 minutes@ 20°C
Sterilization Claim	10 hours @ 20₀-25°C	None	12 minutes @ 50-56°C	6 hours @ 20°C	3 h @ 20°C
Activation	Yes (alkaline glutaraldehyde)	No	No	No	No
Reuse life (number of days a product can be reused as determined by re-use protocol)	14-30 days	14 days	Single use	21 days	14 days
Shelf life stability (time a product can remain in storage (unused))	2 years	2 years	6 months	2 years	2 years
Disposal Restrictions	Local (no U.S. EPA regulations exist but some states and local authorities have disposal restrictions)	Local (no U.S. EPA regulations exist but some states and local authorities have disposal restrictions)	None	None	None
Materials Compatibility	Excellent	Excellent	Good	Good	No data
Safety	Respiratory irritant	Eye irritant, stains skin	Serious eye and skin irritant (concentrated solution)	Serious eye irritant (safety glasses)	Eye irritant
Processing	Manual or automated	Manual or automated	Automated	Manual or automated	Manual
Organic material resistance	Yes	Yes	Yes	Yes	Yes

❖ Different Chemical sterilant its advantage and diadvantages

Chemical	Advantage	Disadvantage
Glutaraldehyde	-Excellent material compatibility (Noncorrosive)	-Pungent and irritating odour -once activated, it tends to produce vapors that cause occupational asthma & contact dermatitis. - should be use in well ventilated area. - It should be stored away from heat sources and in container with close-fitting lids. -Can be a fixative, therefore items must be scrupulously cleaned before immersion. - Coagulase blood and fixes tissues to surface. -**Spillage:** In case of accidental spill, neutralizer such as ammonium carbonate powder or glycine can be used.
Ortho-phthalaldehyde (OPA) (Use similar to that of Glutaraldehyde)	-Does not coagulate blood or fix tissues to surfaces. - Barely perceptible odor. -Lesser eye irritation than glutaraldehyde.	- It stains skin, mucous membrane, clothing and environmental surfaces. Therefore. PPE is indicated during handling and equipment must be thoroughly rinsed after disinfection. - More expensive that glutaraldehyde.
Hydrogen peroxide (H_2O_2) -Safest for fogging: No or lowest risk to the machineries and equipment. -No need of cleaning, de-fogging required after fumigation process. (because residue in air decompose in water and nascent oxygen)	-Extremely stable when stored in dark container. -Have a low toxicity and irritancy. -Inactivates Cryptosporidium -No odor and no irritation. -Does not damage glass or plastic items. -Available in wipes -Rapid action.	-Material compatibility concerns (Brass, zinc, copper, nickel or silver plating) H_2O_2 is an oxidant for metal articles.

Formaldehyde (Formalin is stabilized solution of 40% formaldehyde.)	-It was previously used for fumigation of O.T and high risk areas. -Not recommended now.	- Pungent odor. - Potentially carcinogenic - Eye and Nasal irritant and may cause respiratory distress and allergic dermatitis. - It requires longer contact period (about 2 hr)
Paracetic Acid (0.1-0.2% Concentration used)	-Low temperature sterilant for endoscopes, dental equipment. -In combination with H_2O_2, it is used for disinfection of hemodialyzer.	
Alcohol	-Nontoxic, low cost, rapid action, non-staining, readily available. -ABHR is WHO recommended hand hygiene product.	-Not sporicidal (not effective for *Clostridium difficile*) and against non-envelop viruses. - Evaporate quickly, not a good surface disinfectant. -Inactivated by organic material. -Flammable-should be stored in a cool well-ventilated area. -Need to use as a disinfection of small surfaces only, not for the large surfaces.
Chlorine & Hypochlorite. Liquid form(Sodium hypochlorite) ("Bleach") Solid Form(Calcium hypochlorite)	-Fast acting and have broad microbicidal activity including action on bacterial spores. -Less expensive. -Unaffected by water hardness. -Does not leave toxic residues on the surface.	-Chlorine compound are corrosive to metal, damaged plastic, rubber on prolonged contact (>30min) or if used at an incorrect concentration. -Bleach fabrics, carpets. -Appropriate PPE must be worn when hypochlorite is handled. -Sodium hypochlorite should not be mixed with ammonia or acid or acidic body fluids, (e.g. urine) as it releases toxic chlorine gas, especially in a confined space.

		-Chlorine compounds get polymerized by sun rays and need to be protected in opaque containers. -It gets evaporated if kept in uncovered container. Therefore, hypochlorite solutions should be freshly prepared daily.
Chlorhexidine (uses as mouthwash, skin disinfectant(for dressing), body wash (before surgery)	-Longer acting than alcohol & cause less irritation to skin.	- Activity is pH dependent and is greatly reduced in the presence of organic matter.
Phenolic (Carbolic acid)	-5% Phenol is RNTCP recommended disinfectant for decontamination of sputum. -Lysol is commercially preparation made of a mixture of phenol.	-Not sporicidal. -Absorbed by porous materials and irritates tissues. -Can cause hyperbilirubinemia in infants when not prepared as recommended.
Quaternary Ammonium Compound (QAC) Most common active ingredient found in disinfectants used in healthcare environments.	- Good cleaning agent and use as disinfectants for environmental surfaces, floors, walls and furnishings in healthcare settings, non-autoclave items. -Noncorrosive, nontoxic, low irritant. -Higher generations have broader spectrum efficacy.	-Materials such as cotton and gauze pads can make them less microbicidal because of insoluble precipitates or cotton and gauze pads absorb the active ingredients, respectively. -Less effective with high water hardness.

(In AIIMS Jodhpur 4% Hypochlorite solution in 5Lit. cane is available)

Preparation of 1 Litre Hypochlorite solution from 4% after dilution.

- **1 % हाइपो क्लोराइट** बनाने की विधि, एवम खून लगे कपडे साफ करनेका तरीका.
- 1 लीटर के लिए = 250 ml हाइपो + 750 ml पानी
- 2 लीटर के लिए = 500 ml हाइपो + 1 .5 (डेढ़) लीटर पानी

concentration required	Dilution	Preparation	Mixture
Neat (4%) Available			
1% of Sodium Hypochlorite	4/1=1:4	1 volume of neat + 3 volume of water	250ml Neat +750ml Water
0.5% of Sodium Hypochlorite	4/0.5= 1:8	1 volume of neat + 7 volume of water	125ml Neat + 875ml water
0.1% of Sodium Hypochlorite	4/0.1= 1:40	1 volume of neat + 39 volume of water	25 ml Neat + 975 ml water
0.05% of Sodium Hypochlorite	4/0.05= 1:80	1 volume of neat + 79 volume of water	12.5 ml Neat + 987.5 ml Water

❖ Chemical Disinfectant – level of disinfection achieved

Agent	Chemical
High Level Disinfectant	Aldehydes (glutaraldehyde, OPA)
	Bacillocid (Glutaraldehyde + Benzalkonium Chloride)
	Echoshield (Hydrogen Peroxide 11% W/V With 0.01%W/V Diluted Silver Nitrate Solution)
	H2O2 and Paracetic acid.
Intermediate level Disinfectants	• Alcohol – ethyl alcohol and isopropyl alcohol
	• Phenolics – Phenol (carbolic acid) ,cresol, Lysol (Commercially made of a mixture of phenolics)
	• Halogens – iodine and chlorine • D-125 (Quaternary ammonium compound QACs, 3rd and higher generations only)
	• Korsolax plus (5th Generation QAC)
Low level disinfectant	• Chlorhexidine

Sterilization

It must be attempted for all critical care items by using the most suitable method accordingto the material involved.

Method of Sterilization	Uses
Autoclave	Surgical instruments, dressing drums/trays/sets, metal endoscopes, glass syringes, needles, implants, rubber catheters, endotracheal tubes and airways.
Dry heat (Hot air oven)	Sterilization of materials that might be damaged by moist heat or that are impenetrable to moist heat (e.g., powders, petroleum products, sharp instruments)
Ethylene oxide (ETO) • Long duration of cycle (12-14hrs or more) • ETO is highly flammable, irritant, explosive and carcinogenic. • Effectiveness of ETO sterilization can be altered by lumen length, lumen diameter, inorganic salts, and organic material. • ETO residues left on instruments may be toxic to patient and staff. Therefore, aeration of sterilized materials for 8-12 hrs is necessary to remove residual ETO.	Sterilize critical items (and sometimes semi critical items) that are moisture or heat sensitive and cannot be sterilized by steam sterilization. E.g. Heart lung machine components, sutures, catheters, respirators, devices that incorporate electronic components, plastic packaging or plastic containers, catheter and stents, wound dressings etc.
Plasma Sterilization (Hydrogen peroxide) • If moisture is present on the objects, the vacuum will not be achieved and cycle aborts. • Sterilized materials can be handled safely, for immediate use or storage.	Sterilization of materials and devices that cannot tolerate high temperatures and humidity, such as some plastics, electrical devices, and corrosion-susceptible metal alloys. (E.g. includes arthroscope and its instruments, micro instruments, vascular instruments, spine sets, laparoscope.)
Irradiation (Cobalt 60 Gamma rays)	Sterilization of medical products (e.g., tissue for transplantation, pharmaceuticals, medical devices) or disposable prepacked items.

❖ Manual Reprocessing of Endoscope

Even though incidence of infection following endoscope use is very low, contaminated endoscopes account for significant HAIs more compared to any other medical device.

Endoscopes belong to semi critical category of medical devices as they come in contact with mucosa. They are heat sensitive, therefore they cannot be processed by steam sterilization

There are several essential steps as follow

Precleaning

- Immediately after the endoscopy procedure, the external surface of the endoscope is wiped with soft lint-free disposable cloth/gauze soaked in freshly prepared enzymatic detergent. (Use distilled water as diluent)
- All air or water channels are flushed with enzymatic detergent as per manufacturer's instruction to remove any block.
- Remove all reusable and removable components from the scope and soak in enzymatic detergent.
- Scope is transported to reprocessing area before drying of patient material occurs.

Leak testing

- Leak testing: Leak testing detects damage to the external surface and internal channels of the endoscope. A leak test is performed by applying air pressure to the inside of the endoscope and by monitoring the presence of air bubbles coming from the endoscope or by the inability to maintain adequate air pressure within the endoscope.
    - -Attach leak tester
    - -ensure that endoscope is fully immersed in water
    - -Do not use any detergent to perform leakage test
    - perform complete manipulation of buttons and lever
    - -ensure deflation of the endoscope before proceeding to the manual cleaning.

Manual cleaning and rinsing

- Fully immerse endoscope in enzymatic detergent in a dedicated basin
- Clean exterior surface with soft lint free cloth or endoscope sponge
- Brush all channels while the scope is immersed

- Flush all channels with enzymatic detergent and ensure appropriate contact time as per manufacturers' of the product.
- Immerse in distilled water in another basin and rinse all channel with clean distilled water
- Purge all endoscope channels with air to ensure removal of water.

High level Disinfection or sterilization

- Disinfectant testing (by rapid test strip) should be done to know the efficacy of HLD or sterilant.
- Fully immerse the endoscope in high-level disinfectant in dedicated basin (or chemical sterilant) e.g. 2% glutaraldehyde
- Fill all channels with HLD and wipe the endoscope with a soft lint free cloth to remove any bubbles on the surface of the endospore.
- Ensure adequate contact time and temperature with all the surface of the endoscope
- Purge all channels with air to ensure removal of all HLD from endoscope and remove the endoscope from HLD.

Rinse

Endoscope is rinsed externally and internally with all channels flushed with sterile water or filtered water to remove the traces of disinfectant.

Drying

Rinse the insertion cord and inner channels are dry with forced air after disinfection and before storage.

Store

Store the endoscope in a way that prevents recontamination and promotes drying (e.g., Hungvertically without coiling and without touching bottom of the cabinet).

Validity

Though poorly defines, the use of endoscopes within 21 days of HLD appears to be safe.

Organisms transmitted through inadequate endoscopy cleaning, disinfection and reprocessing: Carbapenem resistant Enterobacteriaceae, H.Pylori, Pseudomonas aeruginosa, Salmonella species (colonoscopy), Mycobacterium Tuberculosis (Bronchoscope)

❖ REPROCESSING OF PATIENT CARE ITEMS/SURGICAL INSTRUMENTS

This is one of the most critical areas requiring stringent monitoring. It is essential that correct level of reprocessing of instruments and equipment is chosen according to its intended use.

General steps to be followed for reprocessing of patient care devices/instruments are as follows:

- Cleaning
  - A) Manual
    - -Immersion method
    - -Non Immersion method
  - B) Mechanical or Automated cleaning
    - -Ultrasonic cleaners
    - -Automated washers or washer disinfectors
    - -Automated cart washers or Trolley washers
- Disinfection/Sterilization

Manual Cleaning of Instruments

Thorough cleaning, preferably done at the point of use must precede any disinfection or sterilization process. After an instrument has been used, prior to its drying, it should be washed/wet wipe to remove any gross soiling. At this stage, detergent and tap water is appropriate to use. It is preferable to use multi enzymatic cleaning solutions for this purpose, if available.

- 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.

> "Prior to any reprocessing to achieve disinfection or sterility, all instruments and equipment must be cleaned.

METHODS USED FOR CLEANING OF INSTRUMENTS AND EQUIPMENT

Manual Cleaning

- All surfaces of the instrument/equipment must be cleaned taking care to reach all channels and bores of the instrument. If instruments are being washed manually the following procedure should be followed:
- Wear personal protective equipment (plastic apron, rubber gloves, eye protection, surgical mask and/or face shield)

Immersion method: Take instrument apart fully and immerse all parts/dismantle if possible in sink or basin containing warm water with appropriate dilution of biodegradable, non-corrosive, non-abrasive, low foaming and free rinsing detergent or use an enzymatic cleaner as per availability & manufacturer's instructions.

(Note: Enzymatic cleaners are not disinfectants; they only remove protein from surfaces. Used for fibre-optic instruments and accessories, and other items that are difficult to clean. *Rubber or nitrile gloves are recommended when handling enzymatic solutions-as enzymatic cleaners will degrade latex gloves.)*

Cleaning is performed under the surface of water (not under running tap water), to limit the generation of aerosols.

Soft (nylon) bristle brushes should be used to clean the lumens of the instruments. (Don't use metal or abrasive brushes, brushes must the same diameter as the instrument to ensure that all internal surface can be reaches, and must be long enough to exit the distal end of the instrument)

Rinse following cleaning to remove loosened soil and residue detergent, with tapid water only (if instruments are sending for sterilization in CSSD, in CSSD further treatment to equipment will be done as necessary)

Air dry or hand dry with disposable clean, nonlinting cloth. Stainless steel devices are dried immediately after rinsing, so that spotting is prevented.

- Visual inspection to ensure the instrument is clean.

- Pack and send to CSSD Department for Sterilization/or immerse in chemical sterilant as per compatibility of instruments.

Non-Immersion method: The device is clean by wiping surfaces thoroughly with a disposable, clean, non-linting cloth, and detergent; ensuring that moisture does not enter critical devices (e.g. Power connections) until visible soil is removed.

The device is rinsed by wiping surfaces thoroughly with a damp, disposable, clean & non-linting cloth until all detergent residue is removed.

Drying is carried out in a same way as in immersion method.

Ultrasonic Cleaners

- Ultrasonic cleaners and automated washers are recommended for cleaning basic instruments that can withstand this process are preferred for cleaning hard-to-reach parts of surgical instruments such as box locks, serrations, hinges, joints, cervices.
- Using a machine to wash the instruments will cut down on the handling of the instruments.
- Ultrasonic cleaners do not disinfect the instruments.
- Working principle: Ultrasonic high frequency, high-energy sound vibrations pass through the cleaning solution and create bubbles. As the bubbles become larger, they become unstable and implode, a process called cavitation. This create a vacuum in the solution that draws the debris from the instruments in to surrounding fluids.
- Prerequisites:
    - Preclearing before subjecting instruments to ultrasonic cleaners is a mandate.
    - Water temperature should be maintained between 27◦C and 43◦C and never above 60◦C as it results in protein coagulation.
    - Water should be changed daily and whenever visibly soiled.
    - Instruments should be opened and completely submerged and lumens completely filled.
    - The ultrasonic unit should be degassed each time it is filled to remove excess bubbles.

Automated washers or washer disinfectors

- Advantage over ultrasonic cleaners as preclean of instruments is not necessary before subjecting it to automated washer, which saves time.
- Working principle: It works on the principle of impingement, i.e the use of pressurized water to physically remove the bioburden.
- Sequential steps of automated washers include: pre-rinse →Enzymatic wash→detergentwash→lubrication→final risne.

DO's AND DON'Ts FOR DECONTAMINATION OF PATIENT CARE ITEMS

DO's:

- Sterilize all items that are intended to penetrate sterile body sites
- Steam under pressure is the preferred method for sterilizing critical medical and surgical instruments that are not damaged by heat, steam, pressure, or moisture.
- Use low-temperature sterilization technologies (e.g., EtO, hydrogen peroxide gas plasma) for reprocessing critical patient-care equipment that are heat or moisture sensitive.
- Completely aerate surgical and medical items that have been sterilized in the EtO sterilizer (e.g., polyvinylchloride tubing requires 12 hours at 50^0C, 8 hours at 60^0C)before using these items in patient care.
- Sterilization using the paracetic acid immersion system can be used to sterilize heat-sensitive immersible medical and surgical items.
- Critical items that have been sterilized by the peracetic acid immersion process must be used immediately (i.e., items are not completely protected from contamination, making long-term storage unacceptable).
- Ensure that the sterilant has direct contact with contaminated surfaces (e.g., scopes processed in peracetic acid must be connected to channel irrigators).
- Before any instrument or equipment goes under the process of steam sterilization,the following should be checked:
    - Ensure that the instrument can withstand the process,
    - Ensure that the instrument has been adequately cleaned,
    - Ensure that the instrument does not require any special treatment,
    - Ensure that records of the sterilization process and for the traceability of instruments are kept.
    - The object must be wrapped for sterilization. Only a wrapped sterilized objectshould be described as sterile.

DON'T'S

- Ultraviolet light units, incubators, microwave ovens and domestic ovens must not be used for sterilizing.
- Formalin fumes generated by formalin tablets **must not be used** for sterilization/ disinfection or even maintenance of sterilizing conditions of any patient care item as it releases formaldehyde gas which is a proven carcinogen.
- Boiling of medical devices for reuse is not recommended since it does not guarantee sterility. However, in situations where steam sterilization is not possible, these items should be thoroughly cleaned and subjected to a cycle in a pressure cooker for 30 minutes.

REUSE OF SINGLE-USE DEVICES

Single use device (SUD) also known as a disposable device, is a medical device that is recommended for use once, i.e in only one patient for a single procedure. Such devices are not intended by the manufacturers to be disassemble, cleaned, reassembled, and reuse, since doing so may jeopardize its physical and/or chemical integrity, performance, safety, and effectiveness. (Symbol to identify single-use devices)

Reasons for reprocessing SUDs.

Although SUDs are meant for single use, there is increasing trend of reprocessing and reuse of SUDs in HCFs; which may be attributed to the following reasons.

- **Coast-saving measures**: Observed in developing countries, where SUDSs are used prohibitively in unaffordable economically backward patients.
- **Environmental advantage**: Medical waste contribute to significant healthcare hazard, so to follow "greener" concept, many HCFs prefer reuse after proper reprocessing.

Decontamination Protocol for Routinely Used Patient Care Items (A-Z Listing)

Items	Method of Disinfection
Airways & ET Tube	Either use as single-use or heat disinfection in CSSD or Chemical high level disinfection
Ambu bag	Should be cleaned with detergent and water, (remove visible soiling) then dried and sterilized (ETO).
Ampoules or vials	Neck of the vial or rubber top should be wiped with 70% alcohol and allowed to dry before opening or piercing.
Auroscope tip	Use single-use disposable tips. If reusable tips are used then 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 weighing scales	• A fresh liner should be used for each baby. (Or) baby towel for each baby. • Clean tray with detergent and water. • Wipe with 0.1% Hypochlorite, if contaminated.
Baby's feeding bottle and teats	Teats and bottle must be cleaned and disinfected using heat treatment thoroughly friction wash.
Beds and couches Frame	• Clean with detergent and water between patients and as required weekly. • If contaminated with body fluids or if used in isolation room after cleaning, should be wiped with any of the surface disinfectant (sodium Hypochlorite 0.1% or Bacillocid 1.5%)
Bowls (surgical)	Wash with detergent and water and send to CSSD for autoclaving
Bowls (washing)	Wash with detergent and water and decontaminate with 1% sodiumhypochlorite, rinse and dry after each use. -Colonized infected patients: Heat disinfection in a washer/disinfector(80*c for 1 min) -Store inverted and separated
Bedpans / urinals	Clean and disinfect with 0.1% sodium hypochlorite or hot water. Ensure that the item is dry before re-use.
Breast pumps	For single use patient: Wash with detergent and water and immerse in freshly prepared sodiumhypochlorite 0.1% solution at least for 20 minutes. -Heat sterilize before use by subsequent patients.
Cheatle forceps	-Do not use, (Use separate dressing packs for dressing.) -If used, autoclave daily and store in sterile container.

Commodes	Seat and arms—clean with detergent and water, and dry. If soiled or used in isolation wards—wipe with sodium hypochlorite 0.5 % and dried, after cleaning
Cardiac and urinary catheters, IV devices, and All other invasive devices. i.e. needles, syringes	Use sterile single-use disposable item only If re use according to the local policy.
Cardiac monitors, Defibrillators, ECG leads and machines	Use single use disposable ECG pads. Disinfect with 70% alcohol.
Endoscopes	Refer to endoscopy reprocessing section.
Couches (examination)	Cover with rubber mat followed by draw sheet between patients. Send to laundry after each day session, and the mattresses are cleaned with soap and water.
Cradles	Clean with detergent and water and dried. If contaminated use any of the surface disinfectant (sodium Hypochlorite 0.1% or Bacillocid 0.5%)
Curtains	Should be changed as a part of rolling programme by domestic services Should be changed as a part of terminal cleaning programme in isolation areas.
Dressing trolleys	Clean daily with detergent and water. After each use—wipe with 70% isopropyl alcohol.
Drip stands/IV stands	Should be wiped with sodium hypochlorite 1%and dried after cleaning. Or available surface disinfectant.
Dustbins	Wash with detergent and water weekly twice or earlier when visibly dirty.
Drainage bottles	1. Disposable—Single use; discard after use. 2. Reusable—Wash with detergent and water, put jars in the disinfectant solution (1% hypochlorite). Leave for contact time (20 mins), rinse and store dry, or sendto CSSD. Weekly autoclaving or HLD is highly recommended.
Hemodialysis machines	Thoroughly clean between patients and disinfect at the end of the day as per manufacturer's recommendations. *Colonized/infected patients:* after cleaning with detergent, disinfect with hypochlorite (1000 ppm/0.1% available Cl2) solution or other appropriate disinfectant like paracetic acid.
Humidifiers	-Clean and sterilize at low temperature by plasma/ ETO sterilizer. Or Immerse in 5th Generation QAC (e.g Korso plus) solution 20 ml in 1 liter water for 15 min. -Water used in humidifiers--Use sterile distilled/ sterile tap water. -Replace the water used daily/ for every patient. -If water level falls below the designated mark, empty the water. Refill with fresh water. DO NOT TOP UP (BY ADDING WATER) -Humidifiers which are not in use should be cleaned and kept dry.
Infant incubators	Routinely wash with detergent and dry with disposable wipe in a daily basis.

	-*Colonized/infected patients:* After cleaning, wipe with 70% isopropyl alcohol impregnated wipe or use hypochlorite (125 ppm available Cl2) solution. -When the baby is discharged, dismantle incubator and wash *all removable parts* and clean with detergent and then disinfect with hypochlorite (125 ppm available Cl2) solution or other disinfectant as per manufacturer's recommendation and allow to dry. The cleaning and disinfection should be done in a separate area.
Intravenous monitoring pumps (and feed pumps)	Wipe with 0.5% sodium hypochlorite or available surface disinfectant and dry.
Laryngoscopes	Clean with detergent and water and HLD is done with glutaraldehyde 2%. Bulb of the laryngoscope should be removed and cleaned with water andthen wiped with 70% alcohol.
Locker Tops	Damp dust daily with detergent solution and allow to dry. *Colonized/infected patients:* After cleaning with detergent, disinfect with hypochlorite 0.1% Cl2 solution or other available disinfectant and allow to dry.
Mattresses and pillows	• Clean with detergent and water between patients and as required. • Should not be used if cover is damaged. • Contaminated pillows must be discarded. • Torn mattress covers must be replaced before mattress is reused.
Medicine trays	To be cleaned with detergent and water weekly.
Mops	Disposable use for one day. Re-usable to be laundered.
Nebulizers and tubing	-Single use disposable nebulizers are available. -Clean and sterilize nebulizers between patients. -Cleaning and low temperature sterilization by plasma/ ETO/ immerse in Glutaraldehyde solution (2%) for 10 hours.
Proctoscopes	Disposable—single use; Re-usables to be rinsed and autoclaved.
Peak flow	Disposable—single patient use.
Oxygen tubing and mask	Single use only.
Scissors for routine use	Surface disinfect with a 70% alcohol impregnated wipe before use. If visibly soiled clean first with a detergent solution.
Pulse oximeter	Clean with detergent wipe. Do not use Alcohol based products on the probe. Or Manufacturers guideline.
Razor (electronic)	-Detach head, clean thoroughly, and immerse in 0% isopropyl alcohol for 10 min, remove and allow to dry. -Change the electronic blade for each patients.
Refrigerators	- All inside surfaces with soap and water.
Sphygmo-manometer cuffs (BP apparatus cuffs)	-Use dedicated items in high-risk areas (eg. ICU) or patients known to be *colonized/infected*. -Wash sleeve with soap and water once a week.

	-In between patients: Disinfect with 70% alcohol impregnated wipe to cleantubing and inflation bladder.
Sputum pots	Disposable with close fitting lid—should be discarded into clinical waste for incineration. Reusable–Pre-treat with 15ml hypochlorite then toilet flush the material. Clean the emptied pot with detergent and water and disinfect with 0.1% hypochlorite for 30 minutes before reusing.
Stethoscopes	Surface should be wiped with 70% alcohol impregnated wipe between patients. Use dedicated stethoscope in high-risk area eg. ICUs.
Soap dispensers	Should be cleaned weekly with detergent and water and dried.
Suction bottles	**Disposable** liners—must be sealed when 75% full and placed in yellow plasticbag. **Re-usable** (jar and tubings): • Should be cleaned with soap and water followed by 1% sodium hypochlorite and dried. • To be stored dry when not in use. • Must be changed daily and in between each patient. • At least weekly autoclaving of jars should be done whenever applicable. Minimum 1%–2% sodium hypocholorite solution should be kept in jar in volume which is 1/10 volume of the jar. After use, add equal quantity of hypocholorite for disinfection at source before discarding the content.
Stretcher and Wheel-chairs	Clean between patients with detergent and water.
Surgical Instruments	-Should be cleaned in multi enzymatic cleaning solutions at source. - Transport cleaned instruments in closed rigid containers to CSSD for sterilization. -The instruments may be subjected to cleaning by automated washer-disinfectors or ultrasonic cleaners at CSSD, if required.
Thermometer	*-Oral: Single-patient use thermometers* must be dedicated preferably for all patients and patients in high-risk areas, e.g. ICU. They should be cleaned and wiped with a 70% isopropyl alcohol impregnated wipe after each use and stored dry. *-Communal thermometers:* wipe clean, wash in a cold neutral detergent, rinse, dry and immerse in 70% isopropyl alcohol for 10 min. Wipe and store dry. *-Rectal:* clean and wash in detergent solution after each use, wipe dry and immerse in 70% alcohol for 10 min. Wipe and store dry. *-Electronic:* where possible use a single-use sleeve/probe cover. If not possible, use either single-use thermometer or clean and disinfect between use. Single-use sleeve, single-patient use in high-risk areas or infected patient. Clean, then wipe with a 70% isopropyl alcohol impregnated wipe after each use.

	Tympanic: single-use sleeve. Disinfect in between patients by wiping with 70% alcohol
Telephones	To be wiped with70% alcohol
Toilet seats	To be cleaned at least twice daily with detergent.
Tonometer prisms (applicators)	Immersion in 0.05% hypochlorite (500 parts per million available chlorine) for10 minutes
Toys	Clean with detergent and water and dried. Hard toys: wash with detergent and disinfect with alcohol impregnated wipe
Ultrasound machines	Damp dust with detergent solution and allow surface to dry before use. If contaminated use 70% alcohol impregnated wipe and dry or based on the manufacture'srecommendations
Urine pots/ Urine measuring jugs	Clean with detergent and water and disinfect with 0.1% hypochlorite for30 minutes before reusing.
Vaginal speculum	After use immerse in hypochlorite 2% for 15-30 min and Send to CSSD forsterilization or use single-use
Ventilator and breathing circuits	Use single-use (disposable) tubing for every patient if possible or heat disinfect/sterilize in CSSD. If re-used—Daily cleaning and disinfection of tubing must be done. After 72 hrs of use autoclaving should be done for autoclavable tubings. After removing of ventilator tubes wash it with detergent and water and send to CSSD for autoclaving *Infected patients:* for patients with respiratory infection and other serious infection use disposable tubing only. Never use glutaraldehyde to disinfect respiratory equipment.
Ventilators	-After every patient, clean and disinfect ventilators. -Dismantle and sterilize/disinfect (high-level) all re-usable components as per themanufacture's recommendations -Humidifier water must be changed at least every 8 hrs. -Daily autoclaving of humidifiers is recommended where autoclavable. -Heat and Moisture Exchangers (HMEs) must be changed at least every 72 hours or as per manufacturer's instructions.
Vomit bowls	Clean with detergent and water and disinfect with 0.1% hypochlorite for30 minutes before reusing.
Wash bowls	Patients must have own dedicated bowl. After each patient's use, should becleaned with detergent.
Wheel chairs	Patient's own—should be cleaned with detergent and water as necessary.Hospital—clean between patients with detergent and Water

Composition of Disinfectant for Information only.

*(This doesn't mean the promotion of products/Brand/Company)

1) Korsolax Rapid (Aldehyde based)

Composition: Glutaraldehyde- 15.2g & 1, 6,-dihydroxy 2, 5-dioxahene-19.7 g

For heat sensitive and heat tolerant instruments. Broad spectrum microbicidal, ready to use, highly alkaline, alcoholic. It is excellent for emergency disinfection.

Shelf Life: Concentrate is alive for **3 years** in tightly close container**.**

Prepared solution is can be used up to/alive for **7 days**.

Sporicidal action achieved at 3% concentration.

	STRENGTH OF SOLUTION	IMMERSION TIME
STD./ EMERGENCY DISINFECTION (under clean conditions)	5% (50 ml in 1 litre solution)	5 mins only
STD./ EMERGENCY DISINFECTION (under dirty conditions) * Always clean and then disinfect*	5%	10-15 mins only
TOTAL STERILIZATION	5%	4 hours

2) Korsolax Plus (Aldehyde Free)

Composition: (5TH Generation QAC) per 100 gm

Dodecyl Bispropylene Triamine – 9.2 gm
Dodecyldimethylammonium chloride – 13 gm

Excellent material compatibility: on glass, ceramic, stainless steel, non-ferrous metals, aluminum, hard rubber, hard plastic, silicone, Makrolone,& Plexiglas

Shelf Life: Concentrate is alive for **1 years** in tightly close container.

Prepared solution is can be used up to/alive for **7 days**.

	STRENGTH OF SOLUTION	IMMERSION TIME
STD./ EMERGENCY DISINFECTION (under clean conditions)	2% (20 ml in 1 litre solution)	5 mins only
STD./ EMERGENCY DISINFECTION (under dirty conditions) * Always clean and then disinfect*	2%	10-15 mins only

3) Kroso Plus (Aldehyde Free)

Composition: (5TH Generation QAC) per 100 gm

Completely non-toxic compounds

Dodecyl Bispropylene Triamine – 9.2 gm
Didecyl Dimethyl Ammonium chloride – 13 gm

Excellent material compatibility: on glass, ceramic, stainless steel, non-ferrous metals, aluminum, hard rubber, hard plastic, silicone, Makrolone, & Plexiglas

DEGREE OF CONTAMINATION	DILUTION OF BODEDEX FORTE	CONTACT TIME
Fogging/Aerial Disinfection	(0.5%) 5ml in 1 Litre for Non Critical areas (1 %) 10 ml in 1 Litre for Critical area OT,ICU	15 Min
Instrument & Endoscope Disinfection (Immersion) Also including breathing circuits & other plastic Devices & equipments.	20 ml in 1 Litre	15 Min
Surface Moping/Wet wipe/Terminal Cleaning	(0.5%) 5ml in 1 Litre Water for Non Critical areas (1 %) 10 ml in 1 Litre Water for Critical areas	5 Min

Baccishield

Composition: Hydrogen Peroxide (11% w/v) with Silver Nitrate Solution (0.01%)

Solution can also be used in fogging machine.
-Do not ventilate AC rooms immediately after Disinfection.
-During disinfection keep AC & fans off, and allow surfaces to dry in natural conditions.
- Avoid contact with concentrated solution.
-Disinfected surfaces must remain in contact i.e. wet with a solution for 20 minutes for optimum results.

DEGREE OF CONTAMINATION	DILUTION OF BODEDEX FORTE	CONTACT TIME
Non Critical Areas	10% (100 ml in 900 ml water)	20 mins
Critical Areas (O.T/ICU)	20% (200 ml in 800 ml water)	20 mins
Fogging (1000 Cu. Ft.)	20% (200 ml in 800 ml water)	60 Min

D-125 (3rd Generation QAC)

Composition:

Alkyl dimethyl benzyl ammonium chloride 2.37%
Alkyl dimethyl ethylbenzyl ammonium chloride 2.37%

Use for hard surface disinfection including floors, wall, Bed, Furniture, Trolleys, Medical Devices, X-Ray machines.

Shelf Life: 3 Years (Concentrated)
64 Days (Diluted)

	DILUTION OF D-125
Critical area Dilution	15 ml in 1 Litre water.
Non Critical areas	7.5 ml in 1 Litre water.
Fogging	15 ml in 1 Litre water for 1000 cubic feet area.

BODEDEX FORTE (Ph Neutral Cleaner for Heat sensitive & Heat resistant instruments)

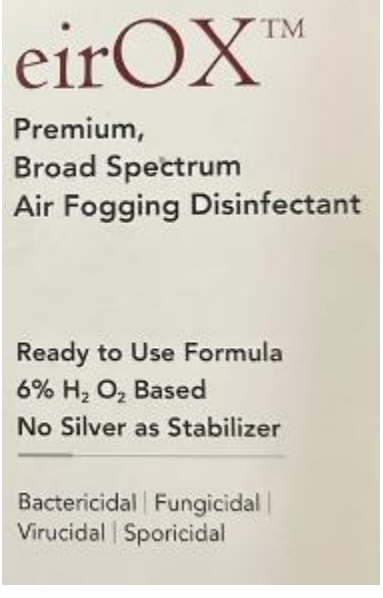
Composition: Non-ionic and Amphoteric surfactants

(Non-ionic Surfactant: The surface active agents which do not disassociate into ions in aqueous solutions are referred as non-ionic surfactants. These are preferred over the ionic surfactants which are usually insoluble in hard water and considered to be poor cleaners.

Amphoteric surfactants: These unique molecules possess both a positive and a negative charge on their hydrophilic end, giving them a net charge of zero.)

DEGREE OF CONTAMINATION	DILUTION OF BODEDEX FORTE	CONTACT TIME
Mild	0.5% (5 ml in 1liter)	5 mins
Heavy	1% (10 ml in 1 Liter)	10 mins

EirOX (Air Fogging Disinfectant) FOR AIR FOGGING ONLY.



Composition: EirOX has 6% stabilized advanced hydrogen peroxide

(The product is formulated with 6% of Hydrogen Peroxide & no Silver Nitrate as a stabilizer, i.e. more safe environment with no possibility of corrosion of metallic instruments.)

- Unlike the routine fogging solution which requires water dilution
-No Need to dilute the chemical with water
- No Need to cover the OT/ICU equipment
- No Need to mop the floor, wall or ceiling after fogging as only residue remains are Oxygen and water.
-No Periodic Acid, Aldehyde, Quats, Phenol Or Chloride
-Wide Material Compatibility
-Contains Only Food Grade Ingredients

Time Required: 2 minutes fogging time for 1000 Cu.Ft. If the flow rate of Fogger is 50ml per minute.

Means for 1000 Cu.Ft. 100ml EirOX is required.

Example: - [15 Ft x20 Ft X 10 Ft (Height)= 3000 Cu.Ft. Volume.

Hence Time= 6 minutes and EirOX= 300 ml]

Bacillol 25 Spray

Composition: Each 100 gms contain

Ethanol 10 gms
2 –propanol 9 gms
1-propanol 6 gms

To eliminate surfaces that are small and difficult to access as source of contamination and infection, the wipe disinfection is ideally complemented by a spray/wipe disinfection or spray disinfection with an alcohol based rapid disinfectant. In doing so it is imperative to apply the products correctly.

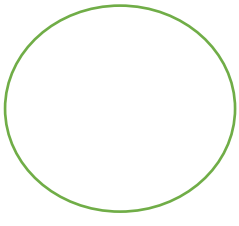
- Always prefer a wipe disinfection over the spray or spray/wipe disinfection as it prevents the formation of aerosols and ensures best possible to ensure complete wetting.
- When spraying, wipe afterwards if possible to ensure complete wetting (spray/wipe disinfection)
- **Limit the simple spray disinfection to areas that cannot be disinfected by using the wipe or spray/wipe procedure.**

Area of Application: Bacillol 25 is suitable for the rapid disinfection of hard surfaces in the spray-wipe procedure, where a rapid effect is necessary eg. For medical equipment that come under the Medical Device Directive (acc. To MDD) in hospitals and residential homes (acc. To BPD) and instant disinfection of high touch surface areas.

Rapid disinfection of hard surfaces: **concentrated 30 seconds exposure time.**

Other Medical Signs on Health care products (Just for Information)

	ATTENTION This indicates that attention must be given before using the product. Read the document enclosed.
	KEEP DRY Indicates a medical device that needs to be protected from moisture.
	Product Expiry Date / Use By – this symbol will be next to the date (year/ month) on which a product must be used by.
	The white factory indicates the date that the product was manufactured.
	The black factory shows details of the product manufacturer and gives that address. It is important to note the difference between the two.
	The product must not be re sterilised.

	This symbol indicates that the medical device is sterile, along with the method by which it has been sterilised – in this specific case ethylene oxide.
	The product has not been sterilised.
	Do not use the product if the box is damaged.
	The manufacturing LOT number of the product is displayed next to this symbol. This ensures traceability in the manufacturing process.
	Reference number of the device. The reorder code is contained next to this symbol for those wishing to order more.
	Double sterile barrier system of packaging Aseptic presentation technique requires opening of the outer sterile packaging by assisting nurse. Sterile nurses & surgeon must not touch the outer surface of the sterile packaging. Outer packaging must not be place on sterile surface. Inner sterile packaging may be handled by sterile personnel and can be placed on sterile surface.

Chapter -5

Hospital environment decontamination

INTRODUCTION

All healthcare environments should pose minimal risk to patients, staff and visitors. However, different functional areas represent different degrees of risk and, therefore, require different cleaning frequencies, and levels of monitoring and evaluation.

Health care organisations are complex environments that contain a large diversity of microbial flora, many of which may constitute a risk to the patients, staff and visitors in the environment. Transmission of microorganisms within a health care organisation is complicated and very different from transmission outside health care settings; and hence the consequences of transmission may be more severe. High-touch environmental surfaces of the health care organisation hold a greater risk due to the nature of activity performed in the health care organisation and the transient behaviour of employees, patients and visitors within the health care organisation, which increases the likelihood of direct and indirect contact with contaminated surfaces.

Patients shed microorganisms into the health care environment, particularly if they are coughing, sneezing or having diarrhoea. Bacteria and viruses may survive for weeks or months on dry surfaces(8)(9)(10) in the environment of the patient (the space around a patient that may be touched by the patient and may also be touched by the health care provider).

❖ CATEGORIZATION OF HOSPITAL AREAS ACCORDING TO RISK

a. ***High Risk Area:*** Consistently high cleaning standards must be maintained in these areas. Required outcomes will only be achieved through intensive and frequent cleaning.

b. ***Moderate Risk Area:*** Outcomes in these areas should be maintained by regular and frequent cleaning with 'spot cleaning' in-between.

c. ***Low Risk Area:*** In these areas, high standards are required for aesthetic and to a lesser extent, hygiene reasons. Outcomes should be maintained by regular and frequent cleaning with 'spot cleaning' in-between.

Environmental surfaces can be further divided into:

- ***Medical equipment surfaces*** (e.g., knobs or handles on hemodialysis machines, X-ray machines, instrument carts, and dental units) and
- *Housekeeping surfaces* (e.g., floors, walls, and tabletops).
  - ***Low Touch Surfaces*:** Surfaces with minimal hand-contact
    Ex. (Floors, ceilings, mirrors, window sills, walls)
  - ***High Touch Surfaces:*** Surfaces with frequent hand-contact
- Ex.(Doorknobs, bedrails, light switches, elevator buttons, telephone, call bells, computer keyboards, monitors, hemodialysis machines, edges of privacy curtains, wall areas around the toilet in the patient's room)

❖ Classification of Housekeeping areas.

High Risk Areas	Moderate Risk Areas	Low Risk Areas
Operation theatre units including recovery area-Major & minor	Medical and allied wards	Departmental areas/office areas
Intensive care units/ Cardiac care units/ Neonatal ICU etc.	Laboratory areas	Outpatient department
High dependency units	Blood bank	Non sterile supply areas
Emergency department/casualty	Pharmacies	Libraries
Labour room	Dietary services	Meeting rooms
Post-operative units	Laundry services	Medical records section
Surgical wards	Mortuary	Stores Section
Central sterile supply department/ Theatre sterile supply unit	Nurses/ Doctors rest rooms	Manifold services/room
Radiation Treatment Areas	Rehabilitation Areas	Telephone rooms, electrical, Mechanical, External surroundings
Chemotherapy ward/room	Psychiatric wards	Staff areas
Renal Dialysis facility	Art Center, ICTC, DOTS Center	
Burn Unit		
Isolation wards/rooms and attached internal areas like bathrooms/toilets		

❖ Frequency and Method of Cleaning in Different Risk Areas

Category	Frequency	Level of Cleaning Required	Method of Cleaning
High risk area	At least thrice a day at fixed times and spot cleaning as required	Cleaning and High level disinfection	Cleaning with soap and detergent plus disinfection with alcohol compound, aldehyde compounds hydrogen peroxide and phenolics (not to be used in the nurseries)
Moderate risk area	At least twice a day at fixed times and spot cleaning as required	Cleaning and intermediate to low level disinfection	Cleaning with soap and detergent plus disinfection with QAC, phenolic, Low concentration hypochlorite.
Low risk area	For areas working round the clock at least once in a shift or in areas having general shift at least twice in the shift and Spot cleaning as required	Only cleaning	Physical removal of soil, dust or foreign material followed by cleaning with water and detergent

❖ Items found to harbour microorganisms in the healthcare environment

Bed	*Bed frames*	*Bed linen*	*Bedside table*
Bedside locker	*Bed rail*	*Call bell*	*Curtains*
Blood pressure machine	*Dustbin*	*Key board*	*Faucet handle*
Couch	*Door handle*	*Thermometer*	*Patients bathroom*
Floor around bed	*Light switch*	*Overbed table*	*Patient lift*
Pen	*Pillow*	*Mattress*	*Sink*
Stethoscope	*Tables*	*Telephones*	*Television*
Toilet commode	*TV remotes*	*Stationery items*	*Window frames*

Environmental surfaces can be further divided into:

Low Touch Surfaces	High Touch Surfaces
Floors, ceilings, mirrors, window sills, walls	Doorknobs, bedrails, light switches, elevator buttons, telephone, call bells, computer keyboards, monitors, hemodialysis machines, edges of privacy curtains, wall areas around the toilet in the patient's room

In general, high touch areas require more frequent and intensive cleaning **(once in two hours)** as compared to lowtouch areas.

❖ Housekeeping policy for routine and scheduled cleaning of commonly used patient care item in Hospital

Area/Surface/Item	Area wise Frequency of Cleaning		
	High Risk	Moderate Risk	Low Risk
Bed	Clean frame daily, Clean underneath weekly, Clean on discharge	Clean frame daily, Clean underneath weekly, Clean on discharge	N/A
Bed Rails, Bed side tables, Lockers, surfaces in patient room	Clean daily and After discharge	Clean daily and After discharge	N/A
Chair	Clean twice daily	Clean daily	Clean weekly
Chapples	Wash once daily and dry	N/A	N/A
Commodes	Twice daily	Twice daily	Daily
Curtains/Blinds With MDRO pt. (change upon discharge) for all areas.	Bed curtains-Change or clean monthly	Bed curtains-Change or clean 3 monthly	Bed curtains-Change or clean Annually
Doormat	Weekly/Whenever it gets fully wet	Weekly/Whenever it gets fully wet	Weekly/Whenever it gets fully wet
Elevators	Damp cleaning daily	Damp cleaning daily	Damp cleaning daily
Drip/intravenous stands	Clean contact points after use	Clean contact points after use	Clean contact points after use
Fan	Clean weekly	Clean weekly	Clean weekly

Floor, non-slip	Damp mop thrice daily	Damp mop twice daily	Damp mop daily
Floor, polished	Dust remove by dry mop, thrice daily.	Dust remove by dry mop, twice daily.	Dust remove by dry mop, daily.
Fridge(drug)	Clean weekly	Clean weekly	Clean weekly
Light switch	Clean daily	Clean weekly	Clean weekly
Mattress Preferably covered by rexin(every 6 months check for durability, sagging)	Clean weekly and after discharge	Clean weekly and after discharge	Clean weekly and after discharge
Case sheet folder	Clean daily	Clean weekly	Clean weekly
Pillow (water proof cover)	Clean twice monthly and after discharge	Clean twice monthly and after discharge	Clean monthly and after discharge
Rubber sheet	Change when soiled and between patients and dry in sun light if reusable.	Change when soiled and between patients and dry in sun light if reusable.	Change when soiled and between patients and dry in sun light if reusable.
Telephone	Clean twice daily	Clean twice daily	Clean weekly
Toilet	Clean thrice daily	Clean thrice daily	Clean daily OPD-Frequent cleaning
Trolley dressing	Clean before and after use	Clean before and after use	Clean before and after use
TV	Clean weekly	Clean weekly	Clean weekly
Walls/window/doors	Spot clean and regular cleaning once a month. ICU glass doors Daily once.	Spot clean and regular cleaning once a month	Spot clean and regular cleaning once a month
Waste receptacle	Clean weekly and spot clean as required	Clean weekly and spot clean as required	Clean weekly and spot clean as required
Wheel chair	Clean daily and after use	Clean weekly and after use	Clean weekly and after use

❖ GENERAL INSTRUCTIONS FOR CLEANING OF HOUSEKEEPING SURFACES

General patient areas include:
Three types of cleaning are required for these areas:

- Routine cleaning/Concurrent cleaning
- Scheduled cleaning
- Terminal cleaning

Before cleaning:

- Follow precautions as indicated.
- Remove clutter before cleaning.
- Follow the manufacturer's instructions for proper dilution and contact time for cleaning and disinfecting solutions.
- Gather materials required for cleaning before entering the room. (Measuring cup for measuring correct amount of solution and dilution)
- Clean hands before entering the room.

During cleaning:

- Progress from the least soiled areas (low-touch) to the most soiled areas (high-touch) and from high surfaces to low surfaces.
- Remove **gross soil** (visible to naked eye) prior to cleaning and disinfection.
- Check privacy curtains for visible soiling and replace, if required.
- Clean all furnishings and horizontal surfaces in the room including chairs, window sill, television, telephone, computer keypads, over bed table etc. Lift items to clean the table.
- **Never shake mops:** Minimize turbulence to prevent the dispersion of dust that may contain microorganisms.
- Use dust control mop prior to wet/ damp mop.
- Wash the mop under the running water before doing wet mopping.
- Do not '**double-dip'** cloths (dip the mop only once in the cleaning solution, as dipping it multiple times may recontaminate it)
- An area of **120 square feet** to be mopped before re-dipping the mop in the solution.
- Cleaning solution to be changed after cleaning an area of **240 square feet.**
- Where facility of laundering mops is not available, mops should be changed at following defined intervals:

o High risk areas - In each shift
o Moderate risk areas - Each day
o Low risk areas - Every week

- **Sequence of cleaning:**

- ***In to out:*** Cleaning of the floor should begin at the end farthest from the door and then move towards the door. The cleaning staff should always move from clean to unclean areas and never vice versa.
- ***Top to down:*** Individual equipment should be cleaned from top to down.
- ***Eight stroke technique for mopping:*** IN open areas, mopping by figure of eight stroke technique should be perform; overlapping between adjacent strokes.
- Mops: wash mops separately from other cloth or linen
- If reusable: launder in hot water (70° - 80° C) if possible.

OR

- Soak in clean water with bleaching powder 0.5% for 30 minutes and then wash with detergent and water to remove the bleach. Mops should not be left wet.
- Mops should be changed routinely and immediately following the cleaning of blood, body fluids secretions and excretions, after cleaning a contaminated area, operating rooms or isolation rooms.
- Mop head should be changed when heavily soiled or at the end of the day.
- Store dry.

- Change cleaning solutions as per manufacturer's instructions. Change more frequently in heavily contaminated areas, when visibly soiled and immediately after cleaning blood and body fluid spills.
- During cleaning staff should be cautious and be alert for needles and other sharp objects. If found, should be safely handle and dispose sharps into puncture proof container. Report incident to supervisor.
- Collect waste, handle plastic bags from the top (do not compress bags with hands).
- Clean hands on leaving the room.
- **Waste bags should be held from top (should not compress bags with hands)**
- Hand hygiene is performed before leaving the room.

After cleaning:

- Do not overstock rooms.
- Tools used for cleaning and disinfecting must be cleaned and dried between uses.
- Launder mop heads daily.
- All washed mop heads must be dried thoroughly before re-use, for drying keep mop upside down (mop on top for proper drying).
- Clean sanitation cart and carts used to transport biomedical waste daily.
- All attachments of machines should be removed, emptied, cleaned and dried before storing.
- Sanitation cart and carts used to transport biomedical waste are cleaned daily.

In addition to routine daily cleaning of patient care areas/rooms, the following additional cleaning should be scheduled:

- High dusting using damp mop (weekly)
- Clean corners / Mechanical Cleaning (weekly)

High dusting includes *all surfaces and fixtures above shoulder height, including vents. Ideally, the patient/resident should be out of the room during high dusting to reduce the risk of inhaling spores from dust particles.*

❖ Equipment Cleaning

As per the disinfection policy all the equipment must be cleaned/disinfected. Non-critical medical equipment that is within the patient's environment and used between patients (e.g., imaging equipment, electronic monitoring equipment, Ventilators, infusion pump, wall mounted monitors etc.) requires cleaning and disinfection after each use. Selection of new equipment must include considerations related to effective cleaning and disinfection.

Follow manufacturers' instructions for cleaning and maintaining medical equipment.

- Do not use alcohol to disinfect large environmental surfaces.

Precaution

Do not use Phenolic compounds for cleaning/ disinfecting purposes in Neonatal units.

❖ FLOOR CLEANING

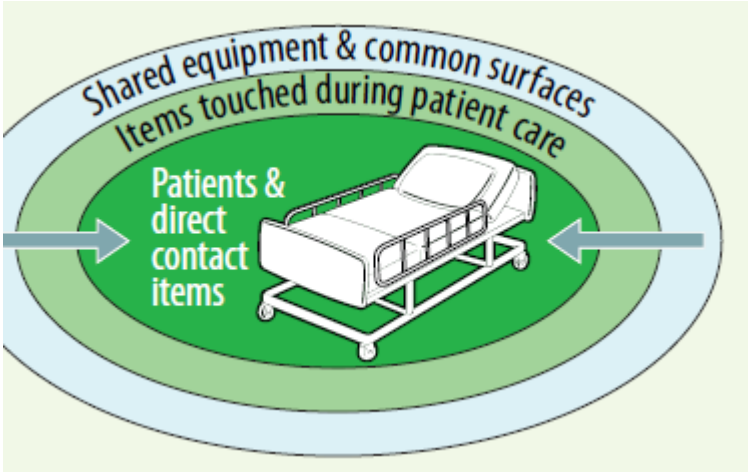
Area	Frequency	Method
General Wards	Twice in each shift	Soap and water
Special Wards—AICU, PICU, NICU, LR, Transplant	• Twice in each shift • Spot clean as required	• Soap and water • Directly with disinfectant(7% lysol)
Operation Theatres	• Before 1st case, • After and in-between each case, • End of the day	• Soap-water-Disinfectant • Disinfectant (1% hypochlorite) on spills and around the table • Soap-water-disinfectant (3 bucket system)

Cleaning/Mopping General Instructions

Proceed From Cleaner to Dirtier

Proceed **from cleaner to dirtier** areas to avoid spreading dirt and microorganisms. Examples include:

- During terminal cleaning, clean low-touch surfaces before high-touch surfaces.
- Clean patient areas (e.g., patient zones) before patient toilets.
- Within a specified patient room, terminal cleaning should start with **shared equipment and common surfaces**, then proceed **to surfaces and items touched during patient care** that are outside of the patient zone, and finally to **surfaces and items directly touched by the patient** inside the patient zone. In other words, high-touch surfaces outside the patient zone should be cleaned before the high-touch surfaces inside the patient zone.
- Clean general patient areas not under transmission-based precautions before those areas under transmission-based precautions.



Proceed From High To Low (Top To Bottom)

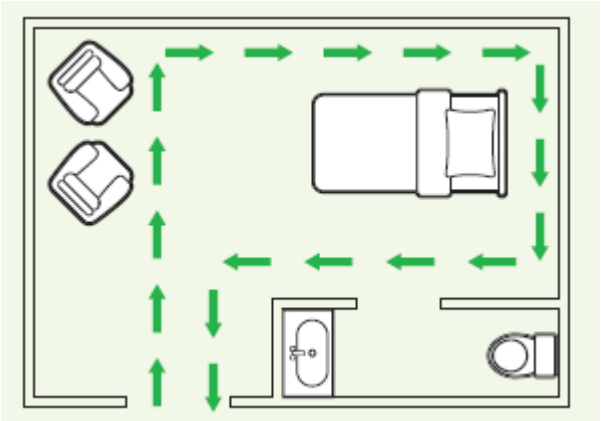
Proceed from **high to low** to prevent dirt and microorganisms from dripping or falling and contaminating already cleaned areas. Examples include:

- cleaning bed rails before bed legs
- cleaning environmental surfaces before cleaning floors
- cleaning floors last to allow collection of dirt and microorganisms that may have fallen

Proceed in a Methodical, Systematic Manner

Proceed in a **systematic manner** to avoid missing areas—for example, left to right or clockwise.
In a multi-bed area, clean each patient zone in the same manner—for example, starting at the foot of the bed and moving clockwise.

This is the general surface cleaning process:



1. Thoroughly wet (soak) a fresh cleaning cloth in the environmental cleaning solution.
2. Fold the cleaning cloth in half until it is about the size of your hand. This will ensure that you can use all of the surface area efficiently (generally, fold them in half, then in half again, and this will create 8 sides).
3. Wipe surfaces using the general strategies as above (e.g., clean to dirty, high to low, systematic manner), making sure to use mechanical action (for cleaning steps) and making sure to that the surface is thoroughly wetted to allow required contact time (for disinfection steps).
4. Regularly rotate and unfold the cleaning cloth to use all of the sides.
5. When all of the sides of the cloth have been used or when it is no longer saturated with solution, dispose of the cleaning cloth or store it for reprocessing.
6. Repeat process from step 1.

For all environmental cleaning procedures, these are the best practices for environmental cleaning of surfaces:

- Use fresh cleaning cloths at the start of each cleaning session (e.g., routine daily cleaning in a general inpatient ward).
- Change cleaning cloths when they are no longer saturated with solution, for a new, wetted cloth. Soiled cloths should be stored for reprocessing/discard.

- For **higher-risk areas/Specialized patient areas**, change cleaning cloths between each patient zone (i.e., use a new cleaning cloth for each patient bed). For example, in a multi-bed intensive unit, use a fresh cloth for every bed/incubator

Specialized patient areas

This vulnerable population is more prone to infection and the probability of contamination is high, making these areas higher risk than general patient areas.

Specialized patient areas include those wards or units that provide service to:

- high-dependency patients, (e.g., ICUs)
- immunosuppressed patients (e.g., bone marrow transplant, chemotherapy)
- patients undergoing invasive procedures (e.g., operating theatres rooms)
- patients who are regularly exposed to blood or body fluids (e.g., labor and delivery ward, burn units)

- Ensure that there are enough cleaning cloths to complete the required cleaning session.
- Never double-dip cleaning cloths into portable containers (e.g., bottles, small buckets) used for storing environmental cleaning products (or solutions).
- Never shake mop heads and cleaning cloths—it disperses dust or droplets that could contain microorganisms.
- Never leave soiled mop heads and cleaning cloths soaking in buckets

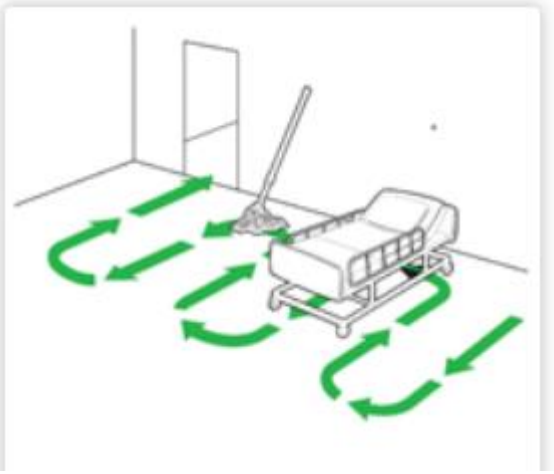
Floor Moping

Floors generally have low patient exposure (i.e., are low-touch surfaces) and pose a low risk for pathogen transmission. Therefore, under normal circumstances they should be cleaned daily, but the use of a disinfectant is not necessary.

This is the general mopping process:

1. Use wet floor or caution signs to prevent injuries.
2. Immerse the mop or floor cloth in the bucket with environmental cleaning solution and wring out.
3. Mop in a figure-8 pattern with overlapping strokes, turning the mop head regularly (e.g., every 5-6 strokes).
4. After cleaning a small area (e.g., 3m x 3m), immerse the mop or floor cloth in the bucket with rinse water and wring out.
5. Repeat process from step 1.
6. Mop from cleaner to dirtier areas.

7. Mop in a systematic manner, proceeding from area farthest from the exit and working towards the exit
8. Change mop heads/floor cloths and buckets of cleaning and disinfectant solutions as often as needed (e.g., when visibly soiled, after every isolation room, every 1-2 hours) and at the end of each cleaning session.
9. Regardless of the risk-level of an area, spills or contamination from blood or body fluid (e.g., vomitus), must be cleaned and disinfected immediately.



For mopping of floors, *3 bucket system* (as described below) should be preferred.

A triple bucket cleaning method consists of three buckets, one dedicated bucket for sanitation, a second bucket for clean rinsing, and a third bucket for dirty rinsing. The sanitation bucket provides a clean disinfectant to use for mopping, the clean rinsing bucket contains a rinse disinfectant solution to assist in removing dirt and residual contaminants, and the dirty rinsing bucket serves as a waste bucket to wring out either excess cleanser or wastewater in-between steps.

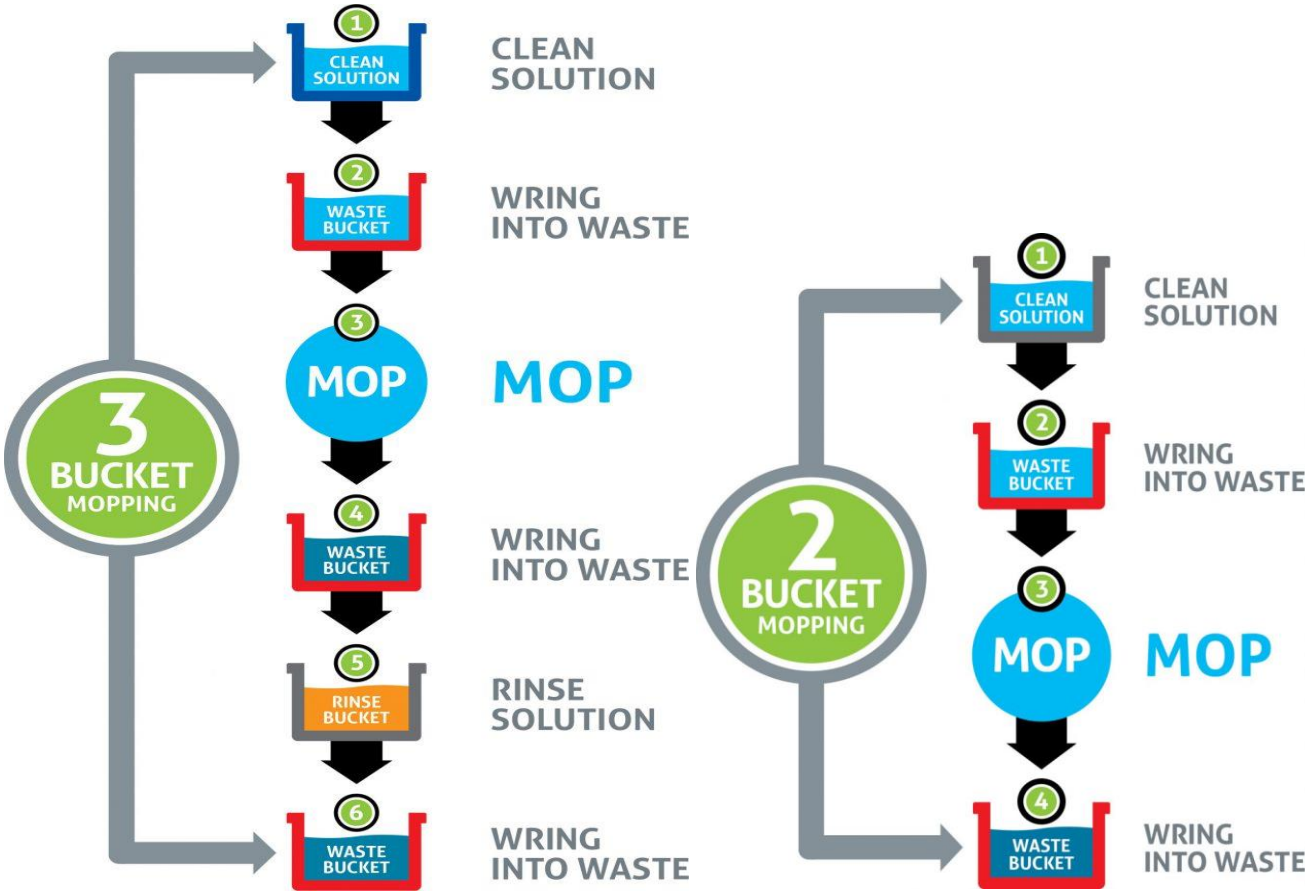
The proper steps for using **a triple bucket** system are as follows:

1. **Clean Solution/Sanitize Bucket** – Prepare your bucket by adding the appropriate level of water and adding the recommended amount of disinfectant as per SOP. Saturate your mop in the solution.
2. **Waste Bucket** – Wring the excess disinfectant solution from your mop into the second bucket – the waste bucket. Ensuring that the level of pressure is appropriate to not remove too much or too little of the solution from the mop head.
3. **Mop the Surfaces** – Apply the disinfectant to the surface with even and overlapping strokes ensuring that the appropriate amount of solution is applied to the surface.
4. **Waste Bucket** – Wring the waste water into the waste bucket for the second time.

5. **Rinse/Wash Bucket** – Rinse the mop in the third bucket, filled with the clean water or detergent water or same disinfectant solution as in the clean solution bucket with the same ratio.
6. **Waste Bucket** – Remove excess water in waste bucket by wring the mop into the waste bucket.
7. **Repeat steps 1-6 again** every time until all surfaces are mopped.

2 Bucket System

1. **Clean Solution Bucket** – Add/Mix your cleaning solution to the first bucket and saturate your mop in the solution.
2. **Waste Bucket** – Wring excess cleaning solution from your mop into the second bucket – the waste bucket.
3. **Mop** – Apply the solution to the surface, using your preferred method of mopping, or you can find our mopping technique guide.
4. **Waste Bucket** – Wring the waste water into the waste bucket for the second time.


3 BUCKET MOPPING
1 CLEAN SOLUTION
CLEAN SOLUTION
2 WASTE BUCKET
WRING INTO WASTE
3 MOP
MOP
4 WASTE BUCKET
WRING INTO WASTE
5 RINSE BUCKET
RINSE SOLUTION
6 WASTE BUCKET
WRING INTO WASTE
2 BUCKET MOPPING
1 CLEAN SOLUTION
CLEAN SOLUTION
2 WASTE BUCKET
WRING INTO WASTE
3 MOP
MOP
4 WASTE BUCKET
WRING INTO WASTE

❖ ISOLATION ROOM CLEANING: TERMINAL CLEAN

PREPARATION AND SETUP

o Prepare equipment and material needed for the task

➢ Available Hospital Disinfectant

➢ Microfiber cloths

➢ Microfiber mop

➢ Dusting mop

➢ Gloves

➢ Anti-microbial soap

➢ Hand sanitizer

PUT ON THE APPROPRIATE ATTIRE and Personal Protective Equipment (PPE)

➢ Eye protection (safety glasses, goggles, or face shield)

➢ Disposable gloves

➢ Disposable Gown, liquid-splash protective suit, or disposable suit

➢ N95 Respirator (In case patient admitted with airborne disease)

PERFORM HIGH DUSTING WITH MICROFIBER FLEXIBLE DUSTING WAND

➢Vents (supply & return)

➢Light fixtures

➢Sprinkler heads etc.

PERFORM TERMINAL CLEANING ON ALL VERTICAL SURFACES, walls, wall mounted objects

➢ Baseboards

➢ Light switches

➢ Thermostat (if present)

➢ Blinds (Curtains)

➢ Door/door frames/handles

➢ Vital machines

➢ Computers/mice/keyboards

➢ Dispensers

➢ Glove rack

➢ Cabinets and handles

o **PERFORM TERMINAL CLEANING ON ALL HORIZONTAL SURFACES**

➢Exam bed/draws/base

➢Cabinet and handles

➢Countertops

➢Hard surfaces

➢ Windows

➢ Wipe down chairs (Non- Porous)

➢ Mattress

➢ Bed frame/rails

o **PERFORM DISINFECTING PROCEDURE**

➢Allow disinfectant to dwell, according to manufactures' instructions

➢Complete the disinfecting process on all surfaces cleaned, spraying, and wiping down all areas with disinfectant spray cleaner.

FLOOR CLEANING AND DISINFECTION

o Put safety signs out indicating floor hazard

o Dust mop floor, beginning in the far corner of the room away from exit.

o Damp mop floor o Dispose of used cloths and mops in facility-approved container

ISOLATION ROOM BATHROOM CLEANING

o Clean the mirror using a Disposable Microfiber cloth

o Clean the sink area, including the counter, faucet and handles, and sink basin with a clean Disposable Microfiber cloth

o Clean other surfaces of the bathroom with a clean Disposable Microfiber cloth

o Disinfect toilet

o Restock consumable supplies

o Empty and line waste containers

FINAL INSPECTION

o Inspect room by concerned area supervisor.

o Remove PPE before leaving the room

o Perform hand hygiene and put on new gloves

o Clean all tools and equipment and return to area

o Remove gloves and perform hand hygiene

Employee Signature_____

Supervisor Signature_____

Cleaning in Operation Theatres

Operating rooms are highly specialized areas with a mechanically controlled atmosphere where surgical procedures are performed. These require environmental cleaning at three distinct intervals throughout the day:

- before the first procedure
- between procedures
- after the last procedure (i.e., terminal cleaning)
- Weekly

❖ Theatre complex should be absolutely clean, it minimize patients and HCWs exposure to potentially infectious microorganism. Dust should not accumulate at any region in the theatre.

First cleaning of the day (before cases begin) should be performed first, every morning irrespective of whether the OT will be used or not.

- The OT staff should not enter the OT before cleaning is complete.
- All horizontal surfaces (all furniture, equipment, lights, suction points, OT table, slabs, etc.) should be cleaned by wet wiping with an HLD. The sequence of cleaning is from top to down and in to out.
- OT should be kept closed for 10-15 min with ventilation equipment on, after cleaning.
- (Under normal circumstances, it is not necessary to perform the cleaning step in the morning if terminal cleaning was conducted the evening before.
- Wipe all horizontal surfaces in the room (e.g., furniture, surgical lights, operating bed, and stationary equipment) with a disinfectant to remove any dust accumulated overnight.
- If there was no written confirmation or terminal cleaning on the previous day, do a full terminal clean)

During Surgery

- Spills/ Blood splashes in the vicinity of the sterile field—absorbed with a cloth and covered with freshly prepared sodium hypocholorite for at least 30 min (see section on management of spills)
- Clean the area with soap and water.

In-between Surgeries

- The air handling unit should be kept on and OT door closed.
- Dampen clot is used along with hospital-approved HLD disinfectant solution to disinfect surfaces that have come in contact with a patient or body fluids.
- Floor—mop 3–4 feet area of the floor around the table.

At the End of the Day (Terminal cleaning)

- Repeat same procedure as earlier
- Wipe over-head lights, cabinets, waste receptacles, and equipment, furniture with soap / detergent and water.
- Wash floor with soap and water followed by disinfectant solution (0.1% hypochlorite solution/ 1% Bacillocid solution/ 7% Lysol)
- Disinfect the operating room, scrub utility, corridor, furnishings and equipment.

Clean and disinfect:

- horizontal surfaces (high- and low-touch) and fixed equipment in the room, including booms and wheels of any equipment (e.g., carts)
- vertical surfaces such as walls and windows as needed to remove visible soiling
- ventilation (ducts)
- handwashing sinks, scrub and utility areas/sinks
- entire floor, including baseboards
- take care to move the operating table and any mobile equipment to make sure to reach the floor areas underneath

Thoroughly clean and disinfect portable patient-care equipment that is not stored within the operating room before removal from the operating room. Examples include:

- suction regulators
- anesthesia trolley
- compressed gas tanks
- x-ray machines
- lead gowns

Detailed wash-down of the OT complex (Weekly)

- Remove all portable equipment.
- Damp wipe lights and other fixtures.
- Clean doors, hinges, facings, glass inserts, and rinse with cloth moistened with detergent.
- Wash and dry all furniture and equipment.
- Scrub floor using detergent and water/Lysol.
- Steel surfaces—clean with detergent, rinse, and clean with warm water.
- Replace all the portable equipments.

○ Cleaning of operating theatre and waste disposal

- Adequate time must be provided at the end of each case to allow for thorough cleaning in coordination with O.T in-charge/TL.
- Cleaning of the operating theatre and the appropriate disposal of clinical waste should be carried out.

➢ Preventive maintenance on all theatre equipment to be carried out every Saturday

❖ Assessment of Cleanliness and Quality Control

- The Sanitation department is responsible to ensure that the quality of cleaning maintained in the health care Organization meets appropriate best practices. HIC Department is responsible for microbiological culture and disseminating its report to all concerned. The responsibility for ensuring that the standardized cleaning practices are adhered to lies not just with the person performing the task but also with the direct supervisor and management of the department or agency providing the sanitation services. To that end, it is important to incorporate elements of quality improvement into the program, including monitoring, audits and feedback to staff and management.

- Monitoring should be an ongoing activity built into the routine cleaning regimen. Regularly scheduled monitoring should take place immediately after cleaning, to ensure that the cleaning has been carried out correctly and to an appropriate standard. Data from monitoring should be retained and used in trend analysis and compared with benchmark values that have been obtained during the validation of the sanitation program

- Round the year, Housekeeping dept. should monitor all areas. It should cover monitoring of a proportion of the facilities/areas within Hospital or may be entire hospital in a phase wise manner. It is recommended that compliance is assessed using a standardized monitoring template, and submit the Feedback received from the end user.

❖ Summary of methodologies for assessing performance & outcome

	Advantage	Disadvantage
Visual Inspection	• Can be used for large areas (wards, rooms) • Can be done with minimal training • Benchmarking possible, simple and inexpensive	• Subjective • Does not assess bioburden
Fluorescent gel	• Quick • *Provides immediate feedback on performance* • Minimal training required • *Objective Benchmarking possible* • Relatively inexpensive	• Does not assess bioburden • *Could be labour intensive as surfaces must be marked before cleaning and checked post cleaning*
ATP bioluminescence	• Quick • Provides immediate feedback • Minimal training required • Objective	• *Expensive Low sensitivity and specificity* • *No current standardisation of tests* • *Variable benchmarks Technology*

Microbial cultures	• High sensitivity and specificity • Objective • *Provides direct indication of the presence of whatever pathogen is isolated* • *May suggest environmental guidelines reservoir(s) and/or source of outbreak*	• Expensive • Prolonged time for results • *Requires accessible laboratory resources and trained personnel for interpreting results* • Not supported for routine use. • Only for intensive units and O.Ts and in case of outbreaks.

DECONTAMINATION OF PATIENT LINEN

- Bed linen is to be changed daily and whenever soiled with blood or body fluids.
- Patient's gown is to be changed every day and whenever soiled with blood or body fluids.
- Dry dirty linen is to be sent to the laundry for regular wash.
- Linen soiled with blood or body fluids, and all linen used by patients diagnosed to have
- HIV, HBV, HCV and MRSA, is to be decontaminated preferably by autoclaving/ immersion in 1% Sodium hypochlorite at least for 30 minutes before being sent to the laundry.

PEST CONTROL

- Cockroach, flies, maggots, ants, mice act as vector for transmission of microorganisms
- Pest control strategies should be developed with emphasis on kitchen, operating rooms, laundries, CSSD, cafeterias and other infection prone areas.
- Install screens on all windows that open to the outside; keep screens in good repair.
- Place Lab specimens in covered containers.

Fogging

The origin of fogging can be traced to the 19th century when Joseph Lister aerosolised carbolic acid to improve antisepsis in operative practice. Fumigation (fogging with formalin) is no longer used.

HVAC (heat ventilation air conditioning) system maintains indoor air temperature and humidity, control odours, remove contaminated air and minimise the risk of transmission of airborne micro-organisms. An HVAC system with modern AHU helps to maintain positive air pressure in OT, and maintain 15-20 air changes/hour. Use of HEPA filters (to remove particles of size of > 0.3 micron) further helps in maintaining asepsis and infection control.

Although, no studies demonstrate that fogging actually reduces the incidence of hospital-acquired infections (HAI), it seems to be the only alternative for health facilities not having HVAC system.

CDC and HICPAC (Healthcare Infection Control Practices Advisory Committee) have recommendations in both *2003 Guidelines for Environmental Infection Control in Health-Care Facilities* and the *2008 Guideline for Disinfection and Sterilization in Healthcare Facilities* that state that the *CDC does not support disinfectant fogging.*

These recommendations refer to the spraying or fogging of chemicals (e.g., formaldehyde, phenol-based agents, or quaternary ammonium compounds) as a way to decontaminate environmental surfaces or disinfect the air in patient rooms. The recommendation against fogging was based on studies in the 1970s that reported a lack of microbicidal efficacy (e.g., use of quaternary ammonium compounds in mist applications) but also adverse effects on healthcare workers and others in facilities where these methods were utilized. Furthermore, some of these chemicals are not EPA-registered for use in fogging-type applications.

These recommendations do not apply to newer technologies involving fogging for room decontamination (e.g., ozone mists, vaporized hydrogen peroxide) that have become available since the 2003 and 2008 recommendations were made.

Disinfection of OT with HVAC System

Fogging is not required for an OT with a HEPA filtered positive pressure air supply system. However, the following should be ensured before deciding not to fogg such an OT:

- The ventilation system design is appropriate and system performance is validated during installation and at least once a year. Records of validation should be available. All parameters in every validation testing should be within permissible limits
- Maintenance of the ventilation system is done at least once a year. HEPA filters are changed at the time intervals recommended by the manufacturer or based on results of the validation tests. Maintenance of the AHU is done as a part of yearly maintenance. Records of maintenance filter replacement to be available

- Air count monitoring using settle plates/air sampler is done. Results are within acceptable limits and test reports are available
- Surface cleaning protocols are implemented correctly with OT cleaning staff knowing clearly how they are supposed to perform the cleaning
- Adequate time is given for OT cleaning.

Fogging in Wards/Room

Important: wards and rooms need not be fogged on a routine basis, done in following condition.

- After an isolation ward/room is emptied at the end of an outbreak
- After an infected patient is discharged from a room (in absence of an outbreak)
- When an outbreak of infection occurs in a ward.

Fogging is indicated in Following Situations

- If there is a case of anthrax, gas gangrene, tetanus or an open septic wound with laboratory evidence of *Clostridium tetani* in any area where surgical procedures are carried out.
- Before functioning of a newly constructed or renovated or repaired operation room/ intensive care unit.
- When routine environmental surveillance reveals *C.tetani* or any pathogenic spore former.
- As a part of terminal cleaning once in a Week/month.
- Daily in operation theatres where surgeries are performed with window ACs.

Requirements

a. A fogging machine (fogger)

b. Fogging solution (quantity as per manufacturer recommendations)

c. Water (In some solutions)

Mechanism: Small aerosol particles of disinfectant solution gets suspended in the air for long time and kill the airborne microorganism, fungus and their spores.

Hydrogen peroxide based Fogging is safe as the residue in air decompose with the water and nascent oxygen. There is no need of cleaning or mopping or any other activity like de-fogging after the procedure.

Procedure

General instructions before fogging:

- Remove all the dust from area where fogging has to be carried out.
- Clean the room thoroughly and mop all the surfaces
- Before starting the fogging process room & all surfaces should be cleaned with disinfectant
- Labels should be put on the door with time of starting & expected time of opening
- Seal the room including windows and ventilators air tight.
- Use adhesive tapes to close the gaps.
- Switch off the fans.
- Keep air conditioning switched off.
- Switch on exhaust for 15 minutes prior starting air conditioning.
- Air conditioning to be started after 1 hour of the procedure.

Precautions to be taken during process of fogging

- Do not use flammable/non approved liquids in the fogging machine.
- Do not use machine without timer device.
- Never probe into front nozzle from where the mist comes out.
- Use funnel to pour the liquid in the machine tank.
- Measure the area of room to be fogged in cubic feet.
- Seal the room including windows and ventilators air tight. Use adhesive tapes toclose the gaps.
- Switch off the fans and ACs.
- For each **1000 cu.ft.** (28.3 cu.mt.) Space, use recommended amount of solution as per manufacturers' guideline.
- No neutralization with ammonia required
- Pour this solution to fogging machine
- Appropriate use of PPE like gloves, masks and goggles etc.
- Check all the activities are being carried out which were mentioned in the instruction for pre-fogging.

- Mark sure that no person will present in the area or room of fogging apart from the person who is carrying the fogging operation.
- The person who is carrying out the operation should be aware of the fogger machine mechanism and handing of the fogging disinfectant liquid
- Once the fogger machine is ready to use for the fogging operation than ensure and make the proper place for the machine. Keep the fogger machine on ground floor only; find out suitable location for the machine as per availability of power plug.
- Make sure that while placing the fogger machine, there should not be any barrier in front of the fogger machine nozzle. 2 to 3 feet empty space must be there.
- Make sure that the fogger machine nozzle is kept at 45-degree angle to the ground floor.
- Switch on the machine
- Keep it for 60 minutes
- After completion of procedure add some plain water in the empty tank and fogger machine should be started for flushing.

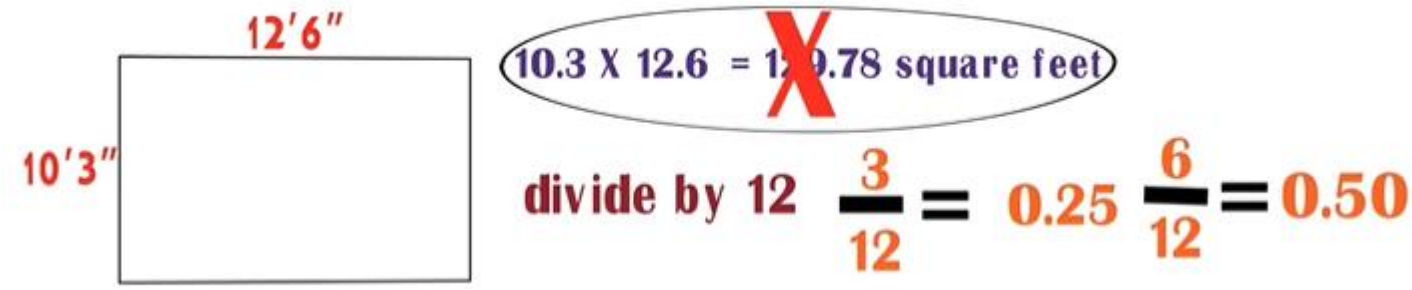
Instructions for the post fogging of the OT

- After stopping the fogger machine, the fogged area must be isolated for one hour
- After one hour of isolation, one should start the AC system for 10 minutes.
- After that the OT is ready for use

Microbiological Surveillance after Fogging

- Recommended only in case of fogging done after new construction/ renovation/ repair work or after procedures done on septic cases.
- Not indicated in case of fogging being done as a part of terminal cleaning. In such case the area/room can be used immediately after fogging.

HOW to calculate Cubic Feet/Meter.



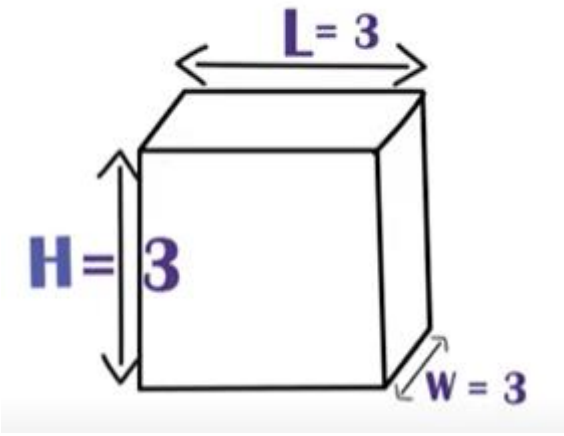
L×W = Sq. feet

In above example 10 feet 3 inch need to multiply by 12 feet 6 inch but inches need to convert in feet dividing by 12 as shown in example.

Correct answer is 10.25×12.5 = 128.125 square feet.

L×W×H= cubic feet/meter

3×3×3= 27 Cubic Meter



References

1) Essential Of Hospital Infection Control By Apurba S Sastry And Deepashree
2) Hospital Infection Prevention And Control Guidelines On Ncdc.Gov.In
3) Guidelines For Implementation Of "KAYAKALP" Initiative
4) Guidelines for Disinfection and Sterilization in Healthcare Facilities, CDC Atlanta, 2008 updated inFebruary 2019.
5) https://www.cdc.gov/hai/prevent/resource-limited/cleaning-
6) Best practice for environmental cleaning for resource limited setting CDC guidelines.

Chapter 6

Needle stick Injury and its management

Introduction

An occupational exposure is defined as:

- Percutaneous injury(e.g. needle stick injury (NSI) or other sharp injury)
- Splash injury with exposure to blood and body fluids:
  - ✓ Contact with the mucous membrane (e.g. eye or mouth)
  - ✓ Contact with non-intact skin (abraded skin or afflicted with dermatitis)
  - ✓ Contact with the intact skin when the duration is prolonged (e.g. several minutes or more)

Note: Occupational injury is often loosely termed as NSI, although in addition to needles it also includes injuries caused by other sharp object (e.g. glass vials, surgical blades, forceps) and splashed (blood and body fluid). This chapter will also follow the terminology NSI to denote occupational exposures.

Infectious and non-infectious materials

Potentially Infectious	**Non-Infectious (Unless Contaminated with Visible Blood)**
1. Blood/ Serum/ Plasma 2. Semen 3. Vaginal Secretions 4. Body fluids—cerebrospinal, synovial, pleural, peritoneal, pericardial, amniotic 5. Any other fluids/ secretions contaminated with visible blood 6. Tissues 7. Laboratory specimens that contain concentrated virus	1. Tears 2. Saliva 3. Urine 4. Stool 5. Sputum 6. Nasal secretions 7. Sweat 8. Vomitus

"Exposed person" is the person who is potentially at risk of acquiring blood-borne infections due to exposure to blood or other body fluids. He/she is generally a HCW.

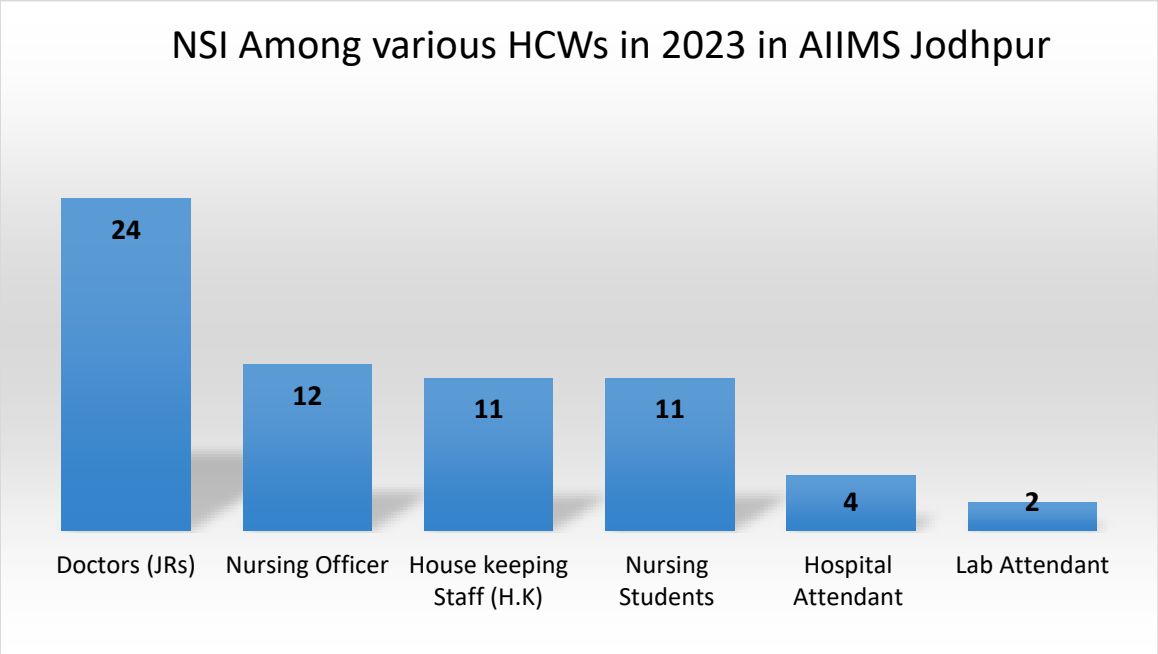
"Source person" is the person who is (either identified or unknown) the possible source of contamination through blood or other body fluids.

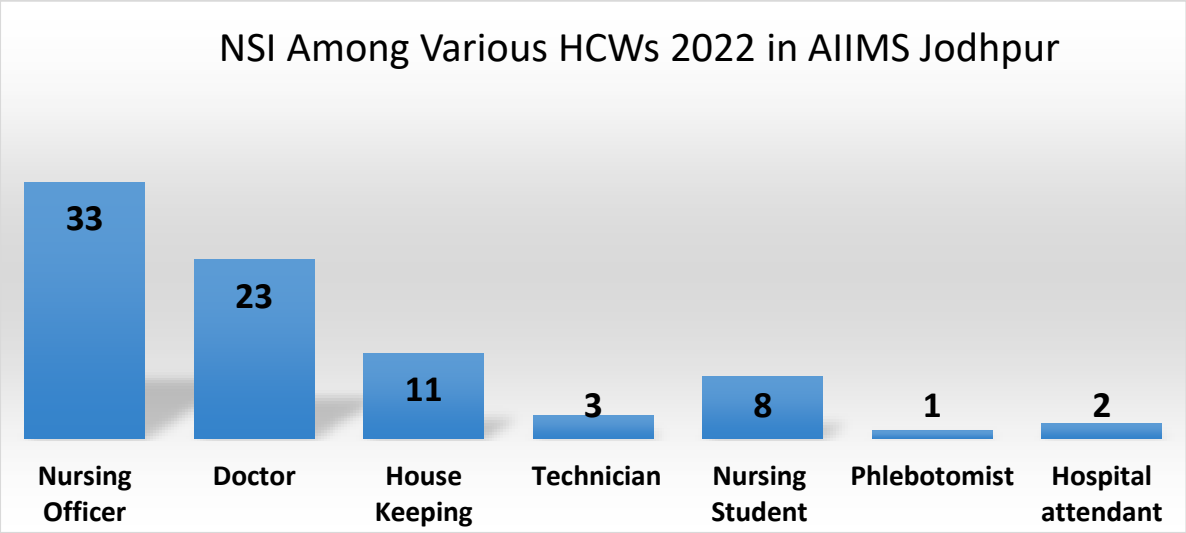
Agents Transmitted: HBV, HCV, HIV are three major blood-borne viruses that are transmitted through NSI.

The risk of transmission following NSI is highest for HBV (9-30%) followed by HCV (1-1.8%) and HIV (0.3%)

Factors influence Risk of NSI

- Reuse of syringes.
- Recapping (Most common)
- Overuse of injections
- Unsafe sharp waste management





Factor caused NSI to various HCWs in AIIMS Jodhpur 2023	No. of Incident
Left over Needles/Sharp	14
Injection Procedure (IV & IM)	10
Procedure in OT/Ward	9
Eye Splash	6
Garbage Collection	5
While Discarding Sharp Waste	5
Recaping	3
Suturing	3
Blood Sampling	5
During Cannulation	2
Surgical Instrument	1
During Autopsy in Morgue	1
Total	**64**

Factor caused NSI to various HCWs in AIIMS Jodhpur 2022	No. of cases
While doing ABG	1
Using Surgical Blade	3
Disposing Needle in Sharp Container	4
EYE Splash	4
Recapping	4
Performing Procedure	6
Suturing	9
Giving S.C Inj.	7
Giving I.M/I.V Inj.	7
Sugar checking (Lancet Prick)	7
During Garbage Collection	10
Left Over Needle/ Stylet/Sharp	19
Total	81

Challenges Encountered are under reporting: Majority of NSIs remain under-reported. Hence all HCWs who got NSIs must report the case, regardless the fear of taking PEP as it is absolutely depend on person's choice, wearer to take or not to take PEP.

Post Exposure Prophylaxis and management for NSI

- Take immediate First aid as delay in first and PEP aid increase risk factor
- Hollow bore needle has a higher risk than solid needle (Suture/stylet)
- Viral load present in the blood/body fluid at the time of exposure.
- Volume of blood involved in the exposure
- Depth of injury- higher is the depth, more is the risk.

Don'ts	Do's
1. Do not panic. 2. Do not place the pricked finger into the mouth reflexively. 3. Do not squeeze/press blood from wound. 4. Do not use bleach, alcohol, iodine, antiseptic, detergent, etc.	1. Stay calm 2. Remove gloves, if worn. 3. Wash exposed site thoroughly with running water and soap. Irrigate thoroughly with water, if splashes have gone into the eyes or mouth 4. Consult the designated physician/ ICN immediately as per institutional guidelines, for management of the occupational exposure. 5. As all the contact numbers are displayed on NSI posters affixed in all areas of Hospital.

For Skin	For the Eye	For Mouth
1. Immediately washthe wound and surrounding skin withwater and soap, and rinse with flowing water or normal saline. 2. In case of skin and mucus membrane exposure immediately wash the area and do not use antibiotics. 3. Do not scrub. 4. Do not use antiseptics or skin washes	1. Immediately irrigate the exposed eye thoroughly with running tap water or normal saline at least for 5 min for blood splash (15 min for chemical splash). 2. If wearing contact lenses, leave them in place while irrigating as they form a barrier over the eye and will help protect it. 3. Once the eye is cleaned, remove the contact lens and clean them in a normal manner. 4. Do not use soap or disinfectant on the eye.	1. Spit fluid out immediately. 2. Rinse the mouth thoroughly using water or saline and spit again. Repeat the process several times. 3. Do not use soap or disinfectant in the mouth.

Steps to be followed after accidental exposure to blood/other body fluids

1. First aid
2. Identify the source status, if available and possible
3. Report to the Infection Control Team immediately/nodal officer
4. Risk assessment by ICN/Nodal person (based on type of injury and source status)
5. Informed consent and counselling
6. Testing for HIV, HBV and HCV for source and HCW
7. Decision on prophylactic treatment for HIV and HBV
8. Documentation and recording exposure.
9. Monitoring and follow up of HIV, HBV, and HCV status of HCW.
10. Documentation and recording of exposure

Exposure code

Mild Exposure (Exposure code-1) EC-1

Mucous membrane/ non-intact skin with small volumes (Few Drops), or less duration.

Example: A superficial wound (erosion of the epidermis) with a plain or low calibre needle, contact with the eyes or mucous membranes, or subcutaneous injections following small bore needles.

Moderate Exposure (Exposure code-2) EC-2

Mucous membrane/ non-intact skin with large volumes/major splashes for several minutes or more duration or percutaneous superficial exposure with solid needle or superficial scratch.

Severe Exposure (Exposure code-3) EC-3

Percutaneous with Large Volume

Example: An accident with a needle/device visibly contaminated with blood;

-A deep wound (hemorrhagic wound and/or very painful);

-Transmission of a significant volume of blood;

-An accident with needle/device that has previously been used intravenously or intra-arterially.

Source code (for HIV status)

(Source code-1) SC-1

HIV Positive, asymptomatic or low viral load (<400 copies/ml)

(Source code-2) SC-2

HIV Positive, symptomatic (advanced AIDS or primary HIV infection), High viral load.

(Source Unknown)

Status of the patient is unknown and neither the patient nor his/her blood is available for testing

HIV Negative

Tested negative.

Revised NACO guidelines for PEP for HIV, 2021

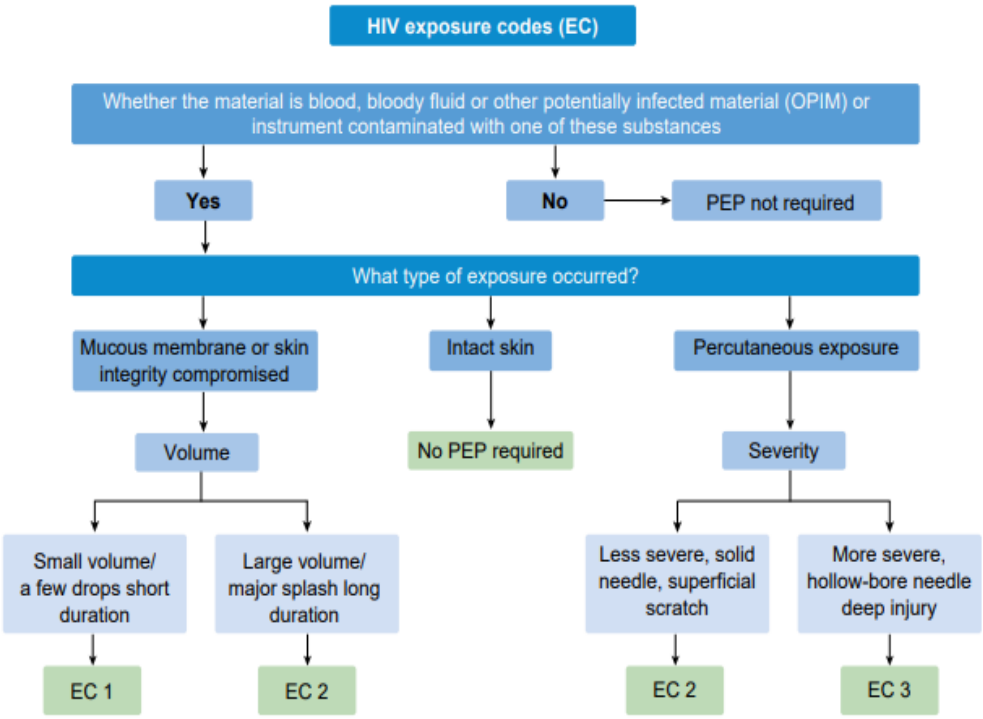
Exposure Codes	HIV Source Codes	PEP Recommendations	Duration
1,2 or 3	Negative	PEP not warranted	
EC 1	SC 1	PEP not warranted	28 Days for Adolescents and Adults (>10 years of age and >30 kg weight) (Daily single daily dose of) Tenofovir 300 mg, Lamivudin 300mg, Dolutegravir 50mg.
EC 1	SC 2	PEP Recommended	
EC 2	SC 1		
EC 2	SC 2		
EC 3	SC 1 or 2		
EC 2/3	SC Unknown (In area with high prevalence)	PEP Recommended	

The first dose of PEP should be administered immediately within 2 hours (greatest impact) and preferably within 72 hours of exposure. There is almost non-existent benefit if .72 hours have lapsed but PEP can still be used if HCW present after 72 hours of exposure.

PEP is not required:

- If exposed person is HIV positive
- If skin is intact
- If source is HIV negative
- Exposure with low risk specimens like tear, saliva, urine, stool, vomits, etc.
- Source unknown (if HIV prevalence is low)
- Delay in reporting exposure by.72 hours (PEP initiation is optional)

HIV Exposure Codes in flow chart representation



Key Considerations while Prescribing PEP

The first dose of PEP should be administered immediately within 2 hours (greatest impact) and preferably within 72 hours of exposure. There is almost non-existent benefit if .72 hours have lapsed but PEP can still be used if HCW present after 72 hours of exposure.

PEP should be made available in any one of this Department i.e Emergency department, labour room, Intensive Care Units and Operation Theatres (OTs)/Microbiology lab.

A HIV testing of the source patient should not delay the decision about whether to start PEP. Start PEP first if required, then refer for consultation.

A In the case of a high-risk exposure (occupational or non-occupational) from a source patient who has been exposed to or is taking ARV medications, consult an expert to choose the PEP regimen, as the risk of drug resistance is high and a change of regimen may be required.

The exposed person should go to the designated clinic/officer, at the earliest, for a complete risk assessment, HIV counselling, testing and PEP.

All hospital staff members must know whom to report to for PEP and where PEP drugs are available.

Unknown source: Use of PEP to be decided on case-to-case basis after considering the severity of exposure and the epidemiologic likelihood of HIV transmission.

Major toxicity of PEP regimen: Minor side effects may be managed symptomatically. Refer to expert for non-tolerance or non-adherence.

Management of minor ARV drug side effects

Sign or Symptom	Management at health facility
Nausea	Take with food; reassure that this is usually self-limited. Treat symptomatically.
Headache	Give paracetamol. If on Efavirenz, reassure that this is common and usually selflimited. If persists more than 2 weeks, call for advice or refer.
Diarrhoea	Hydrate. Follow diarrhoea guidelines. Reassure patient that if it is due to ARV, it will improve in a few weeks. Follow up in 2 weeks. If it does not improve, call for advice or refer.
Fatigue	This commonly lasts 4 to 6 weeks. Take 'sick leave/medical' from work. If severe or longer than this, call for advice or refer.
CNS side effects: Anxiety, nightmares, psychosis, depression	This may be due to EFV. Take EFV at night before sleeping. Counsel and support (usually lasts <3 weeks) The initial difficult time can be managed with amitriptyline at bedtime. Call for advice or refer if severe depression or suicidal tendencies or psychosis (stop EFV)
Rash	If on EFV, assess carefully. Is it a dry or wet lesion? Call for advice. If generalized or peeling, stop drugs and refer for expert opinion
Fever	Assess clinically for Hepatitis; see if this could be primary (acute) HIV infection or other non–HIV-related infections, e.g., concurrent common cold. Call for advice or refer
Jaundice, abdominal or flank pain	Stop drugs; call for advice or refer. If jaundice or liver tenderness is present, send for ALT test and stop ARVs; call for advice or refer.

Decision in Window period

Routinely used serological tests do not detect HIV antibodies during "window period". This implies that a negative testing does not exclude HIV infection. In general, the recommendation for PEP in case of source patient tested negative for HIV is:

- **In High provenance area**: PEP may be required even if the exposure risk is high (EC 2or 3). This is because a higher proportion of HIV-infected individuals in this area are found in the window period.
- **In low prevalence are:** PEP is not required regardless of the exposure risk.

Compliance

Compliance of .95% to the PEP schedule is required to maximize the efficacy of PEP. Therefore, the person should be counselled to continue the PEP. He should take adequate rest, sick leave if required.

PEP for Hepatitis B

Hepatitis B measures are as follows:

1) **For vaccinated HCW with subsequent documented anti-HBs> 10 mIU/ml**
   No need to assess the source status. No post-exposure management is necessary.
2) **For vaccinated HCW with anti HBs<10mIU/ml after two complete vaccination series (i.e. non-responders)**
   Assess the source status as soon as possible. If the source status is positive orunknown give 2 doses of HBIG one month apart.
3) **For vaccinated HCW whose antibody titres are unknown: Check the titres and assess thesource risk as early as possible.**
   i. If the titres are >10 mIU/ml, no action needed irrespective of the source status.
   ii. If the titres are <10 mIU/ml and if the source is negative, give revaccination seriesof hepatitis B(0-1-6 month).
   iii. If the titres are <10 mIU/ml and if the source is positive or unknown give one doseof HBIG and start revaccination series of hepatitis B.
   iv. If the HCW is unvaccinated or incompletely vaccinated or vaccine refusers and ifthe source is positive or unknown—

Do HBsAg for the HCWs and give HBIG one dose and complete the vaccinationseries. If the source is negative complete the vaccination schedule.

HBIG should be administered intramuscularly, as soon as possible after exposure; preferably within 24 hours and ideally within 48 hours when indicated. The effectiveness if HBIG when administer >7 days of exposure is unknown.

Dose: 0.06ml/kg (or 10-12 IU/kg)

When to check Anti HBsAg titre?

- Done after 1–2 months of the last dose of Hepatitis B vaccine.
- When immunoglobulin is received along with vaccination, post-vaccination serology is done after 4–6 months to avoid detection of passively administered anti-HBs.

A Responder is defined as a person with anti-HBs ≥ 10mIU/ml after ≥ 3 doses of hepatitis B vaccine.

A Non-responder is defined as a person with anti-HBs ≤ 10mIU/ml after ≥ 6 doses (or two series of 0, 1, 6) of hepatitis B vaccine.

Institutional Protocol for administering HBIG in case of Needle Stick Injury

Step-1: Exposed person has to inform area Asst. Nursing Superintendent and then contact to ICNs/Medicine SR in OPD 1st Floor and NSI case form will be filled by on duty ICN

Step-2: Send the viral markers of source & exposed HCW from the concerned area only, according to case scenario

Step-3: As per the case, Exposed person will visit to ART Centre (Medicine OPD 1st Floor) to get ART for 28 days

Step-4: In case if HBIG required, request letter of the same will be raised to Medical superintendent from Medicine O.P.D e-Office after recommendation by SR Medicine.

Step-5: The information of e-office receipt no. will be communicated to the central pharmacy store for arrangement of HBIG by HIC Dept.

Step-6: Once availability is confirmed HBIG will be indent form HIC Panel (Mentioning e-Office Receipt No. and Details of HCWs in Remark column)

Step-7: Indent No. of HBIG order and/or e-Office Receipt No. of the request letter will be shared to the concerned area ANS where NSI has occurred, by HIC Dept.

Step-8: Hospital attendant of the concerned area where NSI has been occurred will get HBIG from pharmacy store and Nursing personnel of that particular area will administer HBIG after filling form as per annexure-I

In case of NSI occurred in any outer area like BMW complex/General waste dumping yard/Medical College/Nursing College/Morgue/Laundry/Hostel & any other peripheral area Step-2 & Step-8 will be followed in **Emergency.**

Note:

1) **In no case unnecessary delay need to be done in official formalities to start PEP within stipulated time.**
2) **On GH & Sunday exposed HCW can contact Medicine SR in Emergency.**
3) **In case of continuous holiday & Sunday extra stock of HBIG need to be kept in Emergency under custody of Asst. Nursing Superintendent of Emergency.**

Form for administering of HBIG

Annexure-1

I, the under signed, hereby declare and acknowledge by signing this:

That I have been administered _____ml of Hepatitis-B Immunoglobulin in _____ward/area and no amount were charged for the same.

Name & Sign of exposed HCW: _____

Name & Sign of Nursing Personnel administered HBIG: _____

Name & Sign of area Asst. Nursing Superintendent: _____

Date: _____

Time:_____

PEP for HCV

There is no known effective post-exposure prophylaxis for Hepatitis C. The risk of HCV infection after exposure is approximately 1.8%. Testing should occur within 48 hours of exposure, and the typical guidelines for management and treatment of Hepatitis C should be followed.

There is presently no prophylaxis available against hepatitis C. Post exposure management for HCV is based on early identification of chronic HCV disease & referral to a specialist for management. In the absence of PEP for HCV, recommendations for post exposure management are intended to achieve early identification of chronic disease and, if present, referral for evaluation of treatment options. However, a theoretical argument is that intervention with antivirals when HCV RNA first becomes detectable might prevent the development of chronic infection. Data from studies conducted outside the United States suggest that a short course of interferon started early in the course of acute hepatitis C is associated with a higher rate of resolved infection than that achieved when therapy is begun after chronic hepatitis C has been well established.

Monitoring and follow up of HIV, HBV, and HCV status

Whether or not PEP prophylaxis has been started, follow up is indicated to monitor for possible infections and provide psychological support.

HIV testing (HIV Ab) follow-up is done: at 6 weeks, 3 months and 6 months after exposure.

HBV (HbsAg) and HCV (Anti HCV Ab) testing follow-up is done: at 6 months after exposure.

Precautions during the follow up period: During the follow up period, especially the first6–12 weeks, the following measures are to be adopted by the HCW.

- Refraining from blood, semen, organ donation
- Abstinence from sexual intercourse or use of latex condom
- Women should not breast-feed their infants.
- The exposed person is advised to seek medical evaluation for any febrile illness thatoccurs within 12 weeks of exposure.

Documentation and Recording of Exposure

A *structured proforma* of AIIMS Jodhpur should be used to collect the information related toexposure

Consent form: For prophylactic treatment the exposed person must sign a consent form. If the individual refuse to initiate PEP, it should be documented. AIIMS Jodhpur structured Performa to be used. (As given)

Transmission from HCWs to Patients

Transmission of HBV infection from HCWs to patient is of great concern; although the incidence of such occurrence has been relatively rare. The HCW-to-patient transmission of HBV has substantially decreased in frequency over the past four decades, presumably due to:

- More vigilant screening of HBV in HCWs
- Improved vaccination of HCWs
- Increased awareness to practice standard precautions.
- Formal recommendations from governing bodies on the appropriate restrictions of practice of infected HCWs for exposure prone procedures (EPPs) and
- Increases awareness among HCWs to avoid EPP.

References

1) NACO PEP Guidelines, 2021
2) CDC Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV andRecommendations for Post Exposure Prophylaxis.
3) Essential of Hospital infection control, Apurba S. sastry and Deepashree R.

All India Institute of Medical Sciences, Jodhpur
Department of Microbiology, HIC Dept.

PEP Informed Consent/Refusal Form

(When PEP has been advised this form should be filled in and signed by the exposed person, and signed by the designated officer for PEP.)

I, the under signed, hereby declare and acknowledge by signing this:

That I have been counselled and informed in a language I understand, by Mr/Ms/Dr._____Designation_____, Dept._____ on Date_____.

That I have been informed of the recommendations with regard to prophylactic treatment after accidental exposure to HIV/HBV.

That I understand the risk of transmission after accidental exposure to blood.

That I have been informed of the effectiveness and the possible side-effects of this treatment.

That I have been given full opportunity to ask any and all questions, and that all my questions have been answered to my full satisfaction.

(Please select one option in the following section)

- That I have been offered prophylactic treatment, and

O **That I have decided not to take it**

O **I agree to follow this prophylactic treatment for a period of 28 days for HIV/HBV as recommended and I agree to accept medical supervision and follow up testing for this.**

Name of Exposed person: _____ D.O.B_____

Signature of Exposed person: _____ Age/Gender: _____

Designation _____ Date: _____

Date of Accidental Exposure: _____ Time: _____

Address: _____ Place: _____

_____

Contact No. _____

Chap-7 Prevention of sharp injuries.

❖ Introduction

Needle stick Injuries are Preventable

Sharps – a shortened term for any sharp implement in a medical setting – are classified as biohazardous medical waste due to their ability to puncture, cut, or tear the skin and expose the injured party to contaminants. This category of waste is considered potentially injurious to humans and animals that come in contact with it, not only for the risk of injury itself, but also for the potential exposure to dangerous pathogens from blood and other contaminated bodily fluids.

Biohazardous waste must be scrupulously handled and disposed of to ensure the safety of medical personnel and patients. The most at-risk for sharps-related injuries are those who handle the implements directly. However, when sharps bins aren't used appropriately, incidents and injuries involving tangential personnel (Housekeeping workers, H.A, Doctors, Nurses and other HCWS) and even patients can occur.

The use of sharp containers is a crucial step in the safe disposal of medical sharps. It is important for healthcare providers and facilities to educate their staff and enforce proper disposal practices to ensure the safety of everyone involved. By using sharp containers, we can minimize the risks of injury and the spread of infectious diseases, and protect our environment.

Sharp waste are

- Syringes
- Hypodermic needles
- Phlebotomy needles
- Blunted needles
- Suture needles
- Scalpels
- IV catheters
- Disposable razor blades
- Microscope slides
- Certain broken hard plastics

❖ DOs and DON'Ts of Proper Sharps Disposal and prevent NSIs

- Do avoiding the use of needles where safe and effective alternatives are available
- DO immediately place used needles and other sharps in a sharps disposal container to reduce the risk of needle sticks, cuts or punctures from loose sharps.
- DO use a Temper proof, Leak proof, Puncture proof sharp container. ***If it is not available, some organizations and community guidelines recommend using a heavy-duty plastic household container as an alternative.***

- DO make sure that if a household container is used, it has the basic features of a good disposal container and lid.
- DO carry a portable sharps disposal container for travel.
- DO keep all sharps and sharps disposal containers out of reach of patients.
- Do use wide mouth container for long sharp products.

- DO seal sharps disposal containers when disposing of them, label them properly and how to properly dispose of them.
- DO ask the manufacturer of your sharp products that are used with a needle or other sharps if they provide a sharps disposal container to hospital at no charge.
- DO report a problem associated with sharps and disposal containers.
- Do participating in training related to infection prevention
- Do use vaccutainers for sample collection.
- Do use forceps instead of fingers for guiding sutures.
- Do cover the wound/cut/abrasion if present, before providing care to the patient.

- Do use appropriate PPE whenever indicated.
- Do get Hepatitis B vaccination.
- Do promptly clean spillage of blood and other body fluids and disinfect with sodium hypochlorite.

- DON'T throw loose needles and other sharps into the trash.
- DON'T flush needles and other sharps down the toilet.
- DON'T put needles and other sharps in any other BMW bags.
- DON'T try to remove, bend, break, or recap needles, **(if unavoidable, use single hand-scoop technique)**. This can lead to accidental needle sticks, which may cause serious infections.
- DON'T attempt to remove the needle without a needle clipper because the needle could fall, fly off, or get lost and injure someone.

- Don't wear open footwear in situations where blood may be spilt, or where sharp instruments or needles are handled.
- Work precaution: HCWs with chronic skin disease (e.g. eczema) should avoid invasive procedures, which involve sharp instruments or needles when their skin lesions are active, or if there are extensive breaks in the skin surface.
- Work surfaces disinfected: with 0.1 percent sodium hypochlorite solution
- HBV vaccination: All HCWs must undergo complete vaccination against HBV at the time of joining the institute or thereafter. Once the vaccination series is completed it is necessary for the HCW to have the protective titers of anti Anti HBs immunoglobulin levels. The protective titers must be documented.
- Whenever possible, take a sharp container to the point of use (POU).
- It is the responsibility of the person utilizing the sharp to dispose of it safely.
- If it is necessary to disassemble a needle and syringe, such as before transferring blood from a syringe to a pathological specimen bottle, the needles are placed in the sharps container before transferring the blood.

- Needle collection container/ destroyer must be emptied or more frequently if required. It should never be overfilled.
- Stray sharps should not be present anywhere in the hospital environment, concerned area in charge, Team leader SNO & Asst. Nursing Superintendent must look this while doing daily rounds in area.

❖ PRECAUTIONS TO AVOID SHARPS INJURY DURING SURGICAL PROCEDURES

- *Confine and contain* approach should be implemented for every procedure
- In addition to the standard infection control precautions, the patient known to have Blood Borne Virus (BBV) infections may require the following additional precautions for surgical operation:
  - The lead surgeon should ensure that all members of the team know of the infection hazards and appropriate measures should be followed such as use *of double gloves.*
  - The surgical team must be limited to essential members of *trained staff* only.

- It may help theatre decontamination if *such cases are posted last on the list,* but this is not essential.
- ***Passing of sharp instruments***
  - Before any surgical procedure, the surgeon and scrub nurse should decide on the route for passage of sharp instruments during the procedure.
  - This may entail the designation of a '*neutral zone*'.
  - The surgeon must avoid placing his/ her *less dexterous hand* in potential danger.
  - *Non-touch approach*—Sharp instruments *should not be passed by hand.*
  - Only one sharp at a time should be passed.
  - A specified *puncture-resistant sharps tray* must be used for the transfer of all sharp
  - If two surgeons are operating—then each surgeon needs his/ her own sharps tray.
  - *Diathermy and suction devices* should be placed on the opposite side of the table tothe surgeon, thereby ensuring the assistant does not reach across the table betweenthe surgeon and nurse.

- ***Suturing***

- Needles must never be picked up with the fingers while suturing. Forceps or a needle holder is ideal for holding needle.
- Where practical, blunt needles should be used to close the abdomen.
- Surgeons may use a *sterile thimble* on the index finger of the less dexterous hand for protection when suturing.
- After a surgical procedure, the skin should be *closed with staples* whenever possible.
- Hand-held straight needles should not be used, curved needle is ideal.
- Hands of assisting HCWs must not be used to retract the wound on viscera during surgery.

- ***Disinfection of surgical items after procedure***

- Disposable items should be used wherever possible.
- Reusable items must be decontaminated by sending them to the CSSD

Cleaning of operating theatre and waste disposal

- Adequate time must be provided at the end of each case to allow for thorough cleaning in coordination with O.T in-charge/TL.
- Cleaning of the operating theatre and the appropriate disposal of clinical waste should be carried out.

Prevention of splash injury

- Appropriate use of PPE during surgeries, during labour (amniotic fluid exposure)
- Certain high risk surgeries (cardiac surgeries) with anticipated risk of damaging great vessels require complete set of PPEs including face shield and goggles.
- Laboratory personnel should refrain from mouth pipetting, eating, drinking, or smoking in the work area.

ENGINEERING CONTROLS TO PREVENT NSI

- Improved engineering controls are often among the most effective approaches in reduction of occupational exposures.
- The device should be needleless. Needle less connectors for IV delivery systems.
- Needles that retract into a syringe or vacuum tube holder.
- Blunt suture needles,
- Retractable lancets.
- Auto-disable (AD) syringe
- Syringe with RUP (re-use prevention)
- Syringe with SIP (sharp injury protection).

Burn out Syndrome.

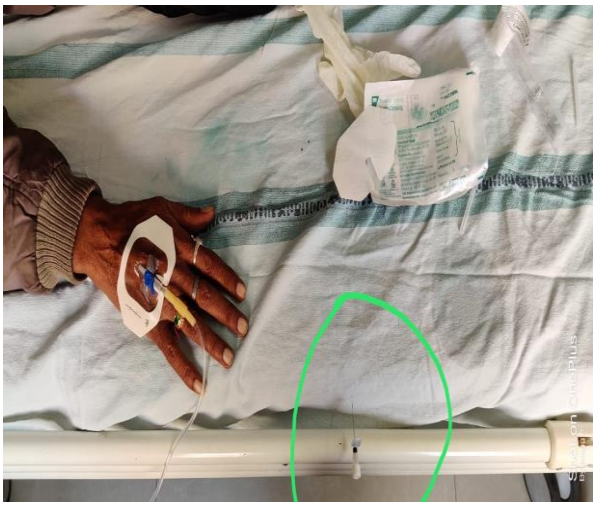
Burnout syndrome is a state of emotional, mental, and physical exhaustion caused by excessive and prolonged stress, in health care setting it has been a common problem.

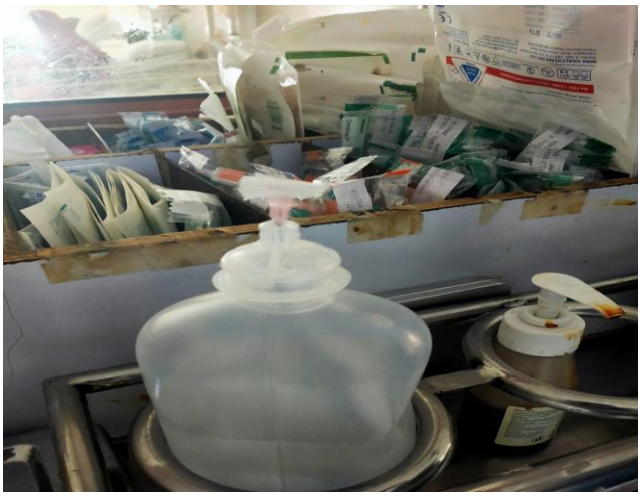
It occurs when HCWs are subjected to various stress such as:

- Increased work pressure
- Constant exposure to morbid patients during prolonged working hours, especially in intensive care unit (ICU).
- Burnout may lead to HCWs undergoing higher levels of sickness absence, dissatisfaction, distress, and decreased work output including providing less quality of care to patients; all of which have particularly devastating effects in healthcare setting.

Don'ts

Left over Sharps






eurolite

Leftover sharp cause injury to other HCWs.

References

1) https://www.fda.gov/medical-devices/safely-using-sharps-needles-and-syringes-home-work-and-travel/dos-and-donts-proper-sharps-disposal
2) https://www.cdc.gov/niosh/newsroom/feature/needlestick_disposal.html
3) CDC work book for designing, implementing and evaluating a sharp injury prevention programme-2008 pdf.
4) Essential of Hospital infection control, Apurba S shastry, Deepashree R.

Chapter-8

Immunization of HCWs

Health care works are at increased risk of exposure. As HCWs are likely to contact with infected body fluids or blood, they should receive vaccination at their initial entry to their respective training or professional practice.

AIIMS Jodhpur provide free immunization and PEP for NSIs.

Immunization is

- Cost effective in comparison to treatment
- Gives indirect protection to other staff, family members, visitors, patients.

❖ VACCINES STRONGLY RECOMMENDED FOR HCW (AS PER CDC GUIDELINE)

Vaccine	Dose	Schedule	Amount	Route
Hepatitis B	Three doses	0,1m,6m	1ml	IM
Influenza	One dose annually	Inactivated Live attenuated	0.5ml 0.5ml	IM Intranasal 0.25 ml per nostril
MMR	Two doses -Measles -Mumps One dose -Rubella	4wks apart	0.5ml	SC
Varicella	Two doses	4-8wks apart	0.5ml	SC

Non-responders for Hepatitis B

- 10%–15% fail to respond to primary series of vaccine
- 30%–50% chance of responding to a second 3-dose series.
- risk of non-response
  - smoking
  - obesity
  - genetic factors
  - immune suppression
  - age >40 yrs
  - chronic illness
  - female sex

HCW previously Immunized with Hepatitis B

Measure Anti-HBs titer; if

- Anti-HBs >10 mIU/ml -No action
- Anti-HBs <10 mIU/ml-revaccinate with three dose.

- **A Responder** is defined as a person with anti-HBs ≥ 10mIU/ml after ≥ 3 doses of hepatitis B vaccine.
- **A Non-responder** is defined as a person with anti-HBs ≤ 10mIU/ml after ≥ 6 doses (or two series of 0, 1, 6) of hepatitis B vaccine.

Contraindications for Vaccination

- Permanent—Severe allergic reaction to any component of vaccine—gelatin, neomycin,yeast, egg protein etc.
- Temporary (For live vaccine)
  - Pregnancy
  - Immunodeficiency

- As per the guideline of community medicine department and their advice.

Counselling services for HCWs

Providing adequate health counselling for staff another crucial element of an effective staff health service. Health counselling allows HCWs to receive individually targeted information regarding:

- The risk and prevention of occupationally acquired infections.
- The risk of illness or other adverse outcome after exposures.
- Management of exposures, including the risks and benefits of post exposure prophylaxis regimens.
- The potential consequences of exposures to communicable diseases from family members, patients, or other personnel, both inside and outside the healthcare facility.

STAFF HEALTH PROGRAM

Health Evaluation at Placement

- A medical checkup is performed at placement according to protocol laid down by Govt. of India. After induction to the hospital services immunization and health appraisal is conducted by preventive health clinic medical officer in conjunction with HICC nominated member. Data is maintained by Preventive Health Clinic Medical Officer and monthly presented in HICC meeting. The data is collected in prescribed form.

- Vaccination for Hepatitis B is provided to all staff members who are not vaccinated or those vaccinated but do not have protective anti-HBs levels. These schedules are completed by the staff member within three months of start of employment. All staff are encouraged to get their Anti-HBs titers done to ensure their safety after vaccination.
- Vaccination for Salmonellosis is mandatory for kitchen staff and must be vaccinated within three months of their employment.
- Vaccination Varicella, Meningococcal Disease etc. will be carried out in staff exposed during the outbreak or as and when required as decided by HICC time to time.

Employee Health Program

- **Employee health education:** Periodic education programs are conducted for paramedical staff by the **ICN**. All employees MUST attend the program within month of their induction to the hospital and time to time. The attendance record is kept by **ICN**. All employees are instructed to adhere to universal precautions, nursing barrier/ isolation policies, hand washing protocols and waste management.
- All infections including contagious and other diagnosed communicable diseases e.g. hepatitis, mumps, rubella, measles, chicken pox, diarrhea, productive cough more than three weeks, rashes etc., MUST to be reported by staff to their immediate supervisor and thereby to **ICN** at which time appropriate action to protect the patients/ staff in the hospital will be taken. Work restrictions may be imposed in situations which call for such action.

- All staff is informed that they should report exposure to potentially infectious body fluid to their immediate supervisor who in turn informs the ICN or secretary HICC in absence of ICN. Action is taken after assessment of risk at each situation (refer PEP guidelines). It is MANDATROY to report all such kind of exposures on prescribed form. Work restrictions may be imposed in situations which call for such action.
- Personnel shall adhere to policies and practices to minimize the potential spread of diseases and /or infection. Personnel shall adhere to existing employee health requirements**.**

Chapter- 9

VISITORS POLICY

Introduction

Although instructing and preparing visitors for patients in isolation is time consuming and often frustrating, their presence is valuable to the emotional well-being of the patient.

- The Nursing officers 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.
- The patient and the relatives must be given health education about the cause, spread and prevention of the infection, in detail. The need for isolation and restriction of visitors are discussed with them.
- Hand washing after all contact with the patient will have to be stressed daily and during ward round by Asst. Nursing Superintendent.
- No more than two adult visitors are allowed 'at a time' during the hospital visiting hours and the length of stay are governed by the needs of the patient.
- Children below 12 years are not allowed into the isolation areas. The policy is to allow one female attendant (Mother) to stay in the ward with the child patient. The attendants are individually trained to avoid infection.
- Before entering the room, visitors must enquire at the nurses' station for instructions and for gown and mask if indicated. Visitor's footwear, bags etc., are left outside the room. Only articles that can be discarded, disinfected or sterilized are taken into the room.
- Visitors are not allowed to sit on the patient's bed.
- Visitors should wash their hands well with soap and water before entering and when leaving the room.
- Active immunization of attendants and other follow up steps, where applicable must be conducted by the physician in-charge.

Emergency Service

Standard precautions are to be strictly adhered and all patients are to be treated as potentially infected with blood – borne pathogens. Importance of this cannot be over emphasizes in this area.

- All the relatives should wash hands with soap and water before and after patient contact.
- Ask relatives to wear masks for all situations where a splash is expected, and where infection that spreads through the respiratory route is possible diagnosis.

AICU: One ID card Mentioning Bed No. is given to the relative while visiting AICU along with mask, cap, and gown. Upon exit the same is taken back so as to maintain only one relative for one patient.

Fig-1: Adult Intensive care unit Visitors ID card

Fig-2: All protective gear is given separately to patient attendants in **PICU**

Fig-3: Two Gate pass is given at the time of admission at the cash counter.

Strict timings to be followed for relatives to meet patient.

Signage board are displayed in all areas of AIIMS Jodhpur.

Chapter-10

Investigation of outbreak

Definition of outbreak

An outbreak or epidemic is defined as:

- Two or more linked cases of the same illness, or
- The situation where the observed number of cases exceeds the expected number, or
- A single case of rare disease caused by a significant pathogen.

Outbreak must be differentiated from **cluster**, which is defined as an aggregation of cases in a given area over a particular period without regard to whether the number of cases is more than expected.

- 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.

Water born outbreak: WHO Definition

At least two people experience a similar illness after exposure to water and the evidence suggests a probable water source.

(Large water supply) waterborne outbreaks

Associated with watershed events:

• Defects in the water-treatment process or distribution system

• Exceedance of water-quality parameters

• Sudden, rapid and widespread occurrence of gastrointestinal consultations

• Clustering of cases in a particular water-supply zone

OUTBREAK INVESTIGATION

Epidemiological steps of an outbreak investigation.

Steps	Description
Step-1	Recognize the outbreak and prepare to investigate • Establish the existence of an outbreak • Determine if immediate control measures are needed. • Notify and communicate • Formation of outbreak control team (OCT)
Step-2	Verify the diagnosis & confirm that an outbreak exists
Step-3	Construct a working case definition
Step-4	Find case systematically and record information • Find case • Standard case report form • Develop line listing of cases
Step-5	Perform descriptive epidemiology with respect to time, place and person
Step-6	Develop hypotheses
Step-7	Evaluate hypotheses epidemiologically
Step-8	Reconsider, refine, and re-evaluate hypotheses
Step-9	Compare and reconcile with laboratory and/or environmental studies
Step-10	Implement infection control measures
Step-11	Initiate or maintain surveillance
Step-12	Communicate finding • Communicate within the hospital • Prepare the final report • Look-back investigations

PSEUDO-OUTBREAK:

- Real clustering of false cases
- Artefactual clustering of real infections

The Reasons for Pseudo-outbreak May be several:

- *Laboratory factors*: False reporting due to new testing technology, new technician, or faulty interpretation of contamination or normal flora.
- *Ward-level factors:* Incorrect diagnosis, sampling errors (collection, mislabeling and transportation).
- *Environmental factors:* due to contaminated tap water used for endoscope cleaning and performing ZN stain

Immediate Control Measures

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

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

Microbiological Study

Microbiological study is planned depending upon the known epidemiology of the infection problem. The study is 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 are 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 procedures ;
- Identification and treatment of carriers, and
- Rectification of lapse in technique or procedure

Evaluation of Efficacy of Control Measures

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.

- ❖ All the outbreak should be documented

References:

file:///C:/Users/HP/Downloads/Module_2.1_outbreak-investigation_ds_220830.pdf

Manual of Infection prevention and control 3rd Edition, NIzam Damani.

Chapter -11

Environmental Surveillance

The environment in the hospital play an important role in the occurrence of hospital-acquired infection (HAI). The various environmental sources from which microorganisms can be transmitted to patients and healthcare workers (HCWs) include water, air, and environmental surfaces. Therefore monitoring of microbiological quality of water, air and surface is important, but it is an expensive and time consuming process that is complicated by many variables like protocol, analysis, and interpretation.

CDC and American Hospital Association (AHA) do not advocate routine/ random undirected sampling of the environment because rates of Hospital Acquired Infections had not been associated with levels of general microbial contamination of air or environmental surfaces and also because meaningful standards for permissible levels of microbial contamination of environmental surfaces and air does not exist.

However, targeted sampling for defined purposes can be undertaken only in case of following indications.

Indications

1) To support an investigation of an outbreak of disease or infections.
2) For research purposes—Well-designed and controlled experimental methods and approaches can provide new information about the spread of health-care associated diseases.
3) Analysis and interpretation of results using scientifically determined or anticipatory baseline values for comparison; and expected root cause analysis and actions based on the results obtained.
4) Quality assurance to evaluate the effects of a change in infection-control practice or to ensure that equipment or systems perform according to specifications and expected outcomes.
5) During construction or renovation period.

Note: Routine environmental microbiological sampling is not recommended as part of a quality assurance program.

Water Surveillance

Hospital water and water containing devices as well as moist environment may serve as a reservoir of heath care-associated waterborne pathogens.

Water in hospital can get contaminated with microorganisms present in hospital environment, which may be due to favourable conditions (e.g. temperature) of water supporting bacterial growth; and also, the complexity of hospital water system which promotes water stagnation leading to corrosion and biofilm formation.

Water Reservoirs

There are variety of water reservoirs which have been linked to hospital outbreaks of water borne diseases; including potable water, sinks, faucet aerators, showers, toilets, dialysis water, ice and ice machine, water baths, flower vas, eye wash stations and dental unit water station.

Modes of transmission for waterborne infections include:

- Direct contact [e.g., that required for hydrotherapy]
- Ingestion of water (Contaminated ice)
- Indirect-contact transmission [e.g., from an improperly reprocessed medical device]
- Inhalation of aerosols dispersed from water sources
- Aspiration of contaminated water.
- Contaminated I.V drugs/saline etc.

Indications for Water Testing

Routine testing of the water in a health-care facility is usually not indicated, but sampling in support of outbreak investigations can help determine appropriate infection-control measures.

How to Collect and How Much to Collect?

- Heat sterilized screw-capped bottles (at least 200 ml holding capacity) should be used for collection of water.
- Extreme care should be taken to avoid contamination of bacteria present in the surrounding environment or hands of collecting person.
- Water from tap:

  Before collection, the tap should be sterilized for a minute with flame from ignited cotton wool swab soaked in alcohol/or by gas burner. Water should be collected only after running for 2–3 minutes. (Midstream specimen) POST FLUSH Technique.

  PRE-FLUSH Technique: Sample is taken from tap when it is not in use at least for > 2hr, (Preferably in early morning). If not possible immediately after tap is opened. Comparison of both will help to point out the source weather at tap outlet or remote point.

  Schedule of AIIMS Jodhpur for water sampling

Every three monthly cooking water is collected from following areas.

- Mohini caters Mess (Patient cooking food)
- AIIMS Hostel Mess
- I.P.D Cafeteria (Demolished Now)

From various sites of AIIMS premises

- When required as random check and during outbreak extensive sampling is done.

Environmental Surface Sampling

Surfaces may become contaminated in a number of ways e.g. microorganisms settling out from the environment or from the direct touch by an operator.

One of the objectives of surface sampling is to determine the efficiency of routine cleaning procedures in removing contamination. Therefore, sampling should be performed before andafter cleaning to determine the effectiveness of the cleaning procedure.

Surface sampling has also been used to determine:

1. Potential environmental reservoirs of pathogens.
2. Survival of microorganisms on surfaces
3. The sources of the environmental contamination.

However in present day context, *Routine environmental-surface sampling (e.g., surveillance cultures) in health-care settings is neither cost-effective nor warranted according to CDC.*

AIIMS Jodhpur routine Schedule for Environmental surface sampling

Area	Month	Method
CTVS ICU, Neuro ICU NICU, DSA, O.P.D O.T 3rd Floor	Jan, March, May, July, September, November	Moistened Swab with Direct Plating
AICU, PICU, Trauma HDU, DSA, Cath Lab	Feb, April, June, August, October, December	Moistened Swab with Direct Plating
Labour Room	Every Month	Moistened Swab with Direct Plating
D & T O.Ts	Every Month	Moistened Swab with Direct Plating

INDEX/BENCHMARK FOR HOSPITAL SETTING

There are no internationally accepted standards (threshold values) for surface microbial monitoring. Several studies used different cut-off values, depending up on the methodology and analytical parameters used.

Air Surveillance

Random, undirected (Routine) air sampling is not recommended because HAI rates are not related with levels of general microbial contamination of air or environmental surfaces.

There are no standard guideline mentioning the permissible levels of microbial contamination of air.

The targeted air surveillance is done only in case of following situations as recommended by CDC.

- After new construction and commissioning of Laminar flow OTs
- After any reconstruction/ repair work inside the Operating rooms.
- After regular maintenance work of HEPA filters to check filter efficiency
- Investigation of an outbreak.
- For research purpose (well designed and controlled experimental methods)
- When potentially hazardous environmental condition is suspected.
- For quality assurance to evaluate the effects of a change in infection control practice.

Schedule of AIIMS Jodhpur for air surveillance

- ALL D&T O.Ts Monthly, where laminar flow installed (HEPA Filtered Operating Room).
- In KTU when requested.

Methods for Air monitoring

1) **Passive**: Standard petri dished containing culture media are exposed to the air as 1,1,1 method, plates are kept in OT one meter always from side walls, one meter above the floor and for duration of one hour.

2) **Active**: Physically drawing a known volume of air by air sampler.

NABH standards for hospital HVAC systems for operating rooms

Standards	Frequency of check (Proposed)
Air Changes Per Hour–20	Once in 3 months
Air velocity—25-35 FPM (feet per minute) from non-aspirating unidirectional laminar flow diffuser/ceiling array	Once in 3 months
Positive Pressure—2.5 Pascal (0.01 inches of water)	Every day
Air Filtration: Two sets of washable flange type filters of efficiency 90% down to 10 microns and 99% down to 5 microns with aluminum/ SS 304 frame withinthe AHU. HEPA filters of efficiency 99.97% down to ≥0.3 microns or higher efficiency are to be provided	HEPA Filters efficiency tested Once in six month—DOP test or polyalphaolefin
Temperature and Humidity- 21^0 C +/- 3^0 C, RH - 20 to 60% though the ideal RH is considered to be 55%	Every day
General consideration • Paints should have antibacterial, antifungal property • OT door should be automatic/touch free • Flooring should be seamless including skirting, should not be of porous stone as it absorbs moisture	
Occupancy	Maximum 5-8 persons at any time inside OT is allowed.

How to Calculate Air Change Rates (ACR)

An air change is defined as occurring when a volume of air equivalent to the volume of theroom has been supplied to or removed from that room (whichever airflow is greater).

The rate of air change is usually given in terms of air changes per hour (ACH) and is derivedfrom the volume of a room and the ventilation rate.

$$ACR = \text{Air supply volume in } m^3/s \times 3600 \,/\, \text{Volume of the room in } m^3$$

Air supply volume = velocity of supplied air in m/s X area of the grille in m^2

Worked Example:

Room Volume: An operating theatre measures 7m long by 6m wide by 3m high: atotal volume of 126m^3.

Ventilation Rate: If it has four ventilation supply grilles with observed flow rates of 0.18, 0.19, 0.18 and 0.17m^3/s, it will have a total air supply (the sum of the individual grille flow rates) of 0.72m^3/s equivalent to 2592m^3/h.

Air Change Rate: The air change rate is calculated by dividing the air supply rate bythe room volume: 2592/126 = 20.6 ACH.

Reference:

1) Guidelines for Environmental Infection Control in Health-Care Facilities (2003), Recommendations of CDC and the Healthcare Infection Control Practices Advisory Committee (HICPAC). U.S. Department of Health and Human Services Centers for Disease Control and Prevention (CDC); available from https://www.cdc.gov/mmwr/preview/mmwrhtml/rr5210a1.htm [last updated July 2019]
2) Textbook of Hospital infection control, Apurba Shastri.

Chapter-12

IPC POLICY ON (CLABSI, CAUTI, VAP)

Each year hundreds of thousands of patients undergo implantation of various medical devices, including prosthetic joints, urinary and venous catheters, and left ventricular assist devices. Although these technologies can improve quality and sometimes even quantity of life, infection remains a potentially devastating complication. Besides significant morbidity and functional impairment, device-associated infection presents a considerable economic burden, accounting for hundreds of millions of rupees in excess health care costs. Despite improved diagnostics and an expanding antimicrobial armamentarium, successful treatment of device-associated infection remains a vital clinical challenge.

Biofilm formation is a crucial step in the pathogenesis of many subacute and chronic bacterial infections, including foreign body-related infections. Biofilms are difficult to eradicate with conventional antimicrobial agents. Bacterial biofilms have several potential antimicrobial resistance mechanisms. Antimicrobial resistance mechanisms may act concurrently, and in some cases, synergistically. Persisted cells play a major role in the tolerance of biofilm bacteria to antimicrobial agents. Understanding the mechanisms involved in biofilm-associated antimicrobial resistance is key to development of new therapeutic strategies.

The three most commonly occurring HAIs are:

- Catheter Associated Urinary Tract Infections (CAUTI)
- Central Line Associated Blood Stream Infections (CLABSI)
- Ventilator Associated Pneumonia (VAP)

PREVENTION OF CATHETER ASSOCIATED URINARY TRACT INFECTION (CAUTI)

CAUTI is defined as a urinary tract infection (significant bacteriuria plus symptoms and/ or signs attributable to the urinary tract with no other identifiable source) in a patient withcurrent urinary tract catheterization or who has been catheterized in the past 48 hours.

The majority of cases are considered to be avoidable with the implementation of infection prevention 5 bundles of care. There are a number of strategies with varying levels of evidence to prevent CAUTI before and after placement of urinary catheters.

Catheter associated urinary tract infection is the most common HAI, accounting for up to 40% of all HAIs.

High Risk of CAUTI is seen in following condition:

- Catheterization for longer duration. (>30 Days)
- Emergency catheter insertion and failure of aseptic technique.
- Colonization of the drainage bag.
- Patient with Diabetes/Diarrhea /Renal Diseases.
- Immunocompromised or debilitated patients.
- Women, Diabetes mellitus
- Absence of Antibiotic Therapy
- Introduction of catheter after a long stay in the hospital.

Appropriate Indications for using Indwelling Catheters

- Anatomic/ physiologic obstruction to urine flow (acute urinary retention or bladder outlet obstruction)
- Patients undergoing surgeries on genitourinary tract
- Anticipated prolonged duration of surgeries (catheters should be removed after surgery)
- When accurate urinary output measurements are required in critically ill patients.
- Patients anticipated to receive large volume infusions or diuretics during the surgery.
- Patients with sacral or perineal wounds suffering from incontinence
- Patients requiring prolonged immobilization (eg. lumbar/ spinal fractures)
- To improve comfort for the end of life care if needed

Prevent unnecessary catheterization.

- Catheterization must be done only in necessary situations.
- Not all operative cases require an indwelling catheter.
- Minimize the duration of urinary cath. in post-op, must be remove as soon as possible, preferably within 24 hours.
- Avoid catheterization just to manage incontinence in patient as a substitute of Nursing care.
- Encourage intermittent cath. Rather than prolonged indwelling catheter.
- NO CATHETER, NO CAUTI.

Sign and Symptom criteria for CAUTI

Any one of the following must be present

- New onset or worsening of fever
- Altered mental status
- Flank pain
- Costovertebral angle tenderness
- Rigors
- Pelvic discomfort
- New or worsening incontinence, malaise or lethargy
- After catheter removal: Dysuria, frequency, and urgency can be consider.

Alternatives to indwelling urinary catheters.

Type of Cath.	Indication	Advantages compared to indwelling catheter	Disadvantage
Suprapubic catheter	• Comatose patient • Infants • Patient undergoing urological or Gynecological procedures.	• Abdominal skin is less likely to colonize with uropathogen, therefore has lesser risk of developing CAUTI	• It is technically difficult procedure, has to be done by physicians • Contraindicated in pregnancy, obesity, bladder volume <200ml etc.
Condom Catheter	It is preferred for short term catheterization in men with low post-void residual urine.	It is associated with lower risk of bacteriuria and lesser urethral trauma	It cannot be use if skin ulceration and maceration are present.
Intermittent catheter	It is technique in which the bladder is drained of urine by catheterization by every 4-6 hours. It is useful in the management of patients with voiding dysfunction such as: • Spinal cord injury • Neuropathic bladder • Bladder outlet obstruction.	It is associated with lesser incidence of CA-bacteriuria, hydro nephrosis, bladder and renal calculi, bladder cancer and autonomic dysreflexia.	• In long term intermittent catheterization, it may be associated with prostatitis, epididymitis, and urethritis, urethral trauma with bleeding and subsequent urethral strictures. • It is difficult to train uncooperative and uneducated patient.

CAUTI bundle (Prevention strategy of CAUTI)

Verification of need prior to insertion.	Insert urinary catheter using aseptic technique.	Maintain urinary catheter
Urinary retention/obstruction Severely ill/immobility Lack bladder control Patient request/end of life Perioperative—selected surgical procedures Assisting with pressure ulcer healing for incontinent patients	Catheter insertion kit with sterile gloves, drape, cleaning supplies, sterile lubricant, sterile urinary catheter attached to a drainage bag	Secure catheter to prevent irritation of the urethra Maintain an unobstructed flow, maintain the drainage bag below the level of the bladder and off the floor Perform hand hygiene before and after each patient contact Provide individual labelled collection container at the bedside Review urinary catheter necessity daily, remove catheter promptly when not needed

CAUTI Care Bundle	D1	D2
Closed drainage system	×	√
Urinary cath. Secure	√	×
Drainage bag above the floor and below the bladder	×	√
Meatal care	√	√
Single use gloves while emptying	√	√
No contact between jug and bag, separate jug for collection.	√	×
Assess readiness of removal-Documented?		

Prevention during catheterization.

- It is Minor surgical procedure, therefore thorough asepsis must be maintain while insertion.
- Select correct fr* size according age to reduce trauma.
- *Aseptic-Nontouch Technique* should be used, in which the operator has no contact with the sterile shaft of the catheter.
- Inflate balloon by recommended amount of sterile water.
- Secure at bifurcation in *plastictape-catheter-plastictape* technique to patient's thigh, to prevent movement and meatal ulceration.

Prevention after catheterization.

- Maintain close drainage system and Drainage bag must be *below the level of bladder* all time to prevent reflux of urine and prevent bag from touching floor.
- In ambulatory patient Leg bag of correct size should be use, and changed every 5-7 days, as more chance of contamination from reflux.
- Drainage bag emptied every 8 hrly, or 2/3rd is full, and before transportation of patient.
- Separate container should be use for emptying bag for each patient, if not available, then No contact between jug and bag.

Meatal and cath. Care.

- MEATAL CARE: (Soap-Water/ Wipes/Hypochlorous acid spray or wipes) will prevent encrustation and contamination.
- Clean from more contaminated to less contaminated area (tip to shaft)
- Fold the wipe after each stroke/ use small size wipe.
- Hold the catheter near tip to prevent pulling and tugging, and clean the *catheter away from tip* in one stroke.
- Repeat until wipe is not stained.
- Pat dry the area from front to back.

Sample Collection

- Alcohol swabs should be used for outlet cleaning before and after emptying/ before collection from sampling port.
- In case NO port, then aspirate from proximal uro-tube (Not to puncture catheter) with small bore needle and syringe after cleaning with alcohol swab.

CAUTI Remains persistent challenge to infection control practitioner and HCWs, though it is categorized as "Reasonably preventable" health care associated infection. All health care workers involved play an essential role in preventing this infection.

"Frontline involvement was key because they could brainstorm solutions, identify issues, and come up with ways to implement things that same day."

For UTI Surveillance

$$\text{CAUTI rate} = \frac{\text{Number of CAUTI cases}}{\text{Number of urinary catheter day's}} \times 1000$$

❖ PREVENTION OF CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION (CLABSI)

Bloodstream infections (BSI) in hospitalized patients may either develop directly without any secondary source (Primary BSI) or occur secondary to another site specific infection (Secondary BSI). Primary BSI may or may not be associated with central line.

A central line bloodstream infection (CLABSI) occurs when bacteria or other germs enter the patient's central line and then enter into their bloodstream. These infections are serious but can often be successfully treated. Health care workers, patients and families can play an active role in CLABSI prevention.

A central line is a catheter that is placed into a patient's large vein, usually in the neck, chest, arms or groin. The central line is often used to draw blood, or to give critically ill patients fluids and medications more easily. The line can be left in place for several weeks or months if needed.

Sometimes, bacteria or other germs can enter the patient's central line and enter their bloodstream. This can cause an infection. AIIMS JODHPUR Hospital infection control Department tracks many different infections, including patients who develop a CLABSI

AIIMS Jodhpur follows evidence-based guidelines and best practices with the goal of eliminating all CLABSIs. One of the mechanisms in place for CLABSI prevention is that staff use a specific central-line insertion checklist to ensure central lines are inserted as safely as possible. The checklist details each action that must be taken before, during, and after the insertion of a central line.

❖ **Risk factors for CLABSI**

- Duration: Longer (72 hr) > Shorter (<72 hrs)
- Site: Femoral Vein > Jugular Vein > Subclavian Vein
- Catheter Type: Nontunneled > Tunneled Cath.
- Lumen: Multiple > Single Lumen
- Insertion Circumstances: Emergency Procedure > Elective Insertion
- Skin Asepsis: 70% Alcohol > 2% Chlorhexidine.
- Poor Hand Hygiene.
- Lack of Care Bundle.
- Prolonged hospitalization before catheterization
- Prolonged duration of catheterization

❖ **Patient related risk factor**

- Immunodeficiency
- Severe underlying illness
- Chemotherapy
- Loss of skin integrity (Burns)
- Presence of distant infection
- Alteration in patients cutaneous microflora

❖ **Caregiver-related risk factors**

- Poor hand hygiene
- Lack of care bundle practices
- Skill of inserter (General clinician>Specialized)

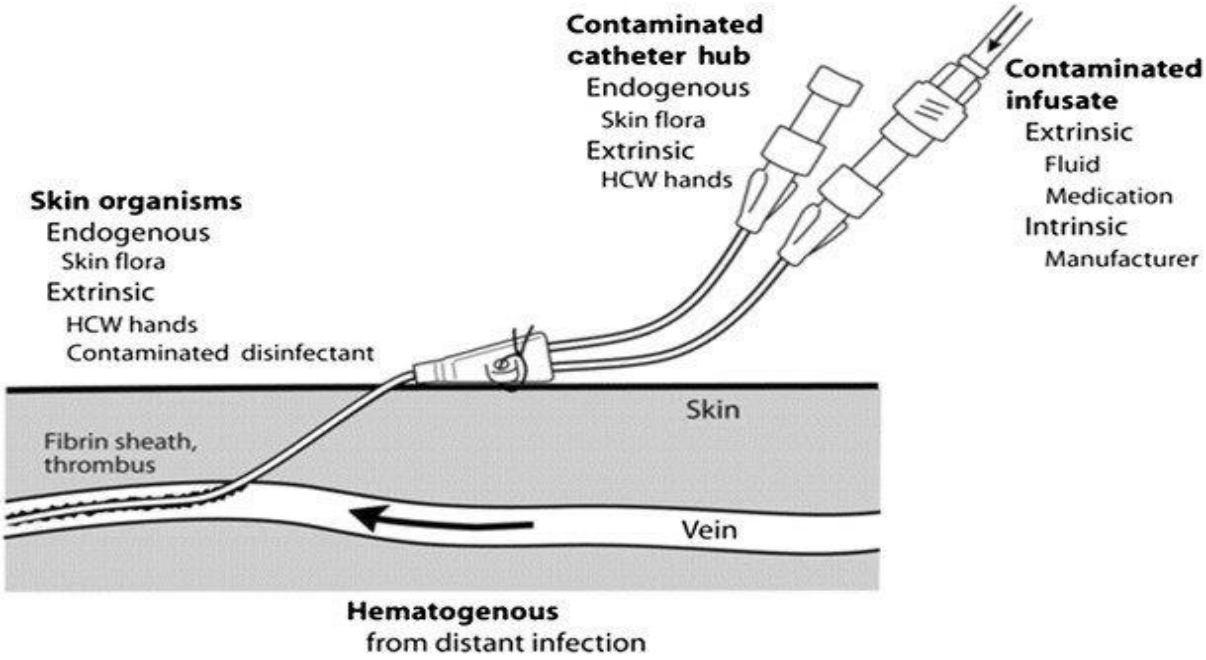


Image: Pathogenesis of CLABSI

The Central Line Bundle

The central line bundle is a group of evidence-based interventions for patients with intravascular central catheters that, when implemented together, result in better outcomes than when implemented individually. The science supporting each bundle component is sufficiently established to be considered the standard of care.

The Central Line Bundle: Five Key Components

1. Hand hygiene;
2. Maximal barrier precautions;
3. Chlorhexidine skin antisepsis;
4. Optimal catheter site selection, with avoidance of using the femoral vein for centralvenous access in adult patients; and
5. Daily review of line necessity, with prompt removal of unnecessary lines.

This is not intended to be a comprehensive list of all elements of care related to central lines; rather, the bundle approach to a small group of interventions promotes teamwork and collaboration. The approach has been most successful when all elements are executed together, an "all-or-none" strategy.

Image: Five KEY Bundle for prevention of CLABSI

(A) Before Insertion

1. Provide easy access to an evidence-based list of indications for CVC use to minimize unnecessary CVC placement.
2. Require education of healthcare personnel involved in insertion, care, and maintenance of CVCs about CLABSI prevention.

    - Ensure that all healthcare personnel involved in catheter insertion and maintenance complete an educational program regarding basic practices to prevent CLABSI before performing these duties.
    - Consider using simulation training for proper catheter insertion technique

3. Bathe ICU patients over 2 months of age with a chlorhexidine preparation on a daily basis.

    - The role of chlorhexidine bathing in non-ICU patients remains to be determined.

(B) At Insertion

1. Ensure and document adherence to aseptic technique.

   - Checklists have to be fill to ensure optimal insertion practices. Checklist documentation should be done by someone other than the inserter.
   - Observation of CVC insertion by a nurse, physician, or other healthcare personnel who has received appropriate education to ensure that aseptic technique is maintained.
   - Such healthcare personnel should be empowered to stop the procedure if breaches in aseptic technique are observed.

2. Perform hand hygiene prior to catheter insertion or manipulation. Use of gloves does not obviate hand hygiene.
3. Avoid using the femoral vein for central venous access in obese adult patients when the catheter is placed under planned and controlled conditions.
4. Do not use peripherally inserted CVCs (PICCs) as a strategy to reduce the risk of CLABSI. The risk of infection with PICCs in ICU patients approaches that of CVCs placed in the subclavian or internal jugular veins.
5. Use an all-inclusive catheter cart or kit.

   - A catheter cart or kit that contains all necessary components for aseptic catheter insertion has to be available and easily accessible in all units where CVCs are inserted.

6. Use ultrasound guidance for internal jugular catheter insertion, as it reduces the risk of CLABSI and of non- infectious complications of CVC placement
7. Use maximum sterile barrier precautions during CVC insertion.

   - A mask, cap, sterile gown, and sterile gloves are to be worn by all healthcare personnel involved in the catheter insertion procedure.
   - The patient is to be covered with a large ("full- body") sterile drape during catheter insertion.
   - (These measures must also be followed when ex- changing a catheter over a guidewire.)

8. Use an alcoholic chlorhexidine antiseptic for skin preparation.

   - The antiseptic solution must be allowed to dry before making the skin puncture.

(C) After Insertion

1. Disinfect catheter hubs, needleless connectors, and injection ports before accessing the catheter by HCWs who all are accessing port.

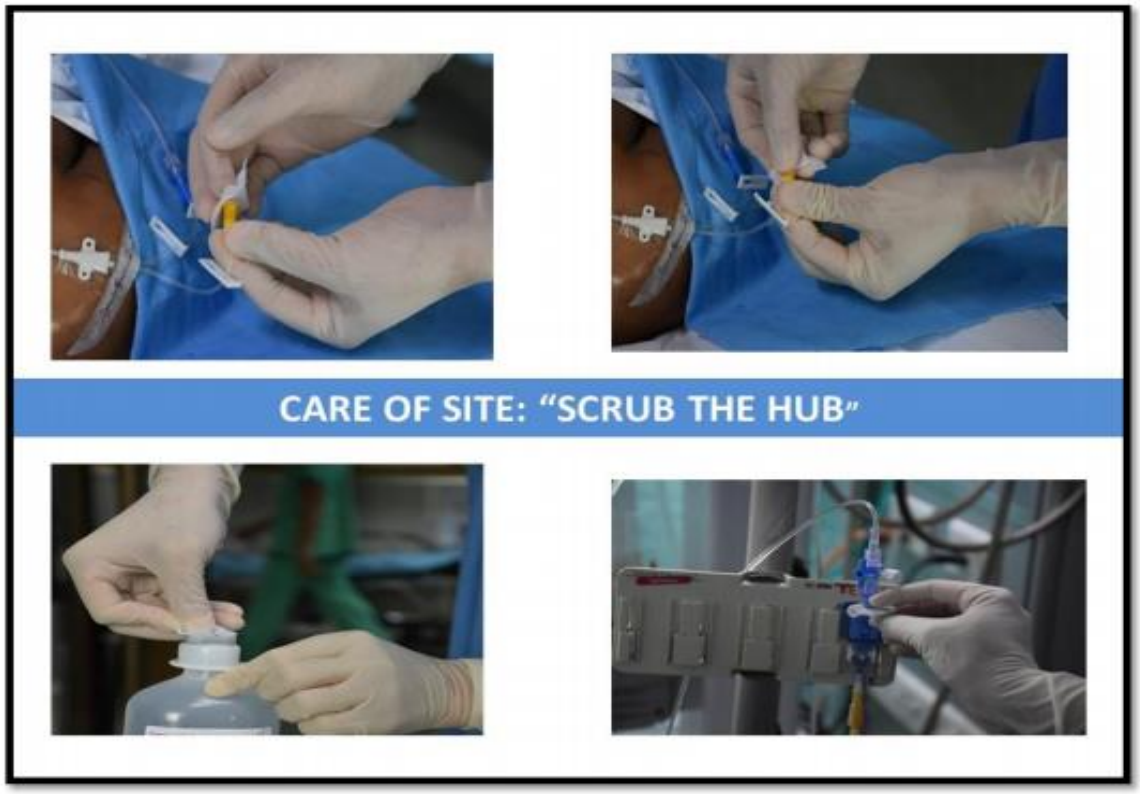
- Apply mechanical friction for no less than 5 seconds to reduce contamination.
- Monitor compliance with hub/connector/port disinfection

2. Remove nonessential catheters.
3. Dressing Change

- For non-tunnelled CVCs in adults and children, change transparent dressings and perform site care with a chlorhexidine-based antiseptic every 7 days or immediately if the dressing is soiled, loose, or damp; change gauze dressings every 2 days or earlier if the dressing is soiled, loose, or damp.

- Less-frequent dressing changes may be used for selected NICU patients to reduce the risk of catheter dislodgement.

4. Perform surveillance for CLABSI in ICU. Measure the unit-specific incidence of CLABSI (CLABSIs per 1,000 catheter-days) and report the data on a regular basis to the units, physician and nursing leadership, overseeing the units.



Special approaches for preventing CLABSI

A number of special approaches are currently available for use. Perform a CLABSI risk assessment before considering implementing any of these approaches, and take potential adverse events and cost into consideration.

These special approaches are recommended for use in locations and/or populations within the hospital with un- acceptably high CLABSI rates despite implementation of the basic CLABSI prevention strategies listed above. These measures may not be indicated if institutional goals have been consistently achieved.

Monitor patients for untoward effects, such as anaphylaxis is required.

1. **Use antiseptic- or antimicrobial-impregnated CVCs in adult patients.**

The risk of CLABSI is reduced with some currently marketed antiseptic-impregnated (eg, chlorhexidine– silver sulfadiazine) catheters and antimicrobial- impregnated (eg, minocycline-rifampin) catheters. Use only if,

- Patients have limited venous access and a history of recurrent CLABSI.
- Patients are at heightened risk of severe sequelae from a CLABSI (eg, patients with recently implanted intravascular devices, such as a prosthetic heart valve or aortic graft).

2. Use chlorhexidine-containing dressings for CVCs in patients over 2 months of age.
   (It is unclear whether there is additional benefit to using a chlorhexidine-containing dressing if daily chlorhexidine bathing is already established and vice versa.)
3. Use an antiseptic-containing hub/connector cap/port protector to cover connectors.
4. Use antimicrobial locks for CVCs.

What can patients do to help prevent CLABSI?

Here are some ways patients can protect themselves from CLABSI:

- Speak up about any concerns so that healthcare personnel are reminded to follow the best infection prevention practices.
- Ask a healthcare provider if the central line is absolutely necessary. If so, ask them to help you understand the need for it and how long it will be in place.
- Pay attention to the bandage and the area around it. If the bandage comes off or if the bandage or area around it is wet or dirty, tell a healthcare worker right away.
- Don't get the central line or the central line insertion site wet.
- Tell a healthcare worker if the area around the catheter is sore or red or if the patient has a fever or chills.
- Do not let any visitors touch the catheter or tubing.
- The patient should avoid touching the tubing as much as possible.
- In addition, everyone visiting the patient must wash their hands—before and after they visit.

DRESSING A CENTRAL VENOUS CATHETER

Changing the dressing of a patient's central venous catheter is a sterile procedure that is performed on a regular basis asa vital component of preventing catheter—associated bloods stream infections.

Indications:

- If the central venous catheter is:
    - visibly soiled
    - saturated with drainage
    - non-occlusive
- Consider routinely changing transparent occlusive central line dressing every 7 days

1. **Wear a mask:**
2. **Wash your hands:**
3. **Prepare your surface:**
   Wipe the surface where you will be placing your sterile equipment with an antiseptic wipe. Be sure to clean thoroughly, especially if you observeany visible soiling on this surface.
4. **Place your sterile equipment safely on the surface, maintaining sterility.**
5. **Position the patient:**
   Have the patient positioned to allow for his or her comfort and your accessto the dressing. Stand on the same side of the patient as the dressing.
6. Wear Glove.
7. **Remove the current central venous catheter dressing:**

Carefully remove the edges of the central line dressing. This will make it easier to lift the rest of the dressing fromthe patient's skin. (Be careful for not to dislodge catheter)

8. **Inspect for signs of infection for edema, redness, oozing.**
9. **Wash your hands:**
10. **Put on sterile gloves:**
11. **Scrub the skin surrounding the central venous catheter:**
    Scrub the skin surrounding the central venous catheter with an antiseptic sponge, starting from just around thecatheter and working your way out to a 2-inch margin around the central venous catheter insertion site. Scrub for1 minute, and allow the area to dry after scrubbing. For a femoral central venous catheter, scrub for 2 minutes.

12. Allow the skin to dry completely:

To avoid skin breakdown, ensure that the patient's skin is dry before proceeding with placing the new dressing.

13. Place a transparent dressing over the catheter insertion site:

As you place the dressing over the insertion site, ensure that you can visualize the catheter exit site to monitor for signs of infection. Write the date and time of dressing change using a date label.

COMPLICATIONS

- Accidental dislodgement of the central line
- Infection at the insertion site
- Irritation or damage to the skin

PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA (VAP)

Healthcare-associated pneumonia (HAP) is the second most common nosocomial infection (After UTI) and accounts for the 15-20% of the total HAIs. Among the factors contributing for HAP, mechanical ventilation (MV) is the single most important cause. Hence, the detail discussion on VAP is done in the current chapter.

Definition: Pneumonia that occurs 48-72 hours or thereafter, following endotracheal (ET) intubation or Mechanical ventilation (MV), Characterized by:

-The presence of a new or progressive infiltrate
- Signs of systemic infection
- Worsening oxygenation.
-Changes in sputum characteristics
-Microbiological detection of causative agent.

Early onset VAP: It occurs during the first 4 days of MV.
Late onset VAP: It develops ≥ 5 days after the initiation of MV and is commonly caused by typical opportunistic and antimicrobial resistant hospital pathogens.

Risk factors for the Development of VAP

Device Related	Patient Related	Intervention Related	Healthcare Worker related
Duration of MV	>60 yr of age (Male Sex)	Irrational use of antibiotics	Improper adherence to aseptic techniques especially hand washing
Reintubation	Underlying condition COPD, ARDS	Stress ulcer prophylaxis	Contaminated environmental source
Nasogastric tube	Patient position: Supine	Sedation	
Use of humidifier	Previous hospital admission and antibiotic use	Paralytic agents (NM Blockers)	
Frequent change of ventilator circuit	Critically ill with comorbidities	Tracheostomy	
Failed subglottic aspiration	Patient with coma		
Intra cuff pressure ,20cm of H2o	Poor Nutrition, Immobilization, Impaired immune system etc.		

Refrerence

1) John Hopkins Medicine, patient safety and quality measures.
2) CDC, Health care associated Infection. https://www.cdc.gov/HAI/bsi/CLABSI-resources.html
3) Cambridge University Press publication, by The Society for Healthcare Epidemiology of America (SHEA).

Chapter-13

IPC POLICY ON PREVENTION OF SSI

Surgical site infections (SSIs) are infections involving either the surgical incision or the organ system involved in the surgical intervention or the potential dead space left behind following surgery. The prevention of SSIs is important to reduce postoperative morbidity and mortality, to curtail the risk of antibiotic related adverse drug reactions and to reduce undue constraint on healthcare resources.

Surgical site infections are defined as infections that develop at the surgical site within30 days of surgery (or within 90 days for some surgeries such as breast, cardiac, and joint surgeries including implants).

In order to reduce the incidence of SSIs in the hospital settings the following important measures need to be followed during planning of an elective surgical intervention.

- Reschedule elective surgery in presence of an active remote site infection in the patient and undertake the procedure after due control of the infective focus.
- Attention to surgical hand hygiene by scrubbing with an antimicrobial soap with water
- Appropriate antibiotic prophylaxis
- Meticulous dissection technique and proper asepsis during the surgical intervention.

Etiology- Type of etiological agents depends upon the site of surgical procedure and the source of infection from which they are acquired.

1. Endogenous source – Patients own skin or mucosa
2. Exogenous source – Operative personnel or instruments

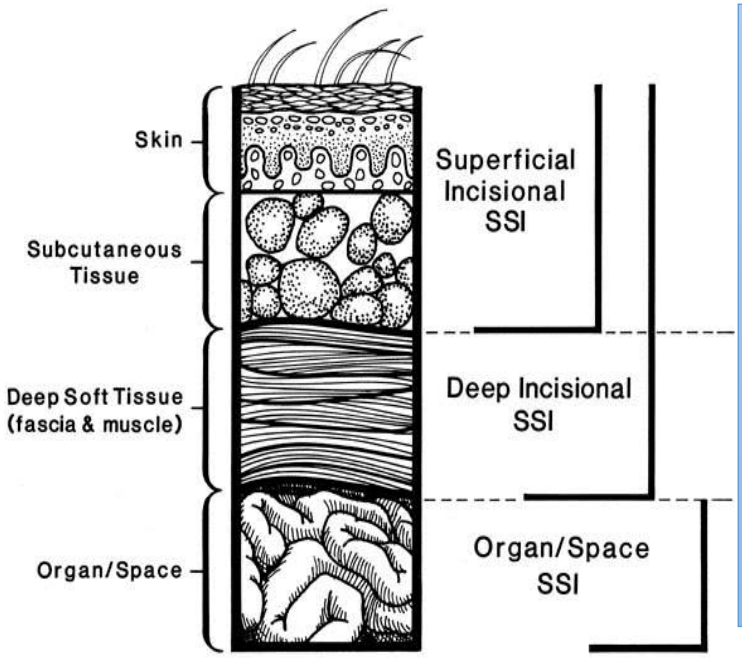
Inoculum load (GI high risk) and virulence of the organism can determine risk.

Risk factors-

1-Patient-related	2- Procedure-related
Age >60 years	Improper surgical scrub
Malnutrition, diabetes	Inadequate skin antisepsis
Immunosuppression	Prolonged operative time
Skin colonization at the time of surgery (e.g. MRSA carrier)	Inadequate antimicrobial prophylaxis
Duration of hospital stay	Poor perioperative glycemic control
Smoking, obesity	Emergency procedure
Higher wound class	Preoperative shaving

3-Organism-related	4-Environmental-related
Inoculum size (e.g. bowel surgery)	Presence of blood/ clot, suture material and foreign bodies at the surgical site
Bacterial virulence	Inadequate ventilation
Ability to form biofilm	Contaminated medications

Classification of SSI



Superficial SSI – 30 days regardless of surgery
Deep SSI – 30 days for all surgeries except breast, cardiac and implant surgeries (90 days).
Organ Space SSI - 30 days for all surgeries except breast, cardiac and implant surgeries (90 days).

The preventive strategies for reducing the incidence of SSIs are categorized into three groups according to their time of implementation in relation to the surgical procedure.

PREOPERATIVE PREVENTIVE MEASURES

- The patients scheduled for elective surgical intervention should be instructed to **have a bath** with either normal or antimicrobial soap on the night before surgery as well ason the morning of scheduled surgery.
- Intranasal application of **2% mupirocin** ointment in perioperative period is beneficialin patients with known nasal carriage of MRSA.
- Body hair in the operative field should be removed with a hair clipper/depilatory cream instead of shaving with razor. Hair removal should not be done inside the operation theater complex in both elective and emergency settings. If feasible, hair removal should be carried out in wards shortly before shifting the patient to the operation theater.

- Isolated mechanical bowel preparation should not be advised in elective colorectal surgery rather it should be carried out in combination with administration of oral antibiotics (Neomycin, Erythromicin).
- The choice of antibiotic prophylaxis should be guided by the microbial flora prevalent in the particular hospital.
- The timing of administration of intravenous **bolus dose** of preoperative antimicrobial agents should be within an hour prior to making the incision (eg: Cefazolin, Cefoxitin, Ceftriaxone, Penicilins) and within two hours prior to incision when the antibiotics is to be given as an intravenous **infusion** (eg: Flouroquinolones, Vancomycin, Linezolid).
- For convenience the bolus antibiotic dose should be administered at the time of induction of anesthesia with the aim to achieve bactericidal concentration in the serum and tissues by the time of making the incision.
- Preoperative antibiotic prophylaxis can be totally done away with in clean orthopedic procedures not involving prosthetic implants and low risk clean lapro-endoscopic procedures (eg: Inguinal hernia).
- The antibiotic prophylaxis regimen in clean contaminated surgery should remain the same whether the patients scheduled for prosthetic joint arthroplasty; receiving systemic corticosteroid or other immunosuppressive therapy or not. Immunosuppressive therapy should not be discontinued prior to elective surgical intervention.

INTRA-OPERATIVE PREVENTIVE MEASURES

- Pre- operative skin preparation with an alcohol-based antiseptic agent based on chlorohexidine gluconate is preferred unless contraindicated.
- The use of plastic adhesive drapes with or without antimicrobial properties on the operative field is not mandatory as it does not contribute to prevention of SSI.
- Sterile reusable woven gowns and drapes as well as sterile disposable non- woven gowns and drapes are equally effective in prevention of SSIs.
- Administration of high concentration of oxygen at 80% FiO_2 during the surgical intervention followed by administration for duration of 2–6 hours in the immediate postoperative period is preferable for reduction in the rate of SSIs.All efforts should be made to prevent intraoperative hypothermia and hyperglycemia. Maintaining intraoperative normothermia (core temperature above 36^0C) with electrical body warming devices or simple blankets in combination with normovolemia and normoglycemia (blood sugar level < 200 mg/dl in patients with or without diabetes mellitus) is associated with reduced risk of SSIs.

- The use of triclosan-coated sutures during surgery can be considered for the prevention of SSI.
- Intraoperative irrigation of deep or subcutaneous tissues with aqueous iodophor solution (5-10% povidone iodine) should be considered for the prevention of SSI; however, intraperitoneal lavage with aqueous iodophor solution in contaminated or dirty abdominal procedures is not necessary.
- Meticulous dissection and hemostasis contribute to reduction of SSIs by preventing blood loss and postoperative hematoma/ seroma formation, and obliterating dead space.
- Transfusion of suitable blood products should be considered when indicated during the surgery. Blood transfusion does not increase the incidence of SSI.

POST-OPERATIVE PREVENTIVE MEASURES

- Post-operative antibiotic administration is not mandatory for clean and clean-contaminated procedures. Additional antimicrobial prophylaxis doses should not be administered after the surgical incision is closed in the operating room, even in the presence of a drain. Timing of drain removal has no relation to the incidence of SSIs.
- Application of antimicrobial agents in the form of ointments, solutions, or powders tothe surgical incision does not contribute for the prevention of SSI.
- Antimicrobial dressings to cover surgical incisions after primary closure in the operating room have no advantage over standard dressing for the prevention of SSIand should not be used.
- Proper asepsis should be maintained during change of dressings to prevent cross infection of admitted patients.

SSI BUNDLE CARE

PRE OPERATIVE	INTRAOPERATIVE	POSTOPERATIVE
Pre –op bathing	Surgical site preparation (antiseptics+ alcohol)	Aseptic non –touch technique (ANTT)
Screening for *S.aureus*	Hand scrub before and in between cases	Surgical dressing
Hair removal not done or removed by clipper	Oxygenation of Fio2 (80%)	Hand hygiene
Surgical antimicrobial prophylaxis	Normothermia (36 C)	
	Blood glucose (140-200mg/dl)	
	Normovolemia	

Reference

1) Report on the burden of endemic healthcare-associated infection worldwide A systematic review of the literature. Geneva: World Health Organization; 2011.
2) Berrios-Torres S.I., Umscheid C.A., Bratzler D.W. *et al.*, Centers for Disease Control and Prevention Guideline for the prevention of surgical site infection,2017. JAMA Surg 2017; 152(8): 784–791.
3) Allegranzi B., Zayed B., Bischoff P. *et al.*, New WHO recommendations on intraoperative and postoperative measures for surgical site infection prevention: an evidence based global perspective. Lancet Infect Dis 2016; published online November 2, http:/ dx.doi.org/10.1016/S1473-3099(16)30402-9.

CHAPTER- 14

Screening for Multi drug resistant Organism

Multi-drug resistant organism (MDRO) infection is a common type of hospital infection. A survey found that the mortality rate of MDRO infection was about 2.17 times higher than that of non-MDRO infections, the length of stay was extended by 15.8 d, and the hospital costs were increased.

When MDRO are introduced into a healthcare setting, a number of factors aid the transmission and persistence of resistant strains in the environment. These include:

- The presence of vulnerable patients, such as those with compromised immunity from underlying medical or surgical conditions, those who have indwelling devices including endotracheal tubes, vascular catheters or urinary catheters
- The reservoir of infected or colonised patients
- The selective pressure exerted by antimicrobial use
- The effectiveness of local infection prevention and control measures

Although transmission of MDROs is most frequently documented in acute care facilities, all healthcare settings are affected by the emergence and transmission of antimicrobial-resistant microbes. The severity and extent of disease caused by these pathogens varies by the population(s) affected and by the institution(s) in which they are found. Institutions, in turn, vary widely in physical and functional characteristics, ranging from long-term care facilities (LTCF) to specialty units (e.g., intensive care units [ICU], burn units, neonatal ICUs [NICUs]) in tertiary care facilities. Because of this, the approaches to prevention and control of these pathogens need to be tailored to the specific needs of each population and individual institution. The prevention and control of MDROs is a national priority - one that requires that all healthcare facilities and agencies assume responsibility.

- **MDRO:** A bacterial isolate that is resistant to one or more antibacterial agents belonging to three or more different classes of antimicrobials (to which the isolate is expected to be susceptible), regardless of the mechanism of resistance.
- Examples of few MDRO:
  - **MRSA** (Methicillin resistant *Staphylococcus aureus)*
  - **VRE** (Vancomycin-resistant enterococci)
  - **ESBL** (Extended-spectrum beta-lactamase) producing Enterobacteriaceae
  - **CRE** (Carbapenem resistant Enterobacteriaceae)

- **VRSA** (Vancomycin resistant Staphylococcus aureus) – Emerging MDROs
- Colistin-resistant Klebsiella pneumoniae – Emerging MDROs
- MDR-*Pseudomonas* Species
- MDR-*Acinetobacter* species

- **MRSA:** *S. aureus* cultured that tests oxacillin-resistant, cefoxitin-resistant, or methicillin-resistant by standard susceptibility testing methods.
- **VRE**: *Enterococcus species* that is resistant to vancomycin, by standard susceptibility testing methods for VRE detection.

- **ESBL (Extended-spectrum beta-lactamase) producing Enterobacteriaceae**: Those Enterobacteriaceae clinical isolates that are sensitive to Beta lactam-beta lactamase inhibitor combination (BL-BLI—now known as beta lactam combination agents) but resistant to Beta lactam drugs are due to production of one/ more Extended spectrum beta lactamase enzymes.
- **MDR-***Klebsiella:* Those Klebsiella species that are resistant to one or more drugs belonging to at least three different categories of antimicrobials, but not producing ESBL.

- **CRE**: Any Enterobacteriaceae clinical isolate testing resistant to imipenem, meropenem, doripenem, or ertapenem by standard susceptibility testing methods (i.e., minimum inhibitory concentrations of ≥4 mcg/mL for doripenem, imipenem and meropenem or ≥2 mcg/mL for ertapenem) OR by production of a carbapenemase (i.e., KPC, NDM, VIM, IMP, OXA-48) demonstrated using a recommended phenotypic or genotypic tests.
  - **MDR**-*Acinetobacter*: Any *Acinetobacter* spp. testing non-susceptible to at least one agent in at least three antimicrobial classes of the six antimicrobial classes namely Aminoglycosides, Carbapenems, Fluoroquinolones, β-lactam/β-lactam β-lactamase inhibitor combination, Cephalosporins and Sulbactam.

DIAGNOSIS AND/OR ACTIVE SCREENING

Swabs are collected from following sites:

- Nasal Swab (one swab each from both nostrils)
- Groin Swab (one swab each from both sides)
- Axillary Swab

- Wound swab—including decubitus ulcer (pressure sore) or surgical wound and device insertion sites, e.g. IV, tracheotomy, drains, PEG, suprapubic

Additional sites: Umbilicus in neonates, Catheter specimen of urine if patient for screening has an indwelling urinary catheter, Sputum from patient with recent MRSA respiratory tract infection (not nasal colonisation) or any other sample as indicated clinically.

The swabs should be clearly labelled and transported to Microbiology laboratory for detection of MRSA.

INFECTION CONTROL MEASURES FOR MDRO

A two level approach has been recommended for the prevention of MDROs.

1) **Core Strategies:** Applicable in any situation where MDRO infection or colonization is suspected or identification.

- Meticulous infection control measures must be undertaken to contain the spread of MDRO transmission. As MDROs spread by contact mode, (Contact precaution must be followed.

- Visitors must perform hand hygiene after visiting the patient.
- Standard Precautions apply at all times.
- single use or patient dedicated equipment (nebulizer, BP cuff, Thermometer, stethoscope) must be used.

- Patient placement: Single isolation room is recommended for patients with MDROs. If not available, cohorting can be done which involves placing a cluster of MDRO patients to an isolation room or one cubicle or corner of a ward. Bed must be separated by privacy curtains with a minimum spatial separation of 3 feet.

- Visual cue such as color code curtains or labeled patient case files can be used for easy identification of MDRO patients.

- Transfer of patient outside the room should be limited only to medically-necessary purposes. If absolutely necessary then appropriate PPE must be worn (gloves and gowns0 by HCW and strict hand hygiene must by followed.

- Hand rub must be available in the trolley used for transfer
- The receiving unit must be informed about the infectious status of the patient before shifting.
- Strict instructions should be given to limit the spread of infection.

- Disinfection of rooms: Rooms of patients with MDRO infections must be frequently cleaned and thoroughly disinfected.

2) **Organism specific or resistance mechanism-based approaches**: recommended when the incidence or prevalence of MDROs is not decreasing despite implementation of the core strategies.

- Prioritization for isolation in resource limiting settings providing isolation room to all MDRO patients may not be practically possible, in such case prioritization of MDRO cases should be done by using **Lewisham Isilation Prioritization Scoring System (LIPS)**, to allocate isolation room, as per parameters present below.
  - Route of transmission (Contact, droplet, airborne)
  - Evidence of transmission
  - Presence of significant resistance.
  - Presence of high susceptibility to other patients with serious consequences of infection
  - Prevalence of the MDRO in the locality
  - Dispersal risk (high, medium, low)
- Target screening
- Decolonization with topical therapy includes use of chlorhexidine whole body washes and topically applied antimicrobial agents like mupirocine. Systemic therapy include orally given antibiotics.
- Surveillance and timely feedback
- Antimicrobial stewardship (AMSP)

MDRO CLEARANCE CRITERIA FOR PATIENTS

A MDRO infected patient should be declared MDRO-free if the following criteria are fulfilled:

- More than 3 months elapsed time from the last positive specimen
- All wounds healed, no indwelling medical devices present
- No exposure to any antibiotic or antiseptic body wash for at least 2 weeks prior to screening.
- In case of MRSA, no exposure to specific ant-MRSA antibiotic therapy in the past 3 months.
- Consecutive negative screens from screening sites on two separate occasions or evaluation of a single set of screening swabs with a broth amplification technique.
- Some patients with VRE may appear to be "clear" with time but relapses with antibiotic therapy.

Objective and/or Indication	Treatment Options
Treatment of the anterior nares (nose)	Mupirocin 2% ointment (Bactroban) • Apply to nose (both sides) 3 times daily for x 5 days • Ointment must only be applied to the skin covered area of the anterior nares just inside the nostrils • Use clean cotton buds for each application
Mupirocin resistant MRSA	Low level (MIC8-256mg/L)-Treatment success rate of 80% High level (MIC>512mg/L)-Naseptin (0.5% neomycin & 0.1% Chlorhexidine) fourtimes a day x 10 days
Neomycin resistant	Prontoderm (polyhexamethylenebiguanide)
Body wash and Shampoo Adults and Children Infants <12 months	-1% Triclosan Skin Cleanser -Use daily as a body wash for showering -Use twice weekly as a shampoo for hair washing -4% Chlorhexidine bodywash (available in community only) -1% chlorhexidine bath or octenidine wash Apply daily to all areas of the skin then rinse off in the bath.Can also be used on head.

MRSA tagging—hospital should tag all patients who are found to be MRSA positive

Untagging/ Clearance Screening:

- Collection of swabs should commence 48 hours after completing decolonisation treatment regime or cessation of antimicrobial therapy.
- The individual is considered 'clear'*when three consecutive sets of swabs (nasal, axillae, groin), collected at least 24 hours apart, are reported negative by the Microbiology Laboratory.
- The patient remains in isolation whilst waiting for results from all three sets of swabs.
- When all three sets of swabs are negative for MRSA, Contact Precautions can be discontinued.
- If the patient is discharged before three sets are obtained, the remaining sets of swabs MUST be obtained on future admissions before the patient is considered clear.The patient will require MRSA precautions until evidence of three clear sets of swabs.

- If no decolonization performed, the patient must meet one of the following criteria: More than 2 years since the last positive culture or Three negative NAG screening culture (at least 1 day apart)

VER (Vancomycin Resistant Enterococci) are group of bacteria that are resistant to glycopeptides such as vancomycine and/or teicoplanin.

Source Reservoir:

- The gastrointestinal tract, female genital tract.
- Contaminated environment and equipment (particularly fecal contaminated equipment).

Diagnosis and/ or Active Screening:

- Specimen recommended: Rectal swab or faeces, Indwelling urinary catheter urine sample, Wound swab / abdominal drain sample or any other sample that is clinically indicated.
- The swab/sample is collected as per standard protocol, clearly labelled and transported to the Microbiology laboratory for VRE detection.

Care and Management of the Patient with VRE:

- Patient to be nursed in a single isolation room
- Hand hygiene with antimicrobial liquid soap or alcohol-based hand rub
- **Contact Precautions** with own toilet facilities (if Pvt. room not available, allocate own commode chair in room or dedicated toilet)
- Use of dedicated patient-care equipment or disinfect between use if shared withother patients
- Gastrointestinal colonization with VRE may persist for longer periods of time andserves as reservoir for transmission of VRE to other patients.

Tagging/ Untagging / Clearance Screening:

- Hospital should tag all patient who are VRE positive.
- Should consider untagging if the patient has either more than 2 years since last positive culture OR 3 negative rectal screening cultures (at least 1 month apart)
- HCW screening and decolonization is not recommended for VRE

Previously Positive Patients:

- Decolonisation of patients with VRE is not recommended so it is likely that a previously positive patient will remain positive during subsequent admissions.
- If previously positive patients are readmitted to hospital, obtain only those samplesthat are clinically indicated, according to symptoms.

ESBL (Extended-spectrum beta-lactamase) producing Enterobacteriaceae

Source Reservoir:

- The gastrointestinal tract is the major reservoir of ESBLs since primarily members of Enterobacteriaceae family like *E.coli, Klebsiella spp., Citrobacter spp., Enterobacter spp.* produce ESBL.
- Contaminated environment and equipment (particularly fecal contaminated equipment).

Risk Assessment for Patients at Risk of ESBL Transmission

Following factors put patients at high risk of spreading ESBL-producing bacteria:

- Diarrhoea, urinary or faecal incontinence
- Abdominal drainage/stoma
- Indwelling urinary catheters/intermittent clean catheterization

- Large wounds that need dressing
- Non-compliance with basic hygiene

Care of patients infected/colonized with ESBL-producing microorganism:

- Follow transmission-based precautions
- Patient to be nursed in a single isolation room
- Contact Precautions with own toilet facilities (if ensuite not available, allocate owncommode chair in room or dedicated toilet)
- Hand hygiene with antimicrobial liquid soap or alcohol-based hand rub
- Dedicated patient-care equipment or disinfect between uses if shared with otherpatients
- Visitors do not wear PPE but are encouraged to perform hand hygiene after visiting the patient
- Standard precautions apply at all times.

ESBL Screening

Do NOT screen patients previously positive for ESBL unless clinically indicated.

The following samples should be taken and 'ESBL Screen' written on the request form:

- Rectal swab/ faeces sample
- Indwelling urinary catheter specimen of urine (CSU)
- Wound swab/ abdominal drain sampleFor previously positive

patients:

- Decolonisation of patients with ESBL is not recommended so it is likely that apreviously positive patient will remain positive during subsequent admissions.
- If previously positive patients are readmitted to hospital, obtain only those samplesthat are clinically indicated, according to symptoms.

CRE (Carbapenem Resistant Enterobacteriaceae)

The majority of CRE are also resistant to other commonly used groups of antimicrobials suchas fluoroquinolones and aminoglycosides.

Risk factors and mode of transmission:

- Exposure to broad spectrum antimicrobials, such as cephalosporins, β-lactam/ β-lactamase inhibitor combinations, fluoroquinolones and carbapenems.
- Prolonged hospitalization
- ICU admission
- Presence of vascular catheters
- Urinary catheterization

Samples for Screening of CRE

CRE surveillance in patients, rectal swabs and faeces are the usual recommended specimens to be taken. Manipulated site swabs such as from skin breaks or vascular catheter sites canalso be considered as part of CRE screening.

Care of Patients Infected/ Colonized with CRE

- Should be isolated in single rooms, using contact precautions.
- If the availability of isolation facilities is limited, priority for isolation should be given to patients with diarrhoea, faecal/ urinary incontinence, copious respiratory secretions and draining wounds.
- Rectal colonization of healthcare workers with resistant Enterobacteriaceae has not yet been implicated in transmission.
- Healthcare workers found to be colonised with resistant Enterobacteriaceae should strictly adhere to Standard Precautions, including optimal hand hygiene practices at all times.

Treatment

Decolonisation of asymptomatic colonizers of CRE is not recommended as the effectivenessof treatment is not proven.

References

1) https://www.cdc.gov/infectioncontrol/pdf/guidelines/mdro-guidelines.pdf
2) Royal College of Physicians Ireland, Guidelines for the Prevention and Control of MDRO Final Revised_July 2014.
3) State of New Hampshire Recommendations for the Prevention and Control of Multidrug-Resistant Organisms (MDROs) and *Clostridium difficile* Infection (CDI) for Healthcare Agencies and Community Settings.

Chapter 15
Laundry services and Linen Management for Hospital Infection Control policy

Introduction

Linen and Laundry services are responsible for providing safe, clean, adequate and timely supply of linen to user units of a hospital at righttime, right price, right quantity and right place.

Adequate supply of clean linen sufficient for comfort and safety of patient and personal appearance and pleasant, neatly attired employees attending patients in fresh crisp uniform do much sell the hospital to the public.

Linen is a general term used to denote clothing items. It includes all the textile used in hospitals including mattress, bed cover, pillow cover, bed sheets, towel, blanket, screen, curtain, doctor's coat, table cover etc.

Cotton is most preferred and frequently used material as it is cheaper and more comfortable.

Hospital laundry receives all the lined material from different areas like ward, OT, OPD, and office area where they undergo process of sorting, washing, extracting, drying, ironing, folding, mending and delivery.

The OT linen materials need special care since it has to be washed and sterilized carefully. So if possible, the hospital can go for separate laundry process for OT linen materials alone with sterilization facility or through CSSD.

Quality of Linen

- Proper moisture repellency
- Dry efficiency (Quick drying)
- Surface fluffy (Soft)
- Tensile strength (*Tensile strength* is the ability of a material towithstand a pulling force).
- Static safety (Poorly static) (The generation of *static* electricity on *clothing)*
- Low flammable
- Easily sanitize
- Good visual appearance
- Microbial repellent
- Non-Irritant

The Importance of Clean Medical Linens

Clean medical linens are important because:

- They allow patients to feel more comfortable and at ease.
- Vital simply from a sanitation perspective
- They prevent the transmission of germs from patient to patient.
- When a scared patient walks into their hospital room, the last thing they want to do is lay down in a bed with dirty linens or change into a gown that has a stain or smell on it.
- It has aesthetic value.

IMPORTANCE OF HOSPITAL LAUNDRY SERVICES :

An effective laundry service in a hospital has the following advantages:

- Provides psychological satisfaction to the patients and improves the aesthetics.
- Efficient laundry service reflects a positive image of the hospital and is an important public relations variable.
- It reduces the incidence of Hospital acquired infection (HAI) by preventing infected laundry from becoming a source of infection.
- It facilitates provision of quality healthcare services.

HOSPITAL LAUNDRY :

INFECTION CONTROL MEASURES AND GENERAL PRACTICE PRINCIPLES

Clinical Bottom Line :

In a healthcare facility laundry refers to bed sheets and blankets, towels, personal clothing, patient apparel, uniform, scrubs, gowns and drapes for surgical procedures. Linen can be categorized as clean, used and infectious. Infectious or contaminated linen can be a source for pathogenic microorganisms and a route of transmission of nosocomial infection. Although the risk of disease transmission is likely to be small, standard precaution measures and measures to remove microbial contaminations of used and worn laundry are important aspects to reduce the risk of disease transmission to patients and staff. The evidence presented in this summary is based on clinical guidelines and expert opinion.

HANDLING :

- Hand hygiene must be performed following handling of used linen and before handling clean linen.
- To avoid cross-contamination, laundry should be handled with minimum agitation and should not be held against clothes, nor placed on the floor.
- Water soluble bags are used for infectious linen.

LAUNDERING :

- Washing process for used linen should include a disinfection cycle.
- Hot water laundry cycles (above 60 degrees Celsius) are known to inactivate microorganisms however,

guidelines differ on the advised temperature and duration; temperature varies between 65-71 degrees Celsius and the duration from 3-25 minutes.

• Cold temperature cycles require the addition of bleach containing detergent however, this may not be enough to kill all microorganisms.

STORAGE :

- Linen should be color coded and clearly labelled to denote the different types of linen (clean, used, heat labile or infectious).
- Clean linen must be protected from environmental contamination and placed away from dirty laundry.

Best Practice Recommendations :

- Hand hygiene should be performed before handling clean linen and after handling dirty linen.
- All linen should be color coded according to the type of linen and clearly labelled.
- Water soluble bags should be used for infectious linen.
- Washing cycles should include a disinfection cycle.
- Clean and dirty linen should be stored away from each other.

The functions of the laundry services:

1. Collecting soiled linen from various places.
2. Sorting the linen and processing (Cleaning) them
3. Inspecting and repairing or replacing damaged materials.
4. Distributing clean linen to the respective user departments.
5. Maintaining different types of registers.

Classification of Hospital Linen

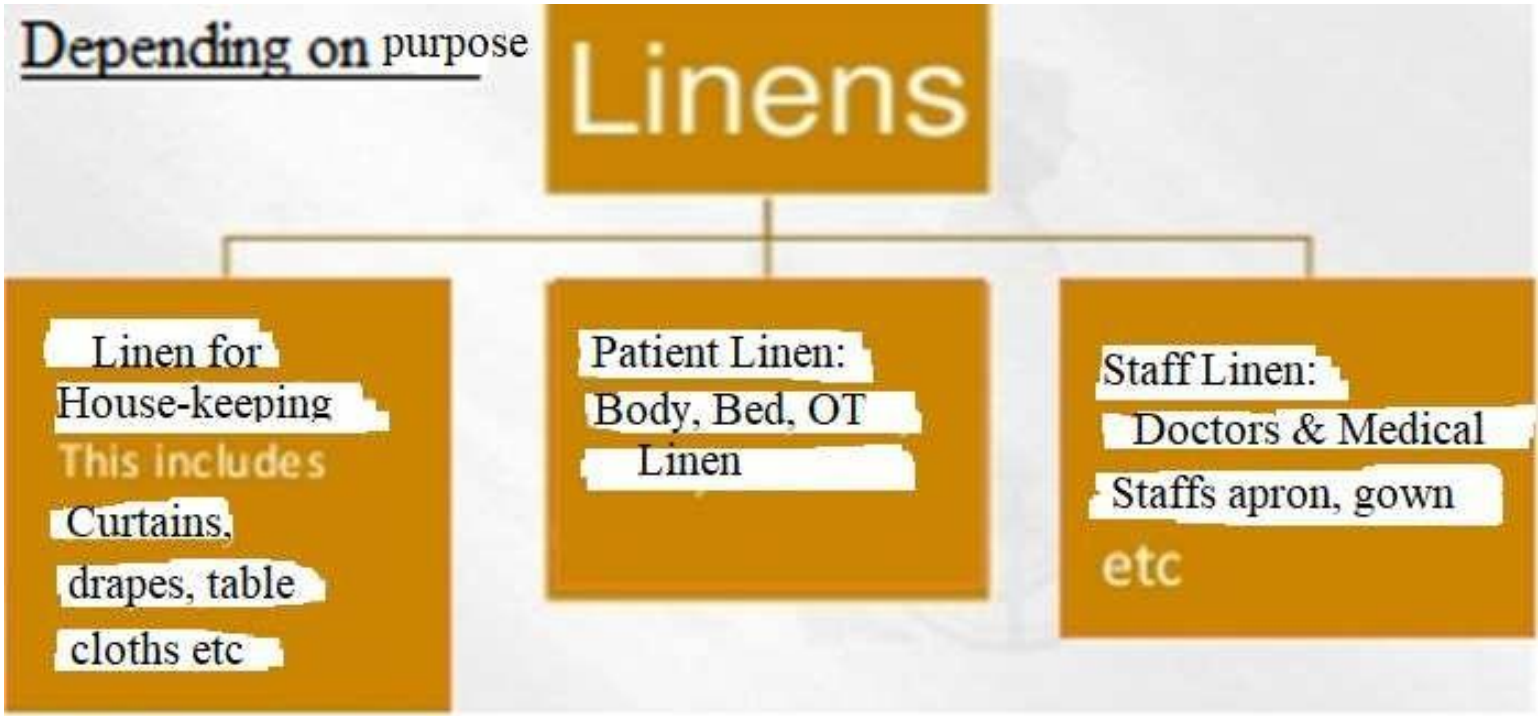
Classification based on use of linen:

- **General Purpose linen:** This includes curtains, drapes, table clothes and similar items commonly used in all parts of the hospital. This is the linen which is not used for patient care.
- **Patient linen:** This consists of patient clothing such as patient pyjamas, shirts, gown, coats etc.
- **Ward Linen:** This consists of patient-bed clothing such as bed sheets, pillow covers , blankets used by the patient.
- **OT, Labour room, Procedure room linen:** This includes items such as pyjamas, kurtas, gowns, coats , shirts etc. worn by surgeons, anaesthetists, OT personnel and also surgical gowns, caps, masks, trolley covers, OT towels etc. required in OT, labour room and procedure room.

Classification based on colour of linen:

- **Ward Linen:** This linen should be white in colour.
- **Operation Theatre Linen:** This should be green in colour including doctor's gown.
- **Patient Linen:** This should be blue in colour

Depending on purpose



DEGREE OF CONTAMINATION:

Planning Considerations

- The following should be considered while planning for a Hospital Linen and Laundry services.
- Size of the Hospital.
- Type of Hospital.
- Availability of Linen and Laundry services in adjacent areas
- Weather Conditions.
- Type of Client.

Workload of a Laundry

Workload of laundering can be projected by using the following guidelines:

American Standards:

An average of 15 pounds (6.80 kg) per bed per day plus 25 pounds (11.33 kg) for each operation or delivery.

British Standards:

60 articles per bed per week at 0.39 kg per article.

Subcontinent Standards:

The rule of thumb is three to five kg per bed per day.

Requirement of linen

Amount of linen required in different wards, OT, OPD differs from hospital to hospital.

If we presume bed occupancy of 100% maximum 4-6 set of linen are required as:

One in use.
One ready for use.
One being processed.
One in transit.
Two sets for weekends and holidays.

Linen Requirement per Unit

S.NO.	NAME	QUANTITY	STANDARD OF LINEN/ BED (Jain Committee)
1.	Doctors Coat	3	Bed Sheet – 6 Pillow Cover – 4 Blanket – 4 Towel – 2 Draw Sheet – 6 Patient Dress – 4 pairs Canvas Crate – 2/ ward Diet Cloth – 2/ pt Mortuary Sheet – 6/ Ward Pillow – 2/ bed Baby Sheet – 10/ bed
2.	Cook Apron	6	
3.	Doctor Towel	6 per ward	
4.	Mattress Cover	2	
5.	Fixed Areas (OPD, Dispensary, O.T, ICU, Labour Room	As per requirement	
6.	Ward Area	3-5 kg per bed per day	
Paed Ward: Number of bed-sheets and draw-sheets to be doubled			

Location

- Ideally, it should be on the ground floor of an isolated building connected or adjacent to the water and power plant.
- Hospital laundry should be located away from the main service area of hospital.
- Close to boiler and water heating system.
- Large hospitals with 500 beds and above should establish their own mechanized laundry.
- Smaller hospitals should take the help of co-operativemechanized laundry.
- The laundry should be located in an area that has ampledaylight and natural ventilation.

Facilities and space requirements

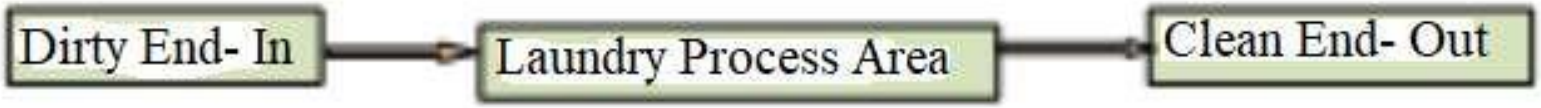
1. Space for heavy equipment like washing machine, squeezer etc.
2. Provision for supply of water and power.
3. Storage place for cleaning agents.
4. Space is also needed for sorting the soiled linen
5. Facilities to manually wash.
6. Clothes to dry in the sun.
7. Place for sewing, and mending area.
8. Place for ironing.
9. Desk to have registers and files.
10. Space in every ward for storing clean linen.

Physical facilities

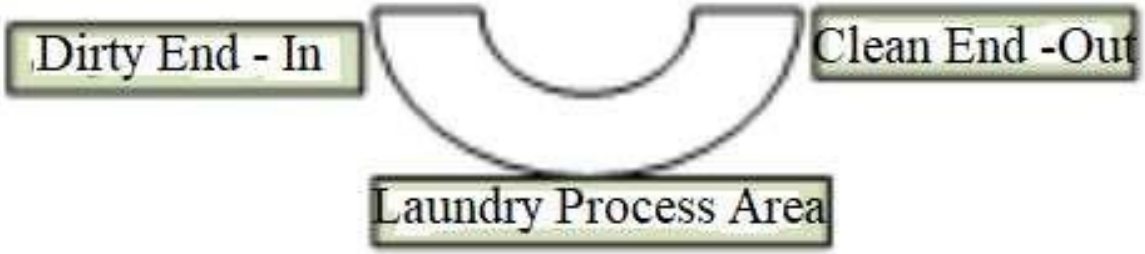
- **Location:** close proximity of CSSD and dietary pattern.
- Ground floor with least disturbance to patients.
- **Space requirement:** 10sq.feet/ bed
- **Floors:** Rust proof, non – slippery, washable sufficient gradient to provide easy flow of water.
- **Ceiling:** Smooth, washable, moisture proof, sound proof with minimum height of 3.5 meter.
- **Wall:** Should be washable and free from crevices, corners, edge or projection.
- **Doors and windows:** Doors should be wide enough to admit heavy machinery and trolleys. Maximum light and natural ventilation should be provided from window.
- For ventilation, 10 air exchange per hour is recommended.
- **Power supply:** 3 KW hour per 45Kg of laundry.
- **Water:** Approx 15 liter of hot water 5 liter of cold water required per 0.5 kg of lined processed.
- **Steam supply:** A temperature of 170 degree Celsius is obtained from steam at 45kg per 6 Sq. cm pressure.
- **Fire safety:** Provision of extinguisher should be located throughout the laundry with fire detection system and alarm. Workers should be instructed not to smoke in laundry while working. They should be trained how to use fire extinguisher. No electric equipment should be left on after working.

Design Consideration

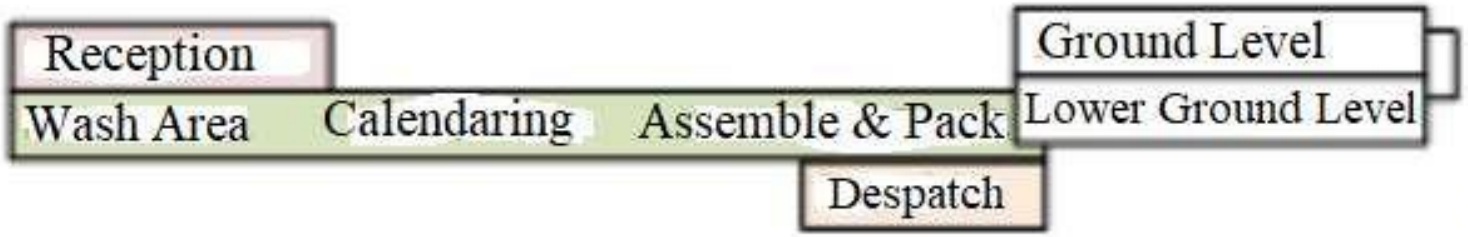
Straight:



U - Flow:



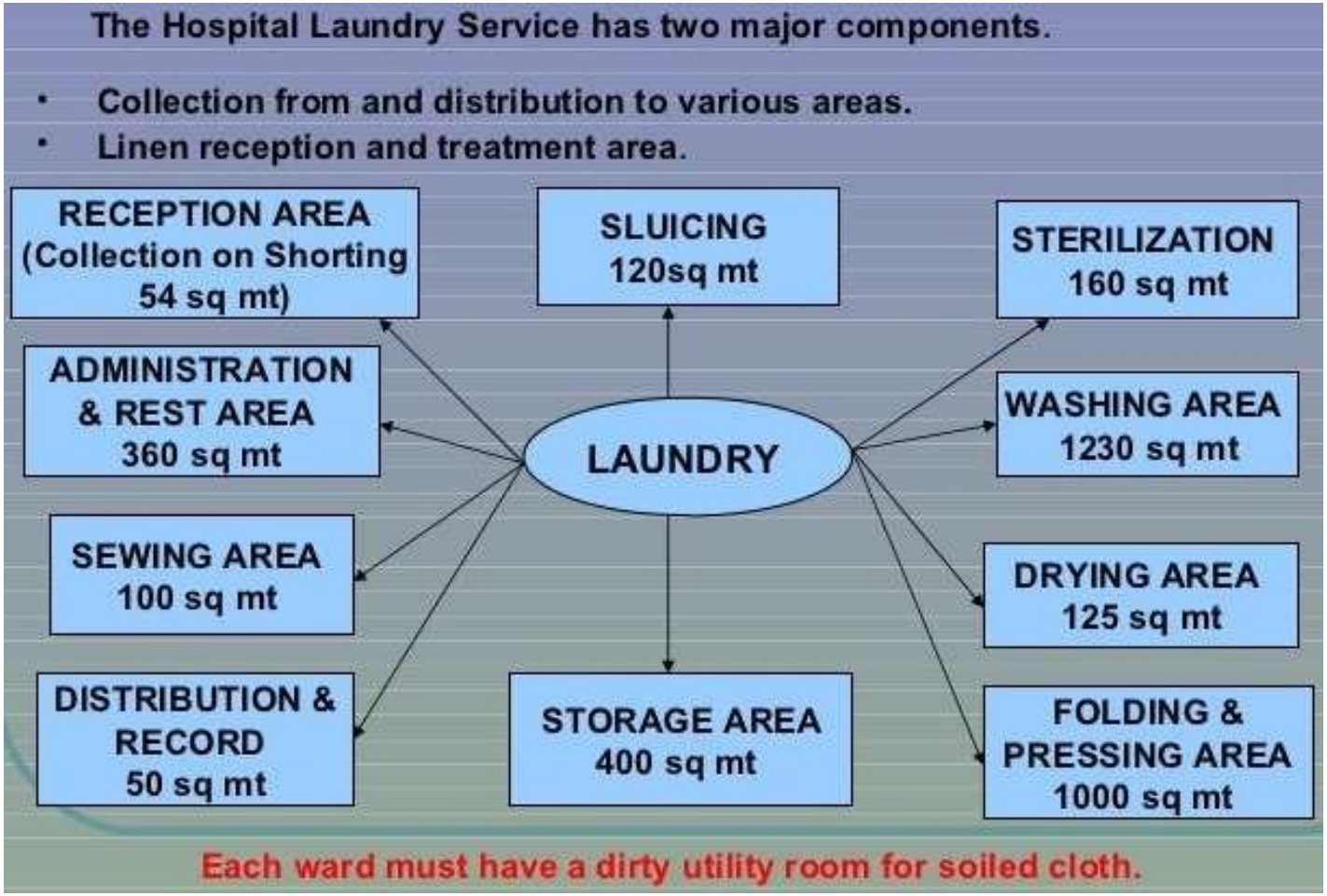
Gravitational (For Vertical Rise Building):



Structural & Engineering equirements

- Lighting of 300 lux in working area with painted surface reflecting values of 0.74 to 0.81 is required.
- Mechanical Laundry consumes a large quantities of water, 30 litersof hot water and 10 Liters of cold water should be catered for every kilogram of linen washed.
- As a thumb rule, 100 liters/bed/day is the requirement for smooth functioning of laundry services.
- A boiler supplying a steam at 170-180 degree Celsius at 100-125 Psi (Pounds per sq Inch) should be collocated to minimize distribution losses.
- A water softening plant according to local water supply is desirable.
- A 400 Volt, three phase connection with a standby backup supply with adequate provisioning of 15 Ampere Sockets should be considered.

Infra-Structure for > 500 beds



Ancillary facilities

- Laundry Managers Office
- Tailoring area
- Workers rest room
- Boiler room
- Stores

Staffing pattern

Four categories of workers are required in laundry

- Supervisor
- Operational
- Semi – skilled
- Unskilled
- Training in infections control and basic hygiene should be given to all workers.

Calculation of Staffs in Laundry

- One washer man for each 60-75 kg of linen
- One man for each 30 bed in hospital.

For 500 beds

- Laundry manager-1
- Supervisor-1
- Store keeper -2
- Orderlies -6
- Tailor-1
- Sweeper-1

- Operators-17

Work schedule

To maintain and manage the laundry department effectively, the housekeeper should follow the planned work schedule.

Daily work

- Clean all equipments in laundry.
- Follow daily work procedure.
- Check the equipment's working condition.

Weekly work

- Indent the washing agents from the stores on every Saturday.
- Wash doctors coat on every Friday and replace.

Monthly work

- Check linen stock in the wards.
- Calculate monthly expenses.
- Check the contaminated and faded, damaged fabrics and enter in the register.

List of equipments

- **Washing machine capacity:**

30 bed sheets / load

60 pillow covers / load

- **Water extractor capacity:**

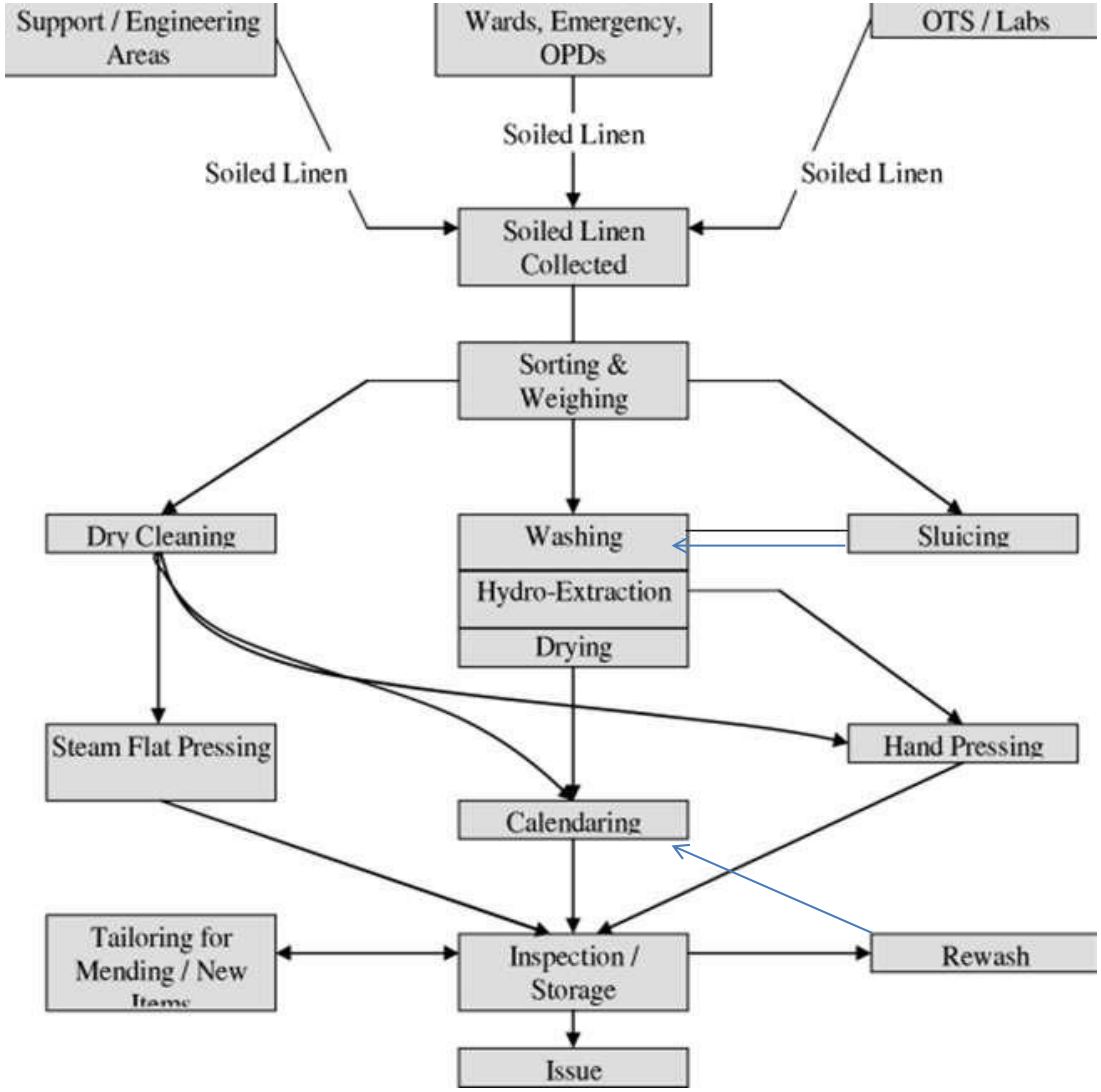
8 bed sheets / load
30 pillow covers / load

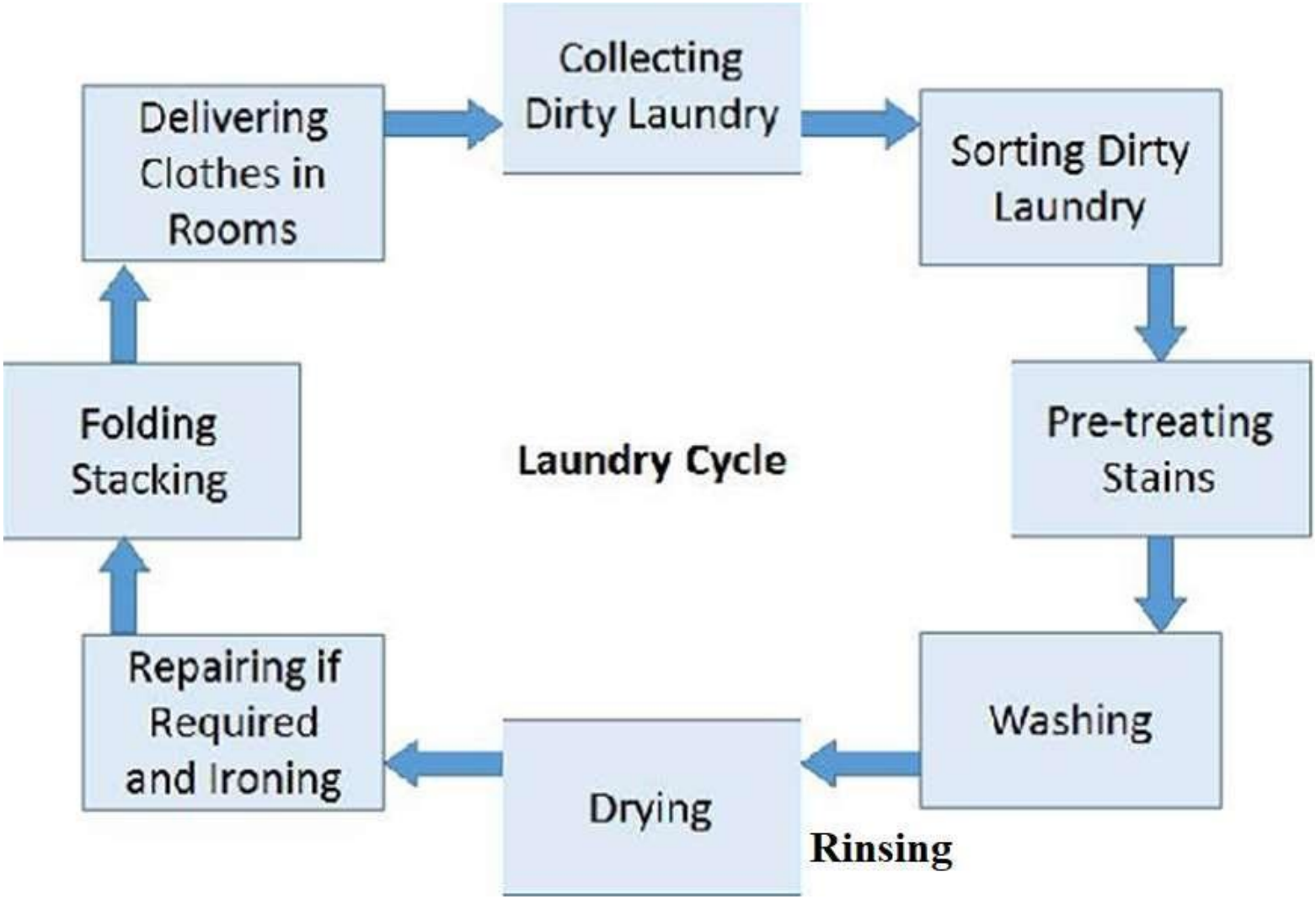
- **Flat work iron (calendaring) capacity:**

5 bed sheets / load
6 pillow covers

- **Hand iron box**
- **Sewing machine**


LAUNDRY PROCESS
Finishing
Hydro Extraction
Rinsing
Washing
Pre-Washing


Support / Engineering Areas
Wards, Emergency, OPDs
OTS / Labs
Soiled Linen
Soiled Linen
Soiled Linen
Soiled Linen Collected
Sorting & Weighing
Dry Cleaning
Washing
Sluicing
Hydro-Extraction
Drying
Steam Flat Pressing
Hand Pressing
Calendaring
Tailoring for Mending / New
Inspection / Storage
Rewash
Issue


Collecting Dirty Laundry
Sorting Dirty Laundry
Pre-treating Stains
Washing
Rinsing
Drying
Repairing if Required and Ironing
Folding Stacking
Delivering Clothes in Rooms
Laundry Cycle

PRE – WASHING

The soiled linen is **collected** from the departments.

The soiled linen is then **transported** to the laundry in two ways. First is, the soiled linen are put in the trolley and are then taken to the laundry via elevators and the second way is that the soiled linen are dumped into the linen chute which is directly connected to the laundry.

The soiled linen is then **sorted** on three basis i.e. by the type of fabric, colour of the fabric, and degree of soiling.

After sorting the soiled linen, the linen is **weighed** according to

the washing machine capacity and is put into the washing machine for wash cycle.

WASHING

The washing depends on 4 things which varies as per the fabric:-

Fabric	temperature	Water level	Time
Less soiled	Low	Less	less
More soiled	high	more	More

Machines have internal electrical heating elements to heat the wash water. Use hot water (60-90ºC) to wash whites; coloured clothes should be washed separately from whites and at coolertemperatures (30-40ºC).

The rate of chemical cleaning action of the detergent and other

laundry chemicals increases greatly with temperature. During the wash, clothes are agitated in a detergent solution which dissolves the dirt, however, both dirt and detergent remain on the clothes.

Rinsing

The rinse cycle on any washing machine is simply to “remove” (rinse out) the residual soap that may be in the clothes in the washer. The rinse is similar to the wash, but shorter, usually with cold water only, and it's function is dilute the dirt and the detergent.

Rinse cycle prepares for second wash cycle. Fill the machine to certain water level agitate the load for a certain amount of time and drain the water.

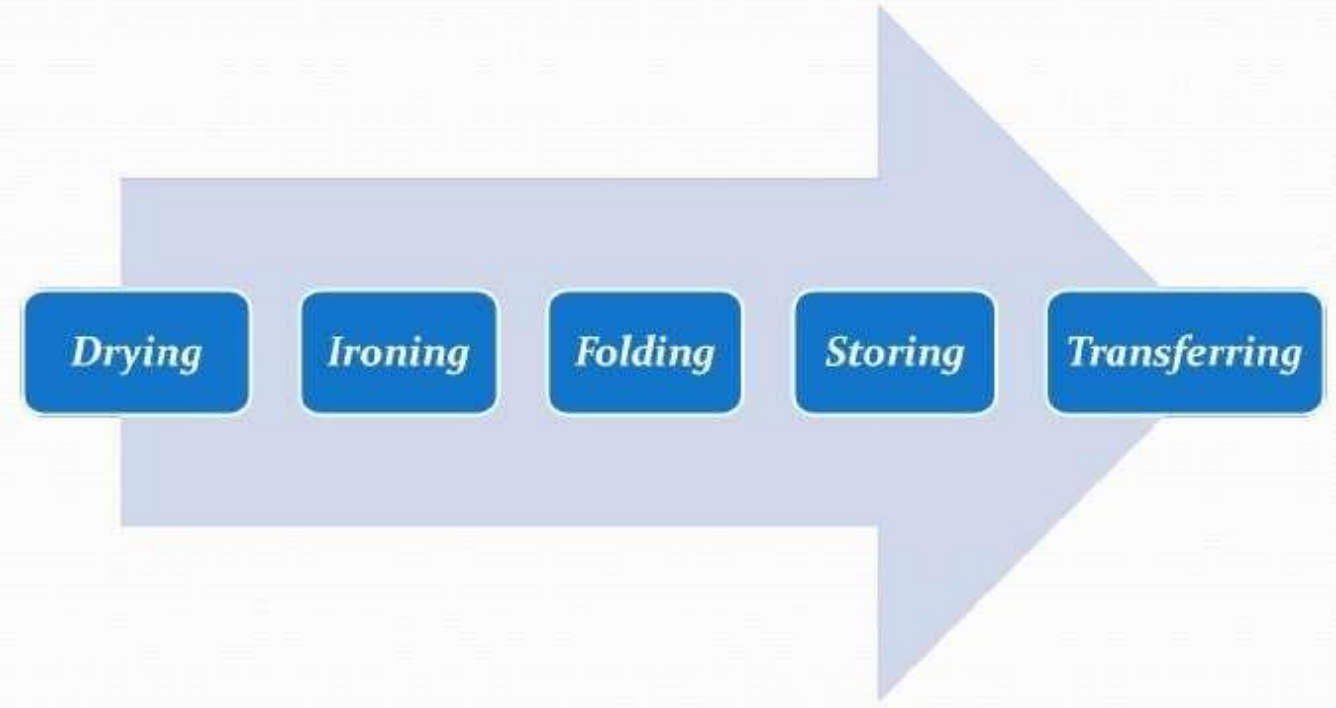
Simply, means machine rinse your clothes with clean water. Machines use around 13-20 gallons of water in the rinse cycle, depending on age of the machine.

Spinning or Hydro-Extraction

Spin speed refers to how many times a washing machine's drum spins round in a minute. It's measured in revolutions per minute (rpm) - so a setting of 1200rpm means the drum will spin all the way round 1200 times every minute. Spinning removes 80% of water from the fabrics at the end of a cycle. Spin speed, for various fabrics:

- Cotton: 1400 rpm
- Wool: 1200 rpm
- Delicates: 600 rpm
- Silk: 400 rpm

FINISHING



Dry Cleaning

Dry cleaning is any cleaning process for clothing and textiles using a chemical solvent other than water. It is used to clean fabrics that degrade in water, and delicate fabrics that cannot withstand therough and tumble of a washing machine.

Unlike what its name implies, dry cleaning is not a "dry" process. Clothes are soaked in a solvent other than water. Tetrachloroethylene (Perchloroethylene), which the industry calls "perc", is the most widely used solvent. Alternative solvents are Trichloroethane andPetroleum spirits.

Advantages of dry-cleaning

- Dry cleaning cleans clothes for which laundering is not suitable.
- It causes no shrinkage to the fabric.
- It does not flatten the pile of fabrics such as velvet.
- Finishes such as moireing are retained even after cleaning.
- Colours do not bleed on dry – cleaning.
- Stains are more readily removed by dry – cleaning.

Disadvantages of Dry- cleaning

- Dry – cleaning is expensive as compare to the laundering.
- Many dry – cleaning solvents are harmful to health if inhaled for long duration.
- After cleaning with solvents, a certain unpleasant smell tends to be retained by the articles.
- Yellows with age.
- Needs special care.

Care of linen materials

1. Linen materials should be stored in dry places
2. Using large amount of washing soda and bleaching agent can damage the linen.
3. Rinse the fabrics properly to avoid deposition of detergents
4. The materials should be dried out properly otherwise it generate terrible odour and also the lifetime of the materials will be shortened.
5. Should not use bleaching powder directly on the fabric.
6. Remove deposited stains immediately from the fabric.
7. Should not mix infected linen with others.
8. Should not overload washing or squeezing machines.

Stain removal procedure

Most stains can be removed if attended to immediately using correct methods.Some common stains and methods for their removal.

S.No	Stains	Method of removal
1.	Ball point	Rub lightly with cotton soaked in denatured spirit.
2	Blood	Soak in coldwater for about an hour. Then transfer to lukewarm water containing an enzyme detergent. Soak for 30 minutes and launder or soak in cold water, to which common salt is added for about an hour and launder.
3.	Chewing gum	Remove surface gum with a blunt knife. Apply ice to the stain. Allow to soak in ice cold water for a few minutes. Launder
4.	Chocolate, coco	Same treatment as for blood.
5.	Coffee, tea	Apply borax solution and allow to dry. Launder
6.	Curry (Turmeric & oil)	Apply soap and bleach in sunlight. When dry, if stain has not disappeared, wet it and put it back in sunlight again.
7.	Fruit juice	White fabrics may be bleached with sodium hypochloride. Colored fabrics may be soaked in warm borax solution. Launder.

8.	Ice cream milk	Rinse through cold water and launder or apply petrol or carbon tetrachloride. Launder
9.	Ink	Hold under running water to remove much of the ink. Then treat with one of the following methods.Apply lime juice and salt and leave for 30 minutes and launder.Soak in sour milk or curds for 30 minutes and launder.Steep in dilute oxalic acid for 10 minutes then rinse thoroughly in dilute borax solution. Launder.
10.	Iodine	Fresh wet stain. Apply starch paste and leave it to absorb the stain. Launder.
11.	Mud	Allow the garment to dry and dust off as much of the mud as possible, then soak the stain in an alkaline bath (20 g / lit of sodium carbonate) for a couple of hours. Launder.
12.	Rust	A patented rust remover may be used or the stain may be soaked in cold 1% oxalic acid for about 15 minutes and then launder.
13.	Urine	Treat as perspiration or apply ethyl alcohol and allow to evaporate. Then apply chloroform and allow to evaporate. Launder.

Detergent Requirement

Classification – Bed sheet / Pillow Cover / All White Linen

Soiling – Medium Soil

Batch Size – 60kg

STAGE	CARD TIME MINS	LEVEL	TEMP	ADDITIONS	
				PRODUCT	Qty. Grm/Ml
Main Wash	20	Low	60	Super Bright HD Ultra Plus	300
				Super Bright 9	200
				Super Bright EL-1	60
				Super Bright 999(P) LT	150
Drain					
Rinse-I	2	High	RT		
Drain					
Rinse-II	2	High	RT		
Drain					
Rinse-III	5	Medium	RT	Super Bright Sour	250

Classification – Staff Uniform

Soiling – Medium Soil

Batch Size – 60kg

STAGE	CARD TIME MINS	LEVEL	TEMP	ADDITIONS	
				PRODUCT	Qty. Grm/Ml
Main Wash	20	Low	50	Super Bright HD Ultra Plus	300
				Super Bright EL-1	60
Drain					
Rinse-I	2	High	RT		
Drain					
Rinse-II	2	High	RT		
Drain					
Rinse-III	5	Medium	RT	Super Bright Sour	200
Drain & Hydro					

Classification – Patient Dress

Soiling – Medium Soil

Batch Size – 60kg

STAGE	CARD TIME MINS	LEVEL	TEMP	ADDITIONS	
				PRODUCT	Qty. Grm/Ml
Main Wash	20	Low	60	Super Bright HD Ultra Plus	300
				Super Bright EL-81	90
Drain					
Bleach Wash	7	Low	RT	Super Bright Bleach	600
Drain					
Rinse-I	2	High	RT		
Drain					
Rinse-II	2	High	RT		
Drain					

Rinse-III	5	Medium	RT	Super Bright Sour	200
Drain & Hydro					

Classification – Infected Linen

Soiling – Medium Soil

Batch Size – 60kg

STAGE	CARD TIME MINS	LEVEL	TEMP	ADDITIONS	
				PRODUCT	Qty. Grm/Ml
Wash 1	5	High	RT	Water	
Drain					
Wash 2	5	High		HOT Water	
Drain					
Main Wash	20	Low	60	Super Bright HD Ultra Plus	300
				Super Bright EL-81	100
				Super Bright 9	100

				Super Bright 999(P) LT	50
Drain					
Rinse-I	2	High	RT		
Drain					
Rinse-II	2	High	RT		
Drain					
Rinse-III	5	Medium	RT	Super Bright Sour	200

Classification – Blanket

Soiling – Medium Soil

Batch Size – 60kg

STAGE	CARD TIME MINS	LEVEL	TEMP	ADDITIONS	
				PRODUCT	Qty. Grm/Ml
Main Wash	15	Low	RT	Super Bright EL-C	250
Drain					
Rinse-I	2	High	RT		
Drain					

Rinse-II	2	High	RT		
Drain					
Rinse-III	2	Medium	RT		

Quality Monitoring

- Surprise visit by superior staff.
- System of delivery of linens.
- System of counting and sluicing.
- Length of washing cycle.

- Right quantity of detergents.
- Removal of stains.
- Strict delivery time 12 hours / 24 hours.

Conclusion

An efficient and effective Linen and Laundry services can enhance patient experience and reduce the risk of cross contamination. Laundry and its products should preserve the patients' dignity, promote the patient's care and be appropriate to patient group, gender, clinical status, religion and beliefs. Quality inspectors may wish to understand how the laundry process impacts above and design a framework to identify necessary quality requirements within the organization.

Chapter -16

MANAGEMENT OF SPILLS OF BLOOD AND (OTHER POTENTIALLY INFECTIOUS MATERIAL)

- Blood and body fluid spillages should be dealt with immediately or as soon as it is safeto do so.
- Other persons should be kept away from the spillage until the area has been cleanedand dried.
- Care should be taken if there are sharps present and should first be disposed off appropriately into a sharps container.
- Spills should be removed before the area is cleaned.
- Area should be well ventilated if using chlorinating agents.
- Adding liquids to spills increases the size of the spill and should be avoided.
- Chlorinating agents should be used (1% hypochlorite) in a well ventilated area and aregenerally only recommended on a small spill.
- Chlorinating agents should not be placed directly on spillages of urine.
- Chlorinating agents are not suitable for use on soft furnishings.
- It is recommended that supplies of personal protective equipment, paper towels andhealthcare risk/ yellow waste bags are available for spills management.
- If non-disposable cloths/ mops are used to clean spillage area they must be thermallyor chemically disinfected.
- Every patient care area must prepare the spill management kit.
- The kit should be prominently labelled and placed at the most accessible site.
- The kit contents should be reviewed daily to ensure completeness of the kit.
- The spill kit must be immediately replenished after use and stored at the originallocation after every use.

Procedure of Spill clean up

- Assemble materials required for dealing with the spill prior to putting on PPE.
- Inspect the area around the spill thoroughly for splatters or splashes.
- Restrict the activity around the spill until the area has been cleaned and disinfectedand is completely dry.
- Promptly clean and decontaminate spills of blood and other potentially infectiousmaterials. Discard blood-contaminated items.
- Use 1% Sodium hypochlorite for small spills and 10% hypochlorite solution for largespills.
- The detailed procedure is explained in the flow chart given below.
-

Steps for cleaning the spill

Step-1 Cordon off the site of spillage

Step-2 Wear gloves and other appropriate PPEas per requirement

Step-3 Inspect the area around the spill thoroughly for splatters or splashes. (If spill contains broken glass material, collect the glass particles with the help of cardboard sheets and forceps and discard in sharps container.)

Step-4 If spill of >10ml or covers >10 cm area (Prepare 10% Hypochlorite Solution)

If spill of <10 ml or covers <10 cm area (Prepare 1% Hypochlorite Solution)

As per current Kayakalp Guidline

Step-5 Cover the spill with absorbent material

Step-6 Pour the prepared hypochlorite solution over the absorbent material

Step-7 Allow the hypochlorite solution to have a contact with the spill for at least 20 minutes

Step-8 Collect the material withcard board sheets and discard in yellow bag

Step-9 Seal and Discard the biohazard bag in appropriate coloured waste bin

Step-10 Mop the area with remaining hypochlorite solution

Step-11 Remove the PPE and discard in appropriate coloured waste bin

Procedure of Mercury Spill Clean Up
(AIIMS Jodhpur is using Mercury free equipment)

Procedure for Mercury Spill

- Remove all items near the mercury spill area. Switch off the fan and Exhaust fan if in use
- Children and pregnant women to be evacuated from that space
- Wear face mask and goggles
- Remove the jewellery and watch from hands, then wear gloves
- Locate all Mercury beads, then carefully use the cardboard strips or Chart Sheet togather them together
- Use the syringe or dropper to draw up the Mercury beads, transfer

them into thewater filled plastic container and close and seal airtight

- Small and hard-to-see beads can be located with the flashlight, after removing thelarger beads, use adhesive tape to collect those beads
- If Mercury spilled on linen, that portion to be cut and removed
- All the materials used for Mercury spill to be placed in the plastic bag and to be labelled as "CONTAMINATED WITH MERCURY".
- Hand over the kit to BMW.
- Doors and windows of the room to be kept open for 24 hours.

DO NOT's

- Never use broom to clean up mercury.
- Never use Vacuum cleaner to clean up mercury.
- Never use bare hands to touch Mercury.
- Never continue wearing shoes and clothing that are contaminated with Mercury.

CHEMICAL SPILLAGE MANAGEMENT

For Chemical spillage, follow the Manufacturer's Instruction as mentioned in the MSDS(Material Safety Data Sheet) of the chemical products. In case of eye splash Wash eye for 30 min under running water and refer to EYE ward/OPD/Emergency.

Management of Spillages of Body Fluids which not visibly contaminated with Blood

These spillages include faeces, vomitus, urine and sputum.

a) Always wear protective clothing, i.e. plastic disposable apron, disposable powder-free, non-sterile latex or similar while dealing with such spills.

b) Use paper towels to soak up the spill.

c) Do not use bare hands for any spill management. It may contain sharps.

Use tongs to separate sharps and put in sharp bin using a scoop.

d) Discard paper towels and any other waste from the spillage into clinical waste bags.

e) Clean the contaminated area with water and detergent.

f) Discard gloves and apron into a red bag

g) Wash hands after removing the PPE.

Note:

1) **All the spill are reported in incident reporting form/Spill register maintained by In-charge.**
2) **Chlorine releasing agents are not be used for urine spillages even if it contains visible blood. (use Lysol In such Cases)**

Reference:

1) Rutala WA,Weber DJ,and the Healthcare Infection Control Practices Advisory Committee (HICPAC). Guideline for Disinfection and Sterilization in Healthcare Facilities, 2008. Updated May 2019

2) KAYA KALP National Guidelines for Clean Hospitals Applicable to Tertiary Care Hospitals, Hospitals associated with Medical Colleges & Super-specialty Hospitals in India. MINISTRY OF HEALTH AND FAMILY WELFARE GOVERNMENT OF INDIA

3) National Guidelines for Infection Prevention and Control in Healthcare Facilities. national Centre for Disease Control, Directorate General of Health Services Ministry of Health and Family Welfare, Government of India January 2020

Introduction to CSSD AIIMS Jodhpur

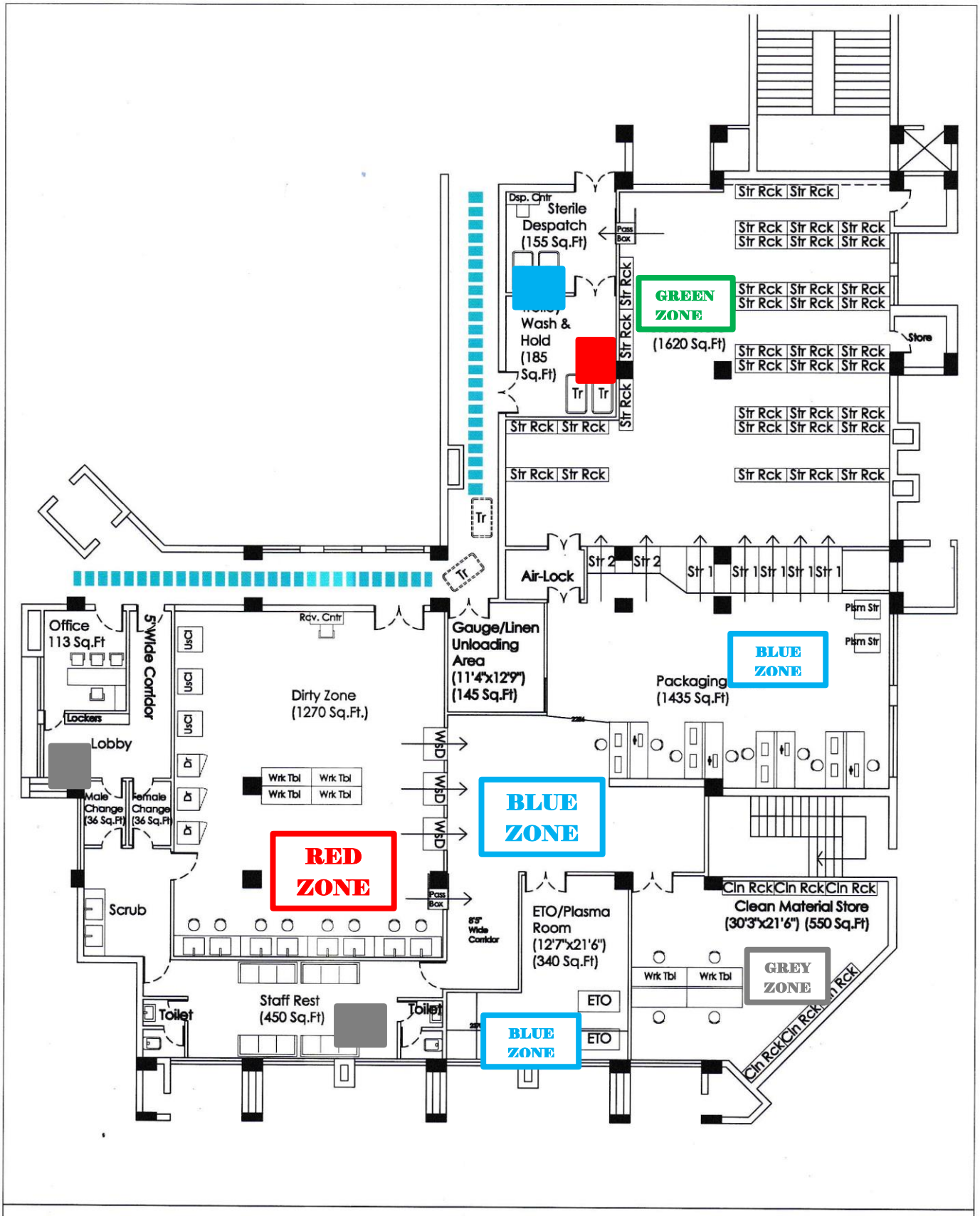
The "state-of-the-art" Central Sterile Services Department (CSSD) is an integral part of AIIMS, Jodhpur. The CSSD was dedicated to the hospital services on 10th April 2019 by Dr. Suresh Chandra Sharma, President of the Institute in the presence of Dr. Sanjeev Mishra, Director AIIMS Jodhpur. The CSSD ensures safe management of decontamination services in the hospital through safe, efficient, effective and reliable systems. The CSSD carries out all procedures on the processes of decontamination, cleaning, assembly, packaging, sterilization and storage of sterile products. It caters all types of sterile items to every major OTs, ICUs, minor OTs, IPDs, OPDs and Casualty etc. The optimum importance is given in upgrading the knowledge and latest practices so that quality management and the highest standard can be maintained in the CSSD which we consider as the backbone of sterile practices at AIIMS, Jodhpur.

Scope of CSSD

1) Receiving of all soiled instruments from various OTs, ICUs, Casualty, Wards, and OPDs.
2) Cleaning and disinfection of all instruments and equipment received from various sites of the hospital.
3) Assembling and packing of instruments sets following cleaning and disinfection.
4) Making & Packing of the gauze, pad, surgical MOP, throat pack for various user departments.
5) Sterilization of instrument, linen and gauze packs.
6) Segregation, storage and dispatch of various sterile sets to user departments.
7) Quality control of cleaning, disinfection and sterilization process.
8) Monitoring of the temperature and relative humidity inside the CSSD.
9) Monitoring the infection control inside the CSSD.
10) Co-ordination with infection control committee of the hospital for optimum infection control in the hospital.
11) Periodical teaching among the CSSD staffs.
12) Periodical teaching to the nursing students & other hospital staff.
13) Conducting CMEs to update the knowledge of CSSD staffs.
14) Periodical orientation program to update the knowledge of nursing officers of the hospital.

Layout of CSSD

CSSD is situated on IPD Building Ground Floor



The design of the CSSD allows unidirectional movement of various instruments from their receiving site in the dirty zone to clean zone for packing and sterilization and then to sterile storage area for dispatch.

Dirty Area (Red Zone)	1455 sq.ft.
Clean Area (Blue Zone)	2075 sq.ft.
Sterile Area (Green Zone)	1620 sq.ft
Utility Area (Grey Zone)	1185 sq.ft.
Total area	**6335 sq.ft.**

STERILIZATION

Definition

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

Methods:

i. **Heat Sterilization:**
   - **Moist Heat:** Exposure to saturated steam at 121°C for 15-20 min or 134°C for 4-7 minutes in any autoclave.
   - **Dry Heat:** Exposure to dry heat at 160°C for 120 min.

ii. **Cold / Chemical Sterilization:** (for heat & moisture sensitive items)
   - Ethylene oxide

iii. **Low temperature Sterilization**
   - Plasma sterilizer using per acetic acid or hydrogen peroxide.

SOP-1: Health, Personal Hygiene and Food

Objective

1) To ensure that all the CSSD staff maintains adequate personal hygiene.

Area of application

1) All areas of CSSD

Procedure

1) Body and hair be cleaned at all times.
2) Hair should be tied properly.
3) Fingernails shall be short and clean.
4) Neither nail polish nor artificial nails shall be worn during working hours.
5) All the staffs shall be free from skin diseases, infectious diseases, and mental illnessand physical handicaps.
6) Any CSSD uniform or other garment that become soiled or wet during work shallbe changed immediately.
7) Hair and beard except eyebrows and eyelashes shall be completely covered byhead cap and facemask.
8) Jewellery and wrist watches shall not be worn during duty.
9) Food and beverages are allowed only in the office area.
10) Cooking inside the CSSD is not allowed.
11) Chewing of any kinds of tobacco products like gutkha, pan and pan masala etc.are not allowed.
12) Smoking is strictly prohibited inside the CSSD.

SOP-2: Departmental Dress Code

Objectives

1) To ensure that staff are properly attired according to the requirements of their work area.
2) To differentiate between various categories of staff.

Procedure

1) On entering the CSSD, all staff will change into departmental uniforms and shoes or chappals (with non-skid soles) provided in the changing areas.
2) All personal belongings will be kept in the locker unit provided in the changingroom.
3) Every staff will wear an ID card issued by Institute.
4) Staff entering into the dirty zone will wear on an extra protection gown (long-sleeved, water repellent gown), elbow-length latex gloves, shoe cover, and

protective goggles or face shield (when splashing is anticipated) in addition to thedepartmental uniform.

5) When leaving the dirty zone, staff will remove and discard the gown and gloves, shoe covers and wash their hands. All PPE will be discarded as BMW disposal guidelines. The hands will be cleaned as per the Institute protocol.
6) Prior to entering the clean area, all staff will wash and dry their hands.
7) Staff entering into the clean area will wear mask and head cap, and heat-resistant rubber gloves (elbow length) while loading the clean items to the autoclaves.
8) Staff working in the sterile area will wear a surgical mask and head cap and heat- resistant rubber gloves (elbow length) while unloading the sterile items from the autoclaves.
9) A visitor will wash hands, wear a gown and PPE (surgical mask and head cap).

SOP-3: Safety Awareness in CSSD

Objective

1) To provide an overview of guidelines and safety awareness procedures for all staff engaged in the CSSD.

Procedure

General Guidelines

1) All staff must follow established work and traffic flow patterns.
2) Material Safety Data Sheets (MSDS) for all chemicals must be available.
3) Training to the employees must be done in a safe working place and staff should be aware of any relevant procedures and policies.
4) All staff must be trained in appropriate PPE designated for each area.
5) Each staff must adhere to the dress code and policies before entering and when leaving the area.
6) Each employee must follow and practice hand washing guidelines (before and after each procedure) following Institute protocols.
7) Eating and drinking is strictly prohibited in all workspaces including the storage area also. Food and beverages should be taken in the staff canteen.
8) Workspaces must be free from clutter and have un-obstructed entrances and exits.
9) Visitors are prohibited from entering CSSD without permission.
10) If a visitor to enter the restricted areas, then appropriate attire is a must and should be escorted by one CSSD staff.
11) A first aid box must be available and checked regularly.

Patient Safety

1) Ensure that all instrument sets are processed according to established protocols. The manufacturer's instructions for the processing of a particular instrument/equipment should be followed if required.
2) All CSSD personnel should receive appropriate training in decontamination and sterilization practices.
3) Safe keeping of all processed items by ensuring that the storage areas are clean, storage cupboards are locked, equipment is covered and preventive maintenance is performed on all equipment on a routine basis.
4) Assure there is no contamination of patient care areas during collection and transportation of contaminated items from user sites to CSSD.

Employee Safety

1) Appropriate PPE to be used and procedures to be followed to prevent burn injuries when loading or unloading steam sterilizers and washer-disinfectors.
2) Appropriate PPE must be worn while handling ethylene oxide (ETO) and hydrogenperoxide plasma sterilizers.
3) Employees must use proper body ergonomics when handling or carrying heavyinstrument/equipment sets.
4) Sharp instruments should be handled with proper care and caution.
5) While handling chemicals used for cleaning and decontamination of instruments, appropriate PPE like a surgical mask, face shield, gloves, and head cap must be worn.
6) During handling of contaminated and sharp instruments in the dirty zone, employees must wear proper PPE to prevent direct exposure from contaminants and injury from sharp objects.

Note

1) All staff must be aware of fire safety regulations.
2) Use of electrical extension cords is strictly prohibited in the CSSD.
3) Before handling chemicals, Material Safety Data Sheet (MSDS) must be referred.
4) If spills occur, institute policy for the management of body fluids spillages must be followed.

SOP-4: Department Cleaning Procedure

Objective

1) To ensure an acceptable level of hygiene and cleanliness throughout the CSSDpremise.

Procedure

1) All the surfaces and equipment will be cleaned following the cleaning policy.
2) All the areas will be cleaned at the end of each shift with a germicidal disinfectant. However, the dirty zone will be cleaned in-between whenever needed.
3) Cleaning will take place before work commences or after work is completed inevery shift.
4) A daily and weekly cleaning checklist will be signed by the housekeeping staffffollowing the completion of work.
5) The supervising technician will countersign the checklist on daily basis.
6) All designated cleaning equipment will be cleaned and stored in their designated area for that areas use only.
7) Cleaning work will only be undertaken by trained housekeeping staff.
8) All CSSD technicians will responsible for making sure that all surfaces and equipment are clean.
9) All cleaning procedures and cleaning chemicals will be in line with departmentalrecommendations.
10) The temperature in the sterile storage zone will be maintained between 20°C-22°C.
11) The relative humidity in the sterile zone shall be kept between 50%-60%.
12) The use of brooms is strictly prohibited for cleaning purposes.

Cleaning Checklist

Daily Cleaning Checklist

SN	Areas	Yes/No
1	All floor surfaces (Vacuum cleaning of the floor first if necessary followed by wet moping)	
2	All low-level ledges, shelves, and skirting and window ledges	
3	Splash stains and finger marks on the walls	
4	Replacement of waste bags	
5	External and internal surfaces of all machines	
6	Sink taps and surroundings	
7	Mirrors	
8	Washbasins	
9	Electrical switches	
10	All furniture	
11	Shoes and Chappals	
12	Waste buckets	

Weekly Cleaning Checklist

SN	Areas	Yes/No
1	All internal glass surfaces	
2	Walls, wall fittings	
3	Ceilings	
4	Ceiling light fittings and air vents	

5	Doors, doorframes, and door handles	
6	Air conditioners (ACs)	

SOP-5: Sending Soiled Instruments & Equipment to CSSD

Objective

1) To ensure the safe transport of contaminated instruments and equipment to the CSSD.

Area of application

1) OTs, ICUs, Wards, OPDs, Casualty, etc.

Procedure

1) An appropriate wear-on and non-sterile gloves should be worn.
2) Gross contaminants such as large amounts of blood, feces, urine, etc. must beremoved at the point of use.
3) All sharps like BP blades, needles etc. to be separated from the instruments anddiscarded in a sharps bin at the site of use.
4) Soak in a plastic container of 0.5% hypochlorite solution/Bleaching Solution/ an enzymatic solution for 10 minutes or wipe with damp cloth at point of use to prevent drying of bio soil on instruments.
5) Linen and waste must be separated from reusable medical devices at the point ofuse.
6) Never overload the container or tray with instruments.
7) Send the contaminated instruments immediately after the procedure. Delaying transport leads to instrument drying and difficulty in cleaning.
8) Secure contaminated items and cover them before transportation.
9) Use only allocated transport trolley.
10) Place heavy instrument containers in the lower compartment of a trolley.
11) The instrument trolley with contaminated instrument sets should not be left unattended during transportation to the CSSD.
12) All the used instruments and equipment must be delivered only to the dirty area of the CSSD.
13) Unload, count and hand over the items to the CSSD technician as per the checklist.
14) Clean and disinfect transport trolleys by enzyme detergent followed by drying inthe trolley wash area, and bring them back to the respective user site.
15) Remove gloves and wash hands according to Institute hand hygiene protocol.

Important: All effort must be made to facilitate the transport of contaminated equipment to the decontamination area as soon as possible to facilitate cleaning. Prompt processing of items will likely decrease potential hazards associated with contamination.

SOP-6: Precaution, first aid measures, handling & storage of multi-enzyme solutions or chemicals

Objective

1) To ensure that safe handling & storage of multi-enzyme solutions or chemicals.

Area of application

1) Washing area (Dirty zone) of CSSD

A) Precautionary measures:

1) Wear protective gloves, protective clothing, eye protection, face protection.
2) Wash exposed skin thoroughly after handling.
3) Do not breathe mist, vapors, spray.
4) Wear respiratory protection.

B) First aid measures:

Eye contact: Immediately flush with plenty of water, after initial flushing remove any contact lenses and continue flushing for at least 15 minutes, keep eye wide open while rinsing.

Skin contact: Wash off immediately with soap and plenty of water removing all contaminated clothes and chappals /shoes.

Inhalation: Move to fresh air.

Ingestion: Rinse mouth & throat with water. Do not induce vomiting.

C) Handling and storage:

Handling: Wear personal protective equipment. Avoid contact with skin, eyes and clothing. Remove and wash contaminated clothing before reuse.

Storage: Keep in properly labeled containers tightly closed in dry, cool and well ventilated place.

NOTE: Before handling multi-enzyme solutions or chemicals, Material Safety Data Sheet (MSDS) must be referred.

SOP-7: Manual Cleaning & Decontamination of Soiled Items

Objectives

1) To ensure that all soiled instruments and equipment received in the dirty zone are cleaned and decontaminated appropriately.
2) To ensure that all instruments and equipment shifted from dirty to clean zone inthe CSSD is cleaned and decontaminated to an acceptable level.

Area of application

1) Decontamination area (Dirty zone) of CSSD

Procedure

1) All staff in the cleaning area must follow standard/universal precautions at alltimes.
2) In addition to the CSSD uniform, all staff must wear masks, single-use fluid- repellent disposable wear-on, face shields, head caps, shoe covers, and gloves.
3) All the staff must be well trained to clean instruments and equipment manually.
4) All contaminated instruments and equipment should be transferred from the trolley to the work surface.
5) All instruments should be checked against the checklist sent with the set and take notice of any comments made on the checklist by the theatre team/user. If any deviation in the number or instrument is found broken, the matter has to be informed to the user department immediately. The instrument set must be kept aside till the matter is solved.
6) Identify if any instrument can be cleaned and decontaminated in the washer.
7) Identify items requiring special attention and handle them according to the manufacturer's instructions.

8) Maintain segregation of designated clean and other areas within the dirty zone.
9) Use and store all cleaning chemicals according to the manufacturer's instructions.
10) Ensure FIFO (first-in-first-out) principle for the use of cleaning chemicals.
11) Keep work areas safe and free from hazards.
12) Place all waste bins in their designated positions and dispose of a ¾ full waste bin immediately. (Institute protocols should be followed for BMW disposal).
13) All contaminated instruments and equipment should be handled as little as possible.
14) Each instrument will be prepared for decontamination as follows-
    a. Remove the protective outer wraps.
    b. Discard any disposable materials into the appropriate waste bin (Follow Institute protocols for BMW disposal).
    c. Avoid contaminating hands with soilage.
    d. Separate baskets, containers and instruments.
    e. Check the degree of soil, sort and discard any disposable material.
    f. If any sharp items (needles/blades) are found, the instrument set should be set aside and the end-user should be contacted to come and remove the sharps.
    g. Separate cannulated from solid devices.
    h. Open all hinged instruments.
    i. Before and following brushing, flush all cannulated instruments with the pressure jet gun/syringe, and then do pressure sprays.
    j. Loosen all instrument pins and separate instruments.
    k. Disassemble all multi-part instruments.
    l. Handle and process all multi-part instruments following the manufacturer's instructions.
    m. If an instrument is broken during the cleaning process, the broken piece is to be located immediately and kept in the same instrument set. If the broken part is not found, a report must be made following standard operating procedure for a missing instrument. It is important to identify any missing screws or broken parts as a matter of urgency, as the sooner it is identified the better chance there is of locating it. The instrument set to be kept aside until the instrument is replaced or repaired. The matter has to be informed to the user department immediately.
    n. Keep sets of items being processed together where ever possible.
15) Sinks and accessories must be cleaned at each water change.
16) When cleaning manually, a pre-rinse, wash, rinse, and drying process must be followed.
17) The temperature of the water should be following the detergent manufacturers instructions.

18) Water and detergent proportions should be following the manufacturers instructions.
19) The dedicated sinks (with measuring marks) should only be used for cleaning the instruments, not for hand washing or anything else.
20) Replace the water in the sink, if the water is visibly stained at any stage of the cleaning process.
21) All instruments must be fully immersed in the washing water while being scrubbed. This prevents aerosol generation during the cleaning process.
22) Special attention must be paid to the joints of any jointed instrument and meticulous attention paid to the tips or crevices. These parts should be cleaned carefully by a soft brush or soft cloth /sponge.
23) After decontamination, all devices must be visually inspected for soil, damage and functionality. A magnifying glass should be used for the inspection.
24) Place clean, functioning items on a drainage area.
25) Keep drainage area dry.
26) Dry all the instruments using a non-linting cloth and compressed air.
27) Clean items should be stored and transported carefully to avoid any cross-contamination.
28) Ensure that all instruments and equipment are cleaned, disinfected, and dried before being sent to the clean zone.
29) Transfer the cleaned and decontaminated instruments and equipment to the clean zone through the pass box.

SOP-8: Cleaning of the Instruments with known Infection

Objective

1) To ensure that all soiled instruments and equipment shifted to clean zone of the CSSD is cleaned and disinfected to an acceptable level.

Area of application

2) Decontamination area (Dirty zone) of CSSD

Procedure

1) Consider every item received in the dirty zone is infectious whether it is labelled or not. Some patients don't inform and in some patients, virus may remain in the incubation period with no symptoms.
2) Ensure proper handling of instruments with complete PPE.
3) Manual wash is to be avoided.
4) Prepare 1% sodium hypochlorite solution according to the protocol.
5) Soak all infected instruments in 1% sodium hypochlorite solution for 30 minutes.
6) Use a washer-disinfector to clean and disinfect all instruments.
7) Although any shelf of the washer-disinfector can be used to keep the

instruments but the lower shelf should be preferred.

8) Run the washer-disinfector cycle at different temperature for effective disinfection and drying of the instruments (45°C for cleaning, 90°C for thermal disinfection,and 95°C for drying).
9) Report any injury or incident that happens according to the Institute protocol.
10) Use a washer-disinfector for the cleaning and disinfection of rigid containers.

SOP-9: Loading and Operation of Ultrasonic Cleaner

Objective

1) To ensure that contaminated instruments and equipment are correctly prepared and loaded for decontamination.

Area of application

1) Decontamination area (Dirty zone) of CSSD

Procedure

1) Identify the correct decontamination process to be chosen for the items to be cleaned and decontaminated. If it is safe to process an instrument in the ultrasonic cleaner then only it should be processed.
2) Use all standard precautions for infection control and safety measures.
3) Use and store all equipment chemicals and materials following the manufacturer's instructions.
4) Highly contaminated instruments should always be pre-cleaned in the ultrasonic bath as otherwise they cannot be properly cleaned in the washer-

disinfector.

5) Instruments that can only be cleaned manually should be cleaned first in theultrasonic washer.
6) All trays with instruments should be cleaned by an ultrasonic cleaner at least oncea week to give them a microscopic clean.
7) Handle contaminated devices as little as possible.
8) Operate ultrasonic cleaner according to the manufacturer's instructions.
9) Fill the tank with RO water up to the designated level, de-gas the water as instructed by the manufacturer, and then add detergent. Use enzymatic detergentthat is effective at low temperatures.
10) Set the heater's temperature comfortable with the detergent's efficacy. (Check detergent manufacturer's recommendations)
11) Separate all cannulated items and solid devices.
12) Open all hinged items.
13) Put all instruments in the basket.
14) Place the basket of instruments into the ultrasonic cleaner tank. Never put instruments directly onto the base of an ultrasonic washer.
15) Make sure that instruments do not stick out of baskets as they may affect theultrasonic cleaner operation.
16) Position the basket into the chamber according to the manufacturer's instructions.
17) Put the enzymatic solution in the tank.
18) Select a program and set the timer control to the time specified by the machine manufacturer.
19) After the cycle has is over, remove the basket from the tank and rinse the itemswith RO water.
20) Drain and dry the items using a non-linting cloth or mechanical drying system.
21) The ultrasonic cleaner should be drained, cleaned, and dried.

SOP-10: Validation of Ultrasonic Cleaner

Objective

1) To ensure that the ultrasonic cleaner is working efficiently and can perform the assigned task.

Area of application

1) Decontamination area (Dirty zone) of CSSD

Procedure

There are few simple tests to check the performance of ultrasonic cleaners.

Glass slide test

1) Wet the frosted portion of a glass slide with tap water and draw an "X" with a leadpencil from one corner to another corner of it on the frosted area.

2) Fill the ultrasonic cleaner tank up to the marked line.
3) Immerse the frosted end of the glass slide into fresh cleaning solution.
4) Turn the ultrasonic cleaner "on".
5) If the machine is working properly then the "X" will begin to remove immediately.

Aluminium foil test

1) Cut three small pieces of aluminum foil about 10cm x 20cm each.
2) Fold each piece of aluminum foil over a rod.
3) Fill the ultrasonic cleaner tank up to the marked line.
4) Immerse the aluminum foil strips into a fresh cleaning solution. Suspend the first strip in the center of the tank and the other two about two inches from each end of the tank.
5) Turn the ultrasonic cleaner "on".
6) Remove the foil and inspect.
7) If the machine is working properly then all three pieces of aluminum foil would beperforated and wrinkled to about the same degree.

Chemical indicators

1) Place the cleaning indicator in mesh basket to check the efficacy of cleaning. Thechange of color from yellow to white indicates effective cleaning.
2) The cavitation triggers removal of the color from the indicator causing a color change.
3) The efficacy of the cleaning depends on the degree of color change.

SOP-11: Loading and Operation of Washer Disinfector

Objective

1) To ensure that medical devices/equipment are correctly prepared and loaded for decontamination.

Area of application

1) Decontamination area (Dirty zone) of CSSD

Procedure

1) The staff must be qualified and have received adequate training to operate themachine.
2) Wear all personal protective equipment.
3) Use and store all equipment chemicals and materials following the manufacturer's instructions.
4) Handle contaminated devices as little as possible.
5) Identify the correct process for the items to be decontaminated following themanufacturer's instructions.
6) Follow manufacturers working instructions manual to run washer-disinfectors.
7) Transfer all equipment from the instrument trolley to the work surface.
8) Identify all the medical devices to be decontaminated in the washer.
9) Identify items requiring special attention.
10) Handle all items as per the manufacturer's instructions.
11) Each instrument needs to be prepared for decontamination as follows:
    a) Remove the protective outer wraps
    b) Discard any disposable materials like wrap material, any gauze piece or sharp items into the appropriate waste bin using cheatle forceps. Avoid contaminating hands with soilage. If needles or blades are found, the instrument set should be set aside and the end-user be contacted to come and remove the sharps.
    c) Separate mesh baskets, rigid containers and instruments.
    d) Sort cannulated and solid devices.
    e) Open all hinged instruments.
    f) Flush all cannulated instruments with the pressure jet gun/syringe before placing in the washer-disinfector tray.
    g) Use pressure sprays according to the manufacturer's guidelines.
    h) Loosen all instrument pins and separate instruments.
    i) Disassemble all multi-part instruments.
    j) Handle and process all instruments/devices following the manufacturer's instructions.
    k) If any instrument is broken or any broken piece is located, a report should be made immediately following the guidelines for the missing instrument. The said instrument tray must be kept aside until the instrument is replaced or repaired. Be aware that small items may become lodged in the drainage system. Please check instruments off against the checklist returned with the

set and take notice of any comments made on the checklist by theatre team/user.

l) Keep sets of items being processed together where ever is possible.

m) Items that are too large or not suitable for cleaning by washer-disinfector clean them by manual method. The manual cleaning should be undertaken following the manufacturer's instructions.

12) Standardized washing and disinfecting processes should be used.
13) Choose a relevant washer rack to keep the instruments.
14) Place instruments into a mesh basket and ensure all items and parts are present.
15) Keep the loaded instrument basket in such a position so that maximum exposure to the decontamination process is achieved on all surfaces of the instrument.
16) Place heavier items at the bottom rack making sure that all surfaces can bereached by the spray jets.
17) Instruments should not be placed too densely in the mesh basket as spray jets willnot be able to reach all surfaces of the instruments.
18) Make sure that instruments do not stick out of baskets as they may affect thewasher operation.
19) Place a chemical cleaning indicator inside PCD and place the PCD at an appropriate location.
20) Chose a suitable fully-automated program that includes pre-rinsing, cleaning at45°C, thermal disinfection at 90°C and drying at 95°C.
21) Check that the cycle is completed satisfactorily.
22) Record data correctly as per departmental procedure using logbooks.

SOP-12: Management of Missing Instruments

Objective

1) To locate instruments missing from a set or parts of instruments.

Procedure

1) Any staff in the dirty or clean zone, identify a missing instrument or part of an instrument, the staff must immediately separate the instrument set or tray and contact the user staff.
2) The CSSD staff must ensure that all wash baskets, washer-disinfectors, transport trolleys, the floor areas, linen, and other areas are checked properly.
3) If the missing instrument is located then the set or tray should be returned to circulation.
4) If the item is not located, the set or tray must be held out of circulation (quarantined) until the missing instrument or part of an instrument is found or

it is replaced.

5) If the set is required to be put into use without replacing the instrument, a note must be completed with the concerned nursing officer's signature as authority to proceed.
6) The incident must be fully recorded.

SOP-13: Control of Packing Area (Clean zone)

Objective

1) To ensure everybody entering the clean zone is correctly dressed and complies with the rules and regulations.

Procedure

1) All staff, visitors, and other personnel wishing to enter the instrument packing area (clean zone) will have to change into the uniform provided in the changing rooms.
2) All personnel must put on head caps.
3) No personal possessions other than locker keys are allowed to be taken into the instrument packing area (clean zone).
4) No facial jewellery is allowed, other than stud-type earrings, and these must be covered completely by the head cap.
5) No food or confectionery of any kind may be taken into any area of the CSSD.
6) At the end of each shift, the uniforms are to be discarded in the linen baskets/buckets kept inside the changing room.
7) All personnel must wash and dry their hands before entering and after returning from the clean zone.
8) Head covering must be worn at all times and only discarded at the end of theshift.

All staff is responsible for keeping the instrument packing room entry/exit neat.

SOP-14: Packing Area (Clean zone) Operation

Objective

1) To describe the operation and procedure controls in the packing area.

Procedure

1) The most senior staff must ensure that the order of production meets immediate customer priority where appropriate.
2) After decontamination of the instruments/equipment in the dirty zone, all clean items are received into the packing area in time.
3) Ensure that any item that is rejected due to evidence of residual blood, body fluid, stains or water are identified before being further processed, placed in a

plastic bag, and returned to dirty zone staffs to action.

4) Ensure that any item that is damaged or broken is sent for repair.
5) As the bio-burden tests are not performed for the ultrasonic cleaners and washer-disinfectors, cleaning indicators must be placed inside the hollow-flow PCD for the validation against test soils (According to ISO/TS 15883-5) to ensure that all items being processed are safely disinfected.

SOP-15: Sterile Packaging

Objective

1) To ensure that the correct materials are used and that items are correctly packaged to maintain sterility.

Procedure

1) Sterile packaging must provide protection against contamination during handling as well as providing an effective barrier against microbial penetration.
2) Items classified as critical devices should be packaged for sterilization (except for flash sterilization methods).
3) An ideal packaging should have the ability to allow sterilization agents (steam, ethylene oxide, and hydrogen peroxide plasma) to penetrate and then provide a barrier, which will maintain the sterility of the wrapped instruments/equipment, and linen etc.
4) Only medical grade US-FDA/CE/ISO/EN ISO approved packaging to be used.
5) The type of packaging and the way the items are packaged determine if the aseptic opening is possible in the operating theatre or the ward.
6) The packaging should allow air that is in the pack to be driven out and the sterilizing agent to reach all surfaces of its content.
7) The packaging should protect the contents against damage during handling and transport.
8) The packaging should be able to withstand the conditions during the sterilization process such as pressure changes, high temperature and humidity, etc.
9) It is important to consider the following points while choosing an instrument tray/set and packaging method:
    a) The type of pack
    b) The size and weight of the items to be packed
    c) The number of times the pack is to be handled before use
    d) The number and training of personnel who may handle the pack
    e) The distances that packs will be transported
    f) Whether the storage system is open or closed
    g) The condition of the storage area (cleanliness, temperature, humidity)
    h) The method of sealing packs
10) The packaging should bear a clearly visible marking (process indicator) indicating whether or not the product has been through a sterilization process.

11) There are many different types of packaging that can be used for different items.
12) The packaging material used in steam sterilization must be able to withstand high temperatures, allow for adequate air removal, be flexible considering changes in pressure during the process, permit steam penetration to the pack's contents and allow for adequate drying.
13) Packaging materials used with low-temperature sterilization processes (e.g. ethylene oxide and gaseous hydrogen peroxide) must have similar properties, particularly being compatible with the sterilization chemicals, moisture, pressure changes and temperature ranges.
14) The packaging system chosen should be appropriate for the items being sterilized and compatible with the specific methods of sterilization being used.
15) Choose packaging to suit the dimensions of the instrument tray/pack and the type of sterilization technique to be used.
16) In addition to containers, individual devices and sets can be packaged with sterilization pouches or wraps.
17) The choice of packaging generally depends on the sterilization method being used.
18) Packaging materials should only be used that have been tested to be compatible and safe for each sterilization purpose.
19) Always follow manufacturer and CSSD guidelines while choosing a packaging.

Medical grade single-use disposable sterilization wrap (SMS and Crepe paperwrap)

1) Double wrapping creates a package within a package. (Double wrap = wrap and wrap)
2) Two sheets of wraps are used providing multiple layers of protection of surgical instruments from contamination.
3) The use of two layers of wraps reinforces the strength of the packaging.
4) Folding the two wraps separately, one after the other, makes the instrument pack more secure, as the greater the number of folds, the more tortuous the path becomes for micro-organisms to penetrate the packaging.
5) The double wrap with two sequential folds also affords a two-step unwrapping process which assists in aseptic presentation and creation of a sterile field for users in the operating theatre; the outer wrap is removed before entering the operating room or by an assistant.
6) Do not re-use single-use packaging.
7) Use a hospital-grade autoclave tape when using a wrap.
8) Do not write on packaging (please write on the autoclave tape).

Disposable peel-open pouches and Reels

1. Paper and plastic peel-open packaging materials are suitable for steam and

low- temperature sterilization processes such as ethylene oxide. It is not suitable for use in hydrogen peroxide gas, again due to the paper (cellulose) content. Disposable peel-open pouches and reels are designed to contain lightweight or small items and are available in various sizes, for single use only.

2. Peel-open packaging should not be used for heavy or bulky items because the seals can become stressed and rupture.
3. Pouches are available in many sizes.
4. The open end of the pouch is closed with a sealing device. It is essential to ensure that the heat sealing machine is functioning effectively to get an adequate seal.
5. Both ready-made pouches and reels are available flat or with side gussets forpacking bulkier objects.
6. The reel can be cut to any size needed, in which both sides of the pack need to be sealed.
7. Peel-open packaging is useful when visibility of the contents is important.
8. When packaging items, care must be taken to leave a minimum of 1 inch (2.5cm) of space between the end of the item and the seal of the pouch or reel to facilitate an aseptic opening.
9. When double pouching, the inner pouch should be at least a size smaller than the outer pouch to prevent folding which may entrap air and inhibit the sterilization process. They must be packaged **paper against paper and plastic against plastic** to enable sterilant penetration.
10. A felt-tip, indelible, non-toxic ink marker must be used on **clear plastic side** of the pouch to label.

Reusable rigid container systems

1. Sterilization containers are a durable sterilization packaging system constructed ofa rigid material such as metal or plastic.
2. A variety of sizes are available to accommodate a wide range of instrument sets.
3. Containers need to be disassembled and cleaned after each use, following the reprocessing instructions as provided by the container manufacturer.
4. Containers themselves are classified as medical devices and as such should be reprocessed after each use, not just wiped down. Containers must be cleaned in the same manner as any other reusable medical device.

SOP-16: Checking and Assembling of Instrument Trays/Sets

Objective

1) To ensure that all instrument trays/sets are complete and safely packed before sterilization procedures.

Area of application

1) Packing area (Clean zone) of CSSD

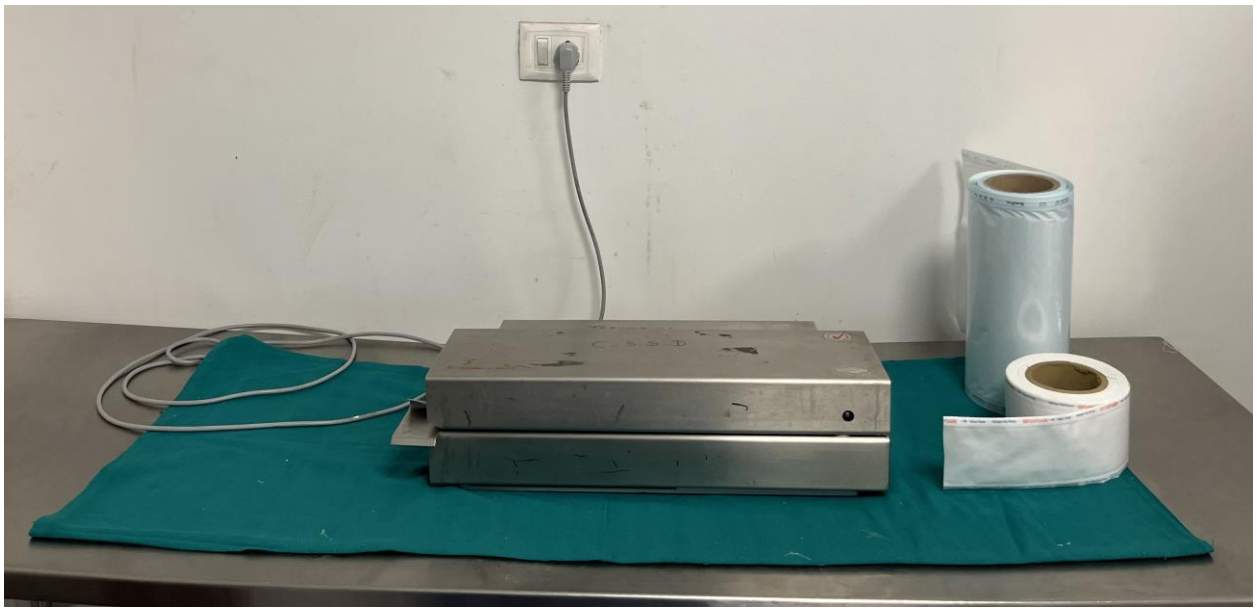
Procedure

1) Staff working in the clean zone will wear protective clothing at all times in compliance with the departmental dress code.
2) Staff should make sure that all work surfaces are clean.
3) Staff must understand what the instruments are used for, that they are functioning correctly and that each set is assembled correctly for that particular procedure.
4) The staff checking the instrument trays/set should indicate and sign that the number of instruments in each tray/set is correct and that nothing is missing.
5) All instruments must be arranged in the tray/set and container according to the order on the checklist.
6) Trays/sets/containers are usually packed in the order that instruments are used. (The contents of instrument sets are usually decided by the surgical team which depends on the type of surgery.)
7) The assembly of a tray/set/container should be agreed by both the CSSD technician working in the clean area and the nursing officer of OTs.
8) The weight of packs must be taken into consideration when assembling

trays/sets/containers.

9) Instruments in overloaded trays/sets/containers may remain wet.
10) Instrument trays/sets/containers must be assembled not only to maximize instrument exposure to the sterilant, but also removal of sterilant and water.
11) Choose the relevant instrument checklist for the instrument set.
12) Place a small strip of autoclave tape in the margin on the front of the checklist, making sure that no information is covered. Place a tray liner (where ever it is indicated) on the bottom of the tray.
13) Check that all instruments are present against the checklist, check instruments one by one.
14) Check instruments visually for cleanliness and missing parts (tips, screws, free movement, sharpness, and overall condition).
15) Do functionality tests on all instruments to check that they are working effectively.
16) Instruments with ratchets or hinges should be held in an open and unlocked position; sliding/extended/complex multiple-part instruments should be disassembled or sufficiently loosened to permit the sterilizing agent to come into contact with all parts of the instrument.
17) The instrument should be left slightly open to allow for sterilant penetration, rings should be slightly separated.
18) Tips of instruments should all be facing the same direction and the use of tip protectors may be considered.
19) Always make sure that all parts of the instruments are present.
20) Items (bowl/basins/receivers) that could hold water during steam sterilization must be placed in such a way that allows easy drainage.
21) Examine hollow ware for cleanliness, place open side down; do not nest bowls and receivers (if included in the same set).
22) Heavy instruments should be placed at the bottom of the tray as the weight of heavy instruments or retractors lying on top or over other small instruments can cause the instruments at the bottom to bend and become misaligned.
23) Placing the instruments in a single layer provides more protection to the instruments.
24) Examine and count linen (if included in the same set) as per tray list, place on top of the tray to prevent them from getting soaked during sterilization. (Keeping the linens inside the instrument set/container is not a recommended practice, and should be avoided)
25) Place an in-pack chemical indicator (Type-6 indicator) into the densest and most challenging part of the tray/container. This indicator will only change color if the in-pack sterilization parameters have been reached, i.e. steam, time, and temperature.
(Important: These indicators act as a final confirmation to the scrub nurse that the set has been through the sterilization process.)
26) Ensure that the tray checklist is dated and signed by the CSSD technician/Nursing officer who has packed the set and checked it.
27) Place the completed checked trays/sets into the packing of choice.

SOP-17: Functionality Check Heat Sealing Machine



Objectives

1) To ensure accurate and safe use of heat sealing machine.
2) To achieve adequate quality control.

Procedure

1) Set the correct temperature and pressure of the heat sealer according to the manufacturer's recommendations.
2) Apply a neat seal to a piece of packaging and check the following:
   a) Nature of seal pattern (the seal pattern should be clean and uniform)
   b) Seal integrity (there should not be any gap between paper and laminate)
   c) Gaps in seal (there should not be any gaps)
   d) Creasing or scorching (there should not be any creasing or scoring)
   e) Seal strength (the seal should be strong enough)
3) If neither the paper nor the laminate tear while opening the pouch, then the seal should be considered as perfect. Usually, it should open neatly along with theseals i.e. both the paper and laminate should separate from each other without a tear.
4) Check the condition of the heat sealer's edge. It should be in good condition for adequate sealing.
5) The edges should be perfectly flush or parallel to the sealing fixture to allow uniform pressure to be exerted.

The checklist should be completed on daily basis. The checklist should be kept in a file for quality control purposes. If any problems are found then the supplier

should be contacted.

DAILY HEAT SEALER CHECKLIST

PROCEDURE	YES	NO
Temperature uniformity (Set the temperature at 185°C for Steripack and 145°C for Tyvek)		
Is the heat sealer sealing edge perfectly flush or parallel to the sealing fixture?		
Seal integrity (No gaps in seal)		
Is there any creasing or scorching?		
Pressure uniformity (Is the pattern uniform?)		
Strength of seal (Pouch opens without tearing)		
(Signature of the CSSD Technician) **(Date)**		

SOP-18: Procedure for Wrapping Medical Devices Ready for Sterilization

Objective

1) To ensure that all instrument sets are complete and safely packed before sterilization.

Area of application

1) Packing area (Clean zone) of CSSD

Procedure

1. Staffs working in this area have to wear personal protective equipment in addition to the normal dress code.
2. Make sure that all work surfaces are clean.
3. Trays should be perforated to allow penetration of the sterilizing agent and efficient drying.
4. The person checking should indicate and sign that the quantities are correct andthat nothing is missing in the instrument set.
5. Instruments must be laid out according to the order on the checklist.
6. The weight of packs must be taken into consideration when assembling trays. Overloaded trays/sets may lead to incomplete dryness of the instruments.
7. Place the instrument list on the top of the tray/set folded inner wrap, between the two layers.
8. Close the inner wrap by taking the wrap on the side nearest to you and folding ittowards the middle of the pack.
9. Fold the edge back towards you, according to the size of the pack, creating a cuff.
10. Repeat this procedure with the opposite side.
11. Paper must be large enough to ensure that both sides meet and overlap in the center.
12. Fold both ends of the wrap to produce a "V" shape.
13. Fold both "V"s towards the center. Both "V"s must meet in the center and overlap.
14. Repeat the folding with the second piece of wrap.
15. Seal the pack with two pieces of masking.
16. Label the pack using a labeling gun. Do not write directly on the wrapping.
17. Place the completed set on the autoclave trolley ready for autoclaving.

SOP-19: Cleaning of Steam Sterilizers (Autoclaves)

Objectives

1) To maintain the steam sterilizer in a good working condition.
2) To prevent the contamination of items due to deposits from the walls of the sterilizer, leaking gasket, or plugged drain.

Area of application

1) Packaging area (Clean zone) of CSSD

Procedure

1) Follow the manufacturer's guidelines for the cleaning of all autoclaves.
2) The autoclave must be turned off and allowed to cool.
3) Daily inspect the door gaskets for cracks and clean it with a lint-free cloth.
4) Wipe outside stainless steel paneling with a lint-free cloth.
5) Daily damp dust loading trolleys carriages, racks, baskets or trays that hold itemsin the sterilizer.
6) Remove the drain plug from the bottom of the chamber and remove lint andsediment from the strainer.
7) Replace the drain plug in the bottom of the chamber.
8) Thoroughly clean the entire inside surface including the walls, rear panel, and floor of the chamber and inside the door.
9) Use a soft mop or lint-free cloth and water to clean.
10) Rinse all the walls of the autoclave thoroughly as detergents can stain the walls ofthe autoclave if not thoroughly rinsed off.

SOP-20: Steam Sterilization Procedure

Objectives

1) To ensure consistent sterilization of items through quality control checks of the autoclave.
2) To ensure that all reprocessed items are sterilized to an acceptable standard and ready for use.

Area of application

1) Packaging area (Clean zone) of CSSD

Daily preparation of autoclaves

1) Check the availability of printing paper.
2) Ensure printer and recorder are working properly.
3) The first cycle is the "warm-up" cycle.
4) The second cycle is a pre-vacuum cycle. In this cycle, place a Bowie & Dick test pack in the warm empty chamber ***above the drain***. Follow manufacturer's instructions to run the Bowie and Dick test.
5) Once the cycle has run, record the Bowie & Dick test result according to the procedure.
6) If the result of the Bowie & Dick test is fail, repeat the test with a new Bowie & Dick test pack.
7) If the Bowie & Dick test result is still failed, shut down the autoclave for repair and recall all sterile packs after the last positive Bowie & Dick test result.
8) Run a weekly biological indicator (BI) test, according to manufacturer's instructions, in the first full load of the specific day as well as any load containing implants.
9) Complete test and record biological indicator (BI) test according to the procedure.

Operational guidelines

1) Record all the contents of a load (The information must be detailed enough to allow for tracking and recall if necessary).
2) Make sure each pack has a tracking label affixed according to the manual tracking system policy of the CSSD.
3) A validation certificate from the packaging material manufacturers is a must to validate that the product contained can be satisfactorily sterilized within the wrap, pouch, container etc.
4) Ensure that items being loaded are compatible with high temperatures.
5) Process full loads (not overloaded) to limit the number of cycles.
6) Load items in a loose fashion to facilitate air removal, and steam penetration of all surfaces (Do not stack items one on top of the other).
7) Packages must not be in contact with the walls or ceiling of the chamber as package damage from heat or moisture may occur.
8) Load the baskets and carts in such a way that the hands won't touch packs when removing the hot trolley.
9) For approved rigid instrument containers, follow the manufacturer's validated loading instructions.
10) Load the autoclave according to manufacturer's instructions, make sure the chamber door is locked, and the appropriate cycle is selected based on the types of items being processed.
11) On completion of the cycle, a cycle complete indicator will appear. Then visually check the graph/printer to determine that all parameters have been met.

12) Follow manufacturer's directions for door opening and load transfer.
13) In the event of a cycle failure/cycle aborted, the entire load needs to be reprocessed through another full reprocessing cycle.
14) The technician responsible for checking the load should write his name on the printout before opening the sterilizer door.
15) Before opening the door, hands should be washed thoroughly following the Institute hand hygiene protocol.
16) Open the door while standing towards the side to avoid burns.
17) Put on heat-resistant gloves and remove the carrier from the autoclave.
18) Allow the carrier to cool for 10-20 minutes before storage or dispensing.
19) Never touch the hot packs.
20) Inspect each package to ensure its integrity.
21) Check the external chemical indicators' color change.
22) Record the results in documentation sheets/register and file for each autoclave according to department protocols.

SOP-21: Loading and Unloading of Items from Autoclaves

Objective

1) To ensure that instrument/equipment packs are correctly loaded and unloaded from autoclaves to maintain sterility.

Procedure

1) Wear appropriate personal protective equipment.
2) Follow manufacturer's instructions for loading and unloading.

3) Load instrument/equipment packs flat in a single layer.
4) Load soft packages on their sides with a hands width between packs.
5) Load soft packs on the top shelf and large/heavy packs on the lower shelf.
6) Do not allow packs to touch the top, bottom or sides of the autoclave chamber.
7) Do not compress packs.
8) Position peel packs on the sides.
9) Do not overload.
10) On completion of cycle record details of the cycle according to CSSD policy.
11) Allow autoclave and packs to cool for 20-30 minutes before handling.
12) Do not touch packs until completely cooled.
13) Do not touch hot racks without wearing heat-resistant gloves.
14) Once packs are cooled, check for wet packs, tears, indicator color changes etc.
15) Store the sterile packs according to CSSD policy.

SOP-22: Monitoring Steam Sterilizers (Autoclaves)

Objective

1) To monitor that all steam sterilizers (autoclaves) are functioning optimally

Procedure

1) Monitoring of steam sterilizers (autoclaves) includes all sterilizer components that track and record time, temperature, and pressure during each cycle, printouts, gauges, round charts, etc.
2) Documentation of critical cycle parameters permits the earliest detection of equipment malfunctions since they can be evaluated when the cycle is in progress.

Sterilization failure can be identified at several stages:

a) Autoclave parameters are not met
b) Biological test shows growth
c) Failure of Bowie & Dick test
d) Failure of process challenge device or load control failure
e) External process indicator failure
f) Internal chemical indicator failure
g) Wet packs

Chemical Indicators

Chemical Indicators are used in combination with the physical parameter to monitor the effectiveness of the steam sterilizers. They monitor the conditions inside the sterilizer chamber or from within the load as part of a total system of sterilization monitoring.

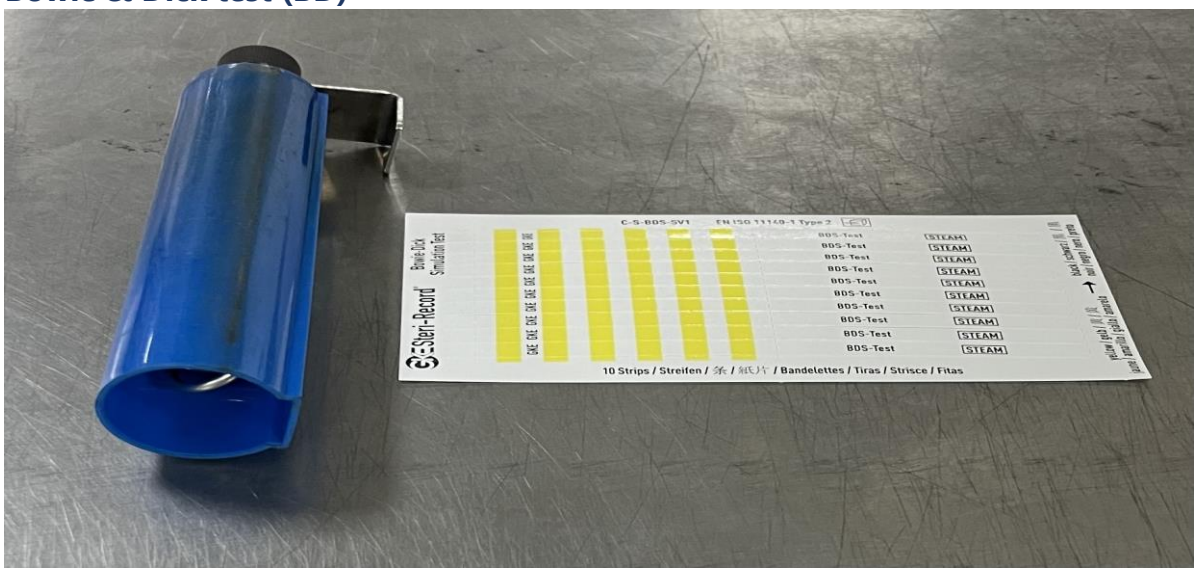
The following three main types of chemical indicators are available:

1) Process indicators
2) In-pack indicators
3) Load controls or Process challenge devices

The EN ISO 11140-1 standard classifies indicators according to intended use or performance criteria as follows:

1) Type 1: Process indicators/external indicators
2) Type 2: Indicators for use in specific tests (Bowie & Dick test)
3) Type 3: Single parameter indicators (Respond to one parameter)
4) Type 4: Multi-parameter indicators (Respond to 2 or more parameters)
5) Type 5: Integrating indicators (React to all parameters/mirror the performance of biological indicators)
6) Type 6: Emulating indicators (React to all parameters/verify specific cycle parameters)

Bowie & Dick test (BD)



1) Bowie & Dick test is to be run and documented at least daily before the first process load and after any steam autoclave shut-down.
2) This test is done to identify whether or not air is being removed completely from the autoclave.
3) Manufacturers of the Bowie & Dick should be followed to get the data on the reliability, safety and performance characteristics of their product as well as for instructions for use storage and handling.
4) The Bowie & Dick is placed on a rack **above the drain** of the autoclave in an **EMPTY load**.
5) A complete and uniform color change indicates a pass.
6) A pass indicates that the sterilization process was effective since there was no air inside the chamber.
7) An incomplete/non-uniform or no color change indicates failure.
8) A fail indicates air was present inside the chamber and sterilization was not

achieved.

9) If fails, the Bowie & Dick test should be repeated.
10) If the result still shows a fail, then the autoclave should not be used.
11) The test results must be recorded and stored.

External chemical indicators

1) A process indicator is placed on the outside of each package to verify that the package has been exposed to the conditions necessary to achieve the sterilization process.
2) The indicator should be clearly visible on the outside of the sterilized package. This helps differentiate sterilized from unsterilized items.
3) The process indicator tape or label should be fixed on the outside of the package or rigid container, once it has been assembled and ready for sterilization.
4) Readily visible and color change provides a quick indication that the load has been exposed to the sterilization process.
5) Before placing the package in a sterile storage rack, it is necessary to check that the process indicator has changed color according to the manufacturer's instruction after the sterilization cycle has been completed.
6) If the color of the process indicators has not changed, the packages should not be kept in the sterile storage rack to release for use.
7) The process indicator helps to detect failures in packaging, loading and sterilizer malfunction.
8) A process indicator pass means the medical device can be moved to the sterile storage area for use.
9) A process indicator failure means the medical device needs to be reprocessed.

Internal chemical indicators

1) Internal (in-pack) chemical indicator can detect sterilizer malfunction or human error in packaging or loading of the sterilizer.
2) The internal chemical indicator should be placed in the densest part of each package.
3) It measures the sterilizing parameters that have been met inside the pack.
4) The nursing officer of the surgical team should retrieve the internal chemical indicator at the time of use and interpret its reaction to the sterilization process.

5) This is a patient legal record and must be stored.
6) If the color change of the internal chemical indicator is even and according to the manufacturer's recommendations, it means it is passed and the medical devicecan be used.
7) If the color change of the internal chemical indicator is uneven and not according to the manufacturer's recommendations, it means it fail and the medical device should not be used.
8) The package should be sent back to CSSD for reprocessing.

Process challenge devices/ Load controls (PCD)

1) This indicates to CSSD staff that the sterilization parameters have been met in the load and that it can be released.
2) The PCD are devices designed to act as a challenge to the steam penetration capability of a sterilizer and are made up of a barrier system, inside of which a chemical or biological indicator is loaded.
3) The intension of a PCD is to challenge the sterilization process, by either using an instant biological indicator (steam) i.e. biological indicator with Type 5 chemical indicator (Integrating indicator).
4) The load checks are reusable devices; therefore a new indicator has to be loaded into it before use.
5) Load the PCD with an unused chemical indicator, following the manufacturer's instructions. Place it in a peel-open sterilization pouch and seal.
6) Place the PCD in every full sterilizer load at a point where steam penetration will be most difficult.
7) Process the load as usual.
8) After the sterilization process, retrieve the PCD and interpret the result of the chemical indicator against its color standard.
9) The test result pass or fail should be recorded in the sterilizer logbook.

10) Complete uniform color change means pass.
11) If the PCD shows a pass, it can be assumed that the entire load has met the necessary conditions required for that particular sterilization process. It indicates that the sterilization process was effective and autoclave load can be released.
12) Incomplete color change means fail.
13) If the test result is a fail, the load should be quarantined and not used until the reason for the failure can be determined and rectified. It indicates that the sterilization process was ineffective and the load cannot be released.
14) If PCD fails, repackage all sets with new indicators and re-autoclave.
15) If results still show a fail, the autoclave should not be used.

Biological indicators (BI)

1) Biological indicators are the preparation of living spores that provide a defined resistance to a specified sterilization process.
2) A pass BI indicates sterilizing conditions were adequate to kill micro-organisms.
3) In BI, non-pathogenic micro-organisms are used.
4) The manufacturer of the BI provides data on the reliability, safety, and performance characteristics of their product, as well as for instructions for storage,handling and use.
5) A test must be performed at least once a week in each sterilizer.
6) Place the BI in a test pack, into the center of a full load.
7) Process the load as usual.
8) After sterilization, retrieve the BI test out of the pack.
9) Allow the BI to cool for 10 minutes after sterilization. (Note the BI contains a glass ampoule, which needs to cool before crushing and incubating)
10) Check the chemical indicator strip on the BI has changed appropriately according to the manufacturer's instructions.
11) Record the sterilizer, load and date on the BI label.
12) Crush the vial inside of the self-contained BI and start incubation.
13) Follow BI manufacturer's instructions for activation and incubation.
14) Now take an unprocessed BI from the same box/batch, and write a 'C' (control) onthe side of it.
15) Write the date on the vial.
16) This control vial does not go through the sterilization cycle and validates that the spores and media solution are viable, the incubator is operating at the correct temperature and that the BI's have been stored correctly.
17) Incubate the test BI and the control BI for 24 to 48 hours according to the manufacturer's instructions.

18) Run control BI every time a BI is incubated.
19) If the spores are alive, they give off an acid, which changes the color of thesolution in the vial.
20) Check for any signs of color change.
21) Document the visual result at 24 or 48 hours in the Log Book, dependent on the type of spore being used.
22) Negative '-' means no color change and no growth and the sterilization process was effective.
23) Positive '+' means color change and growth of microorganisms. It indicates microorganism growth and sterilization was not achieved.
24) If there is a BI failure on any load, the whole load must be recalled, repackaged,and resterilized.
25) The BI results must be recorded and stored according to CSSD policy.

Maintenance

The following information should be recorded in the maintenance logbook for each autoclave:

1) Date of servicing or repair work
2) Description of work performed
3) Name of the service engineer
4) Signature of the service engineer

SOP-23: Ethylene Oxide (ETO) Sterilization

Objectives

1) To ensure that all ETO sterilizers are functional and operated according to departmental policy.
2) To ensure that all reprocessed medical devices are sterilized to an acceptable standard and ready for use.
3) To ensure that the work environment is safe for employees.

Area of application

1) Packaging area (Clean zone) of CSSD

Safety warnings

1) ETO is an odorless gas
2) Skin contact with liquid ETO - immediately wash the affected area.
3) Eye contact with liquid ETO - flush eyes with copious amounts of water for at least15 minutes.
4) Ensure staffs have been educated regarding safety precautions when working withETO.

Procedure (Preparation of ETO Sterilizer)

1) All staff members must be aware of the policy and procedures related to ETO sterilization.
2) Operators need to understand the environmental requirements and safe work practices.
3) Operators must know about the emergency management procedures in case

of a leak or accident.

4) The ETO sterilizer must be operated following the manufacturer's instructions.
5) Ensure the work environment is safe for employees.
6) Ensure the availability of computer printout paper.
7) Ensure printer is working where applicable.
8) Complete the test and record the biological indicator (BI) test according to the manufacturer's instructions.
9) The ETO sterilizer must be kept in a room with dedicated exhausts, emission control, ventilation, air exchanges, and environmental monitoring provided.
10) Single-use cartridge delivers the appropriate volume/concentration of ETO.
11) Check with the ETO cartridge manufacturer for their storage recommendations and MSDS sheet.
12) ETO gas must be stored at the prescribed temperature in a well-ventilated area in a safety cabinet marked with a hazardous materials label.
13) The cycle must be long enough to allow thorough ETO penetration to kill microorganisms.
14) The sterilizer operating temperature is usually pre-set by the sterilizer manufacturer. There are usually two options: 37^0C (cold cycle) 55^0C (warm cycle).
15) The manufacturer of a device is responsible for providing validated information regarding proper sterilization and aeration of their products, usually between 1 to 6 hours, depending on the concentration, humidity, temperature parameters and the type of sterilizer.
16) The ETO cartridge must be discarded safely according to gas manufacturer/supplier and hospital policies.
17) Personnel exposure must be measured as a Time Weighted Average based on environmental exposure. Average personnel exposure concentration should be measured over a specific period, usually 8 hours.
18) The employer must ensure that no employee is exposed to airborne concentrations of ETO above the concentration recommended by suppliers (<1ppm).
19) The ETO won't penetrate the soil, so proper cleaning and decontamination must be done for the items that will be processed.
20) Soil and liquids hinder sterilization efficacy and may result in harmful residuals being formed: Water + EO = Ethylene Glycol (Antifreeze); Saline + EO = Ethylene Chlorohydrins (Possible carcinogen).
21) Material compatibility with ETO must be validated by the device manufacturer.
22) If plastic instrument containers/trays are used, make sure they can be sterilized with ETO and aerated.
23) The ETO must be aerated from the device within and from the plastic container itself with no cumulative ETO absorption/residual into the plastic that cannot be

satisfactorily removed by each aeration cycle.

24) Plastic, rubber or silicone mats must have been validated by the manufacturer for suitability in ETO processing.
25) Make sure that instrument tip protector manufacturers have validated their recommendations for the application and use of ETO.
26) Verify with the manufacturer if color code tape can be used with ETO.
27) Packaging manufacturers must validate that the product contained can be satisfactorily sterilized within the wrap, pouch, container, etc., and can release ETO upon aeration in a reasonable amount of time; not only from the device but the packaging material too.
28) Do not use plastic-coated baskets unless designed and validated for ETO sterilization and aeration.
29) Label each package according to CSSD policy.
30) Load items in a loose fashion to facilitate air removal, humidification, ETO circulation and penetration of all surfaces, and ETO removal during aeration.
31) Packages must not contact walls or ceiling of sterilizer chamber, as package damage from heat or moisture may occur.
32) Process full loads to limit the number of cycles you need to run.
33) Load the sterilizer according to the manufacturer's instructions, make sure the door to the chamber is locked, and the appropriate cycle is selected based on the types of devices being processed.
34) Group similar products that need the same aeration times to avoid ETO gas exposure when opening the sterilizer to retrieve items.
35) Length of aeration depends on the composition of materials, thickness, design, and weight of the device and its wrapping, sterilization and aeration system used, temperature, ETO concentration, duration of gas exposure, rate of air exchange, and airflow pattern.
36) Follow manufacturer's directions for door opening.

SOP-24: Monitoring Ethylene Oxide (ETO) Sterilization

Objective

1) To ensure that all ETO sterilizers are functioning optimally.

Procedure

Physical monitors

1. Check all measures that the ETO machine is functioning effectively.
2. Monitoring includes all sterilizer components that track and record time, temperature and pressure during each cycle, printouts, gauges, round charts, etc.

3. Documentation of critical cycle parameters permits the earliest detection of equipment malfunctions since they can be evaluated when the cycle is in progress.

Chemical indicators (CI)

1. The chemical indicators indicate that the load has been exposed to the conditions necessary to achieve sterilization.
2. They help to detect failures in packaging, loading, and sterilizer malfunction.
1. They are placed on the outside of each pack to be sterilized.
2. Often included on load record cards.
3. Readily visible and color change provides a quick indication that the load has orhas not been exposed to the sterilization process.
4. If the process indicators have not changed, the packages should NOT be releasedfor use.

Biological indicators (BI)

1. Indicates that sterilizing conditions are adequate to achieve sterilization.
2. A non-pathogenic microorganism, *Bacillus atrophaeus* is the microorganism of choice for monitoring ETO sterilization as it offers the best test challenge since itis most resistant to kill.
3. The manufacturer of the BI provides data on the reliability, safety, and performance characteristics of their product, as well as for instructions for storage,handling, and use.
4. An important factor to remember is that the equipment sets/trays prepared with surgical towels may absorb too much of the humidification available to the ETO process that the biological indicator may show positive results because enough humidity was not available to kill the test spore. Thus limited absorbent surgical towels should be used.
5. The BI is placed into the center of a full load. Consider placing the test pack into a small metal basket or instrument tray for easy retrieval.

Incubation

1. Follow BI manufacturer's instructions for activation and incubation.
2. Be careful with dual temperature incubators; be certain you put the ETO BI in the appropriate place. For example, ETO (*Bacillus atrophaeus*) is incubated at 37°C for 48 hours; but steam (*Geobacillus stearothermophilus*) is incubated at 55°C for 48 hours. The *Bacillus atrophaeus* does not grow at higher temperatures.
3. Incubate an activated but not sterilized BI as a control to verify that the test

microorganisms are alive and ready for use in testing.
4. Run control BI every time a new package of BI's is opened and in every week.
5. If there is a BI failure on any load, the whole load must be recalled, repackaged, and resterilized.

Test results

1. Negative "-" test results indicate that the sterilization process was effective since there was no growth.
2. Positive "+" test results indicate that there was microorganism growth and the sterilization was not achieved.
3. Implants that have been ETO sterilized must not be released until the BI results are known.

Record Keeping

1. Load record register
2. Packages must be properly identified and recorded on the register.
3. Expiration date or statement, load contents, sterilization date, load number, sterilizer number, and name of the sterilizer operator must be on the register. The package load stickers should also be affixed in the register. All of this helps with package retrieval in case of a recall.

SOP-25: Malfunction of Ethylene Oxide (ETO) Sterilizer

Objectives

1) To ensure that all ETO sterilizers are monitored and operated according to CSSD policy and procedures.
2) To ensure a safe work environment

Safety warnings

1) The ETO is an odorless gas.
2) Skin contact with liquid EO-immediately wash the affected area.
3) Eye contact with liquid EO-flush eyes with copious amounts of water for at least15 minutes.
4) Ensure staff has been educated regarding safety precautions when working with ETO.

Procedure

1) Notify Faculty In-Charge or other technicians.
2) Remove sterilizer from service.
3) If the malfunction compromised the sterility of the load, the load is aerated adequately and reprocessed.
4) Microprocessor-controlled ETO sterilizers are designed to indicate

"error"conditions that may lead to malfunction.

5) Messages are provided to alert the operator and are part of the cycle record.
6) Do not use until an Engineers has signed that the machine is safe to use.
7) Do not use after repair until a routine biological test is done.

SOP-26: Hydrogen Peroxide Plasma Sterilization

Objectives

1) To ensure that plasma sterilizers are operated according to department policy.
2) To ensure that all instruments/equipment are sterilized according to an acceptable standard and ready to use.
3) To ensure that the work environment is safe for all employees.

Safety warning

1) Always wear gloves while handling hydrogen peroxide (H_2O_2) cartridges and when removing items from the sterilizer if the cycle has been aborted

Procedure

1) Items that cannot be sterilized in a plasma sterilizer are
   a) An item that is not completely dry
   b) Items or materials that absorb liquids
   c) Items made from materials containing cellulose e.g. cotton, paper, cardboard,linens, gauze or items that contain wood pulp, etc.
2) Wear appropriate personal protective equipment.
3) Check items for any damage.

4) Check the expiry date of the H_2O_2 cartridge.
5) Use manufacturer-approved biological indicators.
6) Place biological indicator into a PCD.
7) Weekly biological monitoring is must.
8) Place the PCD with biological indicator in a load in the sterilizer.
9) Place the biological indicator in the sterilizer as per the manufacturer's recommendation (Sterrad=back of the chamber on the bottom shelf with the opening toward the back of the chamber).
10) Process biological indictor.
11) Incubate biological indicator at temperature as recommended by the manufacturer i.e. 55^0C for 48 hours.
12) Prepare items for loading.
13) All items must be thoroughly cleaned and dried before packaging.
14) Use packaging and containers recommended by the manufacture.
15) Place chemical indicator in each packaged item.
16) Load the sterilizer.
17) Arrange items in such a way as to ensure sterilant can come into contact with all surfaces.
18) Do not allow any pack/item to touch the walls or the door.
19) Do not stack containers.
20) Place items packed in Tyvek on their sides.

SOP-27: Sterile Pack Storage

Objective

1) To ensure the safe storage of all sterile packs up to release to other departments.

Area of application

1) Sterile storage area (Green zone) of CSSD

Procedure

1) This is a clean area and should be kept clean and tidy at all times with limited access.
2) Ensure that stock is rotated and monitored.
3) Only the members working in the packaging area (Clean zone) of the CSSD will issue out packs to customers following all the formalities.
4) The entry door and pass box must be kept closed.
5) Temperature and relative humidity should be maintained.
6) The area should be arranged to make it easy to identify packs of every user department.
7) There should be enough shelves and baskets available to store all sterile goods without having to stack them tightly or on top of one another.
8) Products should be stored away from outside walls.
9) There should be space between shelving and floor and ceiling to allow air to circulate and to allow cleaning of the floor area.
10) All sterile items/packages should be stored at least 1 ft from the floor, 1½ ft from the ceiling and ½ ft from outside walls to allow for air circulation in the room and to prevent contamination during cleaning.
11) Items should not be stored next to or under sinks, on the floor or windowsills where they are likely to get wet or damaged.
12) Large packs should not be bent or folded.
13) Storage components should be designed in such a way so that anyone can easily see the number of products in storage. The FIFO (first-in-first-out) principle should be followed.
14) It should be easy to clean the shelves and air to circulate around stored products.
15) Products should be stored away from direct sunlight and water.
16) Do not squeeze packs into tight spaces as this can tear the packaging.
17) Cardboard boxes should not be used for storage as they release fibers are difficult to clean and sometimes the rough edges can make holes in the packaging.
18) Shipping cartons should not be brought into the sterile storage area because they can collect microorganisms during transport, which can increase the risk of infection.
19) Surfaces in contact with sterile goods should be as clean as possible to prevent microorganisms from penetrating the packaging.
20) Trolleys should be cleaned and dried after each use because even though they areused with sterile items, contamination can occur during transport outside the CSSD.

Shelf life

1) The shelf life of a pack depends on the packaging, handling, and storage conditions. In fact, it depends on events rather than time.
2) This also applies to all commercially prepared items which are labeled as "sterile unless opened or damaged".
3) The date on a sterile package indicates the date the item was sterilized. Sterility is maintained as long as the integrity of all barrier properties and seals are maintained.
4) The expiration date is a reminder "Use Before" or "Use First".
5) Storage conditions will be such that product integrity is not compromised by moisture or any other means which breach the wrapping materials.
6) The probability of a contaminating event happening increases over time. The shelflife of a product can be maintained by:
    a) Reducing its exposure to direct sunlight, excessive temperatures and humidity.
    b) Reducing the handling and transportation as much as possible.
7) Events that can compromise the sterility of a sterile item include:
    a) Holes or torn wrappers
    b) Securing tapes or locks that have been tampered with or removed
    c) Broken or incomplete seals on laminated pouches
    d) Items that have been dropped on a dirty surface
    e) Exposure to blood, body fluids or any type of moisture
    f) Use of cardboard boxes
    g) Use of elastic bands or tapes to bundle items

Important: The expiry date is only a guide. Events related to the storage of products are critical for the ability of materials used to maintain integrity. Any event which could deteriorate the wrapping material must be managed so that wraps are not damaged in any way and the sterility of contents compromised.

SOP-28: Delivery and Distribution of Processed Items

Objective

1) To ensure customers receive appropriate sterile items in a safe condition and ready to use.

Area of application

1) Sterile storage area (Green zone) of CSSD

Procedure

1) All items need to be checked for sterility

before they are released from CSSD.

2) The following should be checked when deciding if the pack is still sterile:
   a) Holes or tears
   b) Wetness or stains
   c) Broken seals
   d) Dust
   e) Evidence of crushing etc.
3) All damaged items must be returned to the decontamination area (Dirty zone).
4) All items issued have to be recorded so that a tracking system remains effective.
5) Sterile supplies should be transported in green color-coded covered or enclosed trolleys with a solid bottom shelf. The solid bottom shelf prevents microorganisms on the floor from being picked up by the wheels of the trolley and then spun upwards onto the sterile packs.
6) If items are placed inside plastic or paper bags, they should be arranged to prevent them from being crushed or damaged during transport. They all protect medical devices from damage.
7) Trolleys must not be overloaded.
8) Loaded trolleys must not be left to stand.

SOP-29: Quality Control

Objective

1) To ensure that the CSSD provides a quality service.

Area of application

1) All areas where items are reprocessed

Procedure

The area where the test is to be performed	Details of test
Cleaning area (Dirty zone)	1) Check that complete sets have been received from the user department. 2) Check spray arms and jets of washer and disinfectors. 3) Check enzymatic solution levels on washers. (three doses) 4) Soil tests according to the CSSD policy. 5) Check tracking system is in place.

Packing area (Clean zone)	1) All instruments to be visually inspected for cleanliness or functionality. 2) Damaged items should be dealt with according to CSSD policy. 3) Check all instruments are present in a particular set and packed correctly. 4) Place a chemical in-pack (Type-6) indicator. 5) Place an external chemical indicator (Type-1) on the packet. 6) Check the functioning of heat sealers daily.
Sterilization area (Clean zone)	1) Mechanical monitoring of all sterilizers (Steam, ETO, and Plasma). 2) Perform daily BD test on all steam sterilizers. 3) Perform weekly Biological tests (BI) on all sterilizers. 4) Check that all packs have external chemical indicators before loading into the sterilizer. 5) Check load control test has passed before the load is released. (Ensure a positive color change and record it) 6) Check that all parameters have been met on the autoclave printout and record it.

	7) Complete any log/documentation sheet or register. 8) Check that all items removed from the sterilizer are intact, dry, and undamaged. 9) All items with residual moisture, tears or from a failed cycle are to be dealt with following the CSSD policy. 10) Check tracking system is in place and record it.
Sterile Storage Area (Sterile zone)	1) Before releasing items/packages for delivery, check the packaging for damage. 2) Reject any suspect packs and unpack them before sending to the wash area for reprocessing. 3) Check the external chemical indicator (Type-1) to ensure that the pack has been subjected to the sterilization process. 4) Check tracking system is in place and record it.

SOP-30: Recall Procedure

Objective

1) To ensure that any product suspected of being substandard is identified, quarantined, collected, investigated and the findings recorded.

Area of application

1) CSSD, OTs, ICUs, IPDs, OPDs, Casualty, etc.

Procedure

1) In the event of sterilization failure such as positive biological indicators/failedload controls or sterilizer malfunction, items from that test and previous loads after the last known good test must immediately be recalled.
2) All affected packages must be recalled in the event of failed quality management tests i.e. Biological indicator, Load Control.
3) A written "Recall Procedure" must be followed in the event of a sterilization failure.
4) The sterilizer must be shut down and all staff must be made aware that it is out of operation.
5) The sterilization record register should be checked for a list of "sterilized" items that need to be recalled.
6) The recall procedure should be documented on the sterilization record sheets listing what items have been retrieved and reprocessed and which items had already been used and on whom. Items that may have already been used on the list should be documented.
7) As it becomes apparent that items need to be recalled, reprocessing personnel must immediately notify users and retrieve the supplies from storage and user as soon as possible.
8) A recall will be done by the Faculty In-Charge of the CSSD.
9) Affected departments should be advised verbally as soon as possible, with a follow-up written confirmation advisory stipulating which items, trays/packs froma particular batch are suspect and should be returned.
10) Departments should be requested to check their sterile stock as well as used stock for the suspect batch.
11) The following details are to be given:
    a) The name of the sets to be recalled
    b) The sterilization date
    c) Details of the action to be taken
    d) Reasons for the recommended actions and any likely associated hazards

12) The CSSD staff must do all necessary actions to confirm that the check has been carried out completely.
13) Recalled items have to be labeled "**Under Quarantine**" whilst in transit to the cleaning area of the reprocessing area where it will be reprocessed or be put into quarantine.
14) All items retrieved from a recall must be completely reprocessed.
15) All items must be disassembled, cleaned, reassembled, rewrapped and sterilized.
16) Once the sterilizer has been repaired all monitoring results must be checked before the sterilizer is used.
17) The cause of the recall should be investigated and a written report must be stored.

SOP-31: Validation of Equipment

Objective

1) To ensure that all equipment that can influence quality or safety is not used for processing until its performance has been approved.

Area of application

1) All equipment (new or used)

Procedure

1) Ensure all new equipment ordered for CSSD is appropriate and safe to use.
2) Copies of any relevant documentation relating to the equipment must be given to the Faculty In-Charge of CSSD.
3) Equipment will not be used until it has been validated and assurance is given that the equipment will give an acceptable quality of product and is safe to operate.
4) The supplier/installer/manufacturer should verify in writing that all is in order byway of a certificate.
5) This certificate is to be maintained with the logbook for the equipment.
6) Equipment will only be used after the necessary training is given to the staff.
7) No new or replacement equipment will be used without the appropriate approvaland training.

SOP-32: Action for Breakdown of Equipment

Objectives

1) To record all breakdowns of machinery
2) To record reasons for breakdowns
3) To record action taken to remedy breakdown

Procedure

1. All equipment breakdowns are to be reported to the Faculty In-Charge, CSSD.
2. The equipment is to be removed from further use by switching off (if appropriate),implementing the defect reporting procedure and attaching a clear label showing "**Out of Action-Not for Use**".
3. The equipment must be handed over to the designated service Engineer.
4. The handing over must be documented in the logbook.
5. All breakdowns or repairs must be phoned in to the relevant manufacturer if still

under guarantee/CMC.

6. If equipment is still under guarantee/CMC, NO-ONE must attempt to repair the equipment without the manufacturer's permission.
7. Equipment on loan or used under service exchange must be returned to the relevant company for repair or replacement.
8. All breakdowns are to be recorded in the relevant logbook and the engineer must enter the job number and repairs completed and signed before the equipment is put back into use.