All India Institute of Medical Sciences, Raipur

आरोग्यम् सुख सम्पदा

HOSPITAL INFECTION CONTROL MANUAL

2019

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Version 2.0

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HOSPITAL INFECTION CONTROL COMMITTEE
All India Institute of Medical Sciences, Raipur

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CHAPTER 1

Organization of Hospital Infection Control Programme at AIIMS Raipur

1. INTRODUCTION

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.

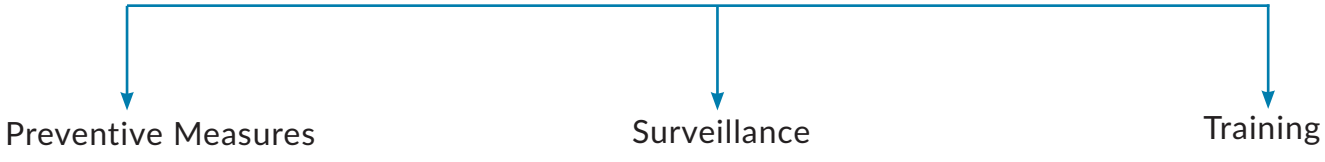
It is important to minimize the risk of spread of infection to patients and staff in hospital by implementing good infection control programme.

Healthcare-associated infection (HCAI) is one of the most common complications of healthcare management and is defined as *an infection occurring in a patient in a hospital or other healthcare facility in whom the infection was not present or incubating at the time of admission. This includes infection acquired in the hospital but appearing after discharge and also occupational infection among staff of the facility.*

This document outlines the broad Principles and Practices of Infection Control that are essential for the prevention and management of these infections.

2. COMPONENTS OF HOSPITAL INFECTION CONTROL PROGRAM

There are three main components of Hospital Infection Control Program



2.1. Preventive Measures

a. Standard Precautions.

b. Isolation Precautions under certain special circumstances or outbreak situation. Eg., combating Swine Flu, MRSA outbreak in any unit etc.

c. Immunization of Healthcare Workers (HCWs).

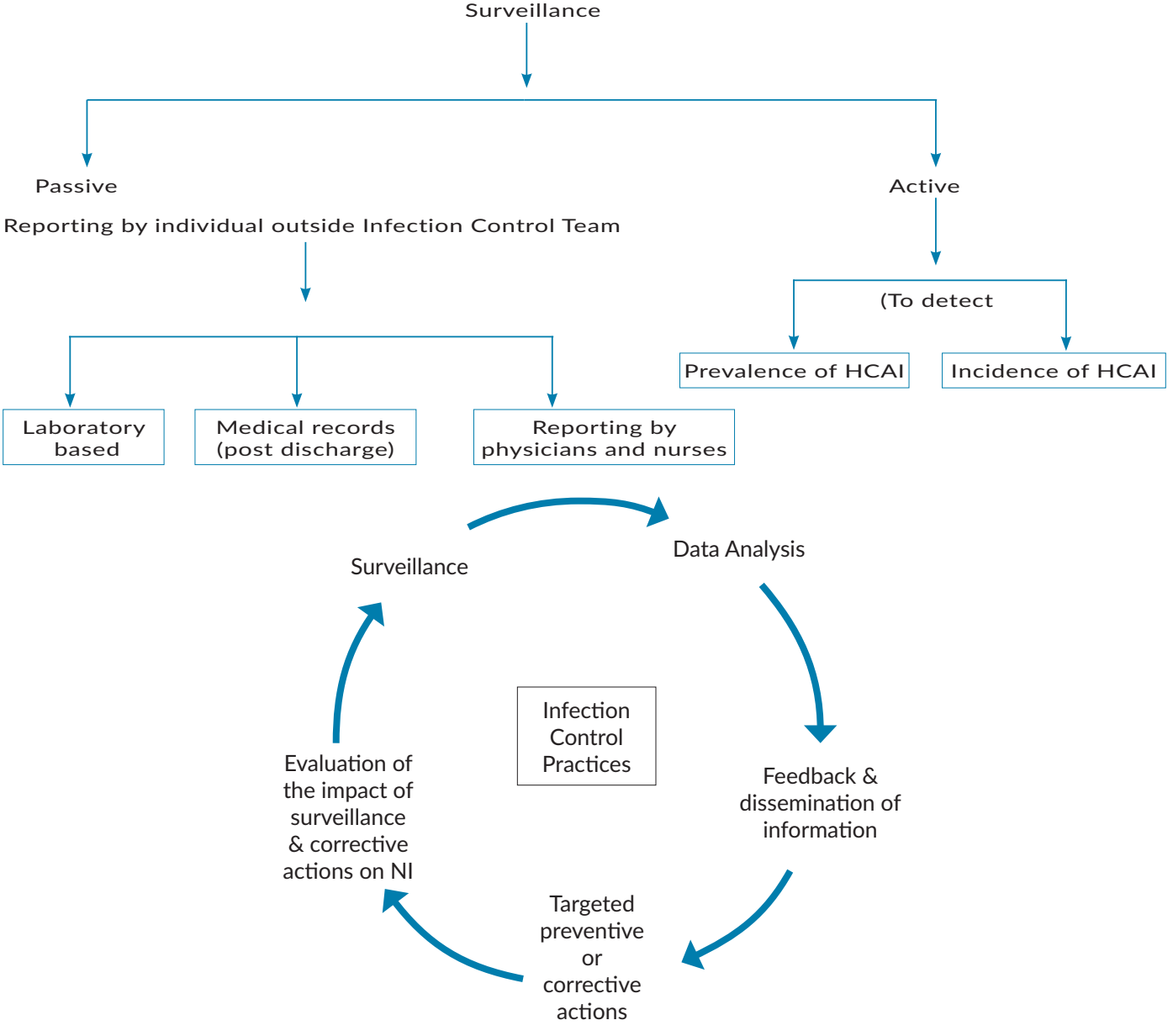
d. Sterilization, disinfection and decontamination of medical instruments and environment.

e. Bundle care approach for certain procedures.

f. Appropriate use of Personal Protective Equipment (PPE).

g. Antimicrobial stewardship program.
h. Use of single use devices.
i. Spill management.
j. Reporting and Management of accidental injuries by sharps.
k. Use of blood and blood products.
l. Hospital Bio Medical Waste Management.
m. Environmental Management Practices.

2.2. Surveillance



2.3. Training of HCWs

a. Sensitization about infection control programme and practices to all cadres of HCWs.

b. Organise and impart periodic in-house training to HCWs.

c. Send members of Hospital Infection Control Committee (HICC), Infection Control Team (ICT), Physicians and Nurses to apex institute for training and create master trainers.

d. Organising regular workshops, symposia, CME and conference on infection control for hospital staff.

3. HOSPITAL INFECTION CONTROL COMMITTEE AT AIIMS RAIPUR.

A Hospital Infection Control Committee (HICC) was constituted by the Hon'ble Director of AIIMS, Raipur.

3.1. Objectives of HICC

a. To minimize healthcare associated infections among patients, staff and visitors.

b. To minimize development of antimicrobial resistance and promote rational use of antimicrobials by antimicrobial stewardship program.

3.2. The Committee is as Follows

1	Dr. Ajay Dani, Medical Superintendent, AIIMS Raipur	Chairman
2	Dr. P.K. Neema, Professor and Head, Anaesthesiology	Member
3	Dr. A.C. Agrawal, Professor and Head, Orthopaedics	Member
4	Dr. Manisha Ruikar, Professor and Head, CFM	Member
5	Dr. Sarita Agrawal, Professor and Head, Obst. & Gyn	Member
6	Dr. Anudita Bhargava, Addl. Professor, Microbiology	Member-Secretary
7	Dr. Padma Das, Addl. Professor and Head, Microbiology and Member Secretary, BMWM Committee	Member
8	Dr. Debjyoti Mohanty, Addl. Professor and Head, General Surgery	Member
9	Dr. Neeta Misra, Addl. Professor, Ophthalmology	Member
10	Dr. Nitin Borkar, Assoc. Professor, Pediatric Surgery	Member
11	Dr. Ajoy K. Behera, Assoc. Professor, Pulmonary Medicine	Member
12	Dr. Sabah Siddiqui, Assoc. Professor, General Medicine	Member
13	Dr. Atul Jindal, Assoc. Professor, Pediatrics	Member
14	Dr. Ripu Daman Arora, Assoc. Professor, ENT	Member
15	Dr. Santosh Rao, Assoc. Professor, Dentistry	Member

16	Dr. Nitin Kashyap, Assoc. Professor, CVTS	Member
17	Dr. Satyajit Singh, Assist. Professor, Cardiology	Member
18	Dr. Anil Kumar, Assist. Professor, Neurosurgery	Member
19	Dr. Ujjwala Gaikwad, Addl. Professor, Microbiology	Infection Control Officer (ICO)
20	Dr. Gouri Kumari Padhy, Addl. Professor, CFM	Member – ICT
21	Mrs. J. Jeaya Reka, Assoc. Professor, Nursing	Member
22	Mr. Nayan Parakh–Junior Engineer (Civil)	Member
23	Mr. Nithin Varghese, Nursing Officer	Infection Control Nurse (ICN)
24	Mr. Yaramareddy Pawan Kumar, Nursing Officer	Infection Control Nurse (ICN)
25	Mr. Libin Abraham, Nursing Co-ordinator	Member
26	Ms. Asha Roshan, Nursing Officer-in-Charge, Major OT	Member
27	Mr. Bishanu Charan Nath, Technical Supervisor, CSSD	Member
28	Mr. Santosh Giri, In-charge, House-keeping Services, Hospital	Member

3.3. Roles and Responsibilities of HICC

a. Developing and preparing various infection control policies and protocols.

b. Promote, implement and monitor optimum infection control practice at all levels of the health facilities.

c. To review and approve an annual programme for surveillance and prevention of HAI.

d. To review epidemiological surveillance data and identify the areas for interventions.

e. To ensure appropriate staff training in infection control and prevention.

f. Developing an effective and practical Antimicrobial Stewardship Program (AMSP) for the institute.

g. To review risks associated with new technologies and monitor infectious risks of new devices and products.

h. To provide expert advice, analysis and leadership in outbreak investigation and control.

i. Research for Infection Control (IC).

j. To communicate and cooperate with other committees of the hospital with common interest such as Biomedical Waste Management Committee, Hospital Blood Transfusion Committee, Antibiotic Policy Committee and Kayakalp Committee.

3.4. Roles and Responsibilities of Member-Secretary, HICC

a. Co-ordinating between hospital administration, Chairperson, other members of HICC and ICT (Infection Control Team).

b. Developing recommendations of various Infection control policies with other members of HICC and ICT.

c. Making an Antimicrobial stewardship program (AMSP) for the institute. Proposing an AMSP team to the Chairperson of HICC.

d. Conducting regular meetings of HICC. Preparing minutes of the meeting and disseminating the same to all the stakeholders of healthcare facility.

e. Conducting emergency meetings in case of outbreak or any other alert situation.

f. Providing action plans in case of any outbreak or any other alert situation like isolation of MDRO from any patient of the hospital.

g. Procuring relevant data from various healthcare units (wards) and laboratories of the hospital for surveillance of HAIs, outbreak investigation and making policies/ recommendations for AMSP.

h. Coordinating the organization of various trainings and workshops for different cadres of HCWs on various aspects of Infection prevention and control.

3.5. 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 kept by the secretary.

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

4. INFECTION CONTROL TEAM AT AIIMS RAIPUR

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

4.1. Members of The Hospital Infection Control Team (ICT) of AIIMS, Raipur

1.	Dr. Ujjwala N. Gaikwad	Infection Control Officer
2.	Dr. Gouri Kumari Padhy	Epidemiologist
3.	Mr. Nithin Varghese	Infection Control Nursing Officer
4.	Mr. Yaramareddy Pawan Kumar	Infection Control Nursing Officer

4.2. Roles and Responsibilities of ICT

1. Coordination and implementation of all infection control and prevention activities. The team is responsible for day-to-day functioning of infection control program.
2. Prepare standard operational procedures for various Infection Control practices.
3. Monitor/Audit the standard precautions as practised by all cadres of HCWs.

4. Conduct active surveillance for the most common HAIs.
5. Periodical training of all category of healthcare workers about Infection Control Protocols and Policies.
6. Monitor the ongoing methods of sterilization and disinfection.
7. Introduce new policies and protocols on the method of disinfection and sterilization.
8. Monitor the quality of in-use and newly purchased disinfectants.
9. Regular monitoring of engineering department and water supply.
10. On-site activities for investigation of an outbreak as recommended by Outbreak Control Team (OCT).
11. Implementation of AMSP and supervising the use of antimicrobials and ensuring its rational use, thereby reducing emergence of further antimicrobial resistance.

4.3. Roles and Responsibilities of ICO

1. The ICO supervises the surveillance of healthcare associated infections.
2. He/she supervises the various infection control programs.
3. Co-ordinate with the HICC in planning Infection Control Programme and Policies.
4. Develops SOPs for various Infection Control Practices.
5. Compile and disseminate data on monitoring of various infection control practices like hand hygiene audit, in-use disinfection testing, environmental microbial surveillance etc. to the stake holders.
6. Compile and present the data of HAIs, hand hygiene audit, disinfection testing, Occupational exposure events, environmental testing etc. in the HICC Meetings.
7. Keep a track of any developing outbreaks. Plan and participate in appropriate management of an outbreak.
8. Participate, guide in research activities related to infection control practices and publish them.
9. Advise on the appropriate use of antibiotics.
10. Appropriate action to be planned in case of isolation of a MDRO/ Pan drug resistant bacteria in the laboratory. This information may be received regularly from the hospital bacteriology laboratory or from the clinician.
11. Ensuring safe laboratory practices to prevent laboratory acquired infections among staff.
12. After receiving antibiogram data from the laboratory the ICO compiles and provides summary reports of prevalence of resistance, bacteria-wise, syndrome-wise and/or unit-wise.
13. Monitoring sterilization, disinfection and the environment where necessary.

4.4. Responsibility of ICN

The ICN is the link between the HICC and the wards/ICUs etc. in identifying problems and implementing solutions.

1. The ICN conducts daily Infection control rounds and records his observation. He maintains records and statistics regarding IC activities.
2. During the infection control rounds he 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).
3. The ICN ensures that all relevant positive culture cases are traced inpatient unit, if it complies with the definition of a HAI, a hospital infection surveillance sheet or surgical site infection sheet is filled and recorded.
4. 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.
5. Performs on-site auditing of various Infection control practices especially, universal precautions like hand hygiene, use of PPE etc.
6. Liaison between laboratory and ward staff: Informing head of department and giving advice on infection control issues.
7. Immediate attention in Needle Stick Injuries (NSIs) and other occupational exposures and facilitates post-exposure measures. Maintains registers and data of Sharps/NSIs and Post–exposure prophylaxis.
8. Notification of communicable diseases and other notifiable disease to the ICO.
9. The ICN is involved in education of practices minimising healthcare associated infections and hand hygiene among healthcare workers.
10. Informs anomalous/irrational use of antibiotics to ICO that must be discussed in HICC meetings.
11. Monitoring engineering activities like maintenance of water filters/RO plants registers and cleaning register of water tanks etc.
12. Conducts special tasks given to him/her as per components and objectives of the hospital infection prevention and control.

5. HIC MANUAL

The overall aim of this document is to provide evidence- based information in the prevention and control of infection. It is relevant to all staff including doctors, nurses, other clinical professionals and managers working in the hospital. This document will be updated as and when required.

Protocols for Infection Control Practices at AIIMS Raipur

Following protocols have been prepared by HICC, AIIMS Raipur and are recommended for strict compliance.

S. No.	Name of the Protocol	Details	Date of Creation	Amend-ments
1	Decontamination of hospital environment	AIIMSRAIPUR/HICC/SOP/**01** version 01	01.01.16	26.12.18
2	Cleaning, Disinfection and Sterilization of Patient care items	AIIMSRAIPUR/HICC/SOP/**02** version 01	01.01.16	26.12.18
3	Hand Hygiene	AIIMSRAIPUR/HICC/SOP/**03** version 01	26.12.16	26.12.18
4	Personal Protective Equipment (PPE)	AIIMSRAIPUR/HICC/SOP/**04** version 01	26.12.16	26.12.18
5	Isolation and Barrier Nursing (old)/ Infection Control Precautions (new)	AIIMSRAIPUR/HICC/SOP/**05** version 01	26.12.16	26.12.18
6	Organization of Infection Control program at AIIMS Raipur	AIIMSRAIPUR/HICC/SOP/**06** version 02	26.12.16	26.12.18
7	Surveillance of various HAI	AIIMSRAIPUR/HICC/SOP/**07** version 02	26.12.18	-
8	Central Sterile Supply Department (CSSD) Workflow and Protocol	AIIMSRAIPUR/HICC/SOP/**08** version 02	26.12.18	-
9	Spillage Management	AIIMSRAIPUR/HICC/SOP/**09** version 02	26.12.18	-
10	Laundry and Linen Management	AIIMSRAIPUR/HICC/SOP/**10** version 02	26.12.18	-
11	Occupational exposure and its management	AIIMSRAIPUR/HICC/SOP/**11** version 02	26.12.18	-
12	Prevention of surgical site infections	AIIMSRAIPUR/HICC/SOP/**12** version 02	26.12.18	-
13	Immunization of healthcare workers	AIIMSRAIPUR/HICC/SOP/**13** version 02	26.12.18	-
14	Environmental surveillance protocol	AIIMSRAIPUR/HICC/SOP/**14** version 02	26.12.18	-
15	Outbreak policy	AIIMSRAIPUR/HICC/SOP/**15** version 02	26.12.18	-
16	Prevention of device associated infections	AIIMSRAIPUR/HICC/SOP/**16** version 02	1.1.2019	-
17	MDRO surveillance and prevention	AIIMSRAIPUR/HICC/SOP/**17** version 02	1.1.2019	-
18	Prevention of sharp injuries in HCW	AIIMSRAIPUR/HICC/SOP/**18** version 02	1.1.2019	-

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. 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 corrective measures 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.

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.

1. High Dependency Units (HDU)/ Medical ICU
2. Surgical Intensive Care Unit (SICU)
3. Neonatal Intensive Care Unit (NICU)
4. Post Operative wards of each surgical department
5. All surgical OPDs (for follow up of post discharge surgical site infections)

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, 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

5.1. Identification of HAI

The patients admitted in respective surveillance area are daily monitored for development of HAIs of interest. The demographic and clinical details are collected by the ICNs in the standardized proforma for data collection pre-approved by the HICC (Refer to Annexures 2,3 and 4 respectively for adult patients, paediatric patients and immunocompromised patients). The ICNs also check Lab reports for these patients simultaneously and correlates with clinical findings. The surveillance is continued till 15 days of admission or till discharge/ death of the patients. The ICNs also monitor patients undergoing major surgeries on daily basis in their respective ward for the development of post-operative infection till their discharge/ death. The monitoring for SSI is done for 30/ 90 days depending upon the type of surgery the patient had undergone (Annexure 5). The patients which are discharged are followed up in the respective surgical OPD at the time of their follow up visit using a separate proforma (Annexure 6).

At the end of month, all the proformas are submitted to Infection Control Officer, who then analyze them to diagnose the HAIs as per case definitions given by CDC.

5.2. Calculation of Denominator Values

ICNs also collect following data during their on their daily rounds to the hospital at the fixed time. The data is collected using Denominator Form (Daily Appraisal Form) as given in Annexure 7.

- Patient days = Number of patients admitted daily in each area of surveillance.
- Device days = Number of patients with devices in the respective areas per day.
  - o Monthly catheter (Foley's) days
  - o Monthly central line days
  - o Monthly ventilator days
- Number of surgeries performed in each OT.

This data is summed up at the end of each month so as to be used as denominator data for calculation of Device utilization ratios and Rates of HAIs. Similarly, total number of surgeries performed are calculated at the end of every month as a denominator data to enable calculation of SSI rates.

6. CALCULATION OF HAI RATES

The standard CDC/ NSHN definition of HAIs is followed. The incidence of CAUTI, CLABSI and VAP are calculated for 1000 device days and the prevalence of SSI is calculated for 100 surgeries done. The formulae for calculation are given below.

HAI Infection Rates	Formulae
VAP Rate	No. of VAP cases/ Total no. of ventilator days X 1000
CLABSI Rate	No. of CLABSI cases/ Total no. of central line days X 1000
CAUTI Rate	No. of CAUTI cases/ Total no. of catheter days X 1000
SSI Rate	No. of SSI/ No. of surgeries done X 100
DUR (Device Utilization Ratio)	No. of device (Foley's catheter/ central line/ ventilator) days /No. of patient days

7. DATA ANALYSIS, DISSEMINATION AND PRESENTATION

7.1. Data Analysis

The data is analyzed using Microsoft Excel to generate a monthly report of HAI rate of AIIMS Raipur. 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.
- To compare the HAIs rates of the hospital with that of CDC/NSHN HAI rate (75% percentile).

7.2. Data Dissemination

The monthly HAI surveillance report is shared with all clinical departments as well as with the Director, Medical Superintendent and the Nursing Co-ordinator via email and printed copy.

7.3. Data Presentation

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.

REFERENCE

[1] National Healthcare Safety Network (NHSN) [Internet]. Centers for Disease Control and Prevention 2018. Available from: https://www.cdc.gov/nhsn/

CHAPTER 3

Infection Control Precautions

1. OBJECTIVE

To practice standard precautions while caring for all patients irrespective of their infective status and to identify the patients infected with highly transmissible or epidemiologically important pathogens and practice additional precautions for them so as to ensure safety of the uninfected patients, visitors as well as healthcare staff.

2. SCOPE

This document applies to all the areas of hospital that encounter patients with highly transmissible or epidemiologically important pathogens.

3. INTRODUCTION

Transmission of infectious agents within a healthcare setting can occur through humans, insects or the hospital environment directly or indirectly. Following modes of transmission are well known in healthcare settings for transmission of healthcare related infections.

Mode of Transmission	Mechanism of Transmission	Examples
Contact		
Direct	Microorganisms are transferred from one infected person to another person without a contaminated intermediate object or person.	• Direct skin to skin or skin to mucous membrane contact • Ingestion • Injection/ percutaneous injury/ splash on mucous membrane
Indirect	Transfer of an infectious agent through a contaminated intermediate object or person.	• Through Contaminated hands, • Touching contaminated inanimate environment or patient care devices • Inadequate sterilization or disinfection of instruments

Droplet		
	Transmission through respiratory droplets (particles >5 µm) carrying infectious pathogens directly from the respiratory tract of the infectious individual to susceptible mucosal surfaces of the recipient, generally over short distances (< 1 metre) May also get inhaled directly.	• Coughing, sneezing, talking by infected persons • during certain procedures like endotracheal intubation, suctioning etc. • Indirectly to mucosal surfaces via hands.
Airborne		
	Transmission occurs by dissemination of either airborne droplet nuclei (≤5 µm) or small particles in the respirable size range containing infectious agents. The droplet nuclei remain infective over longer time and travel longer distance (>1 metre) and gets inhaled directly in the airway.	• Aerosols created during coughing, sneezing, talking by infected person or by evaporation of larger droplets. (e.g., spores of Aspergillus spp, and Mycobacterium tuberculosis)

Successful infection prevention and control programmes involve implementation of work practices to prevent transmission of infectious agents. The most cost-effective, simple, and feasible way to prevent transmission of pathogens, consists in a two-tier approach as described in the CDC-HICPAC guidelines.

3.1. Standard Precautions

Represent a basic list of hygiene precautions designed to reduce the risk of healthcare-associated transmission of infectious agents. These precautions are intended to be applied to the care of all patients in all healthcare settings, regardless of the suspected or confirmed presence of an infectious agent.

Implementation of Standard Precautions constitutes the primary strategy for the prevention of healthcare-associated transmission of infectious agents among patients and healthcare personnel.

3.2. Transmission based Precautions

These precautions are for patients who are known or suspected to be infected or colonized with infectious agents, including certain epidemiologically important pathogens, which require additional control measures to effectively prevent transmission.

Since the infecting agent often is not known at the time of admission to a healthcare facility, Transmission-Based Precautions are used empirically, according to the clinical syndrome and the likely etiologic agents at the time, and then modified when the pathogen is identified or a transmissible infectious etiology is ruled out.

4. STANDARD PRECAUTIONS

Standard precautions are based on the principle that all blood, body fluids, secretions, excretions (except sweat), nonintact skin, and mucous membranes may contain transmissible infectious agents.

4.1. Components of Standard Precautions

- Hand Hygiene (described in detail in chapter 4 of this manual)
- Use of PPE—gloves, gown, mask, eye protection, or face shield, depending on the anticipated exposure (described in detail in chapter 5 of this manual)
- Appropriate handling and disposal of sharps (Refer to chapter 12 of this manual)
- Decontamination of linen (Refer to chapter 10 of this manual)
- Sterilisation and disinfection of instruments and hospital environment (refer to chapters 6 and 8 of this manual).
- Biomedical waste management (refer to separate SOPs on BMW management)

*all components of standard precautions have been described in detail elsewhere in this manual.

4.2. New Elements of Standard Precautions

While most of the standard precautions were evolved from universal precautions and are intended to protect healthcare workers, CDC have added few new elements to it mainly focusing on protection of the patients.

They are:

- Respiratory hygiene and cough etiquettes
- Safe injection practices
- Use of masks for insertion of catheters or injection of material into spinal or epidural spaces via lumbar puncture procedures (e.g., myelogram, spinal or epidural anesthesia).

4.2.1. Respiratory Hygiene and Cough Etiquettes

The elements of Respiratory Hygiene/Cough Etiquette include:

1. Education of healthcare facility staff, patients, and visitors
2. Posted signs, in language(s) appropriate to the population served, with instructions to patients and accompanying family members or friends
3. Source control measures:
    - Covering the mouth/nose with a tissue when coughing/Sneezing, wiping and blowing nose
    - Prompt disposal of used tissues in the nearest receptacle or bin after use.

- If tissues are not available, cough or sneeze into the inner elbow rather than the hand.
- Using surgical masks on the coughing person when tolerated and appropriate

4. Hand hygiene after contact with respiratory secretions; and
5. Spatial separation, ideally >3 feet, of persons with respiratory infections in common waiting areas when possible.

4.3. Indications for Following Standard Precautions

These precautions should be followed for:

- All Patients
- All blood/body fluids exposures
- All sharps
- Irrespective of their Infective Status

5. TRANSMISSION BASED PRECAUTIONS

This refers to specific precautions which are to be followed in situations where standard precautions may not be sufficient to interrupt the specific transmission of diseases depending upon their mode of transmission (as listed in table 1). These precautions are taken in addition to standard precautions not as a replacement and are also known as additional precautions.

5.1. Categories of Transmission based Precautions

There are three categories of Transmission-Based Precautions:

- Contact Precautions
- Droplet Precautions
- Airborne Precautions

5.1.1. Contact Precautions

When these precautions are to be applied?

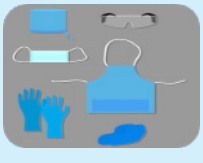
These precautions are to be applied while offering a care to patients suffering from following conditions or infected with following microorganisms.

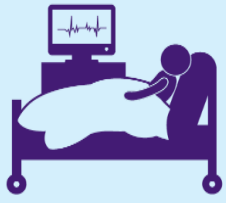
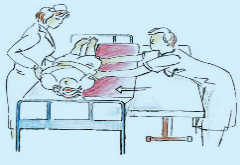
- Abscess/wound infection: major, draining
- Bronchiolitis
- Burkholderia cepacia: patient with cystic fibrosis, infection or colonization
- Conjunctivitis: acute viral

- Gastro-enteritis: C. difficile, Rotavirus, diapered or incontinent person for other infectious agents
- Diphtheria: cutaneous
- Hepatitis, type A and E virus: diapered or incontinent person
- Herpes simplex virus: mucocutaneous, disseminated or primary, severe, and neonatal
- Human metapneumovirus
- Impetigo
- Lice (pediculosis)
- Multidrug-resistant organisms: infection or colonization – by MRSA, VRE, CRE, MDR GNBs
- Para-influenza virus
- Poliomyelitis
- Pressure ulcer: infected
- Respiratory infectious disease: acute, infants and young children
- Respiratory syncytial virus: in infants, young children and immunocompromised adults
- Rubella: congenital
- Scabies
- Leprosy
- Gonorrhoea
- Staphylococcal disease: furunculosis, scalded skin syndrome, burns

How contact precautions are applied?

Key aspects of applying contact based precautions

Hand Hygiene 	• Follow all 5 moments all the time • Use Chorhexidine based hand rubs instead of alcohol based rubs in case of patients infected with C.difficile or non-enveloped viral infections (Rotaviral or Noroviral Diarrhoea) • Prefer hand wash if Chlorhexidine based hand rubs are not available in above situations.
PPE 	• Wear gloves and gowns upon entering the patient room • A surgical mask or protective eyewear must be worn if there is potential for generation of splashes or sprays of blood and body fluids into face and eyes. • Remove and discard the gloves and gown before leaving the area.

Patient Care Equipment 	• Use patient dedicated equipment or single use disposable equipment wherever possible • If dedicated equipment is not possible, clean the equipment and allow it to dry before using on another patient.
Patient Placement 	• A single-patient room is recommended • Keep patients notes and bedside charts outside the room • Keep doors closed • Disinfect hands upon leaving the room and after writing the chart • If single room is not available: 1. Avoid placing these patients with other patients with increased susceptibility of infection 2. Change protective attire and perform hand hygiene between contact with patients in the same room.
Transfer of Patients 	• Avoid transfer of patients so far as possible • If transfer is necessary, ensure that the infected or colonised areas of patients are covered and contained. • Wear PPE while handling the patients at the destination

*For specific recommendations for use of Contact Precautions for colonization or infection with MDROs, refer to Management of Multidrug–Resistant Organisms in Healthcare Settings 2006 (https://www.cdc.gov/infectioncontrol/guidelines/mdro/)

5.1.2. Droplet Precautions

When these precautions are to be applied?

These precautions are to be applied while offering care to patients infected with organisms which are transmitted through respiratory droplets (>5µm) generated by patients during coughing, sneezing or talking. As these droplets can travel only short distance (<1 metre), precautions are required when close contact with the infected patient is expected.

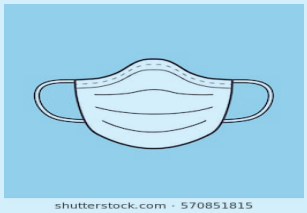
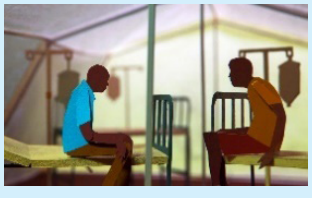
Following diseases/infectious agents warrants droplet precautions:

- Diphtheria: pharyngeal
- Influenza virus: seasonal
- Invasive disease: H. influenzae type b, N. meningitidis, Streptococcus group A
- Mumps
- Parvovirus B19: erythema infectiosum
- Pertussis (whooping cough)
- Plague: pneumonic

- Pneumonia: Adenovirus, H. influenzae type b (infants and children), Mycoplasma
- Rhinovirus, Respiratory syncytial virus
- Rubella
- Streptococcus group A disease: pharyngitis and scarlet fever (infants and young children)
- Viral haemorrhagic fevers due to Lassa, Ebola, Marburg, Crimean- Congo fever viruses

How droplet precautions are to be applied?

Key aspects of applying droplet precautions include:

Hand Hygiene 	• Hand hygiene is must and should be followed as per standard protocol as some infections transmitted by droplet route can also be transmitted through contact.
PPE 	• A surgical mask is must upon room entry. • Hand hygiene should be done before putting on the mask and after removing he mask. • Masks are put whenever HCW is at a short distance from patient (<1 metre). • P2 respirators are not required.
Patient Placement 	• A single-patient room is recommended. • If single room is not available: 1. Priority for single room is given to those patients who have excessive cough and sputum production. 2. Cohortise the patients who are infected with the same pathogen and who are suitable room mates. • If it becomes necessary to place the patients requiring droplet precautions in the same room with patients who do not require it or do not have the same infection— 1. Patients should be physically separated (>1 metre apart) from each other and a privacy curtain is drawn in between them. 2. Avoid placing such patients with in the same room with immuno compromised status or increased susceptibility to infections.
Transfer of the Patients	• Ask the patients to wear a mask while they are being transferred and follow respiratory hygiene and cough etiquette.

5.1.3. Airborne Precautions

When these precautions are to be applied?

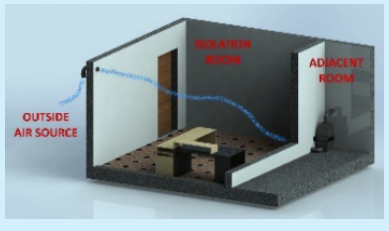
These precautions are applied while dealing with patients having respiratory infections by pathogens which are transmissible through droplet nuclei ≤5 µm. These particles remain suspended in the air for longer duration and can travel longer distances (>1 metre).

Indications for following these precautions are:

- Influenza A: Avian H7N9, Asian H5N1
- Measles
- MERS-Coronavirus: Middle East Acute Respiratory Syndrome
- Mycobacterium tuberculosis: Laryngeal and pulmonary disease, extra-pulmonary draining lesion
- Smallpox
- Varicella-zoster: Disseminated disease, localized disease in immunocompromised patient

How airborne precautions are to be applied?

Essentials of applying airborne precautions include

PPE 	• Wear a P2 respirator or N95 mask when entering the patients room. • Surgical mask do not offer protection but may be given to the coughing patients to limit the spread of aerosols and droplets at the point of generation. • Gloves and gowns are to be worn as per standard precaution.
Patient Placement 	• A single-patient room preferably having negative pressure ventilation is recommended • Door of the room should remain closed • Ask patients to wear surgical mask if he is with other patients in the same room. • Only staff or visitors immune to the infectious agent should be allowed to enter the room if possible.
Transfer of the Patients 	• Ask the patients to wear a a correctly fitted mask while they are being transferred and follow respiratory hygiene and cough etiquette. • Limit transfer as much as possible • Any associated skin lesions with the condition should be covered

Summary of Application of Standard and Transmission based Precautions

Activity	Standard Precautions	Contact Transmission	Droplet Transmission	Airborne Transmission
Isolation Room	Single Room Not Required	Single Room and Minimize Time Outside	Single Room, Minimize Time Outside when Patient may Wear Mask	Single Room with Negative Pressure Ventilation,* Minimize Time Outside when Patient may Wear Mask Exclude Non-Essential Susceptible People
Hand hygiene	Yes	Yes	Yes	Yes
Gloves	When likely to touch blood body fluids and contaminated items	Wear gloves on entering room to provide patient care and when likely to touch blood, body fluids and contaminated items	As per *Standard precautions*	As per *Standard precautions*
Apron/gown	if soiling likely, i.e. during procedures likely to generate contamination from blood and body fluids	Wear it on entering room if clothing will have substantial contact with the patient, environmental surfaces or items in the patient's room	As per *Standard precautions*	As per *Standard precautions*
Mask	Wear regular mask during procedures likely to generate contamination with aerosols**	As per *Standard precautions*	As per *Standard precautions*	Wear high efficiency filtration mask (FFP3 or N95) on entering the room
Eye protection/ face-shields	During procedures likely to generate contamination with blood and body fluids	As per *Standard precautions*	As per *Standard precautions*	As per *Standard precautions* Non-essential susceptible people should be excluded
Equipment decontamination	Yes	*Yes*	*Yes*	Yes
Environment cleaning	Yes	Yes	Yes	Yes
Miscellaneous	Avoid contaminating environmental surfaces with gloves	Remove gloves and gown, wash hands before leaving patient's room	Provide at least 1 metre of separation between patients in cohort	Advise patient to cover nose and mouth when coughing or sneezing

* Keep room vacant for 1 h post discharge of patient and 2-3 h for measles.
** Only for situations that may provoke contamination of mucous membrane, Procedures that are likely to create significant aerosols, suctioning, dentistry, intubation, chest physiotherapy. etc.

For detailed description of types and duration of precautions recommended for individual infection and condition, kindly refer to Appendix A of CDC Guidelines for Isolation

Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings (2007) Available from: https://www.cdc.gov/infectioncontrol/guidelines/isolation/.

6. ESSENTIAL REQUIREMENTS FOR PRACTICING TRANSMISSION BASED PRECAUTIONS

6.1. Infrastructure

- Separate ward/room/area should be designated for keeping the patient requiring any kind of additional precautions. The rooms can be labelled according to the type of precaution required (contact/ droplet/ airborne)
- The patients infected with similar type of pathogens and requiring similar type of isolation precautions can be cohorted together in one room.
- Adequate distancing between patient beds (3-6 feet) to be ensured.
- Should have a hand washing area with sensor based/elbow/foot operated taps.
- Adequate signage for isolation and standard precautions like hand hygiene and use of PPE should be displayed.
- All records and charts should be placed outside the isolation ward/room.
- Overcrowding to be avoided in isolation ward/area.
- Specifications for Airborne Isolation Rooms (AIR)/Negative pressure isolation rooms:
    - Isolation wards/area should have double door entry with a separate changing room (Anteroom).
    - The AIR/ward should have negative pressure ventilation with adequate air changes (6-12/hour) especially for patients suffering from highly transmissible respiratory infections.
    - The air exhausted from the room should be HEPA filtered before it is recirculated to the other areas of healthcare facility.
    - Central air-conditioning and use of desert air coolers is not permitted.

6.2. Precautions to be Followed by the Staff

- Dedicated healthcare staff to be posted for isolation ward/area.
- Availability of Personal Protective Equipment (PPE) and disinfectants should be ensured.
- The staff must follow all standard precautions in addition to special preacautions as listed above.
- No one should be allowed to enter the ward without donning adequate PPE.
- Appropriate use of PPE should be strictly adhered to e.g. use of face masks, N95 masks, gloves, gowns, aprons, shoe covers, head covers etc. as per the requirement (The procedures of donning/undonning of PPE to be displayed).

- Additional precautions should be taken after determining the risk of exposure involved.
- Sample collection to be done using appropriate PPE, following standard work precautions.
- The staff should discard the used PPE before leaving the isolation area or even before touching another patient in the isolation area.
- Sample to be packaged/ transported in triple packaging.
- Use of mobile phones by healthcare staff is prohibited inside the isolation area.
- Unauthorised Visitor's entry is also prohibited.

6.3. Disinfection and Sterilization in Isolation Area

- Regular daily cleaning and proper disinfection of isolation wards to be done at least twice a day. In addition, special attention should be given to cleaning and disinfecting frequently high touch surfaces to prevent aerosolization.
- Follow environmental decontamination protocol for high risk areas as mentioned in SOP for environmental decontamination in the same document.
- Damp sweeping/ wet mopping to be performed. Dry sweeping/ brooming is not recommended.
- All the equipments coming in contact with the patient should be disinfected.
- Separate urinals, bedpans, thermometers should be used for each patient.
- Separate biomedical waste bins with appropriate colour code in each room.
- Cleaning of IV stands and furniture, walls and bathrooms to be done twice daily
- Mattress and pillows—with impervious cover (mackintosh) to damp dust easily
- Sharing of equipments among the patients to be avoided, if unavoidable, ensure that reusable equipments are disinfected before use on other patients (Equipments like Thermometer, Nebulisers, Stethoscopes, BP apparatus cuff to be dedicated for each patient).
- Used linen to be handled as little as possible with minimum agitation and should be transported in closed containers and should be labelled as infectious before sending to laundry for washing.

6.4. Terminal Cleaning after the Discharge of Patient in Isolation Room

- Keep UV light facing each direction of room for $\frac{1}{2}$ hour (2 bedded room) or 1 hr (4 bedded room)
- Pillows, matresses: Clean with detergent, disinfected with 7% lysol and dry in sunlight for 24 hours
- All linen, curtains: Remove, soak in 7% lysol/ autoclave—send to laundry

- After disinfection: Perform high dusting, wash the room, walls, windows, doors, bathroom, sink, furniture with soap and water.
- Soak bedpan, urinal, kidney basin in lysol for 1 hour, wash with detergent and dry under sunlight.
- Bath basins, bins, bucket, jugs, mugs: Wash with soap and water and dry in sunlight.
- Rubber sheets: Clean with 7% lysol, dried in sun, powdered, replaced.
- Thermometer tray and its contents: Soak in 7% lysol after cleaning.

REFERENCES

[1] CDC Guidelines for Isolation Precautions: Preventing Transmission of Infectious Agents in Healthcare Settings (2007) updated on October 2017 Available from: https://www.cdc.gov/infectioncontrol/guidelines/isolation/.

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[3] Eric Nulens (Author). Isolation of Communicable diseases: *Guide to Infection Control in the Hospital, International Society for Infectious Diseases*, 2018.

[4] Prevention of Hospital Acquired Infections: A Practical Guide, 2nd edition. WHO/CDS/CSR/EPH/2002.12

4
CHAPTER

Hand Hygiene

1. OBJECTIVE

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

2. SCOPE

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

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

4.1. 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 during these procedures.

4.1.1. 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
- If alcohol based hand rub is not obtainable.

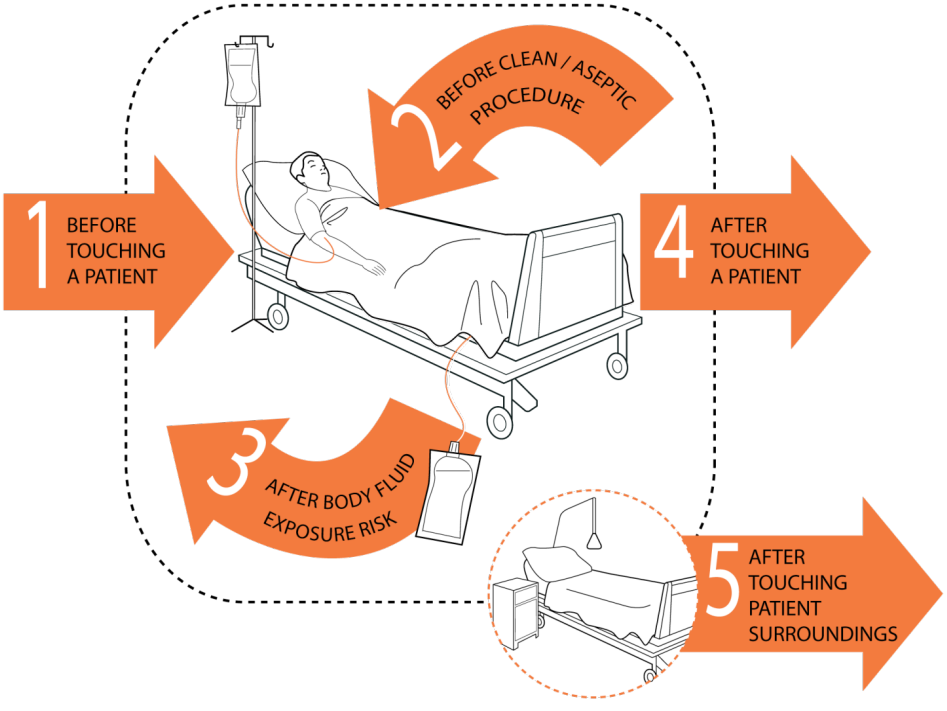


Figure 1: The "My 5 Moments for Hand Hygiene" Approach (WHO)

4.1.2. Procedure for Hand Washing

To effectively reduce the growth of germs on hands, handwashing must last 40–60 seconds and should be performed by following all of the illustrated steps in fig.2. Following precautions should be undertaken while performing hand washing.

- When washing hands with soap and water, wet hands with water and apply the amount 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 be used to allow the bars to dry.

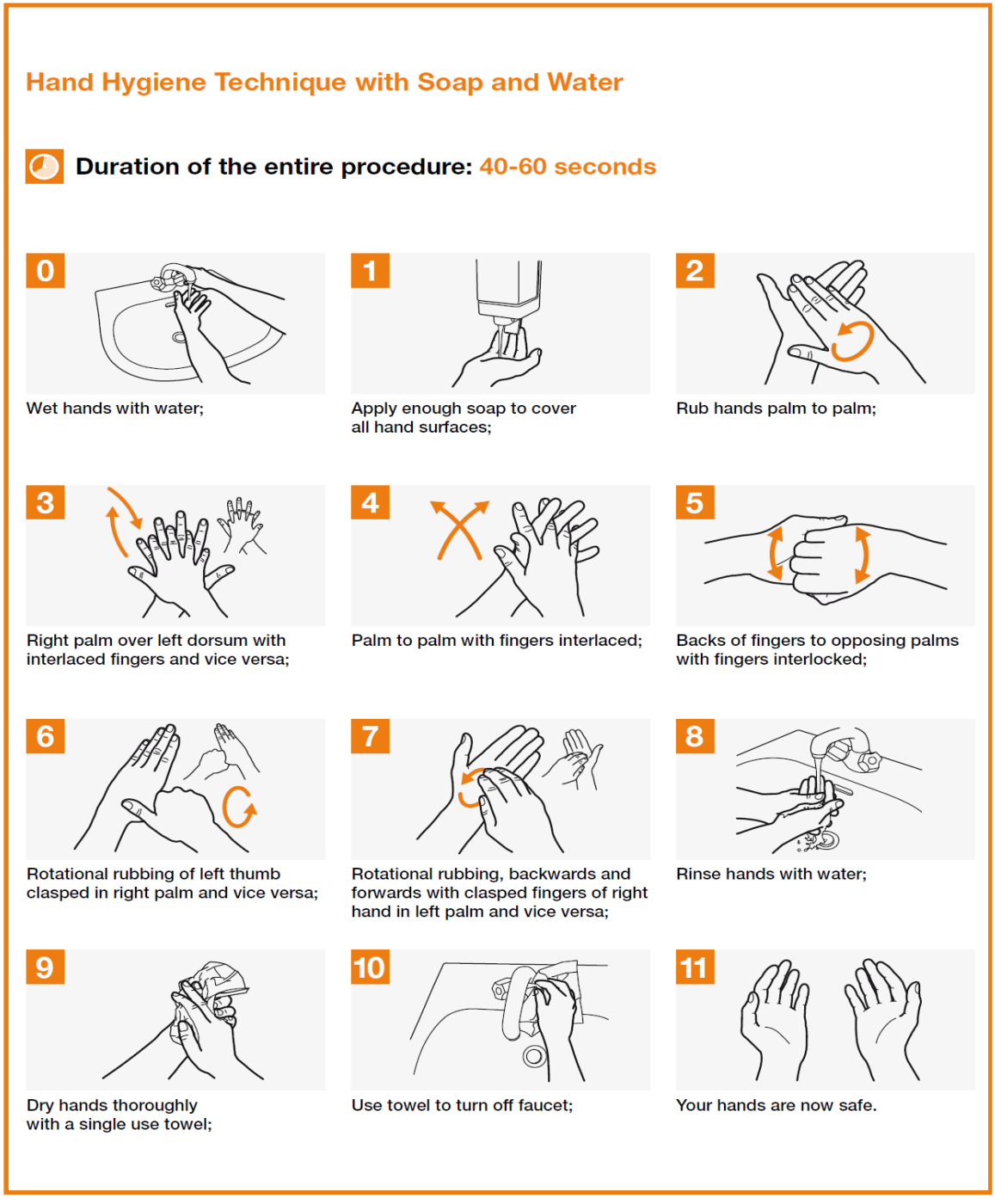


Figure 2: Procedure for Hand Washing with Soap and Water

4.2. Hand Rubbing with Alcohol Based Hand Rubs

4.2.1. Indications for Hand Rubbing

- Before and after touching the patient
- Before handling an invasive device for patient care, regardless of whether or not gloves 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 same patient
- After contact with inanimate surfaces and objects (including medical equipment) in the immediate vicinity of the patient
- After removing sterile or non-sterile gloves
- Before handling medication or preparing food

4.2.2. Hand Rub Formulations: Recommended by WHO

Hand rubs should be compatible with any of the following requirements

- Any product containing WHO formulations I or II
  - Formulation I: Ethanol 80% v/v, glycerol 1.45% v/v, hydrogen peroxide (H_2O_2) 0.125% v/v.
  - Formulation II: Isopropyl alcohol 75% v/v, glycerol 1.45% v/v, hydrogen peroxide 0.125% v/v

OR

- Any commercially available alcohol based hand rub preparation which meets recognized standards for microbicidal efficacy (ASTM or EN standards – EN 1500)
- Hand rub containing Ethyl alcohol 70% + Chlorhexidine gluconate 0.5% w/v should be preferred for hand rubbing in high risk settings like ICUs or while caring for patients with suspected infections with enveloped viruses or spore bearing pathogens.

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.

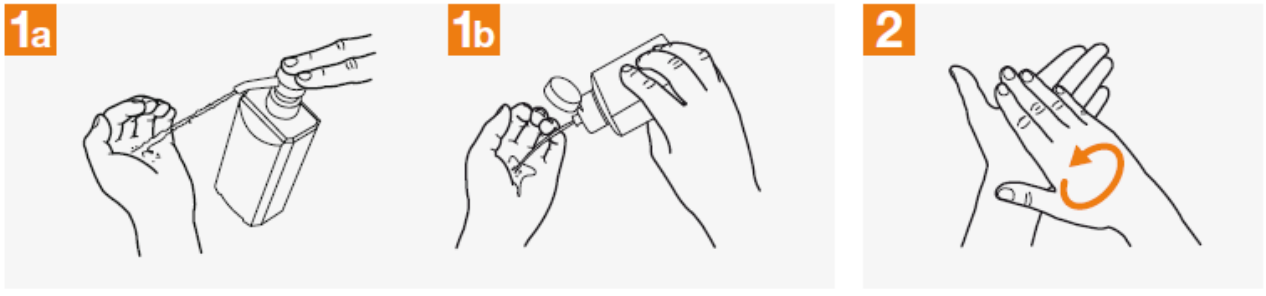
4.2.3. Procedure for Hand Rubbing

To effectively reduce the growth of germs on hands, handrubbing must be performed by following all the steps illustrated in Fig. 3. The process takes only 20–30 seconds!

Apply a palmful of alcohol based handrub and cover all surfaces of hand. Rub hands until dry.

Hand Hygiene Technique with Alcohol-Based Formulation

Duration of the entire procedure: 20-30 seconds



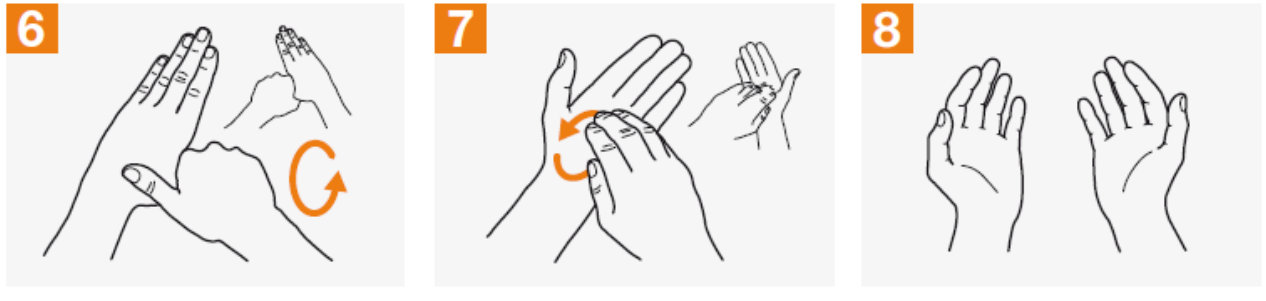
Apply a palmful of the product in a cupped hand, covering all surfaces;

Rub hands palm to palm;

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

Palm to palm with fingers interlaced;

Backs of fingers to opposing palms with fingers interlocked;



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

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

Once dry, your hands are safe.

Figure 3: Procedure for Hand Rubbing with Alcohol based Formulations

4.3. Surgical Hand Preparation

4.3.1. Objectives

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

4.3.2. Preparations before Surgical Hand Antisepsis

- Keep nails short and pay attention to them when washing your hands—most microbes on hands reside beneath the fingernails.
- Do not wear artificial nails or nail polish.
- Remove all personal ornaments (rings, wrist-watch, bangles and bracelets) before entering the operation theatre.
- Wash hands and arms with a non-medicated soap before entering the operating theatre area or if hands are visibly soiled.
- Remove debris from underneath fingernails using a nail cleaner, preferably under running 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 handrub, 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 handrub 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 handrub 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 handrub with alcohol-based products sequentially.
- When using an alcohol-based handrub, use sufficient product to keep hands and forearms wet with the handrub throughout the surgical hand preparation procedure.
- After application of the alcohol-based handrub as recommended, allow hands and forearms to dry thoroughly before donning sterile gloves.

4.3.3. Procedure for Surgical Hand Preparation using Medicated Soap

Following protocol should be followed for surgical hand preparation using medicated soap and water.

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.

4.3.4. Procedure for Surgical Hand Preparation using Alcohol based Hand Rubs

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 period of 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 and water in case of glove puncture or if any residual talc or biological fluids are present.

Follow the steps in sequential manner as illustrated

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)

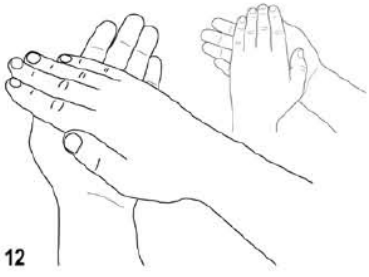
Figure 4: (a) Steps for Surgical Hand Preparation using Alcohol based Hand Rubs

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)

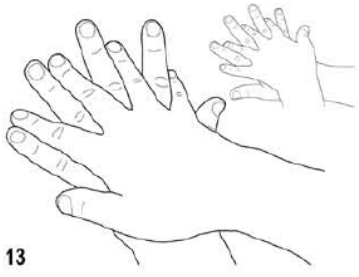
11

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)



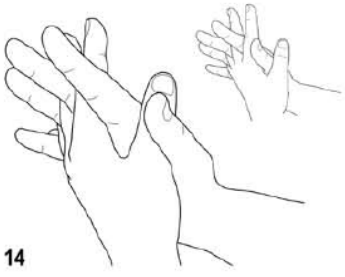
12

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



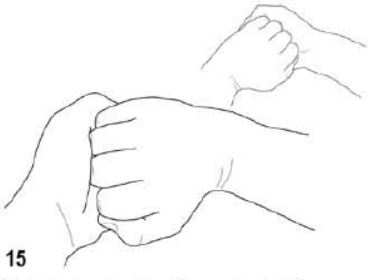
13

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



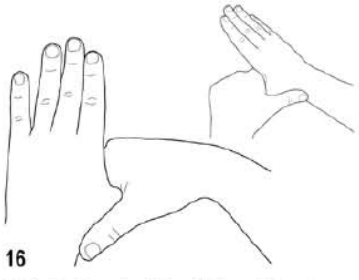
14

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.

(b) Steps for Surgical Hand Preparation using Alcohol based Hand Rubs

REFERENCE

[1] WHO guidelines for hand hygiene in Healthcare. First global patient safety challenge, Clean care is safer care. World Health Organization, 2009.

Personal Protective Equipment (PPE)

1. OBJECTIVE

To promote and practice use of personal protective equipments appropriate for the task while providing patient care by all the healthcare providers.

2. SCOPE

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

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 infectious agents, 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 to attend another patient or another duty.
- Discard the used PPE in appropriate disposal bags.

7. GUIDELINES FOR USE OF PPE

7.1. Gloves

7.1.1. Objective

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

7.1.2. 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 infectious material
  - Between tasks/ procedures on the same patient to prevent cross contamination between different body sites
  - If the patient interaction involves touching portable computer keyboards or other mobile 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 coloured 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.

7.1.3. 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 be used.
- Whether single use (disposable) or reusable gloves are required for the task.

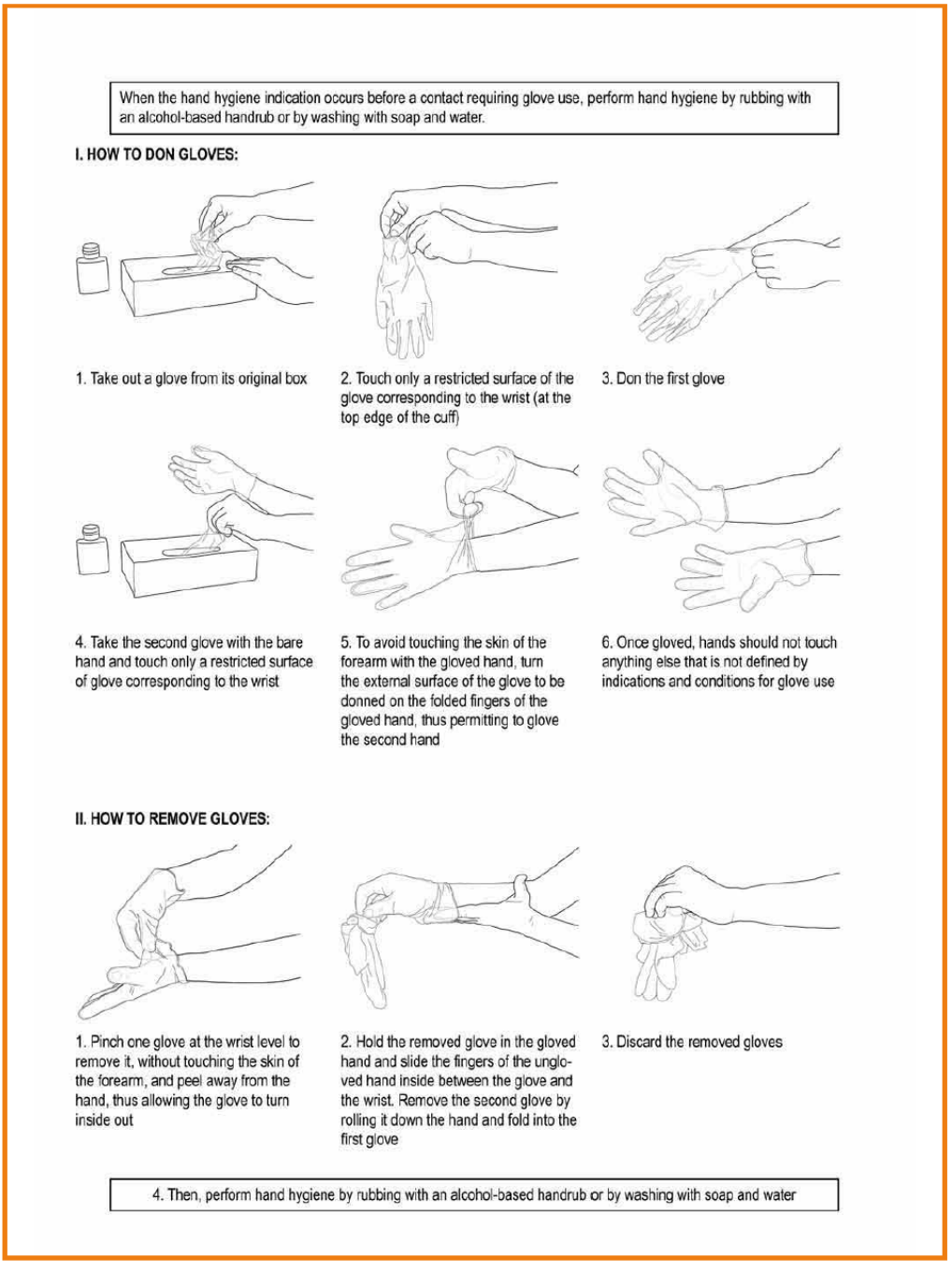


Figure 5: How to Don and Doff Non-sterile Gloves

- 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.

7.2. Procedure to Wear and Remove Sterile and non Sterile Gloves

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

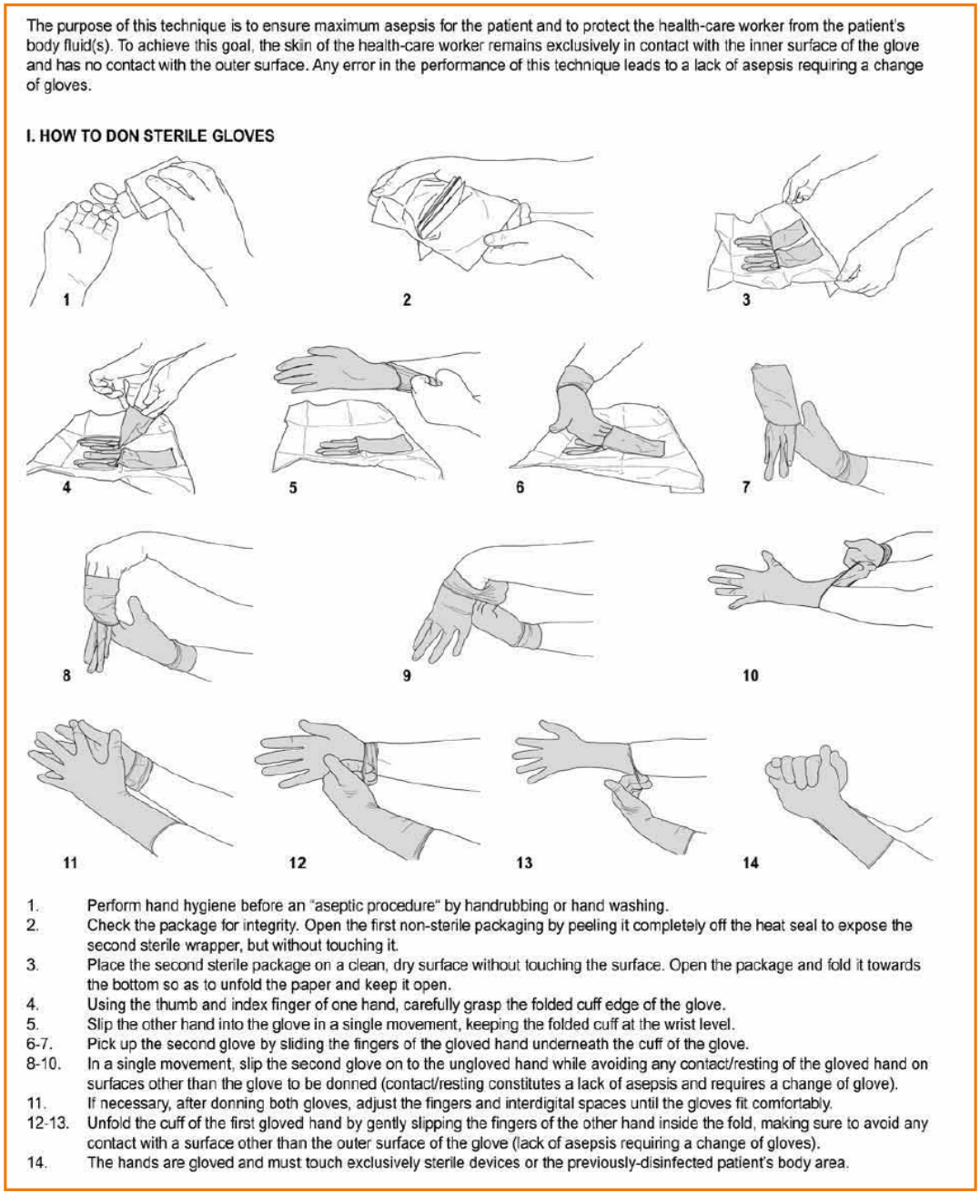


Figure 6: How to Don Sterile Gloves

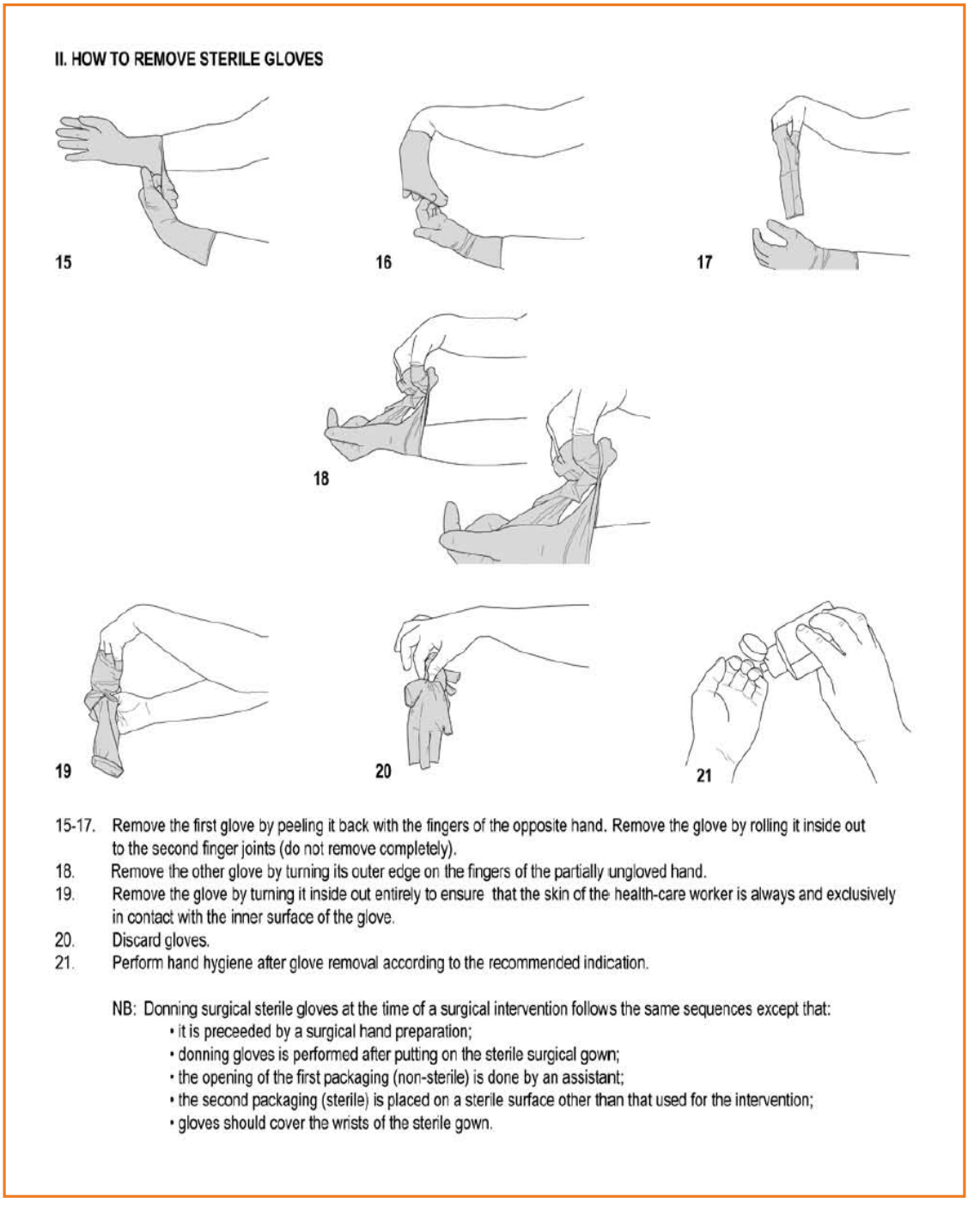


Figure 7: How to Doff Sterile Gloves

Remember

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

7.3. Gowns

7.3.1. 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.

7.3.2. 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 the isolation 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.

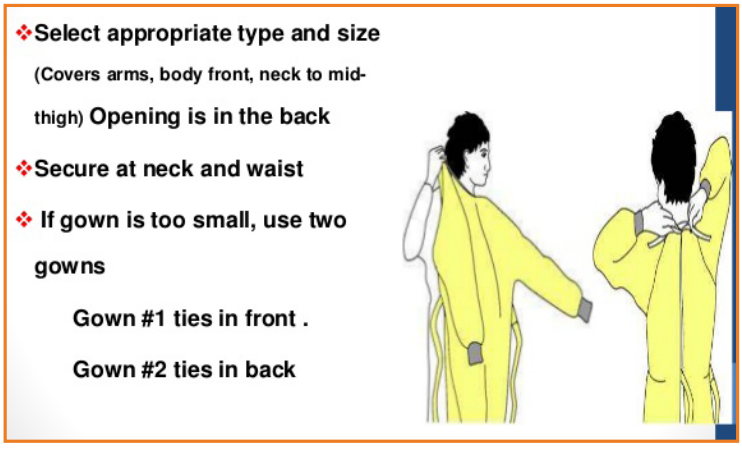


Figure 8: Wearing a gown

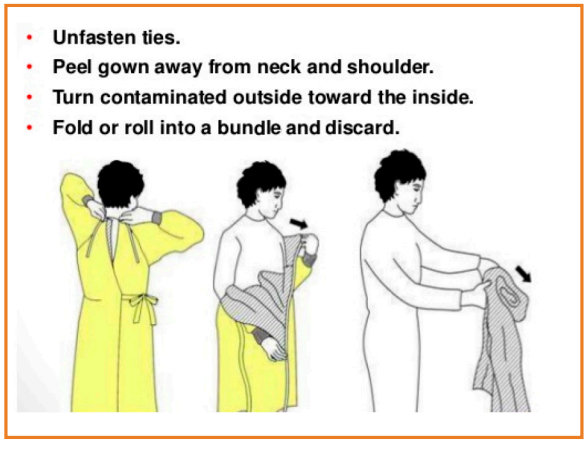


Figure 9: Removing a Gown

7.4. Masks

7.4.1. Objective

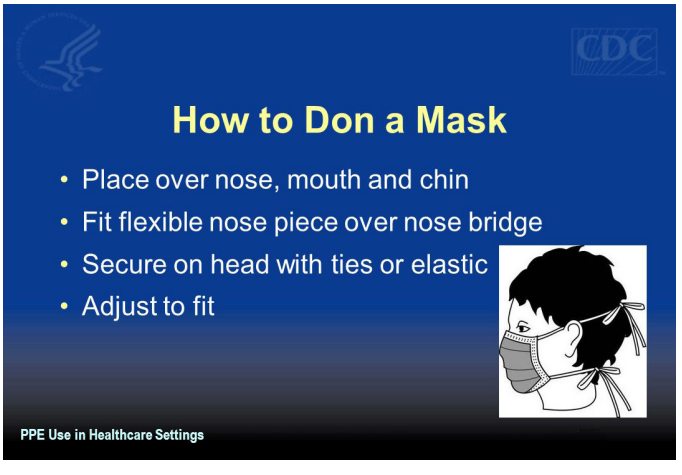
To protect patients from respiratory secretions of healthcare workers as well as to protect healthcare staff while caring for patients with airborne infections, or when performing any procedures with anticipated splashes of blood or body fluids.

7.4.2. 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.

7.4.3. 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.



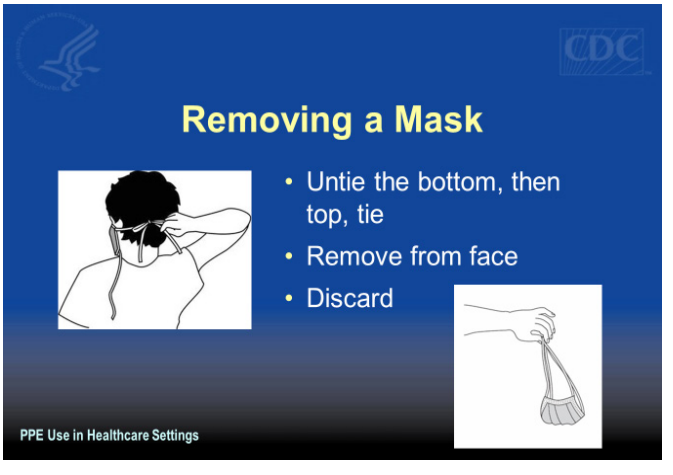


Figure 10: How to Put on and Remove the Mask

7.5. Using N95 Respirator/ any Particulate Respirator

7.5.1. Indication for Use

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

7.5.2. 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
  - o Inhale—respirator should collapse
  - o Exhale—check for leakage around face

7.5.3. 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.

7.6. Protective Eye Wear and Face Shield

7.6.1. 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.

7.6.2. Types and Uses

Goggles—Used to protect eyes only

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

7.6.3. Do's and Don'ts

Goggles

- 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.

7.6.4. 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 are considered 'clean' and therefore safe to touch with bare hands.
- The front of a mask, protective eyewear or face shield is considered contaminated.

7.6.5. 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.

7.7. Caps and Boots/Shoe Covers

7.7.1. Objective

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

7.7.2. 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.

7.8. 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

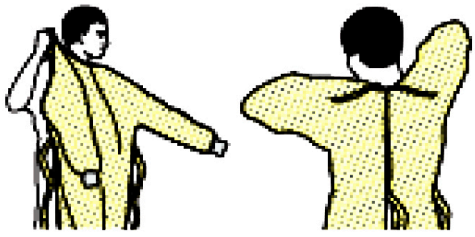
1. Gloves
2. Face shield or goggles
3. Gown
4. Mask or respirator
5. Cap/ head cover
6. Shoe cover

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

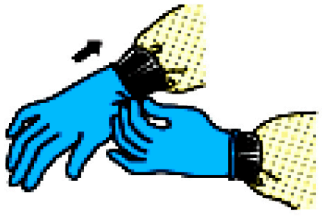
- Secure ties or elastic bands at middle of head and neck
- Fit Flexible band to nose bridge
- Fit snug to face and below chin
- Fit check respirator

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

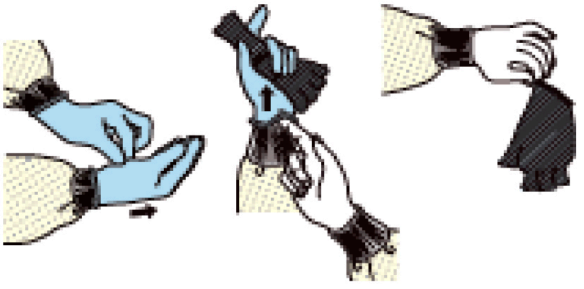
Figure 11: Sequence for Putting on PPE

HOW TO SAFELY REMOVE PERSONAL PROTECTIVE EQUIPMENT (PPE) EXAMPLE 1

There are a variety of ways to safely remove PPE without contaminating your clothing, skin, or mucous membranes with potentially infectious materials. Here is one example. Remove all PPE before exiting the patient room except a respirator, if worn. Remove the respirator after leaving the patient room and closing the door. Remove PPE in the following sequence:

1. GLOVES

- Outside of gloves are contaminated !
- If your hands get contaminated during glove removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Using a gloved hand, grasp the palm area of the other gloved hand and peal off first glove
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist and peal off second glove over first glove
- Discard gloves in a waste container



2. GOGGLES OR FACE SHIELD

- Outside of goggles or face shield are contaminated !
- If your hands get contaminated during goggle or face shield removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Remove goggles or face shield from the back by lifting head band or ear pieces
- If the item is reusable, place in designated receptacle for reprocessing. Otherwise, discard in a waste container

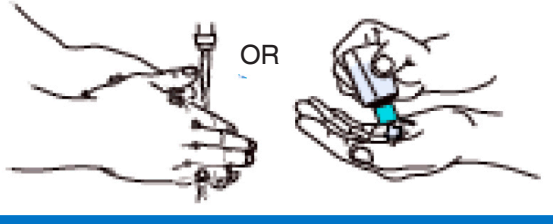
3. GOWN

- Gown front and sleeves are contaminated !
- If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Unfasten gown ties, taking care that sleeves don't contact your body when reaching for ties
- Pull gown away from neck and shoulders, touching inside of gown only
- Turn gown inside out
- Fold or roll into a bundle and discard in a waste container

4. MASK OR RESPIRATOR

- Front of mask/respirator is contaminated—Do Not Touch !
- If your hands get contaminated during mask/respirator removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Grasp bottom ties or elastics of the mask/respirator, then the ones at the top, and remove without touching the front
- Discard in a waste container

5. WASH HANDS OR USE AN ALCOHOL-BASED HAND SANITIZER IMMEDIATELY AFTER REMOVING ALL PPE



PERFORM HAND HYGIENE BETWEEN STEPS IF HANDS BECOME CONTAMINATED AND IMMEDIATELY AFTER REMOVING ALL PPE

Figure 12: Sequence for Removing PPE

REFERENCES

[1] WHO guidelines for hand hygiene in Healthcare. First global patient safety challenge, Clean care is safer care. World Health Organization, 2009.

[2] Prevention of hospital acquired infections, A practical guide, 2nd edition, WHO/CDS/CSR/EPH/2002.12

[3] Guidance for the Selection and Use of Personal Protective Equipment (PPE) in Healthcare Settings. CDC Atlanta. Accessed from https://www.cdc.gov/hai/prevent/ppe.html

Cleaning, Disinfection and Sterilization of Patient Care Items

1. OBJECTIVES

- To maintain standards in infection control measures and minimize hospital acquired infections in patients and staff.
- To define policy and procedure regarding cleaning, disinfection, sterilization and decontamination of patient care items/ instruments/ equipment

2. SCOPE

This document applies for all the areas of hospital services at AIIMS Raipur.

3. BRIEF INTRODUCTION

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.

4. TERMINOLOGIES

Cleaning: Removal of visible soil (e.g., organic and inorganic material) from objects and surfaces and normally is accomplished manually or mechanically using water with detergents or enzymatic products.

Disinfection: A process that eliminates many or all pathogenic microorganisms, except bacterial spores, on inanimate objects.

Sterilization: A process that destroys or eliminates all forms of microbial life and is carried out in health-care facilities by physical or chemical methods.

Decontamination: Refers to the use of physical or chemical means to remove, inactivate, or destroy all pathogens on a surface or item to the point where they are no longer capable of transmitting infectious particles and the surface or item is rendered safe for handling, use, or disposal.

5. CLASSIFICATION OF PATIENT CARE ITEMS

The risk of transferring infection from patient care items is dependent on the following factors:

1. The presence of microorganisms, the number and virulence of these organisms.
2. The type of procedure that is going to be performed (invasive or non-invasive).
3. The body site where the instrument/and or equipment will be used (penetrating the mucosal or skin tissue or used on intact skin).

Contact sites for instruments may be classified as **critical, semi-critical or non-critical** according to "Spaulding Classification" as given below. The level of reprocessing required is based on the classification and level of risk.

Table 6.1: Table showing Spaulding Classification of Items

Intended Use of Items	Class	Level of Risk	Level of Disinfection Required	Methods Used
• Into vascular system, • Into sterile body cavity, • Into sterile tissues: (e.g. Surgical procedures, instrumentation, arthroscopies, biopsies, etc.)	Critical	High	Sterilization or High level disinfection	• Steam under pressure (Autoclave) • Dry Heat (Hot air Oven) • Plasma sterilization • (H_2O_2 Plasma) • ETO gas • Chemical liquid sterliants: o Glutaraldehyde-based formulations (≥2.4%), o Glutaraldehyde (0.95%) with phenol/phenate (1.64%) o Stabilized hydrogen peroxide (7.5%), o Hydrogen peroxide (7.35%) with peracetic acid (0.23%), o Peracetic acid (0.2%),
• Contact with Mucous membrane, non intact skin. (e.g. gastroscopy etc.)	Semi-critical	Medium	High level disinfection	• Glutaraldehyde (as above), • Hydrogen peroxide (as above), • *ortho*-phthalaldehyde (0.55%), • Peracetic acid with hydrogen peroxide (as above)
• Contact with Intact skin or without contact with patient. (e.g. Stethoscopes, BP apparatus, sinks, beds etc.)	Non-critical patient care items	Low	Intermediate level Disinfection	• Ethyl or isopropyl alcohol (70%-90%) • Sodium hypochlorite (1%) • Phenolic compounds (Phenol, Phenyl, Lysol) • Iodophors (eg. Betadine) • Quaternary ammonium compounds (Chlorhexidine, Savlon)
	Non-critical environmental surfaces	Low	Low level Disinfection	• Cleaning and scrubbing with soaps/ detergent water • Intermediate/ low level disinfectants (as above)

6. REPROCESSING OF PATIENT CARE ITEMS

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
- Disinfection/Sterilization

6.1. Cleaning of Instruments

- After an instrument has been used, prior to its drying, it should be washed to remove any gross soiling. At this stage, detergent and water is appropriate to use. It is preferable to use multienzymatic 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.
- If an instrument/equipment is unable to be cleaned then it is unable to be sterilized or disinfected.

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

6.2. Methods Used for Cleaning of Instruments and Equipment

6.2.1. 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, thick rubber gloves, eye protection, surgical mask and/or face shield),
- Remove any gross soiling on the instrument by rinsing in tepid water (15^0C–18^0C),
- Take instrument apart fully and immerse all parts in warm water with a biodegradable, non-corrosive, non-abrasive, low foaming and free rinsing detergent or use an enzymatic cleaner if necessary.
- Ensure all visible soil is removed from the instrument—follow manufacturer's instructions.

- Rinse in hot water (unless contraindicated).
- Dry the instrument either in a drying cabinet, or hand dry with clean lint-free cloth.
- Inspect to ensure the instrument is clean.

6.2.2. Enzymatic Cleaners

Used for fibreoptic instruments and accessories, and other items that are difficult to clean. These products are hazardous and care should be taken when in contact with them. Follow manufacturer's recommendations for their use.

6.2.3. Ultrasonic Cleaners and Automated Washers

- Ultrasonic cleaners and automated washers are recommended for cleaning basic instruments that can withstand this process.
- Using a machine to wash the instruments will cut down on the handling of the instruments.
- Ultrasonic cleaners do not disinfect the instruments.
- By causing high frequency, high-energy sound waves to hit the instrument/ equipment, the soiling matter drops off the instrument, or becomes easy to remove during the rinsing process.
- These cleaners are not appropriate for cannulated instruments (they cannot clean inside the instrument), plastic materials, two or more different metals, or some glass instruments, syringes and lenses. Daily efficiency tests should be done.

Whatever may be the method used for cleaning, an equipment/ instrument must undergo disinfection/ sterilization depending upon the intended use on patient

6.3. Disinfection

6.3.1. Methods for Achieving Disinfection

Thermal Disinfection

This may be used for an instrument that is able to withstand the process of heat and moisture and is not required to be sterile. The level of disinfection depends on the water temperature and the duration the instrument is exposed to that temperature.

Minimum surface temperature and time required for thermal disinfection:

Surface Temperature (^{0}C)	Minimum Disinfection Time Required (Minutes)
90	1
80	10
75	30
70	100

6.3.2. Chemical Disinfection

The performance of chemical disinfectants is dependent on a number of factors including: temperature, contact time, concentration, pH, presence of organic or inorganic matter and the numbers and resistance of the initial bioburden on a surface.

Instrument grade disinfectants are classified as high, intermediate or low level. Some of the commonly used disinfectants are as below.

Table 6.2: Chemical used for Instrument Sterilization/Disinfection

Name (Concentration)	Recommended Use	Examples
Glutaraldehyde (2%)	High level disinfection or sterilization of heat sensitive surgical instruments	Endoscopes, spirometry tubings, dialyzers, transducers, anesthetic and respiratory equipments, hemodialysis proportioning and dialysate delivery systems etc.
Orthophthalyl aldehyde (OPA) (0.55%)	For high level disinfection of heat sensitive surgical instruments	Same as above. Probably more useful than glutaraldehyde where resistant strains have emerged, non irritating to the eyes and nasal passages, does not require activation or exposure monitoring, and has a 12 min contact period.
Hydrogen peroxide (7.35%) with peracetic acid (0.23%)	Can be used as a sterilant	Disinfection/ sterilization of semi-critical/ critical medical or dental equipment.
Stabilized hydrogen peroxide (3%–7.5%)	For high level disinfection	Disinfection of ventilators, fabrics, endoscopes, foot care equipment.
Vapourized H_2O_2	For sterilization	Vaporized H_2O_2 is used for gas plasma sterilization.
Peracetic acid/ peroxyacetic acid (0.3%)	Can be used as sterilant	Low temperature sterilant for endoscopes, dental equipment. In combination with H_2O_2, it is used for disinfection of hemodialyzer.

Ethyl Alcohol/ Isopropyl Alcohol (60%–70%)	Intermediate level disinfectant	Alcohols/ alcohol impregnated wipes are used for disinfection of small, smooth, clean surfaces (eg trolley tops). Disinfection of rubbers stoppers of medication vials, thermometers, stethoscopes, scissors, manual ventilation bags, manikins, ultrasound instrument, and external surface of ventilators, electrical/electronic equipment, which can not be immersed in disinfectants and medication preparation areas.
Sodium hypochlorite	Intermediate level disinfectant High level disinfectant for selected semicritical devices	Dental equipment, CPR mannequins (500 ppm available chlorine x 10 minutes), disinfection of syringes used by drug addicts if sterile disposable needles unavailable (full strength bleach)
Quaternary ammonium compounds	Low level disinfectant	Can be used for non-critical items like BP cuffs and cleansing dirty wounds.

For directions for using chemical disinfectants, refer Annexure 8 at the end of this manual.

Points to Remember

- 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.
- Thermal disinfection is not appropriate for instruments that will be used in critical sites as these instruments must be sterile.

6.4. Sterilization

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

Table. 6.3: Methods for Sterilization of Patient Care Items

Method of Sterilization	Sterilization Conditions	Uses
Autoclave	121^{0}C x 30 min OR 132^{0}C x 15 min/4min Temp and time varies with type of load and type of sterilization cycle (Gravity displacement/ pre vaccum) selected (Refer to SOPs for sterilization procedure at CSSD)	**Surgical instruments, dressing drums/trays/sets, metal endoscopes, glass syringes, needles, implants, rubber catheters, endotracheal tubes and airways.**
Dry heat (Hot air oven)	170^{0}C x 60 minutes 160^{0}C x 120 minutes 150^{0}C x 150 minutes	**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)	100% OR mixtures at various concentrations with inert gases	**Sterilize critical items (and sometimes semicritical items) that are moisture or heat sensitive and cannot be sterilized by steam sterilization.**
Plasma sterilization	Hydrogen peroxide	**Sterilization of materials and devices that cannot tolerate high temperatures and humidity, such as some plastics, electrical devices, and corrosion-susceptible metal alloys.**
Irradiation	Cobalt 60 Gamma rays	**Sterilization of medical products (e.g., tissue for transplantation, pharmaceuticals, medical devices) or disposable prepacked items.**

6.5. Decontamination Protocol for Routinely Used Patient Care Items (A–Z Listing)

Article	Method of Decontamination
Airways and endotracheal tubes	Autoclave preferably or Chemical high level disinfection
Ambubag	Clean with detergent and water, dry and sterilize by autoclaving.
Applicators (Tonometer Prisms)	Immersion in 0.05% hypochlorite for 10 minutes.
Arterial catheters	Sterile, single use only, must be discarded after use.
Baby weighing scales	• A fresh liner should be used for each baby. • Clean tray with detergent and water. • Wipe with 0.1% Hypochlorite if contaminated.
Baby bath	Clean after each use with detergent and water
Beds and couches Frame	• Clean with detergent and water between patients and as required • 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 0.5%)
Bedpans / urinals	Clean and disinfect with 0.1% sodium hypochlorite or hot water. Ensure that the item is dry before re-use.
Breast pumps	Wash with detergent and water and immerse in freshly prepared sodium hypochlorite 0.1% solution at least for 20 minutes.
Bowls (surgical)	Wash with detergent and water and send for Autoclaving
Bowls (washing)	Wash with detergent and water and decontaminate with 1% sodium hypochlorite, rinse and dry after each use. Store inverted and separated
Buckets	Clean with detergent and water and decontaminate with 0.5% bleaching solution, rinse and store dry.
Carpets	• Vacuum daily • Should be shampooed or steam cleaned in isolation rooms as a part of terminal cleaning.
Cheatle forcep	Autoclave daily and keep in fresh solution of 1% savlon (change solution daily) or Glutaraldehyde solution (2%) as per MR
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

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%)
Cutlery and crockery	Should be heat disinfected in dishwasher. If washed in sink, wash with water and detergent.
Curtains	Should be changed as a part of rolling programme by domestic services Should be changed as a part of terminal cleaning programme.
Denture pots	1. To be cleaned by patients themselves with detergent and water 2. Disposable with lid–single use.
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 send to CSSD. Weekly autoclaving or HLD is highly recommended.
Dressing trolleys	Clean daily with detergent and water. After each use—wipe with 70% isopropyl alcohol.
Drip stands/IV stands	Should be cleaned with detergent and water and dried. After use in isolation, should be wiped with sodium hypochlorite 1% and dried after cleaning.
Dustbins	Detergent and water every morning
Ear Pieces for auroscope	Clean with detergent and water and dried.
Earphones	Clean with detergent and water and dried. Foam should be replaced after use in isolation.
ECG leads and machines	Wash with detergent and water and then wipe with 70% alcohol.
Leads and monitors	Dismantle to smallest components and clean with detergent and water and dry.
Furniture	Damp dusted with detergent and water.
Haemodialysis 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 av Cl2) solution or other appropriate disinfectant as per manufacturer's recommendations.
Humidifiers	Clean and sterilize at low temperature by plasma/ ETO sterilizer/ immerse in glutaraldehyde solution (2%) for 10 hours. Water used in humidifiers—Use normal saline/ sterile distilled/ sterile tap water. Replace the water used daily/ for every patient. 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 av 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 av 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)	Clean the outer surface with detergent and water and dry. If used in isolation rooms, wipe with 1% sodium hypochlorite 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 and then 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 1000 ppm av Cl2 solution or other appropriate 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. In case of blood spillage—follow spillage policy
Metal buckets	Clean with Vim powder every week
Mops	Disposable use for one day. Re-usable to be laundered.
Peak flow	Disposable—single patient use.
Nebulizers and tubings	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.
Scissors	Surface disinfect with a 70% alcohol impregnated wipe before use. If visibly soiled clean first with a detergent solution. For sterile use, follow high level disinfection with 2% glutaraldehyde.
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 clean tubing and inflation bladder. After use in isolation, should be laundered in washing machine
Splints and walking frames	Wash and clean with detergent and allow to dry.
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.
Soap dispensers	Should be cleaned weekly with detergent and water and dried.
Stethoscopes	Surface should be wiped with 70% alcohol impregnated wipe between patients. Use dedicated stethoscope in high-risk area eg. ICU. NNU or patients with infection or colonized with MDROs
Suction bottles	Disposable liners—must be sealed when 75% full and placed in yellow plastic bag. 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 by autoclaving/plasma sterilizer/ETO. 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 for infection 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. On discharge of patient, wash both thermometer and thermometer holder with detergent, immerse in 70% alcohol for 10min. Wipe and store 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. If not possible, use either single-use thermometer or clean and disinfect between use. Do not use without sleeve or on patients with an infectious disease. 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) for 10 minutes
Toys	Clean with detergent and water and dried.
Ultrasound machines	Damp dust with detergent solution and allow surface to dry before use. Draw up local protocol for cleaning and disinfection based on the manufacture's recommendations
Urine pots/ Urine measuring jugs	Clean with detergent and water and disinfect with 0.1% hypochlorite for 30 minutes before reusing.
Vaginal speculae	After use immerse in hypochlorite for 15-30 min and Send to CSSD for sterilization 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. 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 the manufacture'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 for 30 minutes before reusing.
Wash bowls	Patients must have own dedicated bowl. After each patient's use, should be cleaned with detergent.
Wheel chairs	Patient's own—should be cleaned with detergent and water as necessary. Hospital—clean between patients with detergent and Water

*MR = Manufacturer's Recommendation

6.6. Endoscope Reprocessing

Endoscopes are medical devices which may be problematic to clean and disinfect (long narrow channels, complex internal design, etc.). Products and/ or processes used (chemical or thermo-chemical disinfection) may not be as reliable as sterilization methods. To reduce nosocomial transmission of microorganisms by endoscopy a standard reprocessing procedure must be systematically followed.

Depending up on area of involvement, scopes can be disinfected by either:

- Chemical sterilants/ Sterilization (for scopes entering sterile or critical sites - e.g., arthroscopes, cystoscope, laparoscopes)
- High-level disinfectants (for scopes entering semi-critical areas i.e. in contact with mucous membrane e.g. flexible endoscopes).

CDC approved disinfectants to process heat sensitive medical devices such as flexible endoscopes:

- ≥2.4% glutaraldehyde—at 25^{0}C for 20-90 minutes (FDA)
- 0.55% ortho-phthalaldehyde (OPA)-not known to irritate the eyes and nasal passages, does not require activation or exposure monitoring, and has a 12 min contact period at 20^{0}C, e.g. of high level disinfectant
- 0.95% glutaraldehyde with 1.64% phenol/phenate
- 7.35% hydrogen peroxide with 0.23% peracetic acid for 15 minutes at 20^{0}C
- 1.0% hydrogen peroxide with 0.08% peracetic acid
- 7.5% hydrogen peroxide
- EtO sterilization (less preferred as longer time and toxic)
- Expose the endoscopes to 2% glutaraldehyde,

Endoscope reprocessing can be done by two methods. Manual and automated using Automated endoscope reprocessors (AER).

6.7. Manual Reprocessing of Endoscope

Endoscope disinfection or sterilization with a liquid chemical sterilant involves five steps after leak testing.

6.7.1. Clean

- After the endoscopy procedure, the external surface of the insertion cord of the endoscope is wiped with gauze.
- Mechanically clean internal and external surfaces, including brushing internal channels
- Endoscope is connected to suction and internal channels are flushed with water and then the air is let out to remove any block.
- Flush with enzymatic solution once and then again flush with water.
- The insertion cord of the endoscope is immersed in enzymatic solution and flushed with enzymatic solution twice.
- Then insertion cord of the endoscope is immersed in water and flushed with water twice.

6.7.2. Disinfect

Immerse the endoscope in high-level disinfectant (or chemical sterilant) e.g. 2% glutaraldehyde and perfuse (eliminates air pockets and ensures contact of the germicide with the internal channels) disinfectant into all accessible channels, such as the suction/biopsy channel and air/water channel. Keep the endoscope immersed for 20 minutes (in case of glutaraldehyde) or for recommended exposure time for the disinfectant used.

6.7.3. Rinse

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

6.7.4. Dry

Rinse the insertion tube and inner channels with alcohol, and dry with forced air after disinfection and before storage.

6.7.5. Store

Store the endoscope in a way that prevents recontamination and promotes drying (e.g., Hung vertically).

Drying the endoscope (steps 4 and 5) is essential to greatly reduce the chance of recontamination of the endoscope by microorganisms that can be present in the rinse water.

Store endoscopes in a manner that will protect them from damage or contamination.

6.8. Precautions while Reprocessing the Endoscopes

- Before any immersion, the endoscope must be leak-tested to detect any damage. Remove from clinical use any instrument that fails the leak test, and repair this instrument.
- Use cleaning brushes appropriate for the size of the endoscope channel or port (e.g., bristles should contact surfaces).
- Cleaning items (e.g., brushes, cloth) should be disposable or, if they are not disposable, they should be thoroughly cleaned and either high-level disinfected or sterilized after each use.
- Discard enzymatic cleaners (or detergents) after each use because they are not microbicidal and, therefore, will not retard microbial growth.
- Check the solution each day of use (or more frequently) using the appropriate chemical indicator (e.g., glutaraldehyde chemical indicator to test minimal effective concentration of glutaraldehyde) and document the results of this testing.
- Discard the solution if the chemical indicator shows the concentration is less than the minimum effective concentration.
- Do not use the liquid sterilant/high-level disinfectant beyond the reuse-life recommended by the manufacturer (e.g., 14 days for ortho-phthalaldehyde).
- Make PPE (e.g., gloves, gowns, eyewear, face mask or shields, respiratory protection devices) available and use these items appropriately to protect workers from exposure to both chemicals and microorganisms (e.g., HBV).
- Mechanically clean reusable accessories inserted into endoscopes (e.g., biopsy forceps or other cutting instruments) that break the mucosal barrier (e.g., ultrasonically clean biopsy forceps) and then sterilize these items between each patient.

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

7.1. 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.
- Cool steam- or heat-sterilized items before they are handled or used in the operative setting.
- Use low-temperature sterilization technologies (e.g., EtO, hydrogen peroxide gas plasma) for reprocessing critical patient-care equipment that is 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^{0}C, 8 hours at 60^{0}C) before using these items in patient care.

- Sterilization using the peracetic 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).
- Dry-heat sterilization (e.g. 170^{0}C for 60 minutes) can be used to sterilize items (e.g., powders, oils) that can sustain high temperatures.
- 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 sterilisation process and for the traceability of instruments are kept.
  - The object must be wrapped for sterilization. Only a wrapped sterilized object should be described as sterile.

7.2. 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.

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CSSD Work Protocol

1. SAFETY AWARENESS IN STERILE SERVICE DEPARTMENT

1.1. Objective/ Purpose

To establish an overview of guidelines and safety awareness procedures in the Sterile service department.

1.2. Procedure

1.2.1. General Guidelines

- All personnel must follow established work flow patterns.
- Material Safety Data Sheets (MSDS) for all chemicals used in the sterile service department must be available in the department.
- Employee must be trained in a safe work procedure and be aware of any relevant procedures, policies.
- All employees must be trained in using appropriate personnel protective equipment designated for each area.
- Employees must adhere to dress code and policies before entering and when leaving the area.
- Employees must follow and practice hand washing guidelines (before and after each tasks) in accordance with WHO guidelines.
- Eating and drinking is prohibited in all workspaces including supply storage, processing and decontamination sections
- Visitors are prohibited from entering CSSD spaces without permission.
- If visitors must enter restricted areas, appropriate attire is required and they should be escorted by CSSD staff.

1.3. Patient Safety

- All CSSD personnel should be trained in Decontamination and Sterilization Practices.
- Safe keeping of all items by ensuring that storage areas are kept clean, equipment is covered and preventive maintenance is performed on all equipment.

- Assure there is no contamination of patient care areas during collection and transportation of contaminated items.

1.4. Employee Safety

- Prevent burn injuries when loading or unloading steam sterilizers and washer disinfectors by following procedure and wearing appropriate PPE.
- Use care and caution when handling sharps.
- When receiving or handling contaminated items, always wear the correct PPE for the task.

1.4.1. Note

- Use of electrical extension cords is prohibited in sterile service areas.
- All employees must be aware of fire and safety regulations.
- If spills occur, refer to policy management of body fluids spillages or consult safety representative.

2. DEPARTMENT CLEANING PROCEDURE

2.1. Objective/ Purpose

To ensure an acceptable level of hygiene and cleanliness throughout the CSSD area.

2.2. Procedure

- The CSSD will be cleaned in accordance with the cleaning schedule.
- Cleaning will take place before work commences or after work is completed, in the case of a 24hour facility cleaning will be rotated through areas when work is not in progress
- The cleaning schedule will specify frequency of cleaning
- Designated cleaning equipment will be stored in a designated area for that area's use only.
- Cleaning work will only be undertaken by staff trained to work in that area.
- CSSD staff is responsible for making sure that all surfaces are clean.
- All cleaning procedures and cleaning chemicals used in the department will be in line with Departmental recommendations.
- The use of brooms is discouraged.

3. DEPARTMENTAL DRESS CODE

3.1. Objective/Purpose

To ensure that staff are properly attired according to the requirements of their work area.

3.2. Procedure

- On entering the Sterile Service Department, all staff will change into departmental uniform provided in the changing area.
- Staff moving into the wash area, who will be engaged in the handling and processing of incoming equipment, must use appropriate PPE.
- When leaving the wash area staff will remove and discard the gown and gloves and wash their hands.

4. MANUAL DECONTAMINATION OF MEDICAL DEVICES

4.1. Purpose

To ensure that all soiled equipment returned to the CSSD is cleaned to an acceptable standard.

4.2. Procedure

- When washing instruments manually, standard/ universal precautions must be applied at all times.
- Only staff trained in decontamination should manually clean medical devices.
- Maintain segregation of designated clean and other areas within the department.
- Identify the correct process for the items to be decontaminated according to manufacturer's instruction.
- Use and store all equipment, chemicals and materials in accordance with manufacturer's instructions and organisational policies and procedures.
- Ensure that stock of chemicals and materials that are being accommodated is rotated so that oldest is used first.
- Place Bio Medical Waste Containers in positions that will minimise hazards to staff and visitors.
- Handle contaminated devices as little as possible.
- Check instruments off against the checklist returned with the set and take notice of any comments made on the check list by the theatre team/user.
- Identify if the medical devices can be decontaminated in the washer.
- Identify items requiring special attention and handle in accordance with documented manufacturers' instructions.

- Each instrument will be prepared for decontamination as follows:
  - Remove the protective outer wraps
  - If needles/blades are found, the instrument set should be set aside and the end user contacted to come and remove the sharps.
  - Sort Cannulated and solid devices.
  - Open all hinged instruments
  - Flush all Cannulated instruments with the pressure jet gun / syringe before and after brushing.
  - Pressure sprays can be used according to manufacturer's guidelines.
  - Disassemble all multi part instruments of Handle and process all devices in accordance with the manufacturers' instructions
  - Keep sets of items being processed together where possible
- Sinks and accessories must be cleaned at each water change
- When cleaning manually, a pre-rinse, wash, rinse and drying process must be followed.
- The water temperature should be according to detergent manufacturers' instructions.
- Water and detergent should be measured according to manufacturers' instructions and should have the correct chemical mixture.
- All devices being manually cleaned must be fully immersed in the washing water while being scrubbed.
- Special attention must be paid to the joints of any jointed instrument and meticulous attention paid to the tips.
- A clean soft brush or soft cloth /Sponge are required to clean the surfaces.
- After decontamination, all devices must be visually inspected for soil, damage and functionality.
- Dry items using a non-linting cloth.
- Clean items should be stored and transported in such a manner that cross contamination is avoided.
- Return cleaning equipment and cleaning materials in good working order and condition to the appropriate place after use.

5. PREPARE, LOAD AND OPERATE AUTOMATED DECONTAMINATION EQUIPMENT

5.1. Objective/ Purpose

To ensure that medical devices/equipment are correctly prepared and loaded for decontamination.

5.2. Procedure

- Identify the correct process for the items to be decontaminated following manufacturer's instructions
- Staff working in this area will wear protective clothing at all times in compliance with the PPE guidelines.
- Handle contaminated devices as little as possible.
- Washer disinfectors will be prepared for use as described in the Working Instructions Manual. Follow manufacturers' instructions.
- All equipment is transferred from the trolley to the work surface.
- Each instrument will be prepared for decontamination same as manual cleaning.
- Standardised washing and disinfecting processes should be used and validated.
- Place instruments into a wash basket and check to ensure all items and parts are present.
- Load items to be decontaminated in the correct position in baskets so that maximum exposure to the decontamination process is achieved on all surfaces of the instrument
- Place heavier items at the bottom making sure that all surfaces can be reached by the spray jets
- Detergents should be used according to washer manufacturers' instructions
- A full-automated process should be used including pre-rinsing, washing, disinfection and drying.
- Where more than one chemical is used in the automated washer disinfector, the tubing should be marked to indicate which chemical it carries.
- Identify and follow operating instructions for washer disinfectors (W/D's) accurately
- Maintain records of all items received and prepared for processing

6. PREPARE, LOAD AND OPERATE ULTRASONIC CLEANER

6.1. Objective/ Purpose

To ensure that medical devices/ equipment are correctly prepared and loaded for decontamination

6.2. Procedure

- Maintain segregation of designated clean and other areas within the department.
- Identify the correct process for the items to be decontaminated

- Equipment will be prepared for use as described in the Manufacturer's Guidelines.
- Highly contaminated instruments should always be pre-cleaned in the ultrasonic bath as otherwise they cannot be properly cleaned in the washer-disinfector.
- It is also recommended that all trays with instruments should be put through the ultrasonic cleaner at least once a week.
- In the case of table top cleaners;
  - Fill the tank with RO water to the operating level.
  - De-gas the water as recommended by the machine manufacturer.
  - Add detergent, as per requirement.
  - Sort cannulated and solid devices. Avoid contaminating hands with soiled edge.
  - Open hinged items
  - Place the basket of instruments into the tank. Never put instruments directly onto the base of an ultrasonic washer.
  - Make sure that instruments do not stick out of baskets.
- Only prescribed automatic cleaning agents should be used, enzymatic cleaners are recommended bearing in mind manufacturer's instructions.
- Select a program or set the timer control to the time specified by the machine manufacturer.
- After the cycle has been completed, remove the basket from the tank and rinse the items with clean, potable water-unless the machine has an automatic rinse stage, or the load is to be transferred directly into a washer/ disinfector for further processing.
- Drain and dry the items using a non-linting cloth or mechanical drying system.
- Drain the machine after completion of each cycle and left dry and empty until further use.

7. PACKING AREA OPERATION

7.1. Objective/Purpose

To describe the operation and procedure controls in the Packing Room.

7.2. Procedure

- After decontamination, all clean items are received into the packing area
- Any item that is rejected due to evidence of residual blood, body fluid, stains are placed in a plastic bag and identified before being returned for washing again
- Any item that is damaged or broken is sent for repair

8. STERILE PACKAGING

8.1. Objective/ Purpose

To ensure that the correct materials are used and that items are correctly packaged in order to maintain sterility

8.2. Procedure

- Sterile packaging must provide protection against contamination during handling as well as providing an effective barrier against microbial penetration.
- An ideal packaging should have the ability to allow sterilization agents to penetrate and then provide a barrier, which will maintain the sterility of the wrapped devices.
- Use only medical grade packaging.
- The type of packaging and the way you package the devices will determine if aseptic opening is possible in the operating theatre or the ward.
- The packaging should protect the contents against damage during handling and transport.
- The packaging should be able to withstand the conditions during the sterilization process such as pressure changes, high temperature and humidity
- It is important that the following points are taken into consideration when choosing a tray/set and packaging method:
    - The type of pack.
    - The size and weight of items to be packed.
    - The number of times the pack will be handled before use.
    - The distance that packs will be transported.
    - Whether the storage system is open or closed.
    - The condition of the storage area (cleanliness, temperature, humidity).
    - The method of sealing packs.
- The packaging should bear a clearly visible marking indicating whether or not the product has been through a sterilization process.
- 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.
- Packaging materials used with low temperature sterilization processes (e.g., ethylene oxide and gaseous hydrogen peroxide processes) must have similar properties, particularly being compatible with the sterilization chemicals, moisture, pressure changes and temperature ranges.

8.3. Medical Grade Single Use Disposable Sterilization Wrap

- Double wrapping creates a package within a package.
- Two sheets of wraps are used providing multiple layers of protection of surgical instruments from contamination. Double wrap = wrap and wrap
- The use of two layers of wraps reinforces the strength of the packaging.
- 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.
- Do not re-use single use packaging
- Use a hospital grade masking tape and autoclave tape when using wrap
- Do not write on packaging

8.4. Disposable Peel-open Pouches and Reels

- Paper/Plastic peel-open packaging materials are suitable for steam and EO.
- Peel-open packaging should not be used for heavy or bulky items because the seals can become stressed and rupture.
- Pouches are available in many sizes.
- The open end of the pouch is closed with a sealing device. It is essential that the heat sealer is functioning effectively in order to get an adequate seal.
- The user can cut reels to any size needed, in which case both sides of the pack will need to be sealed by the user.
- Peel-open packaging is useful when visibility of the contents is important.
- When packaging items, care must be taken to leave a minimum of 1 inch (2.5cm) space between the end of the item and the seal of the pouch or reel in order to facilitate aseptic opening.
- 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, plastic against plastic in order to enable sterilant penetration.
- A felt-tip, indelible, non-toxic ink marker can be used on clear plastic side of the pouch to label.

8.5. Reusable Rigid Container Systems

- Sterilization containers are a durable sterilization packaging system constructed of a rigid material such as metal, or plastic.
- A variety of sizes can accommodate a wide range of instrument sets.

- Containers need to be disassembled and cleaned after each use, following the reprocessing instructions supplied by the container manufacturer.
- Remember ! Containers are classified as devices themselves and as such should be reprocessed after each use, not just wiped down. Containers must be cleaned in the same way as any other reusable device.

9. STEAM STERILIZATION PROCEDURE

9.1. Objective/ Purpose

To ensure consistent sterilization of items through quality control checks of the autoclave to ensure that all reprocessed medical devices are sterilized to an acceptable standard and ready for use.

9.2. Procedure

- Check to ensure printer, recorder is working properly
- The first cycle will be a “warm up” cycle.
- On the second cycle place a Bowie and Dick Test Pack, in the warm empty chamber above the drain, on a pre-vacuum cycle.
- Once the cycle has run record the Bowie and Dick test according to procedure.
- If the Bowie Dick test result is a fail, repeat the test with a new Bowie Dick Test pack.
- If the Bowie Dick test is still fail shut down the autoclave for repairing.
- Run Biological indicator once a week, according to CDC Guidelines, in the first full load of the day as well as any load containing implants.
- Record the result according to procedure.
- Record contents of load, information must be detailed enough to allow for tracking and recall if necessary.
- Label package according to policy.
- Make sure each pack has a tracking label affixed.
- Ensure that items being loaded are compatible with High Temperatures.
- Process full loads—not overloaded—to limit the number of cycles you need to run.
- 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.
- Packages must not be in contact with walls or ceiling of chamber or else damage from heat or moisture may occur.

- Load baskets and carts in a manner that hands won't touch packs when removing the hot trolley.
- On completion of cycle, 'cycle complete indicator' will appear, visually check the graph / printer to determine that all parameters have been met.
- In the event of a cycle failure/ cycle aborted, the entire load will need to go through the full reprocessing cycle.
- The person responsible for checking the load should sign their name on the printout before opening the sterilizer door.
- Open the door while standing towards the side to avoid burns.
- Put on heat resistant gloves and remove carrier from Autoclave.
- Allow to cool for 10–15 minutes before storage or dispensing.
- Do not touch hot packs
- Inspect packages to ensure integrity and external chemical indicators have changed.
- Record results in the register and file for each autoclave according to batch no.

10. LOADING AND UNLOADING ITEMS FROM THE AUTOCLAVE

10.1. Objective/ Purpose

To ensure that items are correctly loaded and unloaded from autoclaves in order to maintain sterility.

10.2. Procedure

- Wear relevant protective clothing.
- Load instruments sets flat in single layer.
- Load soft packs on top shelf and large instrument trays on lower shelf.
- Do not allow packs to touch top, bottom or sides of autoclave.
- Do not compress pack.
- Position peel packs on sides.
- Do not overload
- On completion of cycle record maintain according to policy.
- Allow autoclave and packs to cool before handling.
- Do not touch hot racks without heat resistant gloves.
- Once cooled check for wet packs, tears, indicator changes etc.
- Store according to policy.

11. LOW TEMPERATURE STERILIZATION (H_2O_2)

11.1. Objective/ Purpose

To ensure that all soiled returned equipment is sterilized according to an acceptable standard and ready to use. To ensure the work environment is safe for all employees.

11.2. Procedure

Items that cannot be processed in a Hydrogen Peroxide Plasma/ Vaporized Hydrogen Peroxide:

- Any item that is not completely dry
- Items or materials that absorb liquids
- Items made from materials containing cellulose e.g., cotton, paper, cardboard, linens, gauze or items that contain wood pulp

Inserting and removing cassettes/ cartridge:

- Check item for damage
- Do not remove cassette from plastic wrapper if indicator strip is red, which indicates that the cassette might have been damaged
- Check expiry date of biological indicator/ monitor.
- Daily biological monitoring is recommended.
- Place biological monitor in a load in the sterilizer
- Process biological indictor
- Incubate biological indicator at temperature as recommended by manufacturer.

Preparing Items for loading:

- All items must be thoroughly cleaned and dried before packaging.
- Use packaging and containers recommended by the manufacture.
- Arrange items in such a way as to ensure sterilant will come into contact with all surfaces.
- Do not allow any items to touch the walls or the door.

12. STERILE PACK STORAGE

12.1. Objective/Purpose

To ensure the safe storage of all sterile packs until their release to other departments.

12.2. Procedure

- This is a clean area and should be kept clean and tidy at all times with limited access.
- Ensure that stock is rotated and monitor stock levels.
- Any member of the CSSD staff may issue out packs to customers, provided that all the checks have been carried out by the person releasing the goods.
- Only CSSD staff should be allowed access to the storage area.
- Doors and windows must be kept closed.
- Temperature and humidity should be controlled.
- The sterile storage area should be arranged to make it easy to identify packs and be well lit and easy to clean.
- Surgical and medical supplies should be stored at least 25 cm from the floor, 45 cm from the ceiling and 5 cm from outside walls to allow for air circulation in the room and to prevent contamination during cleaning.
- Follow a system of use the First in First out (FIFO) system. Rotate stock so that oldest items are used first.
- Products should be stored away from direct sunlight and water.
- Do not squeeze packs into tight spaces as this can tear the packaging
- Cardboard boxes should not be used as storage containers because they release fibres, cannot be easily cleaned and sometimes have rough edges which can make holes in packaging.
- The shelf life of a pack is dependent on packaging, handling and storage conditions.
- The shelf life of a CSSD processed sterile item is based on events rather than time.
- Expiration date is a reminder “Use Before”/ “Use First”.
- Events that can compromise the sterility of a sterile item include:
    - Holes or torn wrappers.
    - Broken or incomplete seals on laminated pouches
    - Items that have been dropped on a dirty surface
    - Elastic bands or tapes should not be used to bundle items

13. THE DELIVERY AND DISTRIBUTION OF PROCESSED ITEMS

13.1. Objective/ Purpose

To ensure customers receive sterile items in a safe condition and ready to use.

13.2. Procedure

- All items will be checked for sterility before they are released.
- The following should be checked when deciding if the pack is still sterile:
  - Holes or tears
  - Wetness or stains
  - Broken seals
  - Dust
  - Evidence of crushing
- All damage items are returned to the decontamination area.
- Various methods can be used in the transport of sterile packaged items to their point of use.
- Sterile supplies should be transported in covered or enclosed trolleys with a solid bottom shelf. The solid bottom shelf prevents microorganism on the floor being picked up by the wheels of the trolley and then spun upwards onto the sterile packs.
- If items are placed inside plastic or paper bags, they should be arranged to prevent them from being crushed or damaged during transport.
- Items must be placed onto a clean trolley that can be covered.
- Trolleys must not be overloaded.
- Soiled items must NOT be loaded onto the same trolley.
- Loaded trolleys must not be left to stand.

14. QUALITY CONTROL

14.1. Objective/ Purpose

To ensure that the CSSD provides a quality service

14.2. Procedure

Area where to Perform Test	Detail of Test
Washing Area	• Checks that complete set have been received from user. • Check detergent level on washer.
Packing Area	• All instruments to be visually inspected for cleanliness/ functionality—deal with rejected items according to policy. • Check all instrument are present and packed correctly. • Place a chemical in-pack indicator. • Check the functioning of heat sealers daily.

Autoclave Area	• Physical monitoring of all sterilisers. • Perform daily Vacuum Tests on all steam autoclaves (BD). • Perform weekly Biological Tests on all sterilisers. • Check that all packs have external chemical indicators before loading into steriliser. • Check that all parameters have been met on autoclave. Take a printout and keep for record. • All items that have residual moisture, tears or from a failed cycle are to be dealt with in accordance with policy.
Sterile Store Area	• Before releasing goods for delivery, check the packaging for damage. • Check the external chemical indicator to ensure that the pack has been through a steriliser.

15. MONITORING STEAM AUTOCLAVES

15.1. Objective/ Purpose

To monitor that all steam autoclaves are functioning optimally.

15.2. Procedure

- Monitoring includes all sterilizer components that track and record time, temperature and pressure during each cycle, printouts, gauges, round charts, etc.
- 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 a number of stages:
- Autoclave parameters are not met
- Biological Test shows growth
- Bowie Dick Test Failure
- Process Challenge Device or Load Control Failure
- External Process Indicator Failure
- Internal Chemical Test Failure

The ISO 11140-1 standard classifies indicators according to intended use or performance criteria as follows:

Class 1: Process indicators/ external indicators Indicators for use in specific tests/ Bowie Dick

Class 3: Single parameter indicators/ respond to one parameter

Class 4: Multi-parameter indicators/ respond to 2 or more parameters

Class 5: Integrating indicators/ react to all parameters/ mirror the performance of Biological indicators

Class 6: Emulating indicators/ react to all parameters/ verify specific cycle parameters

15.2.1. Bowie Dick Test (BD)

- Bowie-Dick test should be run and documented at least daily before the first process load and after any steam autoclave shut-down.
- This indicates if air is being removed completely from the autoclave.
- The Bowie Dick is placed on a rack above the drain of the autoclave in an EMPTY load.
- This test should be done daily in each machine, the machine must be warm.
- There must be a complete, uniform colour change which indicates a PASS.
- A PASS indicates that the sterilization process was effective since it indicates no air was present.
- An incomplete or no colour change—FAIL.
- A FAIL indicates air was present and sterilization was not achieved.
- Repeat the test.
- If results still show a FAIL do not use the autoclave.
- The Autoclave number and test result must all be recorded in the record book provided.
- A Process indicator is placed on the outside of each individual package to verify that the package has been exposed to a sterilization process.
- Indicator should be clearly visible on the outside of the sterilized package. This helps differentiate sterilized from unsterilized items.
- Fix the Process indicator tape or label on the outside of the package or rigid container, once it has been assembled for sterilization.
- Colour change according to the manufacturer's reference—Pass–Medical Device can be moved to the Sterile Storage Area for use
- Colour change not according to the manufacturer's reference—Fail–Medical Device should be reprocessed CSSD.

15.2.2. Internal Chemical Indicators (CI)

- In-pack chemical indicator can detect sterilizer malfunction or human error in packaging or loading of the sterilizer.
- Place the CI in an area of the package, instrument tray or rigid container in an area that is determined to be the densest part of each pack

- Measure if sterilizing parameters have been met inside the pack
- Colour change even and according to the manufacturer's reference—Pass–Medical Device can be used
- Colour change uneven and/or not according to the manufacturer's reference—FAIL–Medical Device should not be used
- Send back to Sterilization Department for reprocessing.

15.2.3. Biological Indicators (BI)

- A biological indicator is a preparation of living spores which provide a defined resistance to a specified sterilization process.
- A PASS indicates if sterilizing conditions are adequate to kill micro-organisms.
- Non-pathogenic micro-organisms are used.
- Manufacturer of the BI should provide data on the reliability, safety and performance characteristics of their product, as well as instructions for storage, handling.
- A test must be performed once a week in each sterilizer.
- Place the BI in a test pack, into the centre of a FULL load.
- After sterilization, retrieve the BI Test out of the pack.
- Allow the BI to cool for 10 minutes after sterilization. (Note the BI contains a glass ampoule, which needs to cool prior to crushing and incubating)
- Record the sterilizer, load and date on the BI label.
- Send the BI to microbiology for incubation process.
- Sterilization process was effective since it indicates no growth.
- Positive '+' means colour change/growth of microorganisms.
- Indicates microorganism growth and sterilization was not achieved
- If there is a BI failure on any load, the whole load must be recalled, repackaged and resterilized.
- Results must be recorded and stored according to Hospital policy

Decontamination of Hospital Environment

1. OBJECTIVES

1. To maintain standards in infection control measures and minimize hospital acquired infections in patients and staff.
2. To define policy and procedure regarding cleaning, disinfection and sterilization of hospital environment.

2. SCOPE

This document applies for all the areas of hospital service at AIIMS Raipur.

3. BRIEF INTRODUCTION

The environment serves as a reservoir for a variety of microorganisms, however, it is rarely implicated in disease transmission except in the immunocompromised population. Inadvertent exposures to environmental opportunistic pathogens or airborne pathogens may result in infections with significant morbidity and/or mortality. Lack of adherence to established standards and guidance can result in adverse patient outcomes in health-care facilities.

4. RISK CATEGORIZATION OF HOSPITAL AREAS

Different functional areas represent different degrees of risk and, therefore, require different cleaning frequencies, and levels of monitoring and evaluation. A functional area refers to any area in a healthcare facility that requires cleaning. Accordingly hospital areas can be categorized as:

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.

8.1. Categories of Patient Care Area

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		
Burn Unit		
Isolation wards/rooms and attached internal areas like bathrooms/toilets		

Note: Following additional facilities may be treated as '*moderate risk areas*' for the purpose of this document.

- Designated microscopy centre and DOTS centre under RNTCP and
- ART centre and HIV testing laboratory under ICTC

Table 8.2: Frequency and Method of Cleaning in Different Risk Areas

Category	Frequency	Level of Cleaning Required	Method of Cleaning
High risk area	Once in two hours and spot cleaning as required	Cleaning and Intermediate 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	Once in four hours and spot cleaning as required	Cleaning and low level disinfection	Cleaning with soap and detergent plus disinfection with aldehyde compounds, hydrogen peroxide, phenolics
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

5. CLASSIFICATION OF ENVIRONMENTAL SURFACES FOR CLEANING PURPOSES

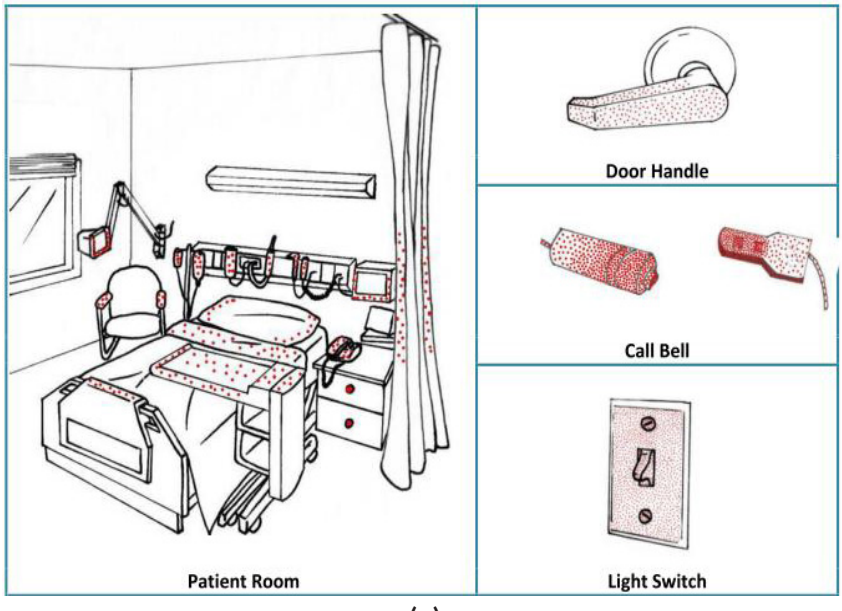
Environmental surfaces carry the least risk of disease transmission and can be safely decontaminated using less rigorous methods than those used on medical instruments and devices. Environmental surfaces can be further divided into:

- *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).
  - o *Low Touch Surfaces*: Surfaces with minimal hand-contact
  - o *High Touch Surfaces:* Surfaces with frequent hand-contact

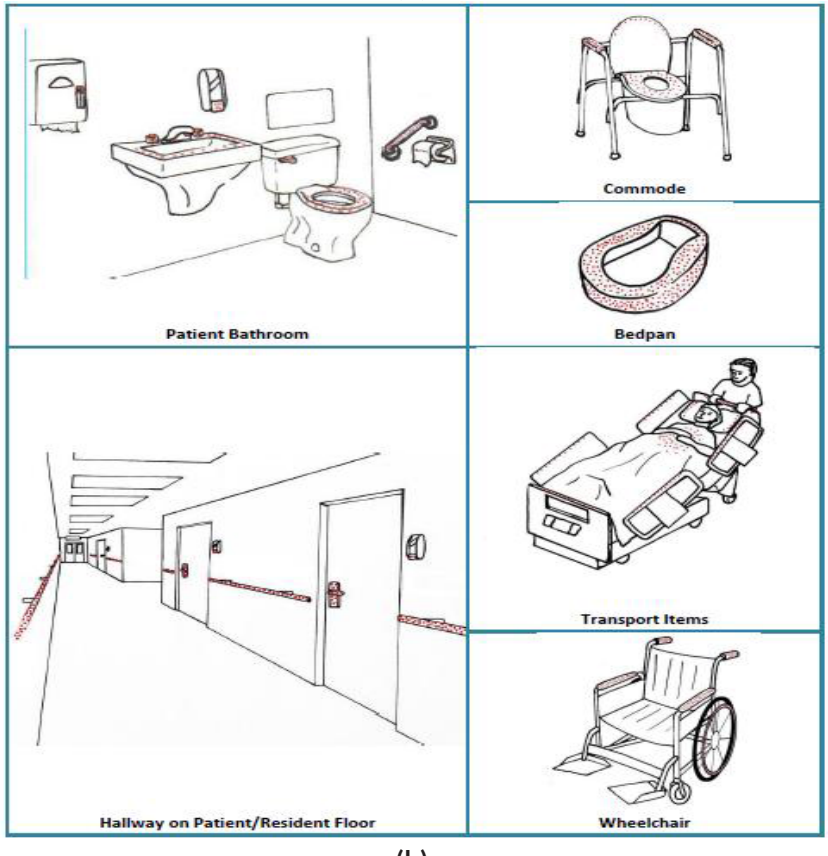
5.1. Examples

Low Touch Surfaces	High Touch Surfaces
Floors, ceilings, mirrors, window sills, walls	Doorknobs, bedrails, light switches, elevator buttons, telephone, call bells, computer keyboards, monitors, haemodialysis 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 as compared to low touch areas.



(a)



(b)

Figure 13: High Touch Objects in Hospital Environment

Recommendations for cleaning and disinfection of medical equipment surfaces and housekeeping surfaces are described below.

Note: Requirements for cleaning, disinfection and sterilization of medical devices/ instruments/ patient care items have been described in details in Chapter No. 6. of this manual.

6. RECOMMENDATIONS FOR CLEANING OF MEDICAL EQUIPMENT SURFACES

- Follow manufacturers' instructions for cleaning and maintaining noncritical medical equipment.
- In the absence of a manufacturer's cleaning instructions, follow certain procedures as detailed below.
- Clean noncritical medical equipment surfaces with a detergent solution.
- This may be followed with an application of intermediate/ low level surface disinfectant (Bacillocid 0.5%, Hypochlorite 0.1%), in accordance with disinfectant label instructions and after assessment of compatibility of the disinfectant with instrument.
- Do not use alcohol to disinfect large environmental surfaces.
- Use barrier protective coverings as appropriate for noncritical equipment surfaces that are,
  - Touched frequently with gloved hands during the delivery of patient care (e.g. handles of dental equipment);
  - Likely to become contaminated with blood or body substances; or
  - Difficult to clean (e.g., computer keyboards).

7. RECOMMENDATIONS FOR CLEANING OF HOUSEKEEPING SURFACES

7.1. General Considerations While 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.
- Minimize turbulence to prevent the dispersion of dust that may contain microorganisms.
- Never shake mops.
- 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:

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

- 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.
- Be alert for needles and other sharp objects. Safely handle and dispose sharps into puncture proof container. Report any incident to supervisor.
- Collect waste, handle plastic bags from the top (do not compress bags with hands).
- Clean hands on leaving the room.

Table 8.3: Method and Frequency of Cleaning

Area/Surface	Area wise Frequency of Cleaning			Method of Cleaning
	High Risk	Moderate Risk	Low Risk	
All work surfaces/table tops	Every two hourly and after discharge	Every four hourly and after discharge	Daily and after discharge	Cleaning with detergent and water followed by Disinfection with either Bacillocid* or 7% Lysol or Sodium hypochlorite 0.1%
All high touch objects (Doorknobs, Bed rails, Light switches, elevator buttons, telephone, call bells, computer keyboards, monitors, haemodialysis machines, edges of privacy curtains, and surfaces in and around toilets in patients' room)	Every two hourly and after discharge	Every four hourly and after discharge	Daily and after discharge	Clean with detergent and water followed by disinfection with Bacillocid* Or 7% Lysol Or Sodium hypochlorite 0.1%.
Wash basins	Twice daily and after discharge	Twice daily and after discharge	Daily and after discharge	Clean with detergent / vim powder and water. Use HCL to remove stains.
Toilet seats	Twice daily Clean contact sites after every use	Twice daily Clean contact sites after every use	Daily	Clean with brush and detergent then disinfect (7% lysol). Use Hydrochloric acid (HCL) to remove stains
Floor of bathroom	Twice daily	Twice daily	Daily	Clean with broom and detergent then disinfect (7% lysol)

Floor (see section of floor cleaning)				Clean with detergent and water and disinfectant
Walls	Twice daily and after discharge	Twice daily and after discharge	Daily and after discharge	Clean with detergent and water with brush
Patient's cot	Twice daily and after discharge	Twice daily and after discharge	Daily and after discharge	Clean with detergent and water If visibly soiled, Clean with 0.1% hypochlorite/ 7% Lysol/ Bacillocid*
IV stands	Twice daily Clean contact sites after every use	Twice daily Clean contact sites after every use	Daily	Clean with detergent and water
Cupboards, shelves, lockers, stools and other fixtures	Daily	Daily	Weekly	Clean with detergent and water
High dusting	Weekly	Weekly	Weekly	Wet mop
Cleaning of corners	Weekly	Weekly	Weekly	Clean with detergent and water
Curtains	Weekly or after discharge	Monthly	Biannually	Change and send for laundering
Window blinds	Weekly or after discharge	Monthly	Biannually	Damp dusting
Fans and light	Weekly	Weekly	Monthly	Soap and water

*Use bacillocid in 0.5% concentration in moderate/ low risk areas and 1% concentration in high risk areas.

7.1.1. Precaution

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

7.2. Cleaning in Isolation/ Infectious/ Septic Wards

7.2.1. Pre-Requisites for Isolation

- Rooms—isolated according to disease and well lit
- Mattress and pillows—with impervious cover (mackintosh) to damp dust easily
- Separate urinals, bedpans, thermometers for each patient
- Separate bins with appropriate colour code in each room

7.2.2. Cleaning Practices—as Mentioned above in Addition to Following

Daily cleaning of IV stands and furniture, walls and bathrooms

7.2.3. Terminal Disinfection (at Discharge)

- Keep UV light facing each direction of room for ½ hour (2 bedded room) or 1 hr (4 bedded room)
- *Pillows*, *matresses*: clean with detergent, disinfected with 7% lysol and dried in sunlight for 24 hours
- *All linen*, *curtains*: remove, soak in 7% lysol/ autoclave—sent to laundry
- *After disinfection*: perform high dusting, wash the room, walls, windows, doors, bathroom, sink, furniture with soap and water.
- Soak bedpan, urinal, kidney basin in lysol for 1 hour, wash with detergent and dry under sunlight.
- Bath basins, bins, bucket, jugs, mugs—wash with soap and water and dried in sunlight.
- *Rubber sheets*: clean with 7% lysol, dry in sun, powdered, replaced.
- *Thermometer tray and its contents*: soak in 7% lysol after cleaning.

7.3. Cleaning in Operation Theatres

Theatre complex should be absolutely clean at all items. Dust should not accumulate at any region in the theatre.

7.3.1. Frequency of Cleaning

- Operation rooms–daily
- Entire theatre complex–once a week

7.3.2. Schedule for Cleaning of the OTs

- Before first case i.e. beginning of the day
- During a surgery
- Between surgeries
- End of the day
- Weekly/ monthly

7.3.3. Prior to First Case

- Wipe all furniture, equipment, lights, suction points, OT table, slabs, etc with a detergent/soap and water
- Complete at least one hour before start of surgery

7.3.4. 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.

7.3.5. In-between Surgeries

Gather all soiled linens in the receptacles and place them in trolleys to be taken for sorting. The dirty linen is then sent to the laundry. Use gloves while handling dirty linen.

- Used instruments.
  - o Wash in adjacent room by scrubbing with brush, liquid soap Multi enzymatic cleane or Vim—Send for sterilisation.
  - o In Septic Theatres: autoclave first—then clean manually—pack and reautoclave.
- Furniture, Operating Lights, Suction Cannisters and other equipment used—Wiped with a detergent.
- Patient transport vehicles are wiped.
- Floor—mop 3–4 feet area of the floor around the table.

7.3.6. At the End of the Day

- Repeat same procedure as earlier
- Wipe over-head lights, cabinets, waste receptacles, 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.

7.3.7. Weekly

- Remove all portable equipments.
- 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 equipments.
- Scrub floor using detergent and water—disinfect.
- Steel surfaces—clean with detergent, rinse, and clean with warm water.
- Replace portable equipments.

7.3.8. Other Aspects

- Machinery and equipment—checked, cleaned and repaired routinely on Saturdays
- Urgent repairs—carry out at the end of the day
- ACs, suction points—checked, cleaned, repaired weekly
- Preventive maintenance on all theatre equipment to be carried out every Saturday

Major work—at least once in a year

8. FLOOR CLEANING

Area	Frequency	Method
General Wards	Twice a day	Soap and water
Special Wards—MICU, SICU, NICU, LR, Transplant	• 4 times a day • One instance • Remaining 3 instances	• 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)

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

- 1st Bucket with water:
  - Dirty mop is rinsed
- 2nd Bucket with fresh water for rinsing:
  - Mop rinsed again in this water
- 3rd Bucket with low level disinfectant:
  - Mop is immersed in the solution and the floor mopped liberally.
  - Wash the used mop with disinfectant after use and dry thoroughly before reuse.

Following things should also be considered while mopping the floors:

- Prepare cleaning solutions daily or as needed and replace with fresh solution
- Change the mop head at the beginning of the day and after cleaning up large spills of blood or other body substances.
- Clean mops and cloths after use and allow drying before reuse; or use single-use, disposable mop heads and cloths.

9. FOGGING IN PATIENT CARE AREAS

CDC and HICPAC 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.

9.1. 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.
- Daily in operation theatres where surgeries are performed with window ACs.

9.2. Requirements

a. A fogging machine (fogger)

b. Baciliocid extra/ Ecoshield solution (11% Hydrogen Peroxide and 0.01% dilute Silver Nitrate)

c. Water

9.3. Procedure

1. Measure the area of room to be fogged in cubic feet.
2. Seal the room including windows and ventilators air tight. Use adhesive tapes to close the gaps.
3. Switch off the fans and ACs.
4. For each **1000 cu.ft.** (28.3 cu.mt.) space, use one litre of 0.5% Baciliocid extra solution/ 20% Ecoshield solution
5. Pour this solution to fogging machine
6. Switch on the machine
7. Keep it for 60 minutes

No neutralisation with ammonia required.

9.4. 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.
- Surveillance cultures in the form of air sampling by open plate cultures (settle plates) and swabs for isolation of aerobic and anaerobic bacteria should be taken by infection control nurse.
- Information regarding the same should be provided to infection control team prior to fogging.
- The area/room where fogging was performed **should not be used** until the microbiological surveillance cultures are reported as negative.

9.5. Action Plan in Case of Positive Microbiological Surveillance Report

- In case of positive microbiological sampling report, the area/ site should be cleaned and scrubbed thoroughly with soap/ detergent and water followed by cleaning with disinfectant (phenolic agents/ hypochlorites). This should be followed by repeat fogging and repeat microbiological testing.
- OT/ room/ area can be used only after microbiological surveillance cultures are reported as negative.

> *There is "No substitute" for vigorous scrubbing, washing of surfaces and removing the organic matter.*

10. 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 7% Lysol/ 1% Sodium hypochlorite at least for 30 minutes before being sent to the laundry.

Detailed Policy Regarding Use of Linen is Given in Chapter No. 10 of this Manual

11. FLOWERS AND PLANTS IN PATIENT CARE AREA

- No restriction in immunocompetent patient care areas
- No fresh or dried flowers or potted plants in patient care areas for immunosuppresed patients.
- If used, vase water to be changed frequently.
- Designate care and maintenance of flowers and potted plants to staff not directly involved with patient care.
- If plant or flower care by patient-care staff is unavoidable, instruct the staff to wear gloves when handling the plants and flowers and perform hand hygiene after glove removal.

12. 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.

13. PERSONAL SAFETY PRACTICES DURING ENVIRONMENTAL CLEANING

Healthcare staff involved in environmental cleaning must adhere to routine practices while carrying out cleaning. These include:

- Hand hygiene
    - o Before initial patient/patient environment contact (e.g. before coming into the patient room or bed space).
    - o After potential body fluid exposure (e.g. after cleaning bathroom, handling soiled linen, equipment or waste etc.).
    - o After patient/patient environment contact (e.g., after cleaning patient room; after cleaning equipment such as stretchers; after changing mop heads etc.).
- Use of Personal Protective Equipment (PPE)

Appropriate PPE should be used wherever indicated for protection from microorganisms, chemicals used in cleaning and to prevent transmission of microorganisms from one patient environment to another. PPE include,

- o Heavy duty gloves
- o Impermeable plastic apron
- o Gum boots

- Disposable mask and caps
- Eye protection wherever required

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Spillage Management

1. MANAGEMENT OF SPILLS OF BLOOD AND OPIM (OTHER POTENTIALLY INFECTIOUS MATERIAL)

- Blood and body fluid spillages should be dealt with immediately or as soon as it is safe to do so.
- Other persons should be kept away from the spillage until the area has been cleaned and 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 are generally 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 and healthcare risk/ yellow waste bags are available for spills management.
- If non-disposable cloths/ mops are used to clean spillage area they must be thermally or 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 original location after every use.

1.1. Contents of spill management kit

- Personal Protective Equipment
  - o Gloves–2 pairs (single use)
  - o Plastic Apron–1

- Face masks–2
- Caps–2
- Goggle–1
- Shoe Covers–2 pairs
- Forceps

- Absorbent Material (Cotton/ Blotting Paper/ Tissue Paper)
- Yellow Biohazard bag
- Small card board Sheets
- Sodium hypochlorite solution (use Phenol/ Lysol in case of spill clean up of urine)

1.2. Preparation of Hypochlorite Solution

Preparation of Working Hypochlorite Solution from Available Sodium Hypochlorite Solution

Concentration of Commercially Available Hypochlorite Solution	Required Working Concentration	To Prepare 1000 ml		To Prepare 100 ml		Shelf Life
		Hypochlorite Solution (in ml)	Add water (in ml)	Hypochlorite Solution (in ml)	Add Water (in ml)	
5%	1%	200 ml	800 ml	20 ml	80 ml	8 hours
10%	1%	100 ml	900 ml	10 ml	90 ml	8 hours

Preparation of Working Hypochlorite Solution from Bleaching Powder

Concentration of Commercially available Bleaching Powder	Required Working Concentration	To Prepare 1000 ml		To Prepare 100 ml		Shelf Life
		Quantity of Bleaching Powder (in gm)	Add water (in ml)	Quantity of Bleaching Powder (in gm)	Add Water (in ml)	
30%	1%	33.3 gm (2 table spoons/6 tea spoons)	1000 ml	3.3 gm (Half tea spoon)	100 ml	8 hours
30%	10%	330 gm (20 tablespoons)	1000 ml	33.3 gm (2 table spoons/6 tea spoons)	100 ml	8 hours

1.3. Procedure of Spill clean up

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

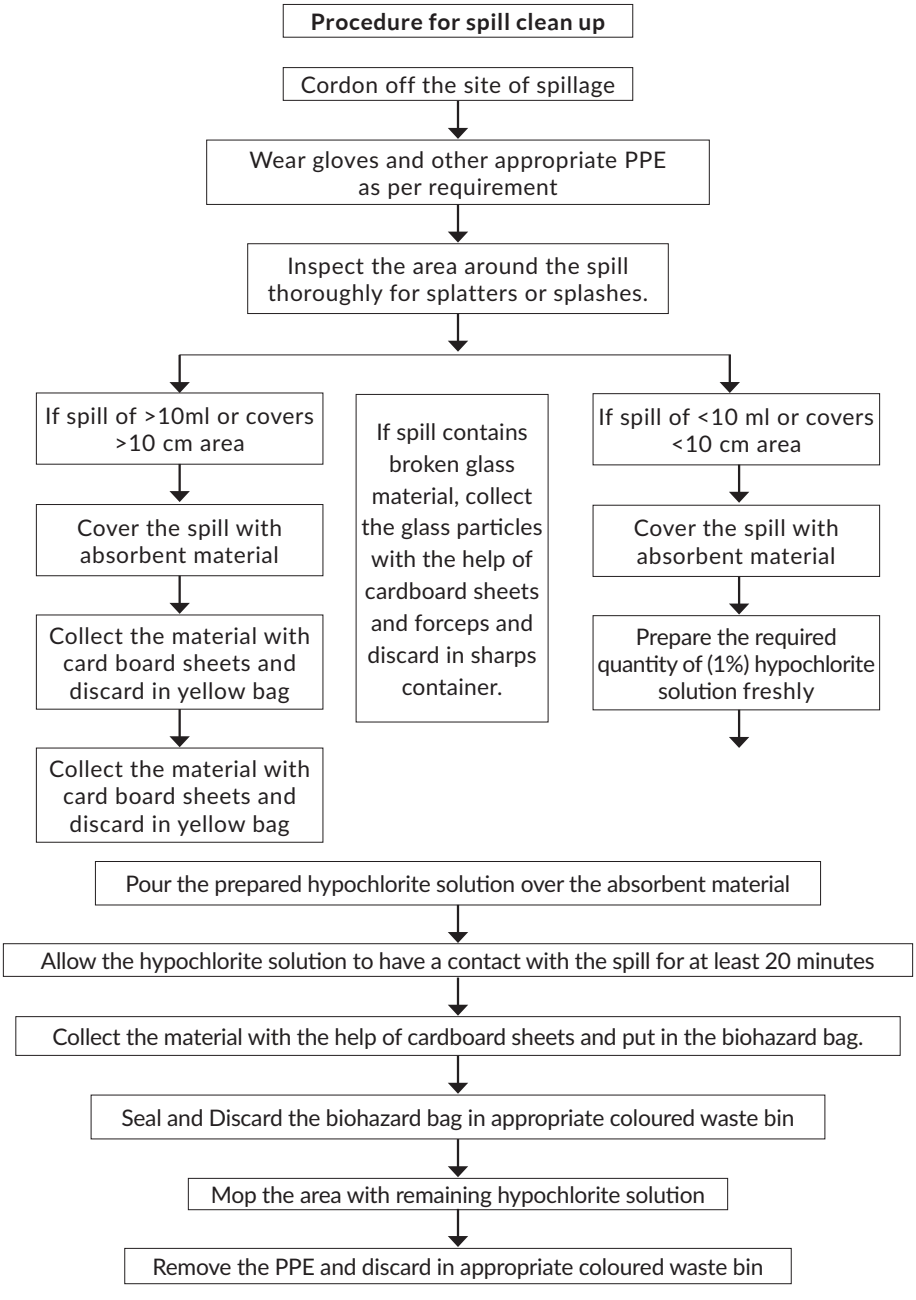

Figure 14: Spillage Management Protocol

2. MERCURY SPILL MANAGEMENT

2.1. Contents of a Mercury Spill Kit

1. Gloves
2. Mask
3. Goggles
4. Syringe 5 ml or dropper
5. Plastic container with lid that seals
6. Adhesive plaster strips
7. Cardboard strips or chart paper pieces
8. Thick plastic bag
9. Torch

2.2. Procedure of Mercury Spill Clean Up

- 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 to gather them together
- Use the syringe or dropper to draw up the Mercury beads, transfer them into the water filled plastic container and close and seal airtight
- Small and hard-to-see beads can be located with the flashlight, after removing the larger 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 BMWM.
- 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.

3. CHEMICAL SPILLAGE MANAGEMENT

For Chemical spillage, follow the Manufacturer's Instruction as mentioned in the MSDS (Material Safety Data Sheet) of the chemical products.

Laundry and Linen Management

1. INTRODUCTION

a. Hospital should have a policy for laundry infection control. It is important that linen is appropriately managed to ensure contamination does not occur as this can then lead to transmission of micro-organisms to people or the environment.

b. The purpose of this policy is the prevention of infection or injury in service users and healthcare staff involved in the use, handling or laundering of hospital linen.

2. CLASSIFICATION OF LINEN

For the purpose of infection control, linen can be classified into 4 categories.

a. *Clean Linen:* Linen items that are new, have been processed or are otherwise clean and have not yet been used.

b. *Used Linen:* Fouled or blood stained linen from patients not considered to be infectious or have communicable diseases.

c. *Infectious Linen*: Linen from patients with known infectious etiology such as MRSA/ VRE/ MDRO or any other infections such as HIV, HAV, HBV, HCV etc.

d. *High Risk Group Linen*: Diseases that can be transmitted through a low infectious dose of organisms, e.g Escherichia coli O157, shigellosis etc.

e. *Infested Linen*: From patients infested with lice and fleas.

- The laundry should be informed before-hand to ensure proper arrangement for these type of linen.

f. *Heat Labile Linen:* linen which is made from fabrics likely to be damaged by normal disinfection process, e.g personal clothing.

g. *For Category 4 Pathogens:* Linen originating from patients with these pathogens should be bagged in yellow clinical waste bags and incinerated, e.g anthrax, viral haemorhhagic fever, bioterrorism agents.

3. FREQUENCY OF BED LINEN CHANGE

1. Ideally it should be changed daily.
2. Linen must be changed and laundered between patients and when visibly soiled.
3. Immediately, when fouled.

4. STORAGE OF NEW LINEN IN WARD / DEPARTMENT

1. Clean linen should be stored in a clean area of the ward in closed cupboard.
2. They must be stored separate from used/ soiled linen.
3. At least 5 sets per bed should be available.

5. INFECTION CONTROL PRACTICES FOR LINEN DISPOSAL

5.1. General Consideration

1. All personnel involved in the collection, transport, sorting, and washing of soiled linen should be *adequately trained and wear appropriate* PPE.
2. All workers must cover all lesions on exposed skin with waterproof plasters and wear appropriate gloves.
3. Gloves used for the task of sorting laundry should be of sufficient thickness to minimize sharps injuries.
4. They must have access to hand washing facilities.

If the laundry services is outsourced then it is important that the hospital administration should include the hospital linen policy in the contract-setting process for provision of such services.

5.2. Laundry Bags

1. Single bags of sufficient tensile strength must be used
2. Leak-proof containment is needed if the laundry is wet and can soak through a cloth bag.
3. Only two-thirds of the bag be filled to allow secure closure.
4. Bags containing soiled laundry should be clearly identified with labels containing site of origin and colour coding. HCWs may handle these items safely, regardless of whether the laundry is transported within the facility or destined for transport to an offsite laundry service.
5. Infected linen should be placed in an impervious bag that can be emptied into a washing machine with no or minimal handling and the bag either decontaminated in the washing process or disposed of as infectious healthcare waste.

5.3. Segregation

Infectious linen should be *segregated at the point of generation and not at the laundry site.*

5.4. Sorting

1. Soiled and infected linen must be handled with care at all times.
2. Linen should be placed into bags at the point of generation as soon as possible.

3. Bags must be securely tied to prevent spill-over.
4. Rinsing soiled laundry at the point of generation should not be done.
5. *Infectious linen must not be sorted and loaded into a washing machine with no or only minimal handling.*

5.5. Transport

1. There should be separate, designated bags and storage receptacles for clean and used linen and must never be transported together.
2. Soiled linen in bags can be transported by cart.
3. Clean linen must be wrapped or transported in a closed container to prevent inadvertent contamination from dust and dirt during loading, delivery, and unloading.
4. Trolleys should be cleaned and disinfected
   a. After any spillage
   b. After transportation of dirty laundry
   c. Thorough cleaning with soap and water atleast weekly

5.6. Storage

1. Clean linen should be stored in a clean area of the ward in closed cupboard.
2. They must be stored separate from used/ soiled linen.

5.7. Disposal of Linen

5.7.1. Criteria for Condemnation

- There will be no more than three patches in any 35cm square
- No repairs or patches will be larger than 15cm square
- There will be no more than 5 patches over the entire piece of Linen

1. The linen that required to be disposed off must be disinfected and duly washed as soiled linen.
2. After maintaining a log book for such linens, it should be shredded and then dispose off in yellow bag to bio medical waste collector for final disposal.

6. LAUNDRY PROCESS

Linen and clothing used in healthcare facilities are disinfected during laundering and generally rendered free of vegetative pathogens (hygienically clean), but they are not sterile.

6.1. Laundry Area

a. All laundry area must have impermeable floor surfaces.
b. Walls and floors should be washable.
c. The ventilation should include adequate filtration and exhaust.
d. The area should be partitioned into two area
   - o A “dirty” area for receiving and handling the soiled laundry.
   - o A “clean” area for processing the worked items and textile storage.

6.2. Washing Cycles

The washing cycles used for laundering may be:

a. Thermal washing cycle
b. Low temperature cycle
c. Dry cleaning
d. Home washing machines

6.2.1. Thermal Washing Cycle (A)

Washing machines in healthcare facilities can be either washer/ extractor units or continuous batch machines.

A typical washing cycle consists of three main phases, i.e. pre-wash, main wash, and rinse cycle.

a. Pre wash cycle—linen should be washed with water and soap and detergent. Anti-microbicidal action is due to cleaning, dilution and agitation during the pre-wash cycle.
b. Main wash—minimum holding time 65°C for 10 minutes. (71°C for 3 minutes). Additional time should be given to allow mixing and heat penetration.
c. Rinse cycle—removes excess of the soap and detergent present, if any.

6.2.2. Low-Temperature Washing Cycle (B)

This is useful for:

- Heat labile fabrics
- To reduce hot water consumption.
  - o The steps are same as that of the typical thermal washer except that **Sodium Hypochlorite (NaClO)** is used as disinfectant instead of heat.
  - o Usual recommendation for bleach–150 ppm.

6.2.3. Dry Cleaning (C)

- It involves use of organic solvents such as *perchloroetylene* to remove soil from heat labile linen.
- It should not be used routinely as it is relatively ineffective in reducing the microorganisms.

6.2.4. Home Washing Machine (D)

Can be used for cleaning staff uniforms.

- If the staff uniforms become grossly contaminated should be washed as "used" or "infected" hospital linen.

6.3. Drying and Ironing

1. Drying of the linen is done preferably in a drier.
2. Heavy duty washers/ driers are recommended for drying.
3. Dryer temperatures and cycle times are determined by the type of materials in the fabric.
4. Ironing is done preferably by automated systems or may be manually.

If the laundry service is outsourced, then it is to be ascertained that the laundry process is being carried out properly by the vendor.

6.4. Pillows, Duvets, Blankets, Mattress Overlays

1. These must be protected by heat-sealed, waterproof covers which are cleaned with detergent and water between service users.
2. Duvets, pillows, *blankets* must be laundered between service users if waterproof covers are not suitable.
    i. *Blankets* can be dry cleaned or hand washed. Hand-washing can be done by first soaking for 15 minutes in lukewarm water. The soap suds are squeezed through the blanket and then rinsed in cold water at least twice. The blanket should not be twisted or wrung. It should be dried by spreading it on a clean surface.
    ii. Pillows and mattresses can be washed with soap and water and left to dry in the sun.
3. If clostridium difficile is present, they should be wiped with a solution of chlorine based disinfectant.

7. MONITORING

Routine microbiological sampling is not recommended.

7.1. Indication

1. When commissioning new machines.
2. During outbreak investigation—if epidemiological evidence suggests linen or clothing as a source of disease transmission.

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Occupational Exposure and its Management

1. INTRODUCTION

Occupational exposures to potentially infectious clinical material are not uncommon in healthcare setting. A percutaneous injury (e.g. needle-stick or cut with a sharp instrument), contact with the mucous membranes of the eye or mouth, contact with non-intact skin (particularly when the exposed skin is chapped, abraded, or afflicted with dermatitis), or contact with intact skin when the duration of contact is prolonged (e.g. several minutes or more) with blood or other potentially infectious body fluids is termed as exposure. Standardized practices should be followed in all kinds of Accidental Exposure to Blood (AEB). Most important concerns after NSI is the risk of infection from blood borne viruses. of all, most important viruses are HIV, Hepatitis B virus and Hepatitis C virus.

Risk of infection is 0.3 per cent with HIV infected percutaneous exposure to blood, 3% after Hepatitis B virus exposure and approximately 30% after Hepatitis C virus exposure.

2. INFECTIOUS AND NON-INFECTIOUS MATERIAL

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

3. POST-EXPOSURE MANAGEMENT

Steps to be followed after accidental exposure to blood/other potentially infectious materials:

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

3.1. Dos and Don'ts for the Exposed Individual

Don'ts	Do's
1. Do not panic 2. Do not place the pricked finger into the mouth reflexively 3. Do not squeeze blood from wound 4. Do not use bleach, alcohol, iodine, antiseptic, detergent, etc.	1. Stay calm 2. Remove gloves, if appropriate 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/ personnel immediately as per institutional guidelines, for management of the occupational exposure.

3.2. First Aid: Management of Exposed Site

For Skin	For the Eye	For Mouth
1. Immediately wash the wound and surrounding skin with water 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. This will make them safe to wear again. 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.

3.3. Identify the Source if Available

If source is found to be negative, first dose of PEP for exposed person is not required but the exposure should be reported to HICC for documenting the NSI. If the source status is unavailable or found as positive for HIV or source is unknown, then first dose of PEP is essentially required.

3.4. Reporting to the Infection Control Team

Consult the designated infection control nurse/ physician (who so ever is available earliest) of the institution for the management of exposure immediately (the helpline numbers are displayed in charts provided at every hospital area). The help line support is available for 24 hours.

3.5. Risk Assessment by Nodal Person

The evaluation to be done by the designated person (Nodal Officer) preferably within 2 hours but certainly within 72 hours.

Categories of exposure based on amount of blood/fluid involved and the entry port these includes.

3.5.1. Mild Exposure

Mucous membrane/ non-intact skin with small volumes.

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.

3.5.2. Moderate Exposure

Mucous membrane/ non-intact skin with large volumes or percutaneous superficial exposure with solid needle.

Example: A cut or needle stick injury penetrating gloves.

3.5.3. Severe Exposure

Percutaneous with Large Volume

Example: An accident with a high calibre needle (2:18 G) visibly contaminated with blood; A deep wound (haemorrhagic wound and/or very painful); Transmission of a significant volume of blood; an accident with material that has previously been used intravenously or intra-arterially.

In case of an exposure with material such as discarded sharps/ needles, contaminated for over 48 hours, the risk of infection becomes negligible for HIV, but still remains significant for HBV. Hepatitis B virus survives longer than HIV outside the body.

3.6. Take First Dose of PEP

The first dose of PEP should be administered preferably within the first 2 hours of exposure but certainly within 72 hours.

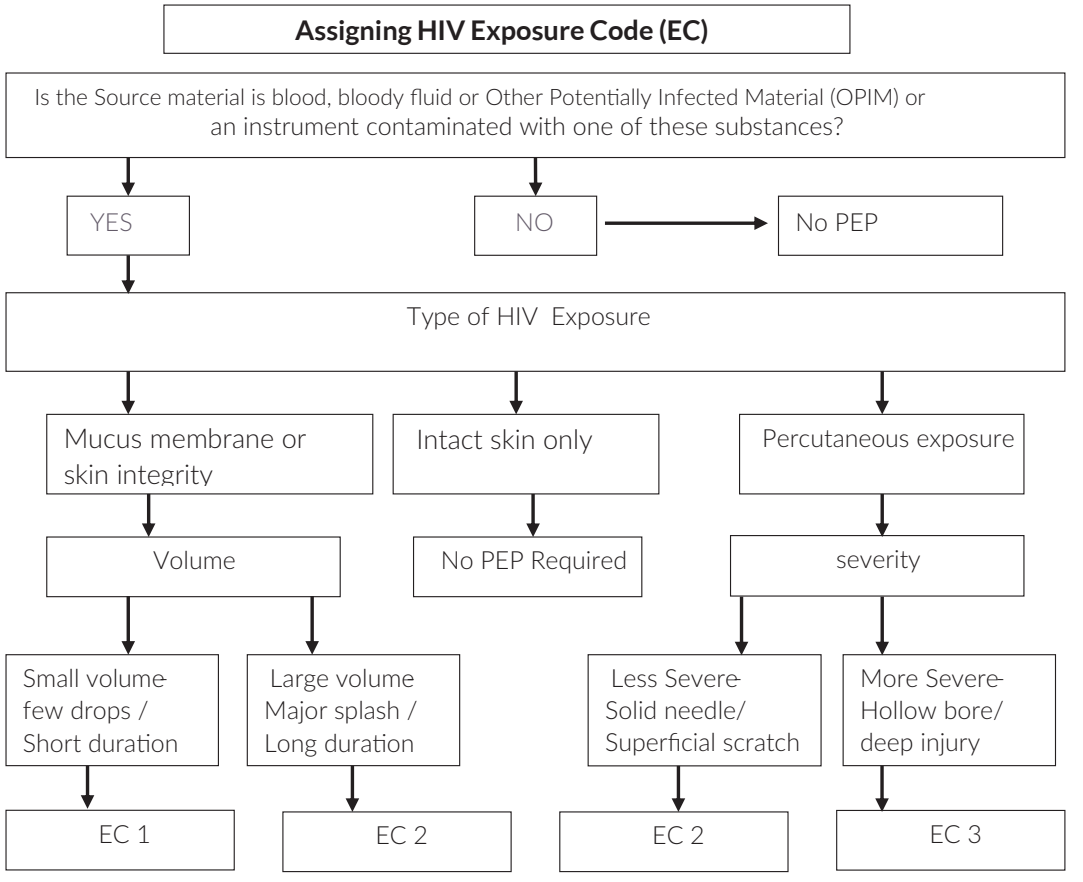
If the risk is insignificant, PEP could be discontinued, if already commenced.

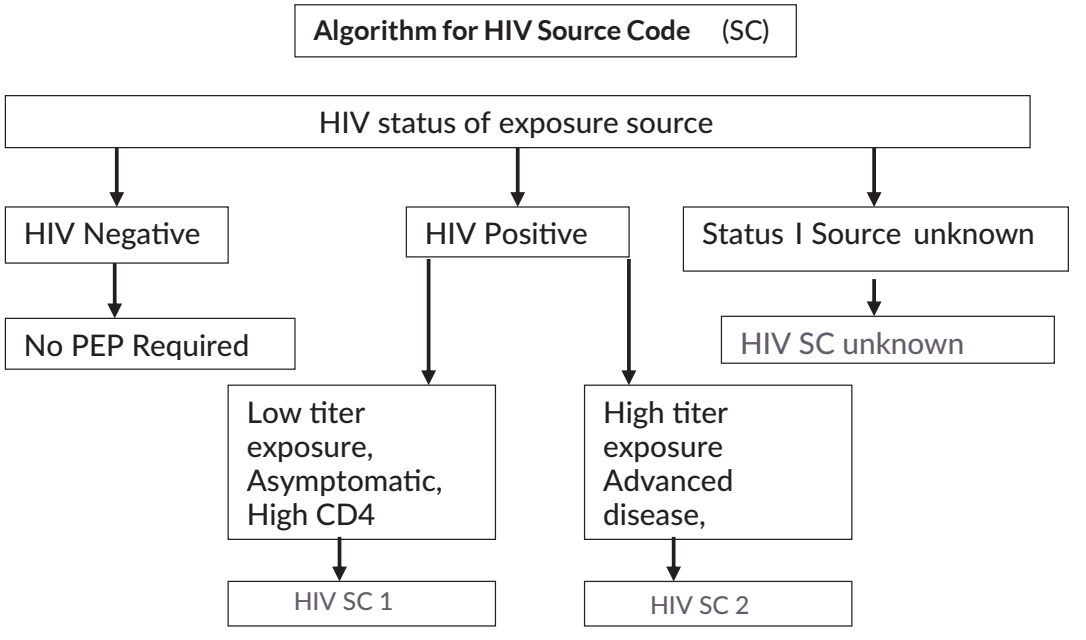
3.7. Testing for HIV, HBV and HCV for Source and HCW

- Once the HCW reports to the nodal centre, both the source (in case the status of the source is unknown and source is available for) and the HCW are tested for their baseline status for HIV (antibody), HCV (antibody), and HBV (HBsAg) by rapid methods.
- If the HCW is Prior Vaccinated, then Check for HBsAb Titre
- (HCW's baseline status is determined. Otherwise, it may be difficult to attribute the infection acquired due to exposure in the occupational setting. This may have bearing on the claims for compensation from the health authorities.)
- A baseline HIV testing should be done after proper counselling; Informed consent should be obtained before testing of the source as well as person exposed. Initiation of PEP, where indicated, should not be delayed while waiting for the results of HIV testing of the source of exposure.
- Exposed individual who are known or discovered to be HIV positive should not receive PEP. They should be offered counselling and information on prevention of transmission and referred to antiretroviral therapy (ART) centre after their complete laboratory work up which also include testing for Hepatitis B and C virus infection.

3.8. Decision on Prophylactic Treatment for HIV and HBV

This is based on assessment of exposure and source status.





Exposure Codes	HIV Source Codes	PEP Recommendations	Duration
EC 1	SC 1	Not Recommended	28 Days
EC 1	SC 2	Recommended	
EC 2	SC 1		
EC 2	SC 2		
EC 3	SC 1 or 2		
EC 2/3	SC Unknown	Consider PEP, if HIV prevalence is high in the given population and risk categorization	

3.8.1. PEP Regimen for HIV

- Wherever PEP is indicated and source is ART naive or unknown: recommended regimen is Tenofovir 300 mg + Lamivudine 300 mg + Efavirenz 600 mg once daily for 28 days. Wherever available, single pill containing these formulations should be used. Dual drug regimen should not be used any longer in any situation for PEP.
- The first dose of PEP regular should be administered as soon as possible, preferably within 2 hours of exposure and the subsequent dose should be given at bed time with clear instruction to take it 2-3 hours after dinner and to avoid fatty food in dinner
- In case of intolerance to Efavirenz, regimen containing Tenofovir + Lamivudine + PI (ATV/r or LPV/r) can be used after expert consultation by an experienced physician.
- In case of exposure where source is on ART, Tenofovir 300 mg + Lamivudine 300 mg + Efavirenz 600 mg should be started immediately. And an expert opinion should be sought urgently by phone/e-mail from CoE/ART Plus centre.
- Appropriate and adequate counselling must be provided regarding possible side effects, adherence and follow up protocol.
- PEP is continued for 28 days in all source positive and source unidentified cases, regardless of the risk of exposure and CD4 count of the source.

3.8.2. PEP for Hepatitis B

Hepatitis B measures are as follows:

- For vaccinated HCW with subsequent documented anti-HBs> 10 mIU/ml
- No need to assess the source status. No post-exposure management is necessary.
- 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 or unknown give 2 doses of HBIg, one month apart.

- *For vaccinated HCW whose antibody titres are unknown:* Check the titres and assess the source risk as early as possible.
    - o If the titres are >10 mIU/ml, no action needed irrespective of the source status.
    - o If the titres are <10 mIU/ml and if the source is negative, give revaccination series of hepatitis B(0-1-6).
    - o If the titres are <10 mIU/ml and if the source is positive or unknown give one dose of HBIg and start revaccination series of hepatitis B.
    - o If the HCW is unvaccinated or incompletely vaccinated or vaccine refusers and if the source is positive or unknown—

Do HBsAg and anti HBc for the HCWs and give HBIg one dose and complete the vaccination series. If the source is negative complete the vaccination schedule.

When to check HBsAb 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.

3.8.3. 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.

3.9. 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 3 months and at 6 months after exposure.

Precautions during the follow up period: During the follow up period, especially the first 6–12 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 that occurs within 12 weeks of exposure.

Figure 15 : Information Display on Prevention and Management of Occupational Exposures

3.10. Documentation and Recording of Exposure

- A *structured proforma* (annexure 9) should be used to collect the information related to exposure: Date, time, and place of exposure, type of procedure done, type of exposure: percutaneous, mucus membrane, etc., duration of exposure and exposure source and volume; type of specimen involved.
- *Consent form:* For prophylactic treatment the exposed person must sign a consent form. If the individual refuse to initiate PEP, it should be documented. The designated officer for PEP should keep this document.

REFERENCES

[1] NACO PEP Guidelines

[2] CDC Guidelines for the Management of Occupational Exposures to HBV, HCV, and HIV and Recommendations for Post Exposure Prophylaxis.

Prevention of Sharp Injuries among HCW

Safe handling and disposal of sharps is a vital component of the Standard Precautions approach to reduce the risk of transmission of blood borne virus.

Following preventive measures should be considered and practiced at individual or team level to reduce the incidence of sharp injuries among HCWs.

1. GENERAL CONSIDERATIONS TO PREVENT SHARP INJURIES

- Apply standard infection control precautions while working.
- **3 All:** *Consider All patients, All blood/ body fluids and All sharps should be considered infectious unless proved to be negative.*
- *Use appropriate PPEs:* Wear gloves, gowns/aprons, masks, and goggles, while handling all potentially infectious material.
- *Adhere to hand hygiene:* Thoroughly wash hands with water and soap after removing gloves, handling infectious materials, before leaving the laboratory area, and immediately after any contamination of skin surfaces.
- Avoid wearing open footwear in situations where blood may be spilt, or where sharp instruments or needles are handled.
- For all clinical procedures, *cover existing wounds*, *skin lesions*, *and all breaks* in exposed skin with waterproof dressings or with gloves if hands extensively affected.
- *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 titres of anti Anti HBs immunoglobulin levels. The protective titres must be documented.

- Clear up spillage of blood and other body fluids promptly and disinfect surfaces
- HCW should be aware of the first aid treatment following a needle-stick injury.
- HCW should be aware of the follow up treatment after a used needle-stick injury

2. PRECAUTIONS WHILE HANDLING AND DISPOSING SHARP OBJECTS (LIKE NEEDLES, LANCETS, SCALPELS, ETC.)

- Avoid unnecessary use of sharps and needles. Use of alternative instruments, cutting diathermy, and laser.
- Disposable needles should be used.
- Handle hollow bore needles with care as it may lead to deep injuries
- **Never recap needles: If unavoidable, use single hand-scoop technique**
- Never break/ bend needles by hand
- Needles/ sharps should not be left on trolleys and bed side tables and must be disposed of immediately
- Never pass used sharps from one person to another directly.
- **Dispose sharps directly in a puncture resistant container.**
  - o Ensure that an adequate number of sharps containers, are located and conveniently placed in clinical areas.
  - o Ensure that the sharps containers have been assembled correctly.
  - o Make sure the department's name is identified on the sharps bin.
  - o Sharps containers should be sealed closed when two-thirds to three-quarters full.
  - o Hold the sharps containers away from the body when being carried.

- Whenever possible, take a sharp container to the point of use.
- It is the responsibility of the person using 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.
- Use needle safety devices where there are clear indications that they will provide a safer system of working.
- Needle collection tray in needle destroyer must be emptied in the morning by the coming nursing staff or more frequently if required. It should never be overfilled.
- Stray sharps should not be present anywhere in the hospital environment.

3. PRECAUTIONS TO AVOID SHARPS INJURY DURING SURGICAL PROCEDURES

- *Confine and contain* approach should be implemented for every procedure
- Surgery lists should be scheduled on the basis of clinical urgency, and in such a way as to allow ample time for adequate infection control procedures to take place.
- 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 last on the list*, but this is not essential.
- *Hair removal:* Depilatory creams should be used for essential hair removal.
- Unnecessary equipment should be removed from the theatre.
- Special surgical equipment reserved for these patients 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 to the surgeon, thereby ensuring the assistant does not reach across the table between the surgeon and nurse.
- Variations in operative technique may be adopted such as cutting (e.g. with lasers), or of wound closure that obviate the use of sharp instruments and lessen the risk of inoculation.

3.1. 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.
- Where practical, suture needles should be cut off before knots are tied to prevent NSI.
- Surgeons may use a *sterile thimble* on the index finger of the less dexterous hand for protection when suturing.
- Wire sutures should be avoided where possible because of the high risk of NSI.
- 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.

3.2. Retraction

- Hands of assisting HCWs must not be used to retract the wound on viscera during surgery.
- *Self-retaining retractors* should be used, or a *swab on a stick*, instead of fingers.
- Certain instruments should be avoided unless essential to the procedure, for example, sharp wound retractors such as rake retractors and skin hooks.

3.3. Drainage and Dressing

- Closed wound drainage systems should be used, where appropriate.
- Wound dressings with an impervious outer covering to contain wound exudates should be used.
- Blood should be cleaned off the patient's skin as far as possible at the end of the operation.

3.4. Disinfection of surgical items after procedure

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

3.5. Cleaning of operating theatre and waste disposal

- Adequate time must be provided at the end of each case to allow for thorough cleaning
- Cleaning of the operating theatre and the appropriate disposal of clinical waste should be carried out as per hospital policy
- Used linen and theatre clothing should be handled in accordance with local policy.

4. 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.
- Spillage management should be done as per the guidelines.

5. ENGINEERING CONTROLS TO PREVENT NSI:

Various engineering controls have been tried to prevent NSI, with mixed results in the studies. Few of them are being described below:

- Safety lock syringes
- Puncture Guard bluntable vacuum tube blood collection needles,
- Needleless IV systems
- Blunt suture needles
- Safety engineered IV systems
- Retractable lancets
- Assistive devices
    - Recapping guard—a plastic shield with a central hole that receives the capped end of the needle—helps to remove and replace the cap or sheath of the needle while keeping the non active hand protected
- Disposal Boxes
    - Change the location to patient bedsides
    - Change in box design to open top or letterbox or units with hinged lids
    - Use of rigid disposal containers
- Use of double gloves

CHAPTER 13

Prevention of Device Associated Infections

Modern healthcare employs many types of invasive devices and procedures to treat patients and help them recover. Bacterial colonization of indwelling devices like catheters or ventilators leads to development of an infection as well as results in malfunctioning. Hence, Device Associated Healthcare Infections (DA-HAIs) are one of the most common causes for morbidity and mortality among hospitalized patients especially in intensive care units. The three most commonly occurring DA-HAIs are:

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

1. 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 with current 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.

These generally include appropriate use, aseptic insertion and maintenance, early removal, and hand hygiene.

Bundle Component	Criteria for Compliance with Bundle
Check the clinical indication why the urinary catheter is in situ–is it still required?	• All urinary catheters are indicated. • If there is no clinical indication then the catheter should be removed. (refer to the list of appropriate and inappropriate indications for catheterization given below)
Check the catheter has been continuously connected to the drainage system	• Urinary catheters must be continuously connected to the drainage bag.
The patient is aware of his/ her role in minimizing the risk of developing a urinary tract infection or ensure routine daily meatal hygiene is performed.	• Patients are involved in their urinary catheter care and educated as to how they can minimize complications. • Routine daily meatal hygiene is performed.
Regularly empty urinary drainage bags as separate procedures, each into a clean container.	• The urinary catheter bag should be emptied regularly, as a separate procedure, into a clean container. • The use of 'separately' here implies that the same container has not been used to empty more than one catheter bag—without appropriate decontamination of the container, change of personal protective equipment and performing hand hygiene. • If the container is for single use it must not be reused—with or without decontamination.
Perform hand hygiene and wear gloves and apron prior to each catheter care procedure; on procedure completion, remove gloves and apron and perform hand hygiene again.	Decontaminate hands (soap and water or alcohol hand rub/gel). • Before accessing the catheter drainage system. • After glove removal following access to the catheter drainage system. • On removal of gloves.

The bundle above is implementable in resource-poor settings, and should be accompanied by a multimodal approach of hand hygiene, healthcare worker education, and feedback of catheter use and CAUTI rates.

1.1. Appropriate Indications for using Indwelling Catheters

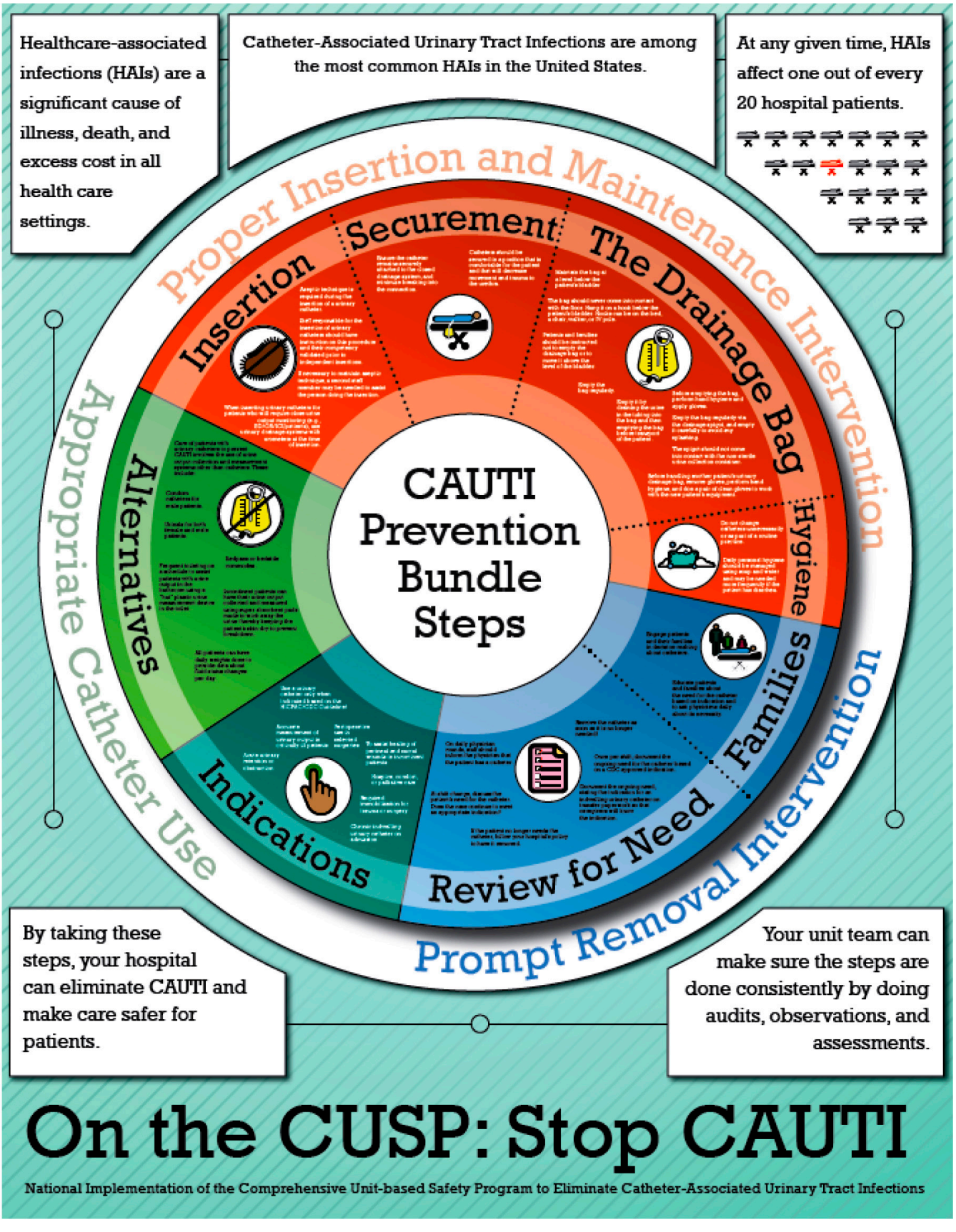
- Anatomic/ physiologic obstruction to urine flow (acute urinary retention or bladder outlet obstruction)
- Patients undergoing surgeries on genitourinary tract
- Anticipated prolonged duration of surgeries (catheters should be removed after surgery)
- When accurate urinary output measurements are required 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

1.2. Inappropriate Indications for using Indwelling Catheters

- As a substitute for nursing care of the patient or resident with incontinence.
- For obtaining urine sample for culture or other diagnostic tests when patient can voluntarily void.
- For prolonged postoperative duration without appropriate indications (e.g structural repair of urethra or contiguous structures, prolonged effect of epidural anaesthesia etc.

1.3. Not Recommended Procedures for Urinary Catheterization

- Routine bladder irrigation with antimicrobials
- Routine instillation of antiseptics or antimicrobials in drainage bags
- Routine use of Antibiotic coated catheters (reserved for patients with highest risk of complications associated with bacteriuria)
- Routine use of prophylactic antimicrobial agents before catheter insertion.
- Clamping of catheters prior to removal.


Healthcare-associated infections (HAIs) are a significant cause of illness, death, and excess cost in all health care settings.
Catheter-Associated Urinary Tract Infections are among the most common HAIs in the United States.
At any given time, HAIs affect one out of every 20 hospital patients.
Proper Insertion and Maintenance Intervention
Prompt Removal Intervention
Appropriate Catheter Use
Insertion
Securement
The Drainage Bag
Hygiene
Families
Review for Need
Indications
Alternatives
CAUTI Prevention Bundle Steps
By taking these steps, your hospital can eliminate CAUTI and make care safer for patients.
Your unit team can make sure the steps are done consistently by doing audits, observations, and assessments.
On the CUSP: Stop CAUTI
National Implementation of the Comprehensive Unit-based Safety Program to Eliminate Catheter-Associated Urinary Tract Infections

2. PREVENTION OF CENTRAL LINE ASSOCIATED BLOOD STREAM INFECTION

CLABSI is defined as a LCBI (Laboratory confirmed blood stream infection) where central line was in place for greater than two calendar days on the date of the event, with day of device placement being day one, and the line was also in place on the date of the event or the day before. These central line associated bloodstream infections must be either laboratory confirmed or the patient must meet criteria for clinical sepsis. Clinical sepsis can be defined as a site of suspected infection and two or more generalized signs and symptoms of infection (formerly known as SIRS criteria). Clinical sepsis can be distinguished from the syndrome—severe sepsis, which adds organ dysfunction, such as hypotension or onset of renal failure. In general, the threshold to establish clinical sepsis is lower than that for severe sepsis.

2.1. 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.

2.1.1. 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 central venous 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.

2.2. Preventing Central Line-Associated Bloodstream Infections: Five Components of Care

2.2.1. Hand Hygiene

One way to decrease the likelihood of central line infections is to use proper hand hygiene. Washing hands or using an alcohol-based waterless hand cleaner helps prevent contamination of central line sites and resultant bloodstream infections.

When caring for central lines, appropriate times for hand hygiene include:

a. Before and after palpating catheter insertion sites (Note: Palpation of the insertion site should not be performed after the application of antiseptic, unless aseptic technique is maintained.)

b. Before and after inserting, replacing, accessing, repairing, or dressing an intravascular catheter

c. When hands are obviously soiled or if contamination is suspected

d. Before and after invasive procedures

e. Between patients

f. Before donning and after removing gloves

g. After using the bathroom

2.2.2. Maximal Barrier Precautions

A key change to decrease the likelihood of central line infections is to apply maximal barrier precautions in preparation for line insertion.

- For the operator placing the central line and for those assisting in the procedure, maximal barrier precautions mean strict compliance with hand hygiene and wearing a cap, mask, sterile gown, and sterile gloves. The cap should cover all hair and the mask should cover the nose and mouth tightly. These precautions are the same as for any other surgical procedure that carries a risk of infection.
- For the patient, applying maximal barrier precautions means covering the patient from head to toe with a sterile drape, with a small opening for the site of insertion.

2.2.3. Chlorhexidine Skin Antisepsis

Chlorhexidine skin antisepsis has been proven to provide better skin antisepsis than other antiseptic agents such as povidone-iodine solutions.

The technique, for most kits, is as follows:

- Prepare skin with antiseptic/detergent chlorhexidine 2% in 70% isopropyl alcohol.
- Hold the applicator down to allow the solution to saturate the pad.
- Press sponge against skin, and apply chlorhexidine solution using a back-and-forth friction scrub for at least 30 seconds. Do not wipe or blot.
- Allow antiseptic solution time to dry completely before puncturing the site (~ 2 minutes).

2.2.4. Optimal Catheter Site Selection, with Avoidance of using the Femoral Vein for Central Venous Access in Adult Patients

- Percutaneously inserted catheters are the most commonly used central catheters.

- Subclavian vein site is associated with a lower risk of CLABSI than the internal jugular vein. However, the risk and benefit of infectious and non-infectious complications must be considered on an individual basis when determining which insertion site to use.
- The femoral site is associated with greater risk of infection in adults; however, this may be limited to overweight adult patients.
- Whenever possible the femoral site should be avoided and the subclavian line site may be preferred over the jugular site for non-tunneled catheters in adult patients. This recommendation is based solely on the likelihood of reducing infectious complications.
- Subclavian placement may have other associated risks.

Note: The bundle requirement for optimal site selection suggests that other factors (e.g., the potential for mechanical complications, the risk of subclavian vein stenosis, and catheter-operator skill) should be considered when deciding where to place the catheter. In these instances, teams are considered compliant with the bundle element as long as they use a rationale construct to choose the site. The core aspect of site selection is the risk/benefit analysis by a physician as to which vein is most appropriate for the patient. The physician must determine the risks and benefits of using any vein. For the purposes of bundle compliance, if there is dialogue among the clinical team members as to the selection site and rationale, and there is documentation as to the reasons for selecting a specific vessel, this aspect of the bundle should be considered as in compliance. It is not the intent of the bundle to force a physician to take an action that he or she feels is not clinically appropriate.

2.2.5. Daily Review of Central Line Necessity with Prompt Removal of Unnecessary Lines

- Review for the necessity of central lines on daily basis.
- This will prevent unnecessary delays in removing lines that are no longer clearly needed for the care of the patient.
- CDC recommendation on replacement of central lines are as follows:
    - Catheter replacement at scheduled time intervals has no added advantage as a method to reduce CR-BSI.
    - Routine replacement of central lines is **not** necessary for catheters that are functioning and have no evidence of causing local or systemic complications.
    - Replacement of temporary catheters over a guidewire in the presence of bacteremia is **not** an acceptable replacement strategy, because the source of infection is usually colonization of the skin tract from the insertion site to the vein.

2.3. Central Line Maintenance

a. Closed medication system and two-person process for all dressing change and tubing change

b. Perform hand hygiene with hospital-approved alcohol-based product or antiseptic-containing soap before and after accessing a catheter or changing the dressing

c. Maintain aseptic technique when changing intravenous tubing and when entering the catheter including 'scrub the hub' for 5–15 seconds.

d. Evaluate the catheter insertion site daily for signs of infection and to assess dressing integrity. At a minimum, if the dressing is damp, soiled or loose, change it aseptically and disinfect the skin around the insertion site with an appropriate antiseptic

e. Daily review of catheter necessity with prompt removal when no longer essential

f. Minimizing the access points

g. Heparin in TPN (0.5 Units/mL)

Some Do's and Don'ts

DO's	DON'Ts
When disconnecting the IV from the patient, put the correct sterile cap on the end	Loop the end back up onto itself
Scrub the hub for 5-15 seconds	Just connect and push when in a rush
Change the IV tubing every 4 days	Pass it off to the next shift
Throw away NS flush after part of it has been used/given	Recap and keep in your pocket. This will harbor infections in the cap.

ACCESSING A CENTRAL VENOUS CATHETER

THEORY

Understanding how to properly access a central venous catheter, so that it may be used to draw blood or to deliver of medications, fluids, or blood products, is an important aspect of caring for a critically ill patient.

PATIENT SELECTION

Indications:

- To draw blood from a patient
- To administer medications, fluids, or blood products in patient with a central venous catheter
- To provide access for:

  —long-term infusion therapy when peripheral access is unavailable

  —vesicant or hyperosmolar infusions

  —complex infusion therapies
- To check the patency of a central venous catheter not in use

Contra-indications:

- Presence of a thrombus or infection in the CVL, which might manifest itself as:

  —an excess amount of fluid

  —discharge at the insertion site
- Fracture or disruption of the CVL

EQUIPMENT

- Syringes:
  - -2 ml
  - -10 ml
- Saline flush
- Blood specimen containers
- Antiseptic wipes
- 2-by-2 gauze
- Clean gloves
- Hand sanitizer

PROCEDURE

1. **Explain the procedure to the patient:**
   Assuming that it is age appropriate, explain what you will be doing to the patient.
2. **Wash your hands:**
   Use antiseptic sanitizer or soap and water to wash your hands before this procedure. If your hands are visibly soiled, wash with soap and water **(Figure 1)**.
3. **Prepare equipment:**
   Put on a clean pair of gloves (note that this is NOT a sterile procedure, so clean gloves are adequate, and no mask is necessary). Open 2x2 gauze and an antiseptic wipe, place the antiseptic wipe right on top of the 2x2 gauze **(Figure 2)**.
4. **Scrub the end of the catheter for 30 seconds:**
   Wrap the gauze and wipe firmly around the end of the catheter, and scrub for 30 seconds **(Figure 3)**. Scrubbing for 30 seconds reduces the rate of central line infections. Allow to dry for 30 seconds after scrubbing to prevent stickiness from forming around the site.

Figure 1
Clean your hands using antiseptic sanitizer prior to performing the procedure. If visibly soiled, wash with soap and water.

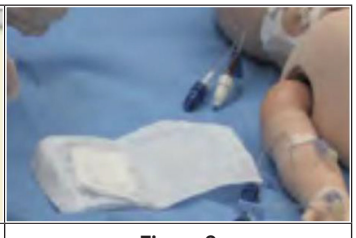


Figure 2
An antiseptic wipe is placed on top of the 2x2 gauze in the above image. This will be used to scrub the end of the catheter.

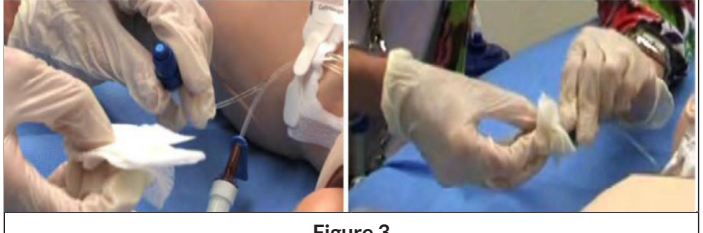


Figure 3
Take the antiseptics wipe and gauze in one hand and the end of the catheter in the other hand (left). Wrap the wipe and gauze firmly around the catheter end and scrub for 30 seconds (right).

ACCESSING A CENTRAL VENOUS CATHETER

5. **Check for a blood return:**
   Attach a normal saline-filled syringe to the line. Pull back and look for blood return **(Figure 4)**.

6. **Flush catheter, if you are not drawing blood:**
   Flush the line with normal saline, ensuring you have cleansed all of the blood from the line. Now the line is ready for medication or fluid administration **(Figure 5)**.

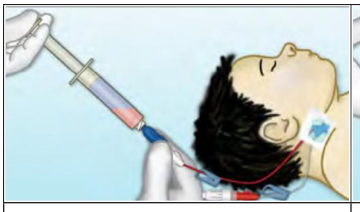


Figure 4
Pull back on the normal saline-filled syringe to obtain a blood return.

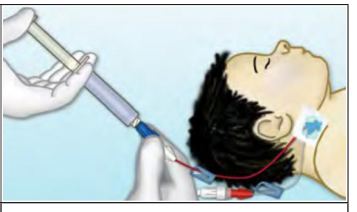


Figure 5
Flush the catheter with normal saline to cleanse the line of any blood to prevent clotting.

7. **Draw blood:**
   After obtaining a blood return, skip the flush catheter step. Attach an appropriately sized syringe (based on the amount of blood to be drawn) to the line. Pull back on the syringe to obtain the amount of blood needed for the tests to be performed. Place the collected blood into appropriate blood specimen containers.

8. **Cleanse the line:**
   Prepare a second antiseptic wipe and cleanse the line by scrubbing for 10 seconds (scrubbing for 30 seconds is not necessary here).

9. **Flush the catheter again to prevent clotting:**
   Flush the catheter with sterile saline to cleanse the line of any blood to prevent clotting, assessing the ease or difficulty to flush the catheter **(Figure 5)**.

TROUBLESHOOTING

- If you meet resistance when flushing and cannot get a blood return, refer to appropriate personnel for identification and management of the central venous catheter dysfunction.

COMPLICATIONS

- Infection
- Air embolism
- Dislodgement of a thrombus
- Dislodgement of central venous catheter

ASSESSMENT AND MONITORING

- Monitor ease or difficulty with obtaining a blood return
- Assess ease or difficulty when flushing the catheter with normal saline
- If placement is in or near the right atrium, monitor for any arrhythmias

*__Note:__ It is advised that you assess and monitor these clinical features before, during and after the procedure.

DOCUMENTATION

- Indication for procedure
- Date and time of procedure
- Type, size and position of central venous catheter
- Appearance of insertion site
- Ease or difficulty with obtaining a blood return when flushing the catheter
- Medications administered through the central venous catheter
- Adverse outcomes

DRESSING A CENTRAL VENOUS CATHETER

THEORY

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

PATIENT SELECTION

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

Contra-indications:

- Patients with an allergy to the transport occlusive central line dressing

EQUIPMENT

- Clear adhesive dressing
- Date label for dressing
- Surface wipes
- Sterile antiseptic sponge
- 2 x 2 gauze
- Antiseptic wipes
- Tape
- Clean and sterile gloves
- Mask with a shield
- Hand sanitizer

PROCEDURE

Preparation

1. **Wear a mask:**
   Put on a mask and provide masks to everybody in the room, including the patient's parents. Parents may be allowed to be present for this procedure if they are assisting in keeping the child still. Provide the patient with a mask if he or she is not intubated. If the child is intubated, there is no need for a mask.
2. **Wash your hands:**
   Use antiseptic sanitizer or soap and water to wash your hands before this procedure. If your hands are visibly soiled, wash with soap and water **(Figure 1)**.
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 observe any 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 access to the dressing. Stand on the same side of the patient as the dressing.

Figure 1
Clean your hands using antiseptic sanitizer prior to performing the procedure. If visibly soiled, wash with soap and water.

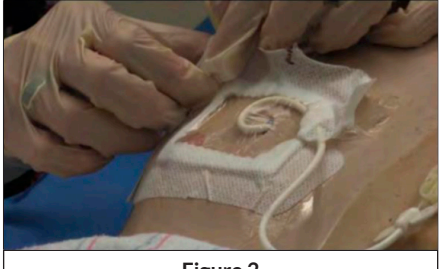


Figure 2
Remove the edges of the dressing first, to make it easier to lift the rest of the dressing from the skin.

Procedure

1. **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 from the patient's skin **(Figure 2)**.

   Be careful not to dislodge the central venous catheter while removing the old dressing !!

DRESSING A CENTRAL VENOUS CATHETER

2. **Inspect for signs of infection:**
   After removing the dressing, inspect the skin surrounding the catheter for edema, redness or drainage.
3. **Wash your hands:**
   Use antiseptic sanitizer or soap and water to wash your hands before this procedure. If your hands are visibly soiled, wash with soap and water **(Figure 1)**.
4. **Put on sterile gloves:**
   As you will be potentially touching exposed areas of the skin and the central venous catheter, sterile gloves should be worn for this part of the procedure.

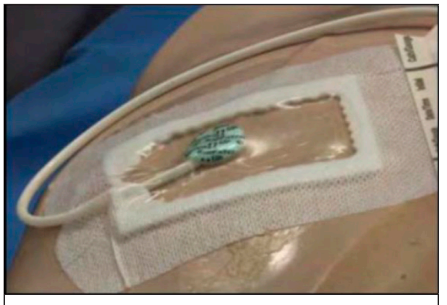


Figure 3
Place a transparent dressing over the exit site of the catheter. Ensure you can visualize the skin at the exit site.

5. **Scrub the skin surrounding the central venous catheter:**
   Scrub the skin surrounding the central venous catheter with an antiseptic sponge, starting from just around the catheter and working your way out to a 2-inch margin around the central venous catheter insertion site. Scrub for 1 minute, and allow the area to dry after scrubbing. For a femoral central venous catheter, scrub for 2 minutes.
6. **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.
7. **If applicable in your hospital, place antiseptic sponge over the exit site of the central venous catheter:**
   This will help to prevent catheter-associated blood stream infections.
8. **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 **(Figure 3)**. 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

ASSESSMENT AND MONITORING

- Assess the patient's skin, looking for signs of infection including erythema, exudate, or rash
- Note the following catheter-related information:
  —type and size
  —depth of insertion
  —changes in placement during the procedure

DOCUMENTATION

- Indication for procedure
- Date and time of procedure
- Characteristics of the skin (including signs of erythema, exudate, and rash)
- Depth of catheter insertion before and after dressing change
- Patient comfort during the procedure
- Any adverse outcomes

3. PREVENTION OF VENTILATOR ASSOCIATED PNEUMONIA (VAP)

3.1. Introduction

Ventilator-associated pneumonia (VAP) is a common healthcare-associated infection occurring in 10%–20% of patients mechanically ventilated in the ICU. VAP occurs because the obtunded, endotracheally intubated patient is at risk of inoculation of the lower respiratory tract with microorganisms. The source of the potential inoculate includes the oropharynx, subglottic area, sinuses and gastrointestinal (GI) tract. Access to the lower respiratory tract occurs around the endotracheal tube (ETT) cuff. Interventions to prevent VAP aim either to prevent repeated micro aspiration, colonization of upper airway and GI tract with potentially pathogenic organisms, or contamination of ventilator/respiratory equipment.

Bundles of care are evidenced-based practices that are grouped together to encourage the consistent delivery of these practices. These bundles are common in the ICU and have been developed for the prevention of VAP.

3.2. Recommended Bundle of Interventions for the Prevention of VAP

3.2.1. Elevation of Head of Bed (30°–45°)

Aspiration of oropharyngeal or gastric contents is implicated in the pathogenesis of VAP. Nursing the mechanically ventilated patient in a semi-recumbent position aims to prevent aspiration of gastric content.

3.2.2. Daily Sedation Interruption and Assessment of Readiness to Extubate

- Minimizing the duration of mechanical ventilation can decrease the chances of developing VAP and should be practiced by Sedation interruption on daily basis.
- Two strategies that have been used to reduce the duration of mechanical ventilation are daily sedation interruption (DSI) and daily spontaneous breathing trials (SBT).
- Strategy of DSI to prevent over-sedation and liberation from mechanical ventilation through SBT has proved beneficial.
- Assess daily the patient readiness to extubate.

3.2.3. Use of Subglottic Secretion Drainage

Secretions that pool above the ETT but below the vocal cords are a potential source of pathogens that could cause VAP. Since conventional suction methods cannot access this area, ETT tubes that have a designated suction catheter for this space allows this pool to be drained.

3.2.4. Avoidance of Scheduled Ventilator Circuit Changes

- Humidified gases condense in the ventilator circuitry and are at risk of becoming contaminated. Frequent circuit changes are associated with an increased incidence of VAP, probably due to the excessive manipulation of the ventilator circuit.
- The circuits to be changed whenever visibly soiled

3.2.5. Oropharyngeal Decontamination

Recent evidence has called into question the widespread use of oral chlorhexidine to decontaminate the oropharynx. Oral chlorhexidine use has been associated with a reduction in respiratory tract infections in the ICU in high profile meta-analyses.

3.2.6. Gastrointestinal Stress Ulcer Prophylaxis (SUP)

Raising the pH of the stomach contents promotes colonisation with potentially pathogenic organisms and so SUP remains a balance of risk between GI bleeding and developing VAP.

3.2.7. Deep Venous Thrombosis Prophylaxis

Sedated ventilated patients are at significantly increased risk for DVT. Hence, DVT prophylaxis is an important component of standard care of these patients. Similar to stress ulcer prophylaxis, DVT prophylaxis has not been demonstrated to reduce the risk of VAP. It remains part of the Ventilator Bundle in order to prevent other serious complications that could increase the morbidity and mortality of these patients.

3.2.8. Initiate Safe Enteral Nutrition within 24–48 hours of ICU Admission

3.3. Pediatric VAP Bundle

1. Elevate the head of the bed
2. Properly position oral or nasal gastric tubes
3. Perform oral care
4. Eliminate the routine use of instill for suctioning

Additional evidence-based components of care:

- Hand hygiene
- Practices that promote patient mobility and autonomy
- Avoiding invasive ventilation whenever possible

VENTILATOR BUNDLE CHECKLIST
(Individual Patient)

Patient:_____

Admit Date:_____

ICU Day	1	2	3	4	5	6	7	8
1. Head of the Bed 30°	☐	☐	☐	☐	☐	☐	☐	☐
2. Daily sedative interruption and daily assessment of readiness to extubate	☐	☐	☐	☐	☐	☐	☐	☐
3. PUD Prophylaxis	☐	☐	☐	☐	☐	☐	☐	☐
4. DVT Prophylaxis	☐	☐	☐	☐	☐	☐	☐	☐
5. Daily Oral Care with Chlorhexidine	☐	☐	☐	☐	☐	☐	☐	☐

Preventive Strategies for Surgical Site Infections

1. INTRODUCTION

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 incidence of SSIs in developing countries stands at 11.8 per 100 patients undergoing surgical intervention. 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.

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.

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.

2. 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 as on the morning of scheduled surgery.
- Intranasal application of 2% mupirocin ointment in perioperative period is beneficial in 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.

3. INTRA-OPERATIVE PREVENTIVE MEASURES

- Pre operative skin preparation with an alcohol-based antiseptic agent based on chlorohexadine 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.

4. 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 to the 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 SSI and should not be used.
- Proper asepsis should be maintained during change of dressings to prevent cross infection of admitted patients.

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CHAPTER 15

MDRO Surveillance and Prevention

1. DEFINITIONS

- **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)
  - MDR-*Klebsiella*
  - MDR-*Acinetobacter*
- **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.

2. CLINICAL RELEVANCE OF DOING SURVEILLANCE AND PREVENTION FOR MDRO

- Resistance of MDRO not only implies to the drug tested for its laboratory detection but has clinical implications as follows:
  - MRSA: Resistant to all beta lactam antibiotics, including 1st, 2nd and 3rd generation cephalosporins, beta-lactam combination agents and carbapenems.
  - ESBL producing GNB: Resistant to all beta lactam antibiotics, including 1st, 2nd and 3rd generation cephalosporins.
  - VRE: Resistant to all penicillins, Cephalosporins, carbapenems and beta lactam combination agents.
  - CRE: Resistant to all penicillins, Cephalosporins, carbapenems and beta lactam combination agents
- Since the treatment options are extremely limited the MDRO infections are associated with high mortality and morbidity.
- They also contribute significantly to increased cost of care due to prolonged hospital stay and the need for more expensive high-end antibiotics.
- MDROs have high propensity to stay and spread in hospital.
- MDROs act as a reservoir harboring several resistant genes that can be readily transmitted to other micro-organisms.

3. PREVENTION AND CONTROL STRATEGIES FOR MDRO

Prevention	Surveillance
Core Strategies	Patients
Organism-based strategies	HCWs
Supplementary measures	Hospital Environment

3.1. Prevention

3.1.1. Core Strategies

Those that are applicable in any situation where MDRO infection or colonization is suspected or identified.

Implementation of transmission-based precautions for all patients infected and colonised with MDRO which includes:

- Performing hand hygiene and using appropriate PPE (like gloves and gowns) before entering the patient care area
- Using patient dedicated or single- use non- critical patient care equipment
- Using single patient room or cohorting patients with the same strain of MDRO in designated patient care areas.
- Ensuring consistent cleaning and disinfection of surfaces in close proximity to patient, at regular intervals.

3.1.2. Organism-based Strategies

They are applicable if incidence or prevalence of MDRO are not decreasing despite implementation of the core strategies.

These depend on:

- Type of MDRO
- Healthcare area
- Patients factor
- Available resources
- Whether the interventions to interrupt transmission are available

It includes:

- **Targeted screening**—active screening to identify colonised patients with the use of contact precautions.

  Collecting samples from patients

  ↓

  Laboratory analysis of samples.

  Clinician and infection control professionals are informed of both positive and negative screening promptly.

- **Decolonization**—Interventions may be topical, systemic or combination of both.
- **Surveillance and timely feedback**—increased surveillance is important to monitor the effect of interventions designed to control particular MDROs. Surveillance information should be fed back to healthcare workers and facility management promptly.

3.1.3. MRSA

MRSA can colonise and grow readily on the skin and mucous membranes of a person, without harm to that person. It is commonly isolated from warm, moist body sites such as the nose, groin and perineum.

Care of the Patient with MRSA:

- Transmission-based Precautions to be followed.
- Patient to be nursed in a single isolation room
- Contact Precautions with own toilet facilities (if not available, allocate own commode chair in room or dedicated toilet)
  - o Hand hygiene with antimicrobial liquid soap or alcohol-based hand rub
  - o Dedicated patient-care equipment or disinfect between use if shared with other patients e.g. blood pressure and oximetry equipment
- Remove unnecessary equipment from isolation room and ensure supplies are not overstocked within the room
- If no ensuite shower is available the patient showers last in the communal shower and the shower is disinfected after use
- Visitors must perform hand hygiene after visiting the patient.
- Standard Precautions apply at all times.

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)
- Perineum Swab (natal cleft)
- 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.

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) four times 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 clinical information record includes all MRSA microbiology positive results within 2 years from date of request and MRSA screening results (positive and negative)

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)

3.1.4. Vancomycin-Resistant Enterococci (VRE)

Source Reservoir:

- The gastrointestinal tract is the major reservoir of VRE.
- Contaminated environment and equipment (particularly fecally 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 ensuite not available, allocate own commode chair in room or dedicated toilet)
- Use of dedicated patient-care equipment or disinfect between use if shared with other patients
- Gastrointestinal colonization with VRE may persist for longer periods of time and serves 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 –
  - o more than 2 years since last positive culture OR
  - o 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 samples that are clinically indicated, according to symptoms.

3.1.5. Extended-Spectrum Beta-Lactamase (ESBL) Producing Organisms

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 fecally 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 own commode 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 other patients
- 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 sample

For previously positive patients:

- Decolonisation of patients with ESBL 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 samples that are clinically indicated, according to symptoms.

3.1.6. CRE (Carbapenem Resistant Enterobacteriaceae)

The majority of CRE are also resistant to other commonly used groups of antimicrobials such as 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 can also 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 effectiveness of treatment is not proven.

3.2. Surveillance

Targeted screening of patients, HCWs and/or hospital environment as per following indications:

S.No	MDRO	Whom to Screen	When to do Surveillance
1.	MRSA	• Patient at high risk of carriage (group I): known to be previously infected or colonised with MRSA, frequent readmission to hospital, those from known MRSA prevalent community • Healthcare workers (group 2): epidemiologically linked to single strain outbreak in hospital • Patients in high risk unit (group 3): ICU/ high dependency unit burns and preoperative unit • If found positive after admission from a clinical sample • As part of outbreak management	• Group 1 and Group 3–at the time of admission • Group 2-after confirmation of epidemiological evidence and 2 weeks after decolonization.
2.	VRE	• Patient admitted to high risk areas (ICU, transplantation units) • Patients transferred from other hospital • 'At risk' patients who have been in contact with known VRE positive patients. • Relevant environmental sampling. • Screening of patients that were previously positive for VRE is NOT recommended unless clinically indicated, since it is likely that a previously positive patient will remain positive during subsequent admissions.	• Whenever there is laboratory confirmation of VRE from in-patient. • Patient is followed, clinical symptoms are noted.
3.	ESBL producing Enterobacteriaceae	• Do NOT screen patients previously positive for ESBL unless clinically indicated. • Patients and Healthcare workers epidemiologically linked to single strain outbreak/ in contact with the index case. • Relevant environmental sampling.	• Whenever there is laboratory confirmed outbreak.
4.	CRE	• Active surveillance culture for rectal carriage is recommended for high-risk patient groups. • Recommended for patients with epidemiological link to the index case. • Not recommended for HCWs	• Whenever there is suspected/ laboratory confirmed outbreak.

3.3. MDRO clearance criteria for patients

1. More than 3 months elapsed time from last positive specimen.
2. All wound healed, no indwelling medical device present
3. No exposure to any antibiotic or antiseptic body washes for at least 2 weeks prior to screening.
4. In case of MRSA, no exposure to specific anti MRSA antibiotic therapy in the past three months.
5. Consecutive negative screens from sites on two separate occasions or evaluation of single set of screening swabs with broth amplification technique.

New or relapsed VRE or MDR-GNB colonization may occur after appearing clear while screening.

3.4. Successful control of MDRO is based on a combination of interventions

- Screening of patients at high risk of MDRO carriage
- Rigorous adherence to hand hygiene
- Appropriate use of personal protective equipment (PPE)
- Implementation of transmission-based precautions
- Cleaning and disinfection of shared patient equipment

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16
CHAPTER

Immunization of Healthcare Workers

1. INTRODUCTION

Healthcare Workers / Healthcare Personnel (HCP) are the persons who provide healthcare to patients or who work in an institution that provides healthcare. Healthcare Personnel (HCP) refers to all people working in healthcare setting who have the potential for exposure to patients and/or to infectious materials, including body substances, contaminated medical supplies and equipment, contaminated environmental surfaces, or contaminated air. HCP include physicians, nurses, nursing assistants, therapists, technicians, emergency medical service personnel, dental personnel, pharmacists, laboratory personnel, autopsy personnel, students, trainees, contractual staff and people (e.g., clerical, dietary, housekeeping, laundry, security, maintenance, billing, administrators and volunteers) not directly involved in patient care but potentially exposed to infectious agents that can be transmitted to and from HCP and patients. Healthcare workers (HCW) are at risk for exposure to a number of diseases. Some of those are serious (because of high risk of complication), and sometimes deadly.

2. MEASURES ADOPTED TO MINIMIZE THE RISK OF DISEASE AMONG HCW

- Adherence to standard precaution
- Isolation of patient with known communicable disease
- Proper use of Personal Protective Equipment
- Appropriate immunization of HCP
- Post exposure prophylaxis

3. BENEFITS OF IMMUNIZATION

- Cost effective in comparison to treatment
- Gives indirect protection to
  - Other staff
  - Family members of HCW
  - Patients
  - Visitors

4. IMMUNIZATION OF HCW

- **Active**—Pre-exposure and Post exposure
- **Passive**—Post-exposure

5. VACCINES RECOMMENDED FOR HCW (AS PER CDC GUIDELINE)

- Hepatitis B*
- Influenza
- Measles
- Mumps
- Rubella
- Tetanus, diphtheria, and acellular pertussis (Tdap)
- Varicella

*for HCW potentially exposed to blood or body fluids

Biomedical waste management and handling rules (2016), of India mentions about Hepatitis B and Tetatus toxoid vaccination.

Table 1: Dosage Schedule of Vaccines

Vaccine	Dose	Schedule	Amount	Route	Effectiveness
Hepatitis B	Three doses	0,1m,6m Or 0,1m,2m* *Booster after 1yr	1ml	IM	90% in <40 yrs
Influenza	One dose annually	Inactivated Live attenuated	0.5ml 0.5ml	IM Intranasal 0.25 ml per nostril	Variable
MMR	Two doses -Measles -Mumps One dose -Rubella	4wks apart	0.5ml	SC	99% measles and rubella 75-95% mumps
Varicella **	Two doses	4-8wks apart	0.5ml	SC	80%
Tdap*	One dose		0.5ml	IM	92%

* booster dose of Td every 10yr
revaccination during each pregnancy with one dose of Tdap

** Persons who have previously been infected with Chickenpox are immune to reinfection and do not require vaccination

6. PRE AND POST–EXPOSURE PROPHYLAXIS USING VARIOUS VACCINES

6.1. Hepatitis B Vaccine (Pre-Exposure Prophylaxis)

Dosage schedule: Three doses-1ml IM at 0,1m, 6m or 0,1m, 2m (with booster after 1yr)

Testing for immunity after vaccination:

- Newly vaccinated HCW should be tested for immunity 1–2 months after the completion of the 3-dose series
- Anti-HBs >10 mIU/ml → no action
- Anti-HBs <10 mIU/ml → revaccinate
  - 3 doses followed by testing (1-2 months after third dose)
  - Anti-HBs <10 mIU/ml after revaccination → test for HBsAg
- HBsAg positive → provide appropriate management
- HBsAg negative → **Non-responder**—susceptible to HBV infection
  - Counsel: precautions to prevent HBV infection (PEP etc)
  - HBIG post exposure prophylaxis for parenteral exposure to HBsAg-positive blood

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

a. Anti-HBs >10 mIU/ml -No action

b. Anti-HBs <10 mIU/ml-revaccinate with one dose of Vaccine

Measure Anti HBs after 1 m*

- Anti-HBs >10 mIU/ml—No action
- Anti-HBs <10 mIU/ml
  - Administer two more doses (1 and 6 month) and measure Anti HBs

- Anti-HBs <10 mIU/ml--Evaluate for each exposure
- Anti-HBs >10 mIU/ml--No action

*If , it is not feasible to measure antibody titre after 1 month, one can go for 2nd 3-doses series of vaccine

Table 2: Post Exposure Prophylaxis for Hepatitis B (HB)

Vaccination and antibody response status of exposed workers*	Treatment		
	Source HBsAg positive	Source HBsAg negative	Source unknown or not available for testing
Unvaccinated	**HBIG$ X 1 and initiate HB vaccine series**	**Initiate HB vaccine series**	**Initiate HB vaccine series**
Previously vaccinated Known responder	No treatment	No treatment	No treatment
Known non-responder	HBIG X 1 and initiate revaccination** or HBIG X 2***	No treatment	If known high risk source, treat as if source were HBsAg positive
Antibody response unknown	Test exposed person for anti-HBs 1. If adequate, no treatment is necessary 2. If inadequate, administer HBIG X 1 and vaccine booster	No treatment	Test exposed person for anti-HBs 1. If adequate, no treatment is necessary 2. If inadequate, administer vaccine booster and recheck titer in 1-2 months

* Persons who have previously been infected with Hepatitis B are immune to reinfection and do not require post exposure prophylaxis

$ Hepatitis B Immunoglobulin (HBIG)

**Persons exposed to HBsAg-positive blood or body fluids and not responded to a primary vaccine series

- single dose of HBIG and restart the hepatitis B vaccine series
- or should receive two doses of HBIG, one dose as soon as possible after exposure, and the second dose 1 month later.

***For persons who previously completed a second vaccine series but failed to respond

- two doses of HBIG are preferred

6.2. Influenza Vaccine

Live attenuated or Inactivated

- Live Attenuated Influenza Vaccines (LAIV)
  - o One dose vial (with 0.5 ml diluent) and five dose vials (with 2.5 ml diluent) are available

- o A dose of 0.5 ml is administered as 0.25 ml per nostril using 0.5 ml or 1 ml syringe and spray device. (One dose annually)
- o HCW who work with patient housed in protected environment like stem cell transplant unit, should avoid working for 7 days after receiving vaccine

- Inactivated Vaccine—
  - o 0.5ml IM (One dose annually)
  - o If age>50 yrs-Inactivated vaccine
  - o If egg allergy-Inactivated vaccine

    (if, only hives one can give LAIV)

6.3. MMR Vaccine

- 0.5ml SC (2 doses 4 wks apart for protection against mumps and measles, one dose gives protection against rubella)
- Avoid pregnancy for 1 month after vaccination

Exposure to Measles

- o If exposures to measles without evidence of immunity–offer the first dose of MMR vaccine or Immunoglobulin and exclude from work from day 5–21 following exposure (under observation)
- o If immune globulin is administered observations should continue for signs and symptoms of measles for 28 days after exposure (immune globulin might prolong the incubation period)

6.4. Tetanus Vaccine

- Pre exposure—3 doses (0,1m, 1yr)—0.5 ml-IM(if not immunized during childhood)
- Post-exposure (for clean minor wounds)—

  Previously immunized—
  - o Last dose within 5 yr—No vaccine
  - o Last dose within 5–10yr—One dose of TT
  - o Last dose within >10yr—One dose of TT*

  Not immunized—Complete course—3 doses*(0,1m,1yr)

*If unclean wound (wound contaminated with saliva, deep puncture wound, etc—add ATS/Human Ig in above two categories)

6.5. Special Circumstances

6.5.1. Vaccine for HCW (Laboratory Personnel) in Special Situation

The following vaccines may be required based on the risk of exposure to the mentioned organisms/ infections.

- Anthrax
- Hepatitis A
- Meningococcal*
- Pneumococcal
- Polio
- Rabies
- Typhoid
- Vaccinia
- Zoster

*Those who are routinely exposed to isolates of N. meningitidis should get one dose of Men ACWY and Men B (two vaccines can be given simultaneously but in two different anatomical sites)

7. ACTIVE IMMUNIZATION AND POST-EXPOSURE PROPHYLAXIS

- TT/Tdap
- Hepatitis B
- Measles-within 3 days of exposure
- Varicella-within 3-5 days of exposure

8. PASSIVE IMMUNIZATION AND POST-EXPOSURE PROPHYLAXIS

- **Hepatitis B**-HBIg 0.06ml/kg IM within 7days
- **Varicella**-VariZIg-12.5unit/kg(max 625U)-IM within 10 days(Pregnant and immune-compromised)
- **Hepatitis A**-Ig-0.02ml/kg-IM within 14days (>40 yrs)
- **Measles**-Ig-0.25ml/kg(max 15ml)-IM within 6 days
- **Tetanus-**ATS(1500) or Human IG (250 units)-IM

9. INFORMATION RELATED TO VACCINATION

9.1. Immunization in Special Groups

- Pregnancy
  - o Avoid live vaccine

- Immuno-compromised
  - Live vaccine contraindicated
  - Extra vaccines required -H.influenzae, pneumococcal ,meningococcal
  - Higher dose of routine vaccine in some cases

9.2. Some Basic Principles of Immunization

- Two live parenteral vaccines—either give simultaneously or keep 4wks interval
- MMR-avoid pregnancy for 1 month
- LAIV-avoid working with pregnant and immuno compromised persons for 7 days

9.3. Information to be Kept while Giving Vaccination

- Name
- Age
- Date of immunization
- Potential contraindication
- Vaccine provided
- Name of manufacturer
- Lot number
- Site and route of immunization
- Date for next dose/additional vaccine
- Complication (if any)

9.4. Contraindications for Vaccination

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

9.5. Precautions for Vaccination

- Moderate or severe acute illness (all vaccines)
- Recent receipt of an antibody—containing blood product (MMR and varicella only).
- Tuberculin test in 4 weeks (MMR)

9.6. No Contraindications to Vaccination

- Mild illness
- Antimicrobial therapy*
- Disease exposure or convalescence
- Pregnant or immunesupressed person in the household **
- Breastfeeding
- Preterm birth
- Allergy to products not present in vaccine or allergy that is not anaphylactic
- Family history of adverse events
- Tuberculin skin test

* Except oral typhoid and live attenuated influenza vaccine

**Except live attenuated influenza vaccine

A contraindication is a condition that makes a particular treatment or procedure, such as vaccination with a particular vaccine, inadvisable.

Precautions are not contraindications, but are events or conditions to be considered in determining if the benefits of the vaccine outweigh the risks

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CHAPTER 17

Environmental Surveillance

1. INTRODUCTION

Hospital environment plays an important role in transmission of hospital acquired infections among the hospitalized patients as well as the healthcare staff. The environment consists of inanimate environmental surfaces like equipment surfaces and housekeeping surfaces, air, water and food. Patients infected with hospital acquired pathogens frequently contaminate environmental surfaces in their immediate surroundings. Contaminated environmental surfaces contribute to pathogen transmission, and serves as a source from which healthcare workers contaminate their hands and gloves. However, the extent to which the hospital environment contributes towards HAIs is largely unknown.

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. Moreover, Microbiological sampling of environment is an expensive and time-consuming process complicated by many variables in protocol, analysis and interpretation.

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

2. INDICATIONS FOR ENVIRONMENTAL SURVEILLANCE/ SAMPLING

1. To support an investigation of an outbreak of disease or infections when environmental reservoirs or fomites are implicated epidemiologically in disease transmission.
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. To monitor a potentially hazardous environmental condition, confirm the presence of a hazardous chemical or biological agent, and validate the successful abatement of the hazard.
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.

3. PROTOCOL FOR ENVIRONMENTAL SAMPLING IN AIIMS RAIPUR

3.1. Air Surveillance

3.1.1. Areas where Air Surveillance is to be Performed

Currently, air surveillance at AIIMS Raipur is performed only for Major Operation theatres with laminar flow installed (HEPA Filtered Operating Room).

The surveillance activity will be extended further to newly constructed OTs and wards requiring protective environment (positive pressure ventilation).

3.1.2. When to Perform ?

Random, undirected (Routine) air sampling is not recommended.

The targeted air surveillance is done only in case of following situations as per recommendations of 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.

3.1.3. How to perform?

As per current recommendations of CDC, air surveillance is mainly done to determine indoor air quality, efficacy of dust control measures or air handling system performance.

It is done by following ways:

3.1.4. Parametric Monitoring

It consists of measuring the physical periodic assessment of the system like air flow direction and pressure, Air Changes per Hour (ACH), filter efficiency, temperature and humidity.

Equipment used: Anemometer/ Indoor air quality monitoring system.

Following standards are expected to be maintained.

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 aluminium/ SS 304 frame within the AHU. HEPA filters of efficiency 99.97% down to 0.3 microns or higher efficiency are to be provided	Once a year—DOP test
Temperature and Humidity- 21^0 C +/- 3^0 C, RH - 20 to 60% though the ideal RH is considered to be 55%	Every day

How to Calculate Air Change Rates (ACR)

An air change is defined as occurring when a volume of air equivalent to the volume of the room 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 derived from the volume of a room and the ventilation rate.

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

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: a total 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 by the room volume: 2592/126 = 20.6 ACH.

3.1.5. Air Sampling by Particle Counting

Air sampling is used to detect aerosols and is done by **particle/particulate counting** (i.e., total numbers and size range of particulates) which is the practical method of evaluating

the infection control performance of HVAC system with an emphasis on filter efficiency in removing respirable particles (<5 µm in diameter) or larger particles from the air.

- Equipment—Light scattering airborne particle counter (LSAPC)
- Formula
  - Number of sampling location—$N_L = \sqrt{A}$
  - where N_L is the minimum number of sampling locations (rounded up to the next whole number).
  - A is the floor area of the clean room in m^2.
- The minimum volume to be sampled is 27L (approx $1ft^3$).
- Particulate counts in the given air space within the healthcare facility should be evaluated against counts obtained in a comparison area. Particle counts of indoor air should be compared with counts of outdoor air.
- Frequency of doing particulate sampling – once in 3 months.

3.1.6. Air Sampling for Microbiological Surveillance

Microbiologic sampling of air in health-care facilities remains controversial because of currently unresolved technical limitations and the need for substantial laboratory support. However several health-care institutions have opted to use microbiologic sampling when construction projects are anticipated and/or underway in efforts to assess the safety of the environment for immunocompromised patients.

Air sampling can be done actively by an air sampler or passively by settle plate method. Active air sampling is a preferred method over passive as settle plates tend to select for larger particles, because they rely on gravity during sampling, and lack sensitivity for respirable particles (e.g., individual fungal spores), especially in highly-filtered environments. Therefore, they are considered impractical for general use. Settle plates, however, may detect fungi aerosolized during medical procedures (e.g., during wound dressing changes).

Microbiological air sampling at AIIMS Raipur is done by Infection Control Team by both active and passive method.

The frequency of sampling - once in 3 months in each operating room as surprise checks and in case of indications for air surveillance as mentioned earlier.

3.1.7. Reporting and Action Plan for Air Surveillance

The reports of air surveillance by all the methods are communicated immediately to the concerned area with following action plan suggested in case of unacceptable reports.

3.1.8. Action Plan

- In case of positive microbiological sampling report, the area/site should be cleaned and scrubbed thoroughly with soap/detergent and water followed by cleaning with disinfectant (phenolic agents/ Bacillocid 1%). This should be followed by repeat fogging and repeat microbiological testing.

- OT/room/area should be used only after microbiological surveillance cultures are reported as negative.
- In case of repeated unacceptable reports—the HEPA filters should be checked for filter efficiency by the concerned engineer and changed if required.

3.2. Water Surveillance

Moist environments and aqueous solutions in health-care settings have the potential to serve as reservoirs for waterborne microorganisms. Under favourable environmental circumstances (e.g., warm temperature and the presence of a source of nutrition), many bacterial and some protozoal microorganisms can either proliferate in active growth or remain for long periods in highly stable, environmentally resistant (yet infectious) forms.

Modes of transmission for waterborne infections include:

- direct contact [e.g., that required for hydrotherapy]
- ingestion of water
- indirect-contact transmission [e.g., from an improperly reprocessed medical device]
- inhalation of aerosols dispersed from water sources
- aspiration of contaminated water.

The first three modes of transmission are commonly associated with infections caused by gram-negative bacteria and nontuberculous mycobacteria (NTM). Aerosols generated from water sources contaminated with *Legionella* spp. often serve as the vehicle for introducing legionellae to the respiratory tract.

3.2.1. Why to do Water Surveillance?

- Improve patient outcomes
- Protect patient
- Safety
- Monitor changing water supply
- Sustain long term patient health

3.2.2. 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.

3.2.3. 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: Water should be collected only after running for 2–3 minutes.

3.2.4. The Standard Tests usually Employed for Bacteriological Analysis of Water

1. Presumptive coliform Count (Multiple Tube Method)
2. Membrane filtration Method
3. Plate count method
4. Presence absence methods

3.2.5. Choice of the Method for Analysis

- If bacterial count is expected to be high (during water born outbreak investigations), to assay small quantity-pour plate method, spread plate method.
- Membrane filtration—when low count specimen is expected and large sampling volumes are required (≥ 100ml). Not recommended for highly polluted water which may block membrane pores.
- Liquid cultivation technique when for detection of target organism i.e. presence absence test
- Multiple Tube Method-all kinds of water can be tested.

3.2.6. Water Analysis in Dialysate Settings:

- Patients on Dialysis are unable to excrete, via their kidney, any contaminants that may be taken up from the dialysate. The acutely ill population may have increased susceptibility to adverse reactions due to co-morbidities.
- Dialysis water treatment should not have chemical and microbial contaminants.

3.2.7. Microbiological Testing Specific to Water in Dialysis Settings

In order to detect the low, total viable heterotrophic plate counts outlined by the current AAMI standards for water and dialysate in dialysis settings, it is necessary to use standard quantitative culture techniques with appropriate sensitivity levels. The membrane filter technique is particularly suited for this application because it permits large volumes of water to be assayed. If it is not available spread method can be used.

Another method used for Endotoxin detection in dialysis water:

1. Kinetic test method (calorimetric method)
2. Gel clot assay (Limulus amebocyte lysate assay)

According to AAMMI guidelines, water used to prepare dilalysate and to reprocess hemodialysis should contain a total microbial count <100 CFU/ml and action has to be taken when it is ≥50 CFU/ml or >0.125 EU/ml endotoxin units /ml.

3.2.8. Water analysis for Legionella species

- *Legionella* spp. are ubiquitous and can be isolated from 20%–40% of freshwater environments, including man-made water systems.
- Routine monitoring is not done.
- Scheduled monitoring is required for units having patients who are highly susceptible to illness (hemopoietic stem cell transplantation unit and solid organ transplant units).
- Collect water (1-litre samples, if possible) in sterile, screw-top bottles.
- Collect culture swabs of internal surfaces of faucets, aerators, and shower heads in a sterile, screw-top container (e.g., 50 mL plastic centrifuge tube). Submerge each swab in 5–10 mL of sample water taken from the same device from which the sample was obtained.
- Transport samples and process in a laboratory by culturing water specimens for Legionella spp. as soon as possible after collection.

4. ENVIRONMENTAL SURFACE SURVEILLANCE

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 and after 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.*

4.2.1. The four conditions where it is indicated

1. To support an investigation of an outbreak of disease or infections when environmental reservoirs or fomites are implicated epidemiologically in disease transmission.
2. Well-designed and controlled experimental methods and approaches can provide new information about the spread of health-care associated diseases.
3. To monitor a potentially hazardous environmental condition, confirm the presence of a hazardous chemical or biological agent, and validate the successful abatement of the hazard.

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.

4.2.2. Undertaking environmental-surface sampling

- Background information from the literature and present activities (i.e., preliminary results from an epidemiologic investigation)
- Location of surfaces to be sampled.
- Method of sample collection and the appropriate equipment for this task.
- Number of replicate samples needed and which control or comparison samples are required.
- Parameters of the sample assay method and whether the sampling will be qualitative, quantitative, or both
- An estimate of the maximum allowable microbial numbers or types on the surface(s) sampled (refer to the Spaulding classification for devices and surfaces)
- Some anticipation of a corrective action plan
- For quantitative assessment of surface organisms, non-selective, nutrient-rich agar media and broth (e.g., TSA and brain-heart infusion broth [BHI] with or without 5% sheep or rabbit blood supplement) are used for the recovery of aerobic bacteria. Broth media are used with membrane-filtration techniques.
- Qualitative determinations of organisms from surfaces require only the use of selective or non-selective broth media.
- Effective sampling of surfaces requires moisture, either already present on the surface to be sampled or via moistened swabs, sponges, wipes, agar surfaces, or membrane filters.
- If disinfectant residuals are expected on surfaces being sampled, specific neutralizer chemicals should be used in both the growth media and the dilution or rinse fluids.
- If sampling is conducted as part of an epidemiologic investigation of a disease outbreak, identification of isolates to species level is mandatory, and characterization beyond the species level is preferred.

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CHAPTER 18

Investigation of an Outbreak

1. DEFINITION OF AN OUTBREAK

An outbreak of infection is defined as:

- An incident in which two / more people experiencing a similar illness are linked in time or place or
- The situation where a greater than expected incidence of infection compared to the usual background rate for the particular location or
- A single case for certain rare diseases or a significant pathogen (e.g. diphtheria or viral haemorrhagic fever) or
- A suspected, anticipated or actual event involving microbial or chemical contamination of food / water

An outbreak is epidemiologically linked to time, place and person.

2. CLASSIFICATION OF AN OUTBREAK

Classification I	
Confined	**Widespread**
Limited to some of the members of one family	Involve cases either locally, nationally or internationally

Classification II	
Obvious	**Insidious**
The suspected source can be easily identified. e.g. An episode of food poisoning that affects both HCWs and patients eating from the same source.	They are slow in onset. Source cannot be obviously defined They reach considerable proportions before they become apparent. These outbreaks are detected by laboratory.

3. CASE DEFINITIONS

There are following three categories:

Confirmed Case	Probable Case	Possible/ Suspect Case
• Patients have clinical signs and symptoms of the disease and • The diagnosis is confirmed by laboratory investigations of relevant specimen.	• Patients have clinical signs and symptoms of the disease **or** • The patients are epidemiologically linked to a confirmed case (exposed to a confirmed case, eaten the same food etc.)	• Patients have clinical signs and symptoms of the disease **or** • Patients with fewer typical clinical features

4. PSEUDO-OUTBREAK:

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

4.1. The Reasons for Pseudo-outbreak May be Several:

- *Laboratory factors*: False reporting due to new technology, new technician, or faulty interpretation.
- *Ward-level factors:* Incorrect diagnosis, sampling errors (collection, labelling and transportation).
- *Environmental factors:* Contamination due to environment. E.g. Contaminated tap water used for endoscope cleaning or contaminated tap water used for staining procedure.

5. OUTBREAK INVESTIGATION AND MANAGEMENT

A suspected outbreak may be identified by a physician or by laboratory personnel, or by ICT while conducting routine surveillance.

When an outbreak is detected, the HICC/ ICT/ ICO/ ICN is immediately informed and an urgent meeting of HICC/ ICT is called depending on the size and seriousness of the outbreak.

6. FORMATION OF AN OUTBREAK CONTROL TEAM (OCT)

An **Outbreak Control team (OCT)** is immediately formed, relevant to the size and seriousness of the outbreak and the healthcare facility involved.

If required the head of the institute and /or state/territory public health unit is also notified.

OCT comprises of:

- Administrators (Medical and Nursing)
- Clinicians/ In-charges/ Managers of implicated areas
- Infection Control Officer—Dr. Ujjwala Gaikwad
- Clinical Microbiologists
- Infectious disease physician
- Clinical Epidemiologist—Dr. Gauri Kumari Padhy
- Public relation Officer (PRO)
- Others as defined by circumstances or as per policy of different hospitals

7. STEPS OF AN OUTBREAK INVESTIGATION

Immediately initiate relevant immediate infection prevention control measures to prevent further transmission and ensure minimum disruption to services.

7.1. Step 1: Recognise Outbreak and Prepare to Investigate

- Ascertain the reliability of both clinical and laboratory information.
- Establish background rate of disease
- Consider if observed number of cases is in excess of the usual number
- Examine HAI surveillance data
- Determine if immediate control measures are needed
    - Reinforce standard precautions
    - Apply appropriate transmission-based precautions
- Notify and communicate
    - Healthcare workers and ancillary staff in immediate area
    - Infection control professional
    - Administration
    - Microbiology Laboratory
    - IDSP-Integrated disease surveillance program (if notifiable disease)
- Urgent meeting of HICC/ICT and
- Formation of an OCT

7.2. Step 2: Verify the Diagnosis and Confirm that an Outbreak Exists

- Confirm that there are more than expected number of cases meeting the surveillance case definition of the disease of interest in the period under review:
    - Confirm clinical diagnoses (symptoms and features of illness)
    - Review laboratory data and request additional laboratory tests if necessary, e.g. molecular typing of organisms to confirm clonality
    - Complete microbiological investigations
- Consider likely outbreak definition and whether criteria are met
    - Are there more cases than expected compared to previous weeks/ months?
    - Review scientific literature
    - Consider epidemiology of cases - are there two or more linked cases of the same illness?

7.3. Step 3: Establish Case Definition and Find Cases

- Establish a set of standard criteria to decide whether or not a person has the disease of concern.
- Case definition is based on:
    - Clinical information about the disease
    - Characteristics of the people who are affected

- Information about the location
- Specification of time period for the outbreak

- Case definition can be refined later after collection of primary data
- Cases can be classified as **Confirmed, Probable** or **Suspect/possible**
- Find cases: Gather critical information by:
  - Interview
  - Follow-up of disease notification
  - Health alerts
- Identify and count cases: Collect the following types of information
  - Identifying information
  - Demographic information
  - Clinical information
  - Risk factor information (including environmental tests)
- Prepare line list of cases based on-
  - Time—date of onset of illness
  - Person—age, sex
  - Place—where did the exposure occur?
  - Other relevant information

7.4. Step 4. Characterise outbreak by person, place, and time

- Review descriptive epidemiology of all cases:
  - Person: sex, age, occupation, residence
  - Place: information that provides indication on possible source of agent and nature of exposure
  - Time: date and time of onset; record relevant events in a timeline
- Plot an epidemic curve to determine hypothesis and analyse the type of outbreak

7.5. Step 5. Determine who is at Risk

- Identify groups at risk:
  - Number of people ill
  - Time and place of onset
  - Personal characteristics

- Initiate precautionary measures
  - Use of standard precautions and appropriate transmission-based precautions
  - Increase frequency and efficiency of environmental cleaning using appropriate products
  - Prophylactic treatment/immunisation
  - Antibiotic restrictions
  - Exclusion of cases from high risk activities
  - Isolation and/or cohorting of patients
  - Restricting movement of patients, staff and visitors
  - Screening of patients with isolation of patients and cohorting of contacts;
  - Provision of health information and advice

7.6. Step 6. Develop Hypothesis—the 'how' and 'why'

- Develop hypotheses from the factual information gathered to date on potential source, vector, pathogen, route of transmission:
  - Data collected by interview
  - Common links
  - Plausible exposures
  - Environmental test results where appropriate
  - Review literature

7.7. Step 7. Test Hypothesis with Established Facts

- Perform epidemiologic study:
  - Retrospective Cohort study—for confined outbreaks
  - Case-control—for widespread outbreaks
  - Analyse the data
  - Compare risk factors among ill (cases) vs. not ill (controls)
  - Attack rates
  - Relative risk

7.8. Step 8. Carry out Further Studies if Necessary

- To support the hypothesis or if analytic studies do not confirm the hypothesis:
  - Further study to refine case definition
  - May involve testing of environmental samples, food samples or environmental screening in some situations (e.g. Legionella, Pseudomonas)
  - HCW screening

7.9. Step 9. Implement Ongoing Control / prevention Measures

(This can be done at any time during the outbreak as deemed necessary)

- Review measures initiated for immediate control (Before Step 1 and Step 5)
- Implement appropriate ongoing control measures and strategies to prevent further illness:
    - Restrict spread from the case
    - Interrupt chain of infection
    - Interrupt transmission or reduce exposure
    - Reduce susceptibility to infection
    - Assessment of policy, regulations, standards
- Monitor-HH Audit, PPE audit, Bundle care audit
- Analyze the trend of outbreak after implementing infection control measures to determine their effectiveness.

7.10. Step 10. Communicate Findings

- Communicate and coordinate with all stakeholders (within the hospital):
    - Electronic flagging of medical records of contacts
    - Reinforcement of infection control precautions to staff, patients and visitors
    - Appropriate signages to limit access to the affected clinical unit/room
    - E-mails and multimedia to target all HCWs
- Prepare written report that evaluates methods used for the control of the outbreak
    - Include discussion of factors leading to outbreak, comprehensive timelines, summary of investigation and documented actions
    - Short and long -term recommendations for prevention of similar outbreak
    - Disseminate to appropriate stakeholders including publication
    - Guidelines for transparent reporting and intervention studies are available as The ORION Statement and should be referred when preparing report or an article for publication.
- Communicate outside the hospital
    - PRO/ a designated person should do it. He/she should have a formal training to do it.

- This person must be attending all the OCT meetings.
- The OCT/any other HCW **must not** communicate directly to media

8. END OF OUTBREAK

- OCT meeting at the end of the outbreak:
  - Review the experience of all team members involved in the outbreak management.
  - Identify gaps and particular difficulties that were encountered
  - Revise the outbreak control plan according to the current experience.
  - Recommend, if required, structural or procedural improvements that would reduce the chances of recurrences of such outbreak in future.
- Write the outbreak report
  - Preliminary and final confidential outbreak reports
  - The report must summarize full investigations, lessons learnt and recommendations.
  - The report must be sent to the senior management and other appropriate personnel/authorities for action.
- Look back investigations
  - Refer to the process of identifying, tracing, recalling, counselling and testing patients or HCWs who may have been exposed to an infection during an outbreak.

9. GENERAL OUTBREAK CONTROL MEASURES

- Staff and patient movement will need to be restricted during an outbreak. If an outbreak has been declared, the rotation of staff or the discharge/ transfer of patients should be discussed with the IPCT/ Health Protection Duty Room.
- In outbreak situations it may be necessary to close a ward /unit / care home. This recommendation will be guided by a risk assessment carried out by the Infection Prevention Control Team in The Trust or the Health Protection Duty-room officer in the independent sector. In an acute Trust setting the IPC Team may immediately advise on the closure of a ward. If an outbreak control team is established it will decide on closures to admissions / transfers and staff movement restrictions.
- It is essential that communication with patients / residents, the public and staff are clear and that messages are consistent.

- Extra cleaning and domestic staff may be required during and immediately following the outbreak.
- It may be necessary to order / purchase additional personal protective equipment. If specialist respiratory equipment is required, then access to fit-testing and training will also be necessary.
- It may also be necessary to purchase additional supplies of cleaning equipment to facilitate enhanced / terminal cleaning of the environment.
- Visiting may need to be restricted and visitors should receive information regarding any risks to them of being exposed to potentially pathogenic micro-organisms.
- It may be necessary to record the details of contacts of cases if advised to do so by the Infection Prevention and Control Team (Trust location) / Health Protection Duty-room officer (Independent Sector).
- Additional work is created during an outbreak and increased staff numbers will probably be necessary to cope with additional pressures.

10. ROLE OF OCT

1. **Inform** all suspect outbreaks to HICC and Microbiology lab.
2. **Drawing** of a detailed outbreak control plan, clearly addressing the areas of individual responsibilities. And action plans for all involved.
3. **Isolate** all the suspected cases.
4. **Record** all information of all the cases comprising of date of admission, clinical diagnosis, time of onset of symptoms, etc.
5. **Relevant specimen** to be sent to microbiology laboratory
6. **Restrict** movement of staff and patients
7. **Closure** of healthcare facility if required
8. **Implement and monitor** the appropriate infection control measures.
9. In case of a major incident the OCT should **seek advice** from experts at both regional and national levels.

11. FLOW CHART OF OUTBREAK INVESTIGATION

Step 1. Recognise outbreak and prepare to investigate

↓

Step 2. Verify the diagnosis and confirm that an outbreak exists

↓

Step 3. Establish case definition and find cases

↓

Step 4. Characterise outbreak by person, place, and time

↓

Step 5. Determine who is at risk

↓

Step 6. Develop hypothesis—the 'how' and 'why'

↓

Step 7. Test hypothesis with established facts

↓

Step 8. Carry out further studies if necessary

↓

Step 9. Implement ongoing control / prevention measures

(This can be done at any time during the outbreak as deemed necessary)

↓

Step 10. Communicate findings

REFERENCES

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[4] Stone SP, Cooper BS, Kibbler CC, Cookson BD, Roberts JA, Medley GF, *et al. (2007).* The ORION statement: guidelines for transparent reporting of Outbreak Reports and Intervention studies of Nosocomial infection. Journal of Antimicrobial Chemotherapy; 59: pp. 833–840.

ANNEXURES

ANNEXURE 1: CASE DEFINITIONS USED FOR SURVEILLANCE OF HAIs

Case definitions as described by National Healthcare Safety Network (NHSN), CDC are being used. The summary diagrams of the common HCAIs are summarized below: Healthcare associated infection (HAI) is acquired in a hospital by a patient, that is, it was not present or incubating at the time of admission. This also includes infection acquired in the hospital but appearing after discharge. These infections can occur from inadvertent exposure to pathogenic bacteria's, viruses, fungi or spores.

BLOOD STREAM INFECTION

LABORATORY CONFIRMED BLOOD STREAM INFECTION			CENTRAL LINEASSOCIATED BLOOD STREAM INFECTION
LCBI-1	**LCBI-2**	**LCBI-3**	**CLABSI**
Patient has a recognized pathogen cultured from one or more blood cultures AND organism cultured from blood is not related to an infection at another site	Patient has atleast one of the following signs or symptoms: fever (>38.0oC), chills, or hypotension AND organism cultured from blood is not related to an infection at another site AND the same common commensal (i.e., diphtheroids [Corynebacterium spp. not C. diphtheriae], Bacillus spp. [not B. anthracis], Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., and Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.	Patient < 1year of age has at least one of the following signs or symptoms: fever (>38.0oC), hypothermia (<36.0oC), apnea, or bradycardia AND organism cultured from blood is not related to an infection at another site AND the same common commensal (i.e., diphtheroids [Corynebacterium spp. not C. diphtheriae], Bacillus spp. [not B. anthracis], Propionibacterium spp., coagulase-negative staphylococci [including S. epidermidis], viridans group streptococci, Aerococcus spp., and Micrococcus spp.) is cultured from two or more blood cultures drawn on separate occasions.	A laboratory confirmed bloodstream infection (LCBI) where central line (CL) or umbilical catheter (UC) was in place for >2 calendar days on the date of event, with day of device placement being Day 1, AND a CL or UC was in place on the date of event or the day before. If a CL or UC was in place for >2 calendar days and then removed, the date of event of the LCBI must be the day of discontinuation or the next day.

SURGICAL SITE INFECTION (MUST MEET THE FOLLOWING CRITERIA)

Superficial SSI	Deep SSI	Organ/Space SSI
Infection occurs within 30 days after any NHSN operative procedure (where day 1 = the procedure date), including those coded as 'OTH'* AND Involves only skin and subcutaneous tissue of the incision AND Patient has at least one of the following: 1. Purulent drainage from the superficial incision. 2. Organisms isolated from an aseptically-obtained culture from the superficial incision or subcutaneous tissue. 3. Superficial incision that is deliberately opened by a surgeon, attending physician** or other designee and is culture positive or not cultured AND Patient has at least one of the following signs or symptoms: pain or tenderness; localized swelling; erythema; or heat. A culture negative finding does not meet this criterion. 4. Diagnosis of a superficial incisional SSI by the surgeon or attending physician** or other designee.	Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) AND Involves deep soft tissues of the incision (e.g., fascial and muscle layers) AND Patient has at least one of the following: 1. Purulent drainage from the deep incision. 2. A deep incision that spontaneously dehisces, or is deliberately opened or aspirated by a surgeon, attending physician** or other designee and is culture positive or not cultured AND Patient has at least one of the following signs or symptoms: fever (>38°C); localized pain or tenderness. A culture negative finding does not meet this criterion. 3. An abscess or other evidence of infection involving the deep incision that is detected on gross anatomical or histopathologic exam, or imaging test.	Infection occurs within 30 or 90 days after the NHSN operative procedure (where day 1 = the procedure date) AND Infection involves any part of the body deeper than the fascial/ muscle layers, that is opened or manipulated during the operative procedure AND Patient has at least one of the following: 1. Purulent drainage from a drain that is placed into the organ/space (e.g., closed suction drainage system, open drain, T-tube drain, CT guided drainage) 2. Organisms isolated from an aseptically-obtained culture of fluid or tissue in the organ/space 3. An abscess or other evidence of infection involving the organ/ space that is detected on gross anatomical or histopathologic exam, or imaging test AND Meets at least one criterion for a specific organ/space infection site

**The term attending physician for the purposes of application of the NHSN SSI criteria may be interpreted to mean the surgeon(s), infectious disease, other physician on the case, emergency physician or physician's designee (nurse practitioner or physician's assistant)

URINARY TRACT INFECTION

Symptomatic UTI (SUTI) Must meet at least one of the following criteria			Asymptomatic bacteremic UTI (ABUTI) Must meet the following criteria
SUTI 1a Catheter-associated Urinary Tract Infection (CAUTI)	**SUTI 1b Non-Catheter associated Urinary Tract Infection (Non CAUTI)**	**SUTI 2 CAUTI or Non CAUTI in patients 1 year of age or less**	**ABUTI**
Patient must meet 1, 2, and 3 below: 1. Patient had an indwelling urinary catheter that had been in place for > 2 days on the date of event (day of device placement = Day 1) AND was either: Still present on the date of event†, OR ·Removed the day before the date of event‡	*Patient must meet 1, 2, and 3 below:* 1. One of the following is true: Patient has/had an indwelling urinary catheter but it has/had not been in place >2 calendar days on the date of event† OR Patient did not have a urinary catheter in place on the date of event nor the day before the date of event	*Patient must meet 1, 2, and 3 below:* 1. Patient is ≤1 year of age (with or without an indwelling urinary catheter)	*Patient must meet 1, 2, and 3 below:* 1. Patient with or without an indwelling urinary catheter has no signs or symptoms of SUTI 1 or 2 according to age
2. Patient has at least one of the following signs or symptoms: •fever (>38.0°C) •suprapubic tenderness* •costovertebral angle pain or tenderness* •urinary urgency* •urinary frequency* •dysuria*	2. Patient has at least one of the following signs or symptoms: •fever (>38°C) in a patient that is ≤ 65 years of age •suprapubic tenderness* •costovertebral angle pain or tenderness* •urinary frequency* •urinary urgency* •dysuria*	2. Patient has at least one of the following signs or symptoms: •fever (>38.0°C) •hypothermia (<36.0°C) •apnea* •bradycardia* •lethargy* •vomiting* •suprapubic tenderness*	2. Patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of ≥10^5 CFU/ml
3. Patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of ≥10^5 CFU/ml	3. Patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of ≥10^5 CFU/ml.	3. Patient has a urine culture with no more than two species of organisms, at least one of which is a bacteria of ≥10^5 CFU/ml	3. Patient has a positive blood culture with at least one matching bacteria to the urine culture, or meets LCBI criterion 2 (without fever) and matching common commensal(s) in the urine.

VENTILATOR ASSOCIATED PNEUMONIA

VAP and other healthcare-associated pneumonias are important, common HAIs. Earlier PNEU/VAP criteria used for surveillance had suffered challenges because of lack of objective, reliable definitions. Hence, NHSN had introduced in 2013 a more objective surveillance criteria, VAE. Currently, NHSN has adopted both the surveillance criteria for ventilated patients—VAE and PNEU/VAP.

1. VAE (ventilator associated events) criteria should be used for surveillance in **adult locations**
2. PNEU/VAP criteria should be used for surveillance in **pediatric locations** and may also be used for off-plan surveillance (who are not reporting to NHSN) in adult as an alternate to VAE criteria.

1. VENTILATOR-ASSOCIATED EVENT (VAE) (FOR USE IN ADULT LOCATIONS ONLY)

The VAE definition algorithm is meant to use only for surveillance; it is not a clinical definition algorithm and is not intended for use in the clinical management of patients.

The earliest date of event for VAE (the date of onset of worsening oxygenation) is day 3 of mechanical ventilation

1.1. Definition of VAE:

There are three events described under VAEs such as **VAC, IVAC and PVAP**.

All the three events are identified by using a combination of objective criteria such as:

i. deterioration in respiratory status after a period of stability or improvement on the ventilator

ii. evidence of infection or inflammation, and

iii. laboratory evidence of respiratory infection.

Ventilator-Associated Events (VAE) Surveillance Algorithm	
MV criteria	Patient has mechanical ventilator (MV) in place for 2 days or more Or If removed: MV was in place on the day of sample collection or the day before
Baseline period	Patient should have a baseline period of stability which is defined as ≥ 2 days of stable or decreasing daily minimum FiO2 or PEEP
Ventilator-Associated Condition (VAC)	After a baseline period, the patient should have at least one of the following criteria of worsening of oxygenation - • ↑ Daily minimum FiO2* of ≥ 0.20 sustained for ≥ 2 days or • ↑ Daily minimum PEEP** values of ≥ 3 cmH2O sustained for ≥ 2 days
Infection-related Ventilator-Associated Complication (IVAC)	During the infection window period*** of VAC, patient should have both: Temperature > 100.4°F or <96.8°F, OR WBC count ≥ 12,000 or ≤ 4,000 cells/mm3 and A new antimicrobial agent(s)# is started, and continued for ≥ 4 days (QAD)##

Possible Ventilator-Associated Pneumonia (PVAP)	During the infection window period*** of IVAC and ONE of the following:	
	Criterion 1	**Positive quantitative/semi quantitative culture** (ET aspirate ≥ 10^5 CFU/ml ; BAL ≥ 10^4 CFU/ml; Lung tissue ≥ 10^4 CFU/g; protected specimen brushing ≥ 10^3 CFU/ml)
	Criterion 2	**Qualitative culture plus Gram stain** Gram stain shows purulent respiratory secretions@ plus positive culture of any growth (criteria-1 specimens and sputum)
	Criterion 3	**One of the following positive tests:** Organism identified from pleural fluid Lung histopathology Diagnostic test for Legionella species Diagnostic test for respiratory viruses@@

2. VAP (VENTILATOR ASSOCIATED PNEUMONIA) CRITERIA

	VAP (Ventilator Associated Pneumonia) criteria
MV criteria (common to all)	Patient has mechanical ventilator (MV) in place for 2 days or more Or If removed: MV was in place on the day of sample collection or the day before
Chest X ray criteria (common to all)	In two serial chest X-rays: At least one of the following: i) new or progressive persistent infiltrate, ii) consolidation , iii) cavitation, iv)pneumatoceles (in infants ≤1 year old) (In patients without underlying pulmonary or cardiac disease- one definitive image is acceptable)
PNEU-1 (for <1yr)	Worsening gas exchange (e.g., O2 desaturations [e.g., pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand) And at least *three* of the following: Temperature instability Leukopenia (≤4000 WBC/mm3) or leukocytosis (≥ 15,000 WBC/mm3) and ≥ 10% band forms New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions or increased suctioning requirements Apnea, tachypnea, nasal flaring with retraction of chest wall or nasal flaring with grunting Wheezing, rales, or rhonchi Cough Bradycardia (<100 beats/min) or tachycardia (>170 beats/min)
PNEU-1 (for 1-12yr)	At least *three* of the following: Fever (>100. 4°F) or hypothermia (<96. 8°F) Leukopenia (≤4000 WBC/mm3) or leukocytosis (≥ 15,000 WBC/mm3) New onset of purulent sputum, or increased respiratory secretions, or increased suctioning requirements or change in character of sputum New onset or worsening cough, or dyspnea, apnea, or tachypnea Rales or bronchial breath sounds Worsening gas exchange (e.g., O2 desaturations [e.g., pulse oximetry <94%], increased oxygen requirements, or increased ventilator demand)

PNEU-2	At least *one* of the following (clinical):
	Fever (>100. 4°F) or hypothermia (<96. 8°F)
	Leukopenia (≤4000 WBC/mm^3) or leukocytosis (≥ 12,000 WBC/mm^3)
	And at least *one* of the following (clinical):
	New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions or increased suctioning requirements
	New onset or worsening cough, or dyspnea or tachypnea
	Rales or bronchial breath sounds
	Worsening gas exchange (e.g., O2 desaturations [e.g., PaO_2/FiO_2 ≤ 240], increased oxygen requirements, or increased ventilator demand)
	And at least *one* of the following finding (laboratory):
	Blood or pleural fluid culture positive
	Positive quantitative culture from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing, lung tissue)
	Histopathologic exam shows at least *one* of the following evidences of pneumonia Abscess formation or foci of consolidation Or Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae
PNEU-3 (for immune-compromised patients)	Patient who is immune-compromised has at least *one* of the following (clinical):
	Fever (>100. 4°F)
	For adults ≥ 70 years old, altered mental status with no other recognized cause
	New onset of purulent sputum, or change in character of sputum, or increased respiratory secretions or increased suctioning requirements
	New onset or worsening cough, or dyspnea or tachypnea
	Rales or bronchial breath sounds
	Worsening gas exchange (e.g., O2 desaturations [e.g., PaO_2/FiO_2 ≤ 240], increased oxygen requirements, or increased ventilator demand)
	Hemoptysis or pleuritic chest pain
	And at least *one* of the following finding (laboratory):
	Blood or pleural fluid culture positive
	Positive quantitative culture from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing, lung tissue)
	Histopathologic exam shows at least *one* of the following evidences of pneumonia Abscess formation or foci of consolidation Or Evidence of lung parenchyma invasion by fungal hyphae or pseudohyphae
	Identification of matching *Candida* spp. from blood and sputum, endotracheal aspirate, BAL or protected specimen brushing
	Evidence of fungi from minimally contaminated LRT specimen (e.g., BAL or protected specimen brushing) from one of the following: direct microscopic exam or culture or non-culture diagnostic laboratory test

ANNEXURE 2: HAI SURVEILLANCE FORM—ADULT PATIENT (PAGE1)

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, RAIPUR (C.G.)
HOSPITAL INFECTION CONTROL COMMITTEE (HICC)
HOSPITAL ACOUIRED INFECTION SURVEILLANCE FORM (ADULT)

Patient Name:	IPD. No.	Age:	Sex:	ICU/Ward:
Department	Admitting Unit:	Dt. of Adm.		Dt. of Adm. to ICU
Provisional Diagnosis:		Final Diagnosis		

Outcome:	Transfer out to ward/unit name & date	LAMA on:	Discharged on	Expired on:

Risk factors/Co-morbidities: (Circle features present at admission)

DM	HTN	CLD	CKD	HIV	TB	Transplantation	Immunosuppressant	any other

Type of Surgery-	Date of Surgery:

Type of device used and Devices Days

Intervention	Date of Insertion	Date of Removal	Re-insertion	Removal
Urinary Catheter				
Mechanical Ventilation /ET tube				
Tracheostomy				
CVC- Jugular/Subclavian/ Femoral/PICC				
Surgical Site Drainage tube				
Dialysis Sheath				

Daily Monitoring

		HD-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11	D-12	D-13	D-14	D-15
HAI	Date															
All	Temperature															
CA-UTI	Catheter Present															
	Suprapubic tenderness															
	Loin pain															
	*1. Urgency, 2.Frequency, 3.Dysuria															
CLA BSI	CL (Central line) present															
	Chills															
	Hypotension (SBP ≤ 90)															
VAE	MV (mechanical ventilator) present															
	$PEEP_{dm}$															
	$FiO2_{dm}$															
	WBC count															
	New Antibiotics															
SSI	Purulent discharge at site															
	Clinician's diagnosis															
	Tenderness, swelling, erythema, heat															
	** Abscess at site															

- *To be reported only when urinary catheter is not in place.
- **Detected by physical exam/ histopathological exam/ imaging dm- daily minimum

HAI surveillance form—Adult patient (page 2)

Microbiology Culture Report (Site specific culture and blood culture; to be filled even when culture is negative)

Date of sample collection	Sample	Organism/s isolated	Colony count	AST report
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -

(S- Sensitive, R- Resistant, I – Intermediate)

A – Ampicillin, Ak- Amikacin, G- Gentamicin, Tb – Tobramycin, AMC – Amoxy-Clav, CTX –Cefotaxime, Ci- Ceftriaxone, Ca-Ceftazidime, Cx- Cefoxitin, Clox- Cloxacillin, M- Meropenem, PIT- Piperacillin-Tazobactam, Cf- ciprofloxacin, N-Nitrofurantoin, E-Erythromycin, P-Penicillin, T-tetracycline, I-Imipenem, Cot – Cotrimoxazole, CL- Colistin, Nx – Norfloxacin, Van - Vancomycin)

ANNEXURE 3: HAI SURVEILLANCE FORM—PEDIATRIC PATIENT (PAGE 1)

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, RAIPUR (C.G.)
HOSPITAL INFECTION CONTROL COMMITTEE (HICC)

HOSPITAL ACQUIRED INFECTION SURVEILLANCE FORM (PEDIATRIC)

Patient Name:		**IPD. No.**	**Age:**	**Sex:**	**ICU/Ward:**
Department		**Admitting Unit:**	**Dt. of Adm.**		**Dt. of Adm. to ICU**
Provisional Diagnosis:			**Final Diagnosis**		
Outcome:	**Transfer out to ward/unit name & date**		**LAMA on:**	**Discharged on**	**Expired on:**

Risk factors/Co-morbidities: (Circle features present at admission)

DM	**HTN**	**CLD**	**CKD**	**HIV**	**TB**	**Transplantation**	**Immunosuppressant**	**any other**

Type of Surgery-	**Date of Surgery:**

Type of device used and Devices Days

Intervention	**Date of Insertion**	**Date of Removal**	**Re-insertion**	**Removal**
Urinary Catheter				
Mechanical Ventilation /ET tube				
Tracheostomy				
CVC- Jugular/Subclavian/ Femoral/PICC				
Surgical Site Drainage tube				
Dialysis Sheath				

Daily Monitoring

		D-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11	D-12	D-13	D-14	D-15
HAI	**Date**															
All	Temperature (>100.4 or <96.8)															
CA- UTI	Catheter															
	Suprapubic tenderness															
	Vomiting															
	Lethargy															
CA-UTI CLABSI, VAP	Apnea															
	Bradycardia															
	CL (Central line)															
VAP	MV (mechanical ventilator)															
	Worsening gas exchange															
	Purulent sputum (new/change) ↑ secrction, ↑ suctioning															
	Sounds: Wheeze/rales or ronchi															
	1)Cough, 2)Tachypnea, 3)dyspnea															
	Nasal Flare with grunting															
	WBC count															
	Chest X ray (any one)*															
SSI	Purulent discharge at site															
	Clinician's diagnosis															
	Pain, tendemess, swelling, erythema, heat															
	** Abscess at site															

- *chest X ray- i) infiltrate, ii) consolidation, iii) cavitation, iv) pneumatocele (<1yr)
- **Detected by physical exam/ histopathological exam/imaging

HAI Surveillance form—Pediatric patient (page 2)

Microbiology Culture Report (Site specific culture and blood culture; to be filled even when culture is negative)

Date of sample collection	Sample	Organism/s isolated	Colony count	AST report
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -

((S- Sensitive, R- Resistant, I – Intermediate)

A – Ampicillin, Ak- Amikacin, G- Gentamicin, Tb – Tobramycin, AMC – Amoxy-Clav, CTX –Cefotaxime, Ci- Ceftriaxone, Ca-Ceftazidime, Cx- Cefoxitin, Clox- Cloxacillin, M- Meropenem, PIT- Piperacillin-Tazobactam, Cf- ciprofloxacin, N-Nitrofurantoin, E-Erythromycin, P-Penicillin, T-tetracycline, I-Imipenem, Cot – Cotrimoxazole, CL- Colistin, Nx – Norfloxacin, Van - Vancomycin)

ANNEXURE 4: HAI SURVEILLANCE FORM—IMMUNOCOMPROMISED PATIENTS (PAGE 1)

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, RAIPUR (C.G.)
HOSPITAL INFECTION CONTROL COMMITTEE (HICC)

HOSPITAL ACQUIRED INFECTION SURVEILLANCE FORM (IMMUNOCOMPROMISED)

Patient Name:		**IPD. No.**	**Age:**	**Sex:**	**ICU/Ward:**
Department		**Admitting Unit:**	**Dt. of Adm.**		**Dt. of Adm. to ICU**
Provisional Diagnosis:			**Final Diagnosis**		
Outcome:	**Transfer out to ward/unit name & date**		**LAMA on:**	**Discharged on**	**Expired on:**

Risk factors/Co-morbidities: (Circle features present at admission)

DM	HTN	CLD	CKD	HIV	TB	Transplantation	Immunosuppressant	Cause of IC status -

Type of Surgery-	**Date of Surgery:**

Type of device used and Devices Days

Intervention	Date of Insertion	Date of Removal	Re-insertion	Removal
Urinary Catheter				
Mechanical Ventilation /ET tube				
Tracheostomy				
CVC- Jugular/Subclavian/ Femoral/PICC				
Surgical Site Drainage tube				
Dialysis Sheath				

Daily Monitoring

		HD-1	D-2	D-3	D-4	D-5	D-6	D-7	D-8	D-9	D-10	D-11	D-12	D-13	D-14	D-15
HAI	**Date**															
All	Temperature															
CA-UTI	Catheter Present															
	Suprapubic tenderness															
	Loin pain															
	*1. Urgency, 2.Frequency, 3.Dysuria															
CLA BSI	CL (Central line) present															
	Chills															
	Hypotension (SBP ≤ 90)															
VAP	Hemoptysis															
	Pleuritic chest pain															
	Altered mental status with no specific focus (adult>70 year)															
	Purulent sputum (new/change) ↑ secretion, ↑ suctioning															
	1)Cough, 2)Tachypnea, 3)Dyspnea															
	Sounds: Wheeze/ rales / ronchi															
	Worsening gas exchange															
SSI	Purulent discharge at site															
	Clinician's diagnosis															
	Tenderness, swelling, erythema															
	** Abscess at site															

- *To be reported only when urinary catheter is not in place.
- **Detected by physical exam/ histopathological exam/imaging

HAI Surveillance form—Immunocompromised patients (page 2)

Microbiology Culture Report (Site specific culture and blood culture; to be filled even when culture is negative)

Date of sample collection	Sample	Organism/s isolated	Colony count	AST report
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -
				S -
				R -
				I -

(S- Sensitive, R- Resistant, I – Intermediate)

A – Ampicillin, Ak- Amikacin, G- Gentamicin, Tb – Tobramycin, AMC – Amoxy-Clav, CTX –Cefotaxime, Ci- Ceftriaxone, Ca-Ceftazidime, Cx- Cefoxitin, Clox- Cloxacillin, M- Meropenem, PIT- Piperacillin-Tazobactam, Cf- ciprofloxacin, N-Nitrofurantoin, E-Erythromycin, P-Penicillin, T-tetracycline, I-Imipenem, Cot – Cotrimoxazole, CL- Colistin, Nx – Norfloxacin, Van - Vancomycin)

ANNEXURE 5: SURVEILLANCE PERIODS FOR SSI FOLLOWING SELECTED NHSN OPERATIVE PROCEDURE

30-day Surveillance			
Code	**Operative Procedure**	**Code**	**Operative Procedure**
AAA	Abdominal aortic aneurysm repair	LAM	Laminectomy
AMP	Limb amputation	LTP	Liver transplant
APPY	Appendix surgery	NECK	Neck surgery
AVSD	Shunt for dialysis	NEPH	Kidney surgery
BILI	Bile duct, liver or pancreatic surgery	OVRY	Ovarian surgery
CEA	Carotid endarterectomy	PRST	Prostate surgery
CHOL	Gallbladder surgery	REC	Rectal surgery
COLO	Colon surgery	SB	Small bowel surgery
CSEC	Cesarean section	SPLE	Spleen surgery
GAST	Gastric surgery	THOR	Thoracic surgery
HTP	Heart transplant	THYR	Thyroid and/or parathyroid surgery
HYST	Abdominal hysterectomy	VHYS	Vaginal hysterectomy
KTP	Kidney transplant	XLAP	Exploratory Laparotomy
90-day Surveillance			
Code	**Operative Procedure**		
BRST	Breast surgery		
CARD	Cardiac surgery		
CBGB	Coronary artery bypass graft with both chest and donor site incisions		
CBGC	Coronary artery bypass graft with chest incision only		
CRAN	Craniotomy		
FUSN	Spinal fusion		
FX	Open reduction of fracture		
HER	Herniorrhaphy		
HPRO	Hip prosthesis		
KPRO	Knee prosthesis		
PACE	Pacemaker surgery		
PVBY	Peripheral vascular bypass surgery		
VSHN	Ventricular shunt		

Note: Superficial incisional SSIs are only followed for a 30-day period for all procedure types.

ANNEXURE 6: SSI SURVEILLANCE FORM AFTER DISCHARGE (DURING FOLLOW UP)

ALL INDIA INSTITUTE OF MEDICAL SCIENCES, RAIPUR (C.G.)
HOSPITAL INFECTION CONTROL COMMITTEE (HICC)

Surveillance of Surgical Site Infections (After discharge)

Patient details			
Patient's Name:		**Age:**	**Sex:**
Department/OPD:	**Date of OPD visit:**	**UHID No.:**	
Name of the consultant:	**Clinical diagnosis:**		

History of Surgical procedure undergone:	
Name of surgery undergone: **1.** **2.** **3.**	**Date of surgery:**

Type of surgery: ☐ **Clean** ☐ **Clean – contaminated** ☐ **Contaminated** ☐ **Dirty or Infected**

Name of the operating department &unit:	**Ward in which admitted postoperatively:**
Dt. of Adm.:	**Postoperative Duration in ward:**
Dt. of discharge/LAMA:	**Outcome at discharge:**

Presenting complaints at follow up visit:

- Presence of Purulent discharge at operative site: ☐
- Pain, Tenderness, Swelling, Erythema, Heat at operative site: ☐
- Abscess at site (Detected by physical exam/ histopathological exam/ imaging): ☐
- Fever: ☐
- Spontaneous dehiscence of the wound: ☐
- Deliberate reopening of the incision by the surgeon: ☐
- Clinician's diagnosis for SSI: ☐

Type of Surgical site infection (diagnosed by surgeon):

☐ **Superficial incisional SSI** ☐ **Deep incisional SSI** ☐ **Organ/ space SSI**

Microbiology Culture Report if available:

Specimen	**Date of collection**	**Organism/s grown**	**Antibiotic sensitivity report**		
			Sensitive	**Resistant**	**Intermediate**

*Data to be collected upto 30 days after surgery in case of suspected superficial SSI and upto 90 days in case of suspected deep or organ/ space SSI.

ANNEXURE 7: DENOMINATOR DATA COLLECTION FORM FOR HAIs

Daily apprasial (denominator) form for adult locations

Hospital Infection Control Committee, AIIMS Raipur

Name of the location/ward - **Month -**

Date	No. of Patients (Bed occupancy)	Catheter (Foley's)		central line		Ventilator		Surgery
		No. of newly insreted catheter	patients already on catheter	No. of newly insterted central line	No. of patients already on central line	no. of new patients on ventlator	no. of pateints already on ventilator	No. of operated patients
1								
2								
3								
4								
5								
6								
7								
8								
9								
10								
11								
12								
13								
14								
15								
16								
17								
18								
19								
20								
21								
22								
23								
24								
25								
26								
27								
28								
29								
30								
31								

Daily denominator Data form for NICU

Month **Year**

Birth Weight Categories

Date	A=≤750gm				B=751-1000 gm				C=1001-1500gm				D=1501-2500 gm				E=≥2501 gm			
	Pt	CL	VNT	UrC	Pt	CL	VNT	UrC	PT	CL	VNT	UrC	Pt	CL	VNT	UrC	Pt	CL	VNT	UrC
1																				
2																				
3																				
4																				
5																				
6																				
7																				
8																				
9																				
10																				
11																				
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24																				
25																				
26																				
27																				
28																				
29																				
30																				
31																				

Pt= No of infants **CL**=No.of infants with 1 or more central lines, including umbilical catheter

VNT=No.of infants on a ventilator **UrC**=No. of infants with a urinary catheter

ANNEXURE 8: CHEMICAL DISINFECTANTS USED AT AIIMS RAIPUR WITH DIRECTIONS FOR THEIR USE

Name of the Disinfectant (Conc)	Method of Preparation	Reuse Life (No. of Days the Product can be Reused)	Contact Time	Purpose of Use	Remarks
Glutaraldehyde (2%)	Add activator powder/ liquid to the liquid in 5 liters jar and use undiluted	28 days	Sterilization - 10 hrs Disinfection - 20-30 min	Disinfection or sterilization of heat sensitive surgical instruments	Chemical test strips should be used at recommended frequency to ensure Minimum effective concentration (MEC) at >1-1.5% while high level disinfecting semi-critical items. If solutions are used daily, test MEC daily.
Orthophthalyl aldehyde (OPA) <0.55%	Use undiluted Activator is not needed.	14 days	Disinfection – 12 mins at 20^0C	Only for High level disinfection of heat sensitive surgical instruments. Don't use for sterilization as the product is not cleared by FDA as a sterilant.	
Ethyl Alcohol/ Isopropyl Alcohol (60-70%)	Use undiluted	Single use	1-10 minutes	Disinfection of thermometers, stethoscopes and other semi critical devices and clinical contact surfaces	-

Name of the Disinfectant (Conc)	Method of Preparation		Reuse Life (No. of Days the Product can be Reused)	Contact Time	Purpose of Use	Remarks
Sodium hypochlorite (1%)	From 5% solution	200ml in 800 ml water	8 hours	15-20 mins	• BMW treatment and small spill management • Discarding jars in labs	Disinfection efficacy reduces at alkaline pH. However, do not mix chlorine releasing agents with acids (including acidic fluids like urine) as toxic chlorine gas is released. Preferably make fresh solutions daily since diluted solutions of hypochlorite are unstable (there is a 50% reduction in the level of free available chlorine at the end of one month).
	From 10% solution	100 ml in 900 ml water				
	From bleaching powder (30%)	33 gms (2 tbsf) in 1000ml water				
Sodium hypochlorite (0.1%)	From 5% solution	20 ml in 980 ml water	8 hours	15-20 mins	Environmental surface cleaning	
	From 10% solution	10 ml in 990 ml water				
Sodium hypochlorite (10%)	From bleaching powder (30%)	330 gm (20 tablespoons) in 1000 ml water	8 hours	15-20 mins	Large spill management	
Bacillocid - 1% (Glutaraldehyde + diethyldioxydimethanol)	10 ml in 990 ml of water		Ready to use	5 mins	• Environmental surface cleaning in moderate high risk areas • Fogging	
Bacillocid - 0.5% (Glutaraldeyde + diethyldioxydimethanol)	5 ml in 995 ml of water		Ready to use	5 mins	Environmental surface cleaning in moderate risk areas	

Annexure 8 (Contd.)...

...(Contd.) Annexure 8

Name of the Disinfectant (Conc)	Method of Preparation	Reuse Life (No. of Days the Product can be Reused)	Contact Time	Purpose of Use	Remarks
Chlorhexidine gluconate solution (4% w/v)	As per manufacturer's recommendation	Ready to use	2-5 min	• Cleaning of wounds, • Surgical antisepsis • Preoperative bath	
Betadine {Povidine Iodine (10%)}	As per manufacturer's recommendation	Ready to use	2-5 min	Dressings, surgical site preparation, surgical scrub	
Alcohol based hand rub {2 propanol, 1- propanol, macetronium ethyl sulfate}	As per manufacturer's recommendation	Ready to use	30 seconds 5 minutes	Hand rubbing Surgical hand scrubbing	Do not use for disinfection of hard surfaces of patient care device or environmental surfaces
Hand rubs containing Chlorhexidine (0.5% w/v) + ethanol (70%)	As per manufacturer's recommendation	Ready to use	30 minutes 5 minutes	Hand rubbing in high risk areas Surgical Hand scrubbing	
Chlorhexidine gluconate (2% w/v) + Ethanol (80%v/v) based skin preparation solution	As per manufacturer's recommendation	Ready to use	2-5 mins	• Surgical site preparation • IV site preparation • CL insertion site preparation	
Alcohol wipes (Wipes soaked in propanolol/ ethanol)	As per manufacturer's recommendation	Ready to use		Scrubbing the hub of CL/IV canula prior to administration of fluids/medication	

Name of the Disinfectant (Conc)	Method of Preparation	Reuse Life (No. of Days the Product can be Reused)	Contact Time	Purpose of Use	Remarks
Phenol/phenyl (0.5-2%)	As per manufacturer's recommendation	Ready to use	Minimum 10 minutes	Floor cleaning Cleaning of toilets Sputum pots in tb wards	Not to be used in newborn units
Lysol (7%)	As per manufacturer's recommendation	Ready to use	Minimum 10 minutes	• Floor cleaning • Cleaning of toilets • Discarding bowls/ jars in labs • Sputum pots in TB wards	
Multienzymatic solutions	As per manufacturer's recommendation	As per manu-facturer's recom-mendation	As per manu-facturer's recom-mendation	For manual and automated cleaning of soiled surgical instruments.	
Soaps	Dissolve in water	Use freshly prepared	5 mins	For general cleaning and floor cleaning in non clinical areas	
Detergents	Dissolve in water	Use freshly prepared	5 mins	For general cleaning and floor cleaning in non clinical areas	

ANNEXURE 9: PROFORMA FOR REPORTING NEEDLE STICK INJURIES AT AIIMS RAIPUR

संक्रमण नियंत्रण विभाग
Department of Infection Control
अखिल भारतीय आयुर्विज्ञान संस्थान, रायपुर (छत्तीसगढ़)
All India Institute of Medical Sciences, Raipur (Chhattisgarh)
Tatibandh, GE Road,
Raipur-492 099 (C.G.)
www.aiimsraipur.edu.in
hicc@aiimsraipur.edu.in

Needle stick & Sharp Object Injury Reporting Form

Name of Department/ Ward/OPD/Patient care area: _____

Name of the Injured Health Care Worker: _____

1) Date of Injury: ☐☐ ☐☐ ☐☐☐☐ **2) Time of Injury:** (24-hour format) ☐☐ ☐☐

5) What is the Job Category of the Injured Worker: (check one box only)

1 Doctor *(attending/staff)*; specify specialty _____
2 Doctor *(intern/resident/fellow)* specify specialty _____
3 Medical Student
4 Nurse: specify ⟹ 1 RN, 2 LPN, 3 NP, 4 CRNA, 5 Midwife
5 Nursing Student
6 CNA/HHA
7 Respiratory Therapist
8 Surgery Attendant
9 Other Attendant
10 Phlebotomist/Venipuncture/IV Team
11 Clinical Laboratory Worker
12 Technologist *(non-lab)*
13 Dentist
14 Dental Hygienist
15 Housekeeper
16 Laundry Worker
17 Security
18 Paramedic
19 Other Student
20 Other, describe: _____

6) Where Did the Injury Occur? (check one box only)

1 Patient Room
2 Outside Patient Room *(hallway, nurses station, etc.)*
3 Emergency Department
4 Intensive/Critical Care unit: specify type: _____
5 Operating Room/Recovery
6 Outpatient Clinic/Office
7 Blood Bank
8 Venipuncture Center
9 Dialysis Facility *(hemodialysis and peritoneal dialysis)*
10 Procedure Room *(x-ray, EKG,etc)*
11 Clinical Laboratories
12 Autopsy/Pathology
13 Service/Utility *(laundry,central supply,loading dock,etc)*
16 Labor and Delivery Room
17 Home-care
14 Other, describe: _____

7) Was the Source Patient Identifiable? (check one box only)

1 Yes 2 No 3 Unknown 4 Not Applicable

8) Was the Injured Worker the Original User of the Sharp Item? (check one box only)

1 Yes 2 No 3 Unknown 4 Not Applicable

9) The Sharp Item was: (check one box only)

1 Contaminated (known exposure to patient or contaminated equipment) ⟹ **was there blood on the device?** 1 Yes 2 No
2 Uncontaminated (no known exposure to patient or contaminated equipment)
3 Unknown

10) For What Purpose was the Sharp Item Originally Used? (check one box only)

1 Unknown/Not Applicable
2 Injection, Intra-muscular/Subcutaneous, or Other Injection through the Skin *(syringe)*
3 Heparin or Saline Flush *(syringe)*
4 Other Injection into *(or aspiration from)* IV injection site or IV Port *(syringe)*
5 To Connect IV line *(intermittent IV/piggyback/IV infusion/other IV line connection)*
6 To Start IV or Set up Heparin Lock *(IV catheter or winged set-type needle)*
7 To Draw Venous Blood Sample
8 To Draw Arterial Blood Sample ⟹ **if used to draw blood was it?** Direct stick? Draw from a Line?
9 To Place an Arterial /Central Line
10 To Obtain a Body Fluid or Tissue Sample *(urine/CSF/amniotic fluid/other fluid, biopsy)*
11 Finger stick/Heel Stick
12 Suturing
13 Cutting
14 Drilling
16 Electrocautery
17 To Contain a Specimen or Pharmaceutical *(glass item)*
18 Other; Describe _____

11) Did the Injury Occur? (check one box only)

1 Before Use of Item *(item broke/slipped, assembling device, etc.)*
2 During Use of Item *(item slipped, patient jarred item, etc)*
15 Restraining patient
3 Between Steps of a Multi-step Procedure *(between incrementalinjections, passing instruments, etc.)*
4 Disassembling Device or Equipment
5 In Preparation for Reuse of Reusable Instrument *(sorting, disin-fecting, sterilizing, etc.)*
6 While Recapping Used Needle
7 Withdrawing a Needle from Rubber or Other Resistant Material *(rubber stopper, IV port, etc.)*
8 Device Left on Floor, Table, Bed or Other Inappropriate Place
9 Other After Use-Before Disposal *(in transit to trash, cleaning, sorting, etc.)*
10 From Item Left On or Near Disposal Container
11 While putting Item into Disposal Container
12 After Disposal, Stuck by Item Protruding from Opening of Disposal Container
13 Item Pierced Side of Disposal Container
14 After Disposal, Item Protruded from Trash Bag or Inappropriate Waste Container
15 Other: Describe: _____

12) What Type of Device Caused the Injury? (check one box only)

☐Needle-*Hollow Bore*
☐Surgical
☐Glass

Which Device Caused the Injury? (check one box from one of the three sections only)

Needles *(for suture needles see "**surgical instruments**")*

☐1 Disposable Syringe
- ☐a Insulin
- ☐b Tuberculin
- ☐c 24/25-gauge needle
- ☐d 23-gauge needle
- ☐e 22-gauge needle
- ☐f 21-gauge needle
- ☐g 20-gauge needle
- ☐h "Other"

☐2 Pre-filled cartridge syringe (includes Tubex™ *, Carpuject ™* - type syringes)
☐3 Blood gas syringe (ABG)
☐4 Syringe, other type
☐5 Needle on IV line *(includes piggybacks & IV line connectors)*
☐6 Winged steel needle *(includes winged-set type devices)*
☐7 IV catheter stylet
☐8 Vacuum tube blood collection holder/needle *(includes Vacutainer™ *–type device)*
☐9 Spinal or Epidural Needle
☐10 Unattached hypodermic needle
☐11 Arterial catheter introducer needle
☐12 Central line catheter needle *(cardiac, etc.)*
☐13 Drum catheter needle
☐14 Other vascular catheter needle *(cardiac, etc.)*
☐15 Other non-vascular catheter needle *(ophthalmology, etc.)*
☐28 Needle, not sure what kind
☐29 Other needle, please describe: _____

Surgical Instrument or Other Sharp Items *(for glass items see "**glass**")*

☐30 Lancet (finger or heel sticks)
☐31 Suture needle
☐32 Scalpel, reusable *(scalpel, disposable code is 45)*
☐33 Razor
☐34 Pipette *(plastic)*
☐35 Scissors
☐36 Electro-cautery device
☐37 Bone cutter
☐38 Bone chip
☐39 Towel clip
☐40 Microtome blade
☐41 Trocar
☐42 Vacuum tube *(plastic)*
☐43 Specimen/Test tube *(plastic)*
☐44 Fingernails/Teeth
☐45 Scalpel, disposable
☐46 Retractors, skin/bone hooks
☐47 Staples/Steel sutures
☐48 Wire *(suture/fixation/guide wire*
☐49 Pin *(fixation, guide pin)*
☐50 Drill bit/bur
☐51 Pickups/Forceps/Hemostats/Clamps
☐58 Sharp item, not sure what kind
☐59 Other sharp item: Describe: _____

Glass

☐60 Medication ampule
☐61 Medication vial *(small volume with rubber stopper)*
☐62 Medication/IV bottle *(large volume)*
☐63 Pipette *(glass)*
☐64 Vacuum tube *(glass)*
☐65 Specimen/Test tube *(glass)*
☐66 Capillary tube
☐67 Glass slide
☐78 Glass item, not sure what kind
☐79 Other glass item: Describe: _____

12a) Brand/Manufacturer of Product: (e.g. ABC Medical Company) _____
12b) Model:

☐98 Please Specify: _____
☐99 Unknown

13) If the Item Causing the Injury was a Needle or Sharp Medical Device, Was it a" Safety Design" with a Shielded, Recessed, Retractable, or Blunted Needle or Blade?

1 Yes
2 No
3 Unknown

13a) Was the Protective Mechanism Activated?

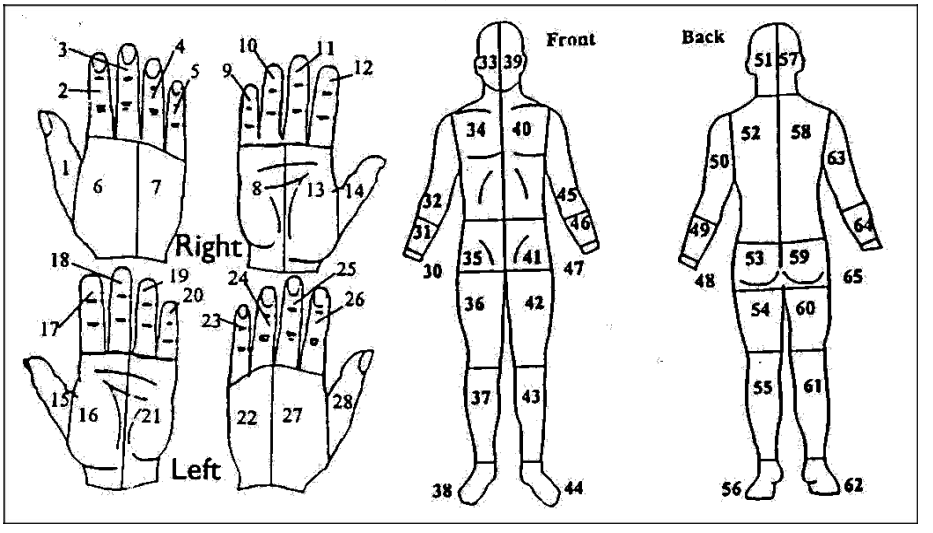
1 Yes, fully
2 Yes, partially
3 No
4 Unknown

13b) Did Exposure Incident Happen?

1 Before activation
2 During activation
3 After activation
4 Unknown

Annexure 9 (Contd.)...

14) **Mark the Location of the Injury:**



15) **Was the Injury?**
1 Superficial *(little or no bleeding)*
2 Moderate *(skin punctured, some bleeding)*
3 Severe *(deep stick/cut, or profuse bleeding)*

16) **If Injury was to the hand, did the Sharp Item Penetrate?**
1 Single pair of gloves
2 Double pair of gloves
3 No gloves

17) **Dominant Hand of the Injured Worker:**
1 Right-handed
2 Left-handed

18) **Describe the Circumstances Leading to this Injury** *(please note if a device malfunction was involved)*:

_____

_____

_____

19) **For Injured Healthcare Worker: If the Sharp had no Integral Safety Feature, Do you have an Opinion that such a Feature could have prevented the Injury?** 1 Yes 2 No 3 Unknown

Describe: _____

_____

_____

_____

20) **For Injured Healthcare Worker: Do you have an Opinion that any other Engineering Control, Administrative or Work Practice could have prevented the Injury?** 1 Yes 2 No 3 Unknown

Describe: _____

_____

_____

_____

ANNEXURE 10: CENTRAL LINE INSERTION CHECKLIST

Central Line Insertion Standard Work and Safety Checklist

Date: ____/____/____ **Start time**: _____

Location:_____

Catheter Type: ☐ Dialysis ☐ Central Venous ☐ Pulmonary

Number of Lumens: ☐ 1 o 2 ☐ 3 ☐ 4

Insertion Site: Jugular: ☐R ☐ L ☐ L **Upper Arm:** ☐ R Artery ☐ L

Subclavian: ☐ R ☐ L **Femoral:** ☐ R ☐ L

Reason for Insertion: ☐ New Indication ☐ Elective ☐ Emergent ☐ Replace Malfunctioning Catheter

Procedure Provider:_____**ProcedureAssistant:**_____

	Standard Work Before, During, and After Procedure	**YES Or True**	**YES** *(After Reminder)*	**NA**
PROCEDURE PREP	Patient has NO allergy to Heparin	☐		
	Patient's latex allergy assessed and procedure plan modified PRN	☐		
	Consent form completed and in chart	☐		
	Perform Procedural Pause Perform patient ID X 2	☐	☐	
	Announce the procedure to be performed	☐	☐	
	Mark / assess site	☐	☐	
	Position patient correctly for procedure	☐	☐	
	Assemble equipment/verify supplies (including ultrasound, unless insertion is subclavian)	☐	☐	
	Verify all medication and syringes are labelled	☐	☐	
	Confirm that all persons in room cleanse hands? (ASK, if unsure)	☐	☐	
	Central line cart utilized?	☐	☐	

How-to Guide: Prevent Central Line-Associated Bloodstream Infections

	Prep Procedure site	Chloraprep 10.5 ml applicator used	☐	☐	
	Dry: 30 second scrub + 30 second dry time	OR	☐	☐	☐
	Wet: 2 minute scrub + 1 minute dry time		☐	☐	☐
	Used large drape to cover patient?		☐	☐	
	Transducer set-up for all jugular and subclavian line insertions		☐	☐	☐

Annexure 10 (Contd.)...

Wear sterile gloves, hat, mask with eyeshield, and sterile gown?

DURING	(all must be worn) Procedure provider Procedure assistant	☐ ☐	☐ ☐	
	Did patient and all other persons in the room wear a mask?	☐	☐	
	Maintain sterile field?	☐	☐	
	Was ultrasound guidance used for all jugular and femoral insertions?	☐	☐	☐ subclavia n
	Venous placement confirmation via: pressure transducer w/ monitor OR Manometry	☐ ☐	☐ ☐	☐ ☐
	Type of solution used to flush/dosage: _____			
	Catheter caps placed on lumens?	☐	☐	
	Catheter sutured in place?	☐	☐	
	Position confirmation Fluoroscopy OR Chest X-ray ordered	☐ ☐	☐ ☐	☐ ☐ femoral
	☐Attending MD ☐Housestaff ☐IV Therapist ☐ IV Therapist ☐ RN			

AERER	***Was sterile technique maintained when applying dressing?***	☐	☐	
	Was dressing dated?	☐	☐	
	Catheter position confirmed by:			
	Already confirmed during procedure via fluoroscopy (see above), **OR**	☐	☐	☐
	Chest X-ray findings	☐	☐	☐
	femoral			

RN Procedure Note:

MD Procedure Note:

DAILY GOALS

PATIENT NAME _____ ROOM NUMBER_____

DATE_____/_____/_____

---Initial as goals are reviewed ----

GOAL	NOTES	0700-1500	1500-2300	2300-0700
What needs to be done for the patient to be discharged from the ICU?				
What is this patient's greatest safety risk?				
Pulmonary/Ventilator: HOB 30 degrees or greater				
Sedation Vacation and Assessment of Readiness to Extubate				
PUD Prophylaxis				
DVT Prophylaxis				
Cardiac Rhythm, Hemodynamics				
Volume Status, net goal for 12 MN				
Neuro/Pain Mgt/Sedation				
GI/ Nutrition/Bowel Regimen				
Mobilization/OOB				
ID, Cultures, Drug levels				
Medication changes (Can any be discontinued?)				
Tests/Procedures Today				
Review scheduled labs. Can any be discontinued?				

Annexure 10 (Contd.)...

Morning labs and PCXR	NOTES	0700-1500	1500-2300	2300-0700
Consultations				
Can central lines or other				
catheters/tubes be DC'd?				
Attending up to date?				
Family Updated?				
Any social issues to address?				
Emotional/spiritual issues addressed?				
Skin Care Addressed?				
Code Status Addressed?				
Advanced Directive in place?				
Parameters for calling MD				

Preventing Hospital Acquired Infection

Hand Hygiene

My Role

PPEs

Timely Removal of catheters and tube

Patient Education

Waste Segregation

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