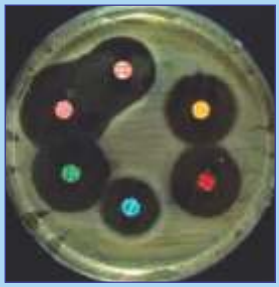
Infection Prevention and Control

An Implementation Handbook for Public Health Facilities in Gujarat



Published by
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Ahmedabad

February 2017

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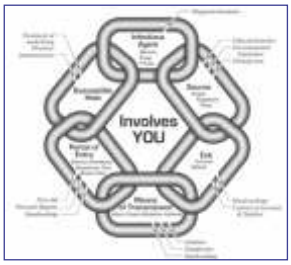

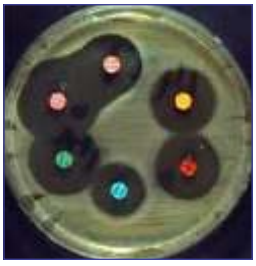

GOVERNMENT (CL&SC) SPINE INSTITUTE AHMEDABAD

सत्यमेव जयते

NATIONAL HEALTH MISSION
राष्ट्रीय स्वास्थ्य मिशन

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Infection Prevention And Control

An Implementation Handbook for Public Health Facilities in Gujarat

Version 01

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This Infection Prevention and Control - An Implementation Hand Book for Public Health Facilities is developed by Department of Health and Family Welfare, Government of Gujarat, will be updated in real time as per the National and International Infection Prevention and Control Guidelines.

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February 2017

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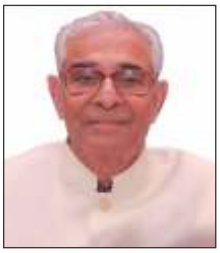

O. P. Kohli
Governor of Gujarat

Raj Bhavan
Gandhinagar. - 382 020.

15 DEC 2016

Message

I am very happy to learn that the Department of Health and Family Welfare, Government of Gujarat, is publishing a book named "Hospital Infection, Prevention and Control : An Implementation Handbook for Public Health Facilities in Gujarat".

It is heartening to know that this book is first of its kind which will ascertain the uniform system and knowledge among all the health professionals across the State to prevent and control hospital associate infection which put lives at risk of both the service providers and service seekers. I am sure that it will provide overall guidance to its users to contribute towards prevention and control of such infections.

I congratulate the entire team of the Health Department for this novel initiative.

O.P.Kohli

(O.P. Kohli)

Vijay Rupani

Chief Minister, Gujarat State

apro/3m/2016/12/08/dt

Dt. 08/12/2016

MESSAGE

"When 'I' is replaced by We,
Even Illness becomes "Wellness"."

-Anonymous.

Health, may it be personal or enmass, is of prime importance for all. Hospitals play role of a temple, where one can disclose, diagnose and get the ailments treated. It is the moral responsibility of those responsible for maintaining it to keep it clean and hygienic for the good cause.

The Government of Gujarat is known for its commitment in ensuring equal accessible quality health care services for all sections of society. I am pleased to learn that the **Department of Health and Family Welfare** is bringing out a bilingual **Handbook of Infection Prevention and Control** in English and Gujarati to facilitate the people with quality health care. I congratulate the **Government Spine Institute, Ahmedabad** and **Health Department** for the publication and extend my best wishes for the success of the **Handbook.**

(Vijay Rupani)

To,
Dr. M. M. Prabhakar, *Director,*
Government (CL & SC) Spine Institute,
Civil Hospital Campus, Asarwa,
Ahmedabad-380 016.
Email: govspineinstitute@gmail.com

૫૭/૪૯૪/૧૬

નીતિન પટેલ

નાયબ મુખ્ય મંત્રી,
ગુજરાત રાજ્ય

કમાંક : નાણાં/શ.વિ.વિ./મા.મ.પા.યો/ન.,ક./પે.કે.

નાણાં, શહેરી વિકાસ અને શહેરી ગૃહ નિર્માણ, માર્ગ અને મકાન, પાટનગર યોજના, નર્મદા, કલ્પસર, પેટ્રોકેમિકલ્સ,
ગુજરાત સરકાર,
સ્વર્ણિમ સંકુલ-૧, બીજો માળ, સરદાર ભવન,
સચિવાલય, ગાંધીનગર-૩૮૨૦૧૦.

તારીખ : ૦૬.૧૨.૨૦૧૬

શુભેચ્છા સંદેશ

ગુજરાત રાજ્ય પ્રજાલક્ષી આરોગ્ય સુવિધાઓ છેક છેવાડાના લોકો સુધી પહોંચાડવા હર હંમેશ કટિબધ્ધ છે. જે થકી વિવિધ પ્રયાસો સુઆયોજિત રીતે અમલીકરણ કરવામાં આવે છે. આરોગ્યનો મુદ્દો એ રાજ્યના વિકાસ માટે સૌથી અગત્યનો હોઈ, પ્રવર્તમાન જરૂરિયાતોને ધ્યાને લઈ પ્રજાલક્ષી કાર્યક્રમોનું આયોજન ગુજરાત સરકારની આગવી ઓળખ છે. બદલાતા સમય સાથે, જાહેર આરોગ્યની સેવાઓનો ઉપયોગ કરનાર લોકોની સંખ્યામાં ઉત્તરોત્તર વધારો થઈ રહ્યો છે. સાથે સાથે આ ભારણને લીધે નવા નવા પડકારો પણ ઉદભવે છે.

અત્યારના સંજોગોમાં રાષ્ટ્રીય સ્તરે પણ જાહેર આરોગ્યની સુવિધાઓ દ્વારા પ્રદાન કરવામાં આવતી સેવાઓમા ગુણવત્તા સભર સેવાઓ પર વિશેષ ભાર મૂકવામાં આવી રહ્યો છે. ગુણવત્તાસભર સેવાઓ પ્રદાન કરવા માટે એક વિશિષ્ટ પાસુ આ સુવિધાઓમાંથી સંભવિત રીતે પ્રસરતા ચેપનો અટકાવ અને નિયંત્રણની કામગીરી વિશેષ મહત્વની છે.

ચેપ આરોગ્યની સેવાઓ મેળવવા માટે ઇચ્છુક પ્રજાજનોમાં આરોગ્ય સુવિધાઓ ખાતે થનાર સંભવિત ચેપના અટકાવ અને નિયંત્રણ માટે લોકહિતલક્ષી પગલાંની દિશામાં એક વધુ પ્રયાસ સમા "ચેપ નિયંત્રણ અને અટકાવ" ના આ પુસ્તક લોકો માટે પ્રસ્તુત કરવા બદલ હું આરોગ્ય અને પરિવાર કલ્યાણ વિભાગને અભિનંદન પાઠવું છું.

(નીતિન પટેલ)

નિવાસ સ્થાન : મંત્રીશ્રી નિવાસ સ્થાન, બંગલા નં. ૨૦, સેક્ટર-૨૦, ગાંધીનગર-૩૮૨૦૨૦. ફોન નં. : ૨૩૨૫૯૭૦૬, ૨૩૨૩૨૪૯૧, ૨૩૨૨૧૮૯૧
કાર્યાલય ફોન : ૦૭૯-૨૩૨૫૦૧૦૬ થી ૨૩૨૫૦૧૧૦, ૨૩૨૩૮૦૭૨-૨૩૨૪૮૦૦૭ ફેક્સ નં. : ૦૭૯-૨૩૨૫૭૬૧૬
વિધાનસભા : ૦૭૯-૨૩૨૫૩૧૯૪/૨૩૨૫૧૦૫૮ ઈ-મેલ : nitinpateldycm@gmail.com

SHANKAR CHAUDHARY

No. VIP/4231/2016
Minister of State,
Health and Family Welfare, Medical Education, Environment (All Independent Charge) and Urban Development, Government of Gujarat
Swarnim Sankul-2, 1st Floor, Sachivalaya,
Gandhinagar-382010
Office Phone No. : (079) 232 50195
Fax No. : (079) 232 50189
Date: 5 DEC 2016

Message

I am glad to know that the Government spine institute is going to launch a book on "Hospital infection prevention & Control"

I hope this will be usefull to estabilsh uniform & knowledge among all health professionals to prevent & control hospital associate infection.

(Shankar Chaudhary)

To,
Dr. M.M. Prabhakar,
Director,
Government (CL & SC) Spine Institute,
Ahmedabad.

Pankaj Kumar, IAS
Principal Secretary
(Medical Education & Medical Services)

No.

Government of Gujarat
Health & Family Welfare Department

MESSAGE

Infection prevention and control practices are important in maintaining a safe environment for patients by reducing the risk of the potential spread of disease from person to person. These practices are designed to reduce the risk of hospital acquired infections and to ensure a safe and healthy hospital environment for our patients, healthcare providers and visitors.

Infection control addresses factors related to the spread of infections within the healthcare services including prevention, monitoring/investigation of demonstrated or suspected spread of infection within a particular health-care services and management. It is on this basis that the common title being adopted within health care is "infection prevention and control."

The general objective of this handbook is to provide administrators and health care workers with the tools to enable them to implement the infection control programme effectively in order to protect themselves and others from the transmission of infections.

Pankaj Kumar
Principal Secretary
(Medical Education & Medical Services)
Health & Family Welfare Department

Block No. 7, 7th Floor, Sardar Patel Bhavan, New Sachivalaya, Gandhinagar-382010, Gujarat, India.
Phone : (079) 23251401, 23251403 **Fax :** (079) 23254653 **E-mail :** sechfwd@gujarat.gov.in

J. P. Gupta IAS
Commissioner &
Principal Secretary (PH & FW)

No.
Commissionerate of Health,
Medical Services, Medical Education & Research, Gujarat
Block. No. -5, Dr. Jivraj Mehta Bhavan
Gandhinagar - 382010
Phone : (079) 23253271,Fax : (079) 23256430
E-mail : cohealth@gujarat.gov.in
Date :

Message

Department of Health and Family Welfare, Government of Gujarat is committed to ensure the health and safety of all patients, employees and visitors in Public Healthcare Facilities. This commitment includes adopting an infection control policy, in practice that minimizes the risk of healthcare consumers and providers acquiring healthcare associated or occupational infection. This goal is best achieved by having an evidence based infection prevention and control program within each Public Health Facility.

Quality is the Degree of Excellence which ensures the role of infection prevention and control practices in Public Health care facilities and provides best quality healthcare needs through effective infection prevention and control practices.

I appreciate the initiative of Government (CL & SC) Spine Institute and our department which has prepared this handbook which will be useful at each and every step of providing quality health care services across the state of Gujarat.

[J.P.Gupta]

सत्यमेव जयते

Dr. M.M. Prabhakar
Additional Director, Medical Education & Research,
Department of Health and Family Welfare, Government of Gujarat.
Medical Superintendent, Civil Hospital, Ahmedabad.
Director, Government (CL & SC) Spine Institute, Ahmedabad.

Health Care Associated Infection (HCAI) is one of the most common complications of health care management. It leads to increased patients morbidity and mortality, length of hospital stay and the costs associated with hospital stay. Effective infection prevention and control is key to provide high quality health care for patients and a safe working environment for those who work in healthcare settings. Thus, Infection control is the discipline concerned with preventing Health Care Associated Infection, a practical rather than only academics.

A systematic approach to infection prevention and control, requires each health care provider to play a vital role in protecting everyone who utilizes the healthcare system. For a medical professional infection prevention and control is more than a system or practice it is a matter of attitude for delivering patient care. Infection prevention and control is everyone's responsibility and a team work to make the healthcare settings a better and safe place.

These guidelines are specifically prepared for the healthcare providers in the integrated management of Healthcare Associated Infection prevention and control (for both curative and preventive activities such as good environmental practices like proper biomedical waste management, standard precautions, sterilization and disinfection etc.).

I thank all the internal and external specialists, who have helped in developing this implementation handbook, to provide comprehensive information to healthcare workers in the prevention and control of Health Care Associated Infections. These guidelines are designed to bring in simple solutions which are standardized and validated across the globe to curtail down the expensive issues of Health Care Associated Infection.

I am sure that these guidelines will help the health care workers with the tools to implement the infection prevention and control programme effectively in order to protect themselves and others from Health Care Associated Infections and lead towards better patient care in all Public Health Care facilities.

(Dr. M. M. Prabhakar)

ડૉ. પરેશ દવે
અધિક નિયામક (આરોગ્ય)

નં.અનિ./આરોગ્ય/પીએ/શુભેચ્છા સંદેશ/૨૦૧૬
કમિશનરશ્રી, આરોગ્ય, તબીબી સેવાઓ અને
તબીબી શિક્ષણ ની કચેરી (આરોગ્ય વિભાગ)
ડૉ.જીવરાજ મહેતા ભવન, બ્લોક નં. ૫, બીજે માળ,
ગાંધીનગર - ૩૮૨૦૧૦
ફોન નં. (૦૭૯) ૨૩૨૫૭૯૪૮,
ફેકસ નં. (૦૭૯) ૨૩૨ ૫૪૫૪૪
તા.૦૬/૧૨/૨૦૧૬

-: સંદેશ:-

આરોગ્ય અને પરિવાર કલ્યાણ વિભાગ, ગુજરાત રાજ્ય હંમેશા રાજ્યની જનતાને આરોગ્યની સર્વોત્તમ અને ગુણવત્તાસભર સુવિધાઓ મળી રહે તે માટે સતત પ્રયત્નશીલ રહે છે. રાજ્યની તમામ હોસ્પિટલો અને આરોગ્ય કેન્દ્રોમાં ચેપ મુક્ત વાતાવરણ રહે તે મુજબની એક પ્રકારની આદર્શ વ્યવસ્થા ગોઠવવાની થાય છે. રાજ્ય સરકાર દ્વારા પ્રથમ વખત હોસ્પીટલ થકી ઉદભવતા અને પ્રસરતા વિવિધ પ્રકારના ચેપના અટકાવ અને નિયંત્રણ માટે હોસ્પિટલ સંલગ્ન ચેપ નિયંત્રણ અને અટકાવ : ગુજરાતના જાહેર આરોગ્ય સુવિધાઓ માટેની અમલીકરણની માર્ગદર્શિકા પ્રકાશિત કરવા જઈ રહ્યું છે.

આ પુસ્તકનો હેતુ સમગ્ર રાજ્યમાં હોસ્પિટલ સંલગ્ન ચેપ નિયંત્રણ અને અટકાવ થકી આરોગ્ય સેવા પ્રદાન કરનાર અને આરોગ્ય સેવા લેનાર એમ બંનેને જે વિવિધ જોખમો રહેલા છે તે ઘટાડવા માટેના જ્ઞાન અને પદ્ધતિનો પ્રસાર કરવાનો છે. આ પુસ્તક થકી હોસ્પિટલો અને આરોગ્ય કેન્દ્રો મારફતે ચેપ મુક્ત ગુણવત્તા સભર આરોગ્ય સેવાઓ પૂરી પાડવામાં મદદ મળશે.

[ડો. પરેશ દવે]

सत्यमेव जयते

Dr. N. B. Dholakia
Additional Director (MS)

No.
Office of the Commissioner, Health,
Medical Services & Medical Education,
Block-5, 1st Floor, Dr Jivraj Mehta Bhavan
Gandhinagar. Gujarat.
Phone: 079-23253286
Fax No: 079-23259900
Date:

Message

Infection prevention and control is required to prevent the transmission of communicable diseases in all health care settings. Infection prevention and control demands a basic understanding of the epidemiology of diseases, risk factors that increase patient susceptibility to infection, and the practices, procedures and treatments that may result in infections.

The Department of Health and Family Welfare, Government of Gujarat is having visionary approach and strategy to curb such infections through a multi-pronged strategy which calls for participation of medical, paramedics and all other support service staff involved in providing health care services to the people.

To strengthen this approach, the department is publishing a handbook which will provide guideline for mandatory and non-mandatory actions at various health care settings in the state for prevention and control of heath care associate infections.

I extend my best wishes.

N. B. Dholakia.

[Dr. N. B. Dholakia]

सत्यमेव जयते

Dr. Prakash Vaghela
Additional Director (FW)

No.
Office of the Commissioner, Health,
Medical Services & Medical Education,
Block-5, 2nd Floor, Dr Jivraj Mehta Bhavan
Gandhinagar. Gujarat.
Phone: 079-23253311
Fax No: 079-23253304
Date:

Message

Infection prevention and control at the hospital, especially among the government health care facility is of utmost importance to ensure safe and secure healtcare services to any person attending, working or visiting a health care facility.

Qualitative health care services, infection control and prevention measures in Public Health Facilities are essential to improve healthcare standards. To emphasis on these quality standards the department of health and family welfare is coming up with the book to train health professionals.

The hand book along with theoratical aspects of infection control also deals with specific day to day measures such as hand wash. In turn it should become habit of all health care providers. The hand book promotes national standards for infection prevention and control which will help our public health facilities to achieve these standards in uniform manner.

I am sure this book will be utilised in full spirit by all level of health professionals.

[Dr. Prakash Vaghela]

सत्यमेव जयते

Dr. J.L Meena
State Quality Assurance Medical Officer

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Phone: 079-23257356
Fax No: 079-23253304
Date:

Message

Department of Health and Family Welfare, Government of Gujarat is committed to provide quality healthcare services to all citizens. Under National Health Mission, the department has taken several initiative to improve the quality standard of public health care facilities in Gujarat in various forms such as resource allocation, capacity building, monitoring and evaluation.

Healthcare associated infections (HAIs) are one of the most common, significant and preventable patient safety issues today. Most of the HAI are preventable and controllable. As we all know to achieve national and international standard of quality health care, hospital associated infection rate, its prevention and control is one of the significant indicator.

To address this issues, the department is coming up with this first of its kind hand book which will be helpful for all health professionals and decision makers at all level to enhance their knowledge as well as improve their practices.

To develop this hand book various reference documents and as well as hands on experience has been utilised. I take this opportunity to thank all professionals who helped us to develop this hand book.

[Dr. J. L. Meena]

FROM THE CONTRIBUTORS DESK

THE GENESIS OF INFECTION PREVENTION AND CONTROL
AN IMPLEMENTATION HANDBOOK FOR PUBLIC HEALTH FACILITIES IN GUJARAT

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Infection prevention and control practices are vital for all health care professionals. It is an essential, though often under-recognized and under-supported, part of the infrastructure of the health care, and thus, to mainstream infection prevention and control practices, as inbuilt part of health system, the team has taken initiative to develop this hand book under the leadership of Additional Director, Medical Education and Research, Dept. of Health and Family Welfare, Govt. of Gujarat, Medical Superintendent, Civil Hospital, Ahmedabad & Director, Govt. Spine Institute, Ahmedabad, Dr M.M. Prabhakar.

This handbook is the outcome of constant hardwork, dedication, strong commitment, perseverance, enthusiasm, zeal, elaborate, collective and relentless efforts of the team. It is made compliant to the National and International Standards, Specific Guidelines and Standard Operative Procedures on the prevention of Health Care Associated Infections from various sources namely WHO, CDC, SHEA , Swachhata Guideline and Kayakalp – National Guidelines for clean hospitals for Public Health Facilities-Ministry of Health (MOH) government of India(GOI). The due care is taken to make this handbook simple, reliable, flexible, practical and adaptable to the public health facilities.

With the vision to make all Public health facilities of Gujarat – a quality and safe health care provider, in this endeavour let us join hands together and make our health care facilities a better and safer place for quality patient care.

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AIM OF THE BOOK

To facilitate implementation and sustain uniform infection prevention and control practices to achieve optimum quality in patient care throughout the public health facilities in the State of Gujarat.

HOW TO USE THE HAND BOOK

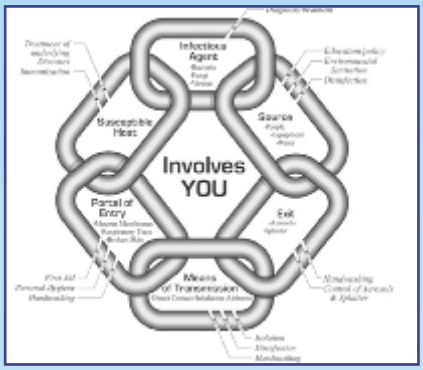
This hand book is based on the current national and international infection prevention and control guidelines. The purpose of this hand book is to enable all personnel working in public health facilities to implement uniform infection prevention and control at their work place. This hand book will help all public health care facilities to achieve the best possible infection prevention and control measures. It provides guidelines to the health care personnel for effective implementation. The user of this hand book is advised to implement the policies and procedures whichever is applicable to their specific health care facility. This hand book advocates affordable and feasible approach for different levels of public health care facilities. The effective infection prevention and control programme provides optimum protection for both health care service providers and health care seekers.

ABBREVIATIONS

ABHR	Alcohol Based Hand Rub
AC	Air Conditioner
ACH	Air Changes per Hour
AD	Auto Disable
AEB	Accidental Exposure to Blood
AHU	Air Handling Unit
AII	Airborne Infection Isolation
ALOS	Average Length of Stay
ALT	Alanine Transaminase
AMR	Antimicrobial Resistance
ART	Anti Retroviral Therapy
ASP	Antimicrobial Stewardship Programme
AST	Antimicrobial Susceptibility
BAL	Broncho Alveolar Lavage
BCG	Bacillus Calmette Guerin
BMW	Bio-medical Waste
BMWM	Bio-medical Waste Management
BOD	Biochemical Oxygen Demand
CAI	Community Acquired Infections
CAUTI	Catheter Associated Urinary Tract Infection
CBWTF	Common Biomedical Waste Treatment Facility
CDC	Centers for Disease Control and Prevention
CDHO	Chief District Health Officer
CDMO	Chief District Medical Officer
CFM	Cubic Feet per Minute
CFU	Colony Forming Units
CHC	Community Health Center
CLABSI	Central Line Associated Blood Stream Infection
CMO	Casualty Medical Officer
COD	Chemical Oxygen Demand
CSSD	Central Sterile Supply Department
CTE	Consent to Establish
CTO	Consent to Operate
CVC	Central Venous Catheter
D.O. A.	Date of Admission

D.O.D.	Date of Discharge
DDD	Defined Daily Dosage
DG	Diesel Generator
DH	District Hospital
DOP	Dispersed Oil Particulate
DPT	Diphtheria Pertussis Tetanus
EQAS	External Quality Assurance Scheme
ETO	Ethylene Oxide
ETP	Effluent Treatment Plan
FL	Formulay
FPM	Feet Per Minute
FRU	First Referral Unit
GMSCL	Gujarat Medical Services Corporation Limited
GPCB	Gujarat Pollution Control Board
HBsAg	Hepatitis B Surface Antigen
HBV	Hepatitis B Virus
HCAI	Health Care Associated Infections
HCF	Health Care Facility
HCV	Hepatitis C Virus
HCW	Health Care Workers
HEPA	High Efficiency Particulate Air
HIC	Hospital Infection Control
HICC	Hospital Infection Control Committee
HIV	Human Immuo Deficiency Virus
IC	In Charge
ICN	Infection Control Nurse
ICO	Infection Control Officer
ICT	Infection Control Team
ICU	Intensive Care Unit
IDSP	Integrated Disease Surveillance Programme
IM	Intra Muscular
IP and CP	Infection Prevention and Control Programme
IPD	Indoor Patient Department
ISO	International Organization for Standardization
IV	Intra Venous
JE	Japanese Encephalitis
kW	Kilo Watt
LBH	Length x Breadth x Height
LRT	Lower Respiratory Tract
MDRO	Multi Drug Resistant Organism
MIC	Minimum Inhibitory Concentration

ML	Millilitre
MRSA	Methicillin Resistant Staphylococcus Aureus
N-95	This mask blocks 95% of very small (0.3 micron) test particles
NACO	National AIDS Control Organization
NCDC	National Centre for Disease Control
NSI	Needle Stick Injuries
OPD	Outdoor Patient Department
OPIM	Other Potentially Infectious Material
OT	Operation Theatre
PDD	Prescribed Daily Dosage
PE	Percutaneous Exposure
PEP	Post Exposure Prophylaxis
PHC	Primary Health Center
PIU	Project Implementation Unit
PLABSI	Peripheral Line Associated Blood Stream Infection
POA	Poly Alpha Olefin
PPE	Personal Protective Equipments
PSI	Pounds per Square Inch
PTB	Pulmonary Tuberculosis
PTC	Pharmaco Therapeutic Committee
QC	Quality Control
RH	Relative Humidity
RUP	Re Use Prevention
SARS	Severe Acute Respiratory Syndrome
SC	Sub Center
SEMD	Safety Engineered Medical Devices
SI	Sanitary Inspector
SIP and CMC	State Infection Prevention and Control Monitoring Cell
SN	Staff Nurse
SNCU	Sick New Born Care Unit
SSI	Surgical Site Infection
STG	Standard Treatment Guidelines
STP	Sewage Treatment Plan
TB	Tuberculosis
TPN	Total Parental Nutrition
VAP	Ventilator Associated Pneumonia
VFD	Variable Frequency Devices
VRE	Vancomycin Resistant Enterococci
WBC	White Blood Cell
WHO	World Health Organization



Section 1

Infection Prevention and Control Programme

1.1 INTRODUCTION

Infection prevention and control is the responsibility of all staff working in health care setting and integral element of patient safety program. It is clinical application of microbiology in practice. Infection or diseases may be caused by various groups of microorganisms such as bacteria, virus, fungi or prions and can result in a wide variety of infections that include, for example respiratory, blood, urinary tract, wound, bone and skin infections. Currently, there is a growing concern about the patient safety in health care facilities.

Patient safety is a fundamental principle of healthcare. Health Care Associated Infections (HCAI) are major public health problems throughout the world. They originate from the endogenous and exogenous sources and occur during hospitalization of the patients. For an infection to be defined as HCAI there must be no evidence that the infection was present or incubating at the time of hospital admission. World wide, HCAI such as the surgical site infections, health care associated pneumonia, catheter related blood stream infection and urinary tract infection affect more than one million patients are infected with HCAI annually, which has tremendous implications in terms of mortality, morbidity, outcome, cost of treatment and add significantly to the expected length of stay of patients.

1.2 PURPOSE

Health care settings can provide a challenging environment to manage risk associated with the transmission of microorganisms from staff to staff, staff to patient and or visitors, patient and or visitors to staff, equipment and environment. An infection control programme is essential to the Health Care Facility (HCF) because it provides guidelines and standards for the recognition, prevention and control of infection in-patients, personnel and visitors within the HCF.

Policies and procedures are required for prevention and control of infections, surveillance and monitoring. Public health facilities under the Health and Family Welfare Department, Government of Gujarat is committed to the prevention of the HCAI through its infection prevention and control policies and guidelines as stated in this handbook. Specific guidelines and standard operative procedures on the prevention of these infections have been formulated keeping in view various sources namely WHO, CDC, SHEA, Swachhata Guideline and Kayakalp – National Guidelines for Clean Hospitals for Public Health Facilities-Ministry of Health (MOH) Government of India (GOI).

1.3 SCOPE OF THE IMPLEMENTATION HANDBOOK

This infection prevention and control implementation handbook has been developed in order to support the public health facilities to implement the infection control programme. It provides important information on the essential principles of infection prevention and control practices. Implementation of the policies and guidelines in this handbook is directed by the scope of services at the public health facilities.

Implementation of the infection prevention and control programme is the major part of quality initiatives. The State Infection Prevention and Control Monitoring Cell (SIP and CMC), Hospital Infection Control Committee (HICC) and Infection Control Team (ICT) shall coordinate and evaluate

the implementation. It is only through the co-operative efforts of the staff that HCAI can be prevented.

1.4 INFECTION PREVENTION AND CONTROL PROGRAMME (IP AND CP)

Centers for Disease Control and Prevention (CDC), USA, puts forward that upto one third of HCAI could be prevented by an effective IP and CP. A special programme to reduce HCAI at the public health facility is dedicated to minimize infection risk in order to prevent infections inpatients, personnel and visitors. The goal of the IP and CP is to identify and reduce the incidence of infection among patients, staff, doctors, contact workers, volunteers, students and visitors. It also endeavors in providing a safe environment to all with the concept that hospitals " Do No Harm ".

Guidelines

- Infection prevention and control programme shall be implemented in each HCF. This includes Medical College Hospitals (MCH), District Hospitals (DH), Community Health Centers (CHC), Primary Health Centers PHC), Sub-Centers (SC) etc.
- A multidisciplinary SIP and CMC, multidisciplinary HICC and ICT shall be established for planning , implementing and evaluating the IP and CP at the HCF.
- The SIP and CMC shall be responsible to monitor, periodically review all infection control policies and procedures, surveillance data and formulate recommendations to the State Health and Family Welfare Dept, Govt. of Gujarat and HICC at the facility level to the Medical Superintendent/ CDMO/ Medical Officer or equivalent regarding infection prevention and control activities for any administrative actions to be taken.
- Infection prevention and control guidelines shall be integrated with the quality improvement programme at the state and facility level.

1.5 OBJECTIVES OF INFECTION PREVENTION AND CONTROL PROGRAMME

- To interpret uphold and implement the infection prevention and control policies and procedures in the facility.
- To develop written policies and procedures for standards of infection prevention and control practices, cleanliness, sanitation and asepsis in the health care facilities.
- To review and analyse data on HCAI in order to take corrective and preventive actions.
- To review and provide input for investigations of HCF related outbreaks.
- To develop a mechanism to supervise infection control measures in all phases of hospital activities and to promote infection control practices at all levels of the facility.
- To ensure continuing education of employees on infection prevention and control practices.

1.6 COMPONENTS OF INFECTION PREVENTION AND CONTROL PROGRAMME

The following are important components of the infection prevention and control programme:

- Provide facilities to HCF staff to maintain good infection prevention and control practices.
- Having a written documents (standard operating procedures) for outlining the various infection prevention and control policies and procedures and periodically updating it.
- Conducting induction and ongoing educational/ training program related to infection prevention and control for all cadres of HCF staff.
- Making provisions for staff health activities and monitoring it to identify and prevent spread of infection from staff to staff, staff to patient and/or visitors, patient and/or visitors to staff.
- Identifying and monitoring housekeeping and sanitation practices.
- Identification and taking appropriate action to control HCF related outbreaks of infections.
- Monitoring the use of antibiotics.
- Microbiological surveillance.

1.7 MANAGEMENT OF INFECTION PREVENTION AND CONTROL PROGRAMME

The HCF shall recognize the control of HCAI as an important issue and is committed to fulfilling its responsibility by ensuring that appropriate measures are instituted to identify and prevent HCAI.

Implementation of the infection prevention and control programme is the major part of quality initiatives. The State Infection Prevention and Control Monitoring Cell (SIP and CMC), Hospital Infection Control Committee (HICC) and Infection Control Team (ICT) shall coordinate and evaluate the implementation of the programme.

State Infection Prevention and Control Monitoring Cell (SIP and CMC)

The competent and active multidisciplinary SIP and CMC is the most important part of the programme for prevention and control of HCAI among patient and occupational health hazards among staff at the state level. To fulfil this aim a SIP and CMC needs to be formed that will look after the infection prevention and control needs of all HCF across the state. This cell is responsible for establishing and maintaining infection prevention and control, system monitoring, surveillance, reporting and training. SIP and CMC provides a forum for multidisciplinary input, cooperation and information sharing. The SIP and CMC shall engage with staff to develop systems and processes that lead to sustainable and reliable improvements in relation to the application of infection prevention and control practices. The cell shall meet once in three months. There shall be a planned agenda for each meeting and proceedings shall be documented.

Membership

SIP and CMC represents key personnel, who are in decision making position from State Health and Family Welfare Department. SIP and CMC shall be chaired by Commissionerate of Health and Family Welfare Department, Govt. of Gujarat. Membership in the cell shall include Additional Directors (Medical Education and Research, Medical Services, Public Health, Family Welfare) Health and Family Welfare Department, Managing Director GMSCL, representatives from the field of Microbiology, Medical and Surgical branches, Clinical Pharmacology, Asst. Nursing Director, Deputy Director

Epidemic, Chief Engineer Project Implementation Unit (PIU), representative from GPCB and State Quality Assurance Officer.

Responsibility of SIP and CMC

- Formulate guidelines for infection prevention and control programme as per the prevailing practices, advice and support on the implementation of it.
- Define quality improvement initiatives, design and evaluate indicators for infection prevention and control parameters and strategies.
- Receive infection prevention and control data from all HCF to analyse and take appropriate corrective and preventive action.
- Review, analyze and consolidate infection prevention and control data of HCF for appropriate actions and its facility wide dissemination.
- Monitor the annual programmes and action plan to reduce HCAI.
- Direct, infection prevention and control audit programme and formulation of the expert group for these audits.
- Advise the HCF authorities to identify the funds necessary for implementation and contingency requirements for infection prevention and control programme.
- Advise on the most effective use of resources.
- Develop guidelines on antibiotic policy based on antibiogram.
- Develop and plan training of different categories of staff on infection prevention and control guideline.

Hospital Infection Control Committee - HICC

The competent and active multidisciplinary Infection control committee is the most important part of the programme for prevention and control of HCAI among patient and occupational health hazards among staff. To fulfill this aim a Hospital Infection Control Committee (HICC) needs to be formed that will look after the infection prevention control needs of the HCF. The committee shall meet once in three months. There shall be a planned agenda for each meeting and proceedings shall be documented.

Membership

HICC committee represents key personnel who are in decision making position from various departments of HCF. HICC is accountable to the medical head of the HCF. Membership in the committee shall include representative from Hospital Administrators, Microbiologists, Clinician, Surgeon, Nursing , Laboratory , Pharmacy, CSSD, Mortuary, Housekeeping, Biomedical Engineer if available and Maintenance Incharge.

Responsibility of HICC

- HICC shall follow the guidelines developed by the SIP and CMC.
- HICC of HCF is responsible to submit the infection prevention and control data to the SIP and CMC.
- Strategically plan for infection prevention and control practices and provide advise and support on the implementation of infection control programme and policies.

- Receive infection prevention and control data from various departments to analyse and take appropriate corrective and preventive actions.
- Monitor the annual programmes and action plan to reduce health care associated infections.
- Direct, infection prevention and control audit programme.
- Advise the HCF authorities to identify the funds necessary for implementation and contingency requirements for hospital infection prevention and control programme.
- Advise on the most effective use of resources.
- Develop guidelines on antibiotic policy based on antibiogram.
- Develop and plan for training of different categories of staff on infection prevention and control guidelines.

Infection Control Team (ICT)

Infection Control Team (ICT) is the functional unit of HICC of HCF. The ICT is responsible for day to day infection prevention and control matters and will report to HICC.

Membership

Membership in the ICT shall include Infection Control Officer (ICO), Assistant Nursing Superintendent, Infection Control Nurse (ICN), Sanitary Inspector/ Supervisor.

Responsibility of ICT

The Infection Control Officer (ICO):

Infection control officer reports to the Medical Superintendent/ CDMO/ Medical Officer or equivalent for infection prevention and control programme in the HCF. ICO is the member secretary of HICC. ICO is responsible for functioning of ICT, verification of data on regular basis and providing feedback regarding HCAI rates, trend and opportunities to improve on a regular basis to appropriate department and personnel.

Duties of Infection Control Officer (ICO):

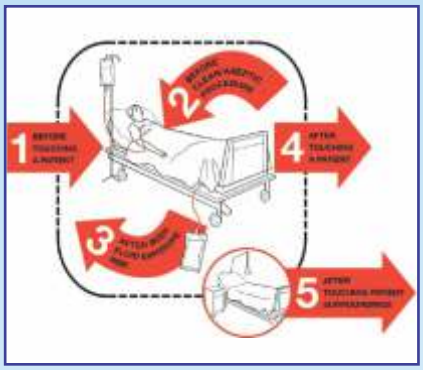
- To develop, implement, review, update and promote infection prevention and control programme in the HCF.
- Outbreak investigation.
- Define quality improvement initiatives, design and evaluate indicators for infection prevention and control parameters.
- Receive infection prevention and control data from all departments to analyse and take appropriate corrective and preventive action.
- Review, analyze and consolidate infection prevention and control data of the HCF for appropriate actions and its department wise dissemination .
- Coordinating the surveillance activities.
- Organizing the training programme for staff which also includes induction training programme on infection prevenion and control.
- Assessment of antibiogram of the isolated organism in order to develop, review and update antibiotic policies.

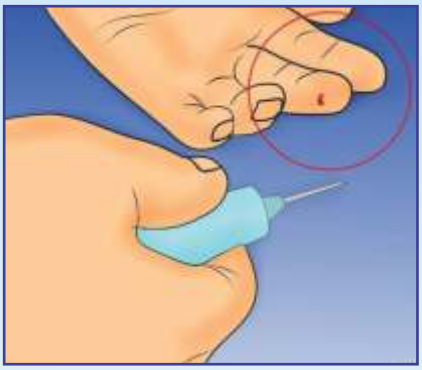
Infection Control Nurse (ICN)

The duties of the infection control nurse are primarily associated with infection prevention and control practices. ICN is an active member of the ICT and responsible for the day to day activities of infection prevention and control in HCF. The ICN reports to the ICO for the matters related to infection prevention and control activities. ICN serves as a resource to staff of all disciplines and level in matters related to infection prevention and control.

Duties of Infection Control Nurse (ICN)

- Monitoring of infection prevention and control practices.
- Monitoring of clinical care, housekeeping, laboratory and other units.
- Monitoring of environmental practices- surveillance of water supplies, high risk environments, air quality etc.
- Evaluate the effectiveness of the surveillance plan and modify as necessary.
- Conduct regular infection control rounds in clinical and diagnostic service areas and support services such as CSSD, laundry, kitchen, housekeeping etc.
- Conducting surveillance activity to detect and record the occurrence of HCAI throughout the HCF on a systematic and regular basis. Taking appropriate actions based on the analysis of surveillance audits. Preparing appropriate records and reports.
- Plan, organize, develop and implement educational programmes for all hospital employees which convey specialized knowledge and skills to increase employee awareness of existence of HCAI, techniques for its prevention, to provide a safe environment for hospital employees and patients. Conducting training programme on infection prevention and control.
- Develop and update isolation techniques and procedures in accordance with current standards of practices, rules and regulations.
- Collect and maintain infection control quality indicators.
- Assist in coordination of regularly scheduled HICC meetings and dissemination of recommendations across HCF.
- Participate in investigations of unusual hospital infection outbreak.
- Collection of data in support of epidemiological studies of specific problems or problem areas to determine the source of the problem and make appropriate recommendations.
- To serve as a knowledgeable and available resource on infection prevention and control practices and policies to patients, families and staff etc.





Section 2

Standard Precautions

2.1 INTRODUCTION

Standard precautions are basic infection prevention and control practices to reduce the risk of transmission of infectious agents from both recognized and unrecognized sources of infection. These practices are to be used by all staff, in all care settings, at all times for all patients, regardless of the suspected or confirmed presence of an infectious agents. Implementation of these precautions is a primary strategy for successful prevention of HCAI. Standard precautions apply to blood, all body fluids, secretions and excretions except sweat, non-intact skin and mucous membranes.

The use of standard precautions is based on the assessment of infection risk, the nature of activity involved, level of interaction and the anticipated level of exposure to blood and or other body fluids. To be effective in protection against infection risk, standard precautions must be continuously followed by all the staff, all the times.

According to 2007 Centers for Disease Control and Prevention (CDC) guidelines for isolation precautions in hospitals, recommendations for standard precautions include respiratory hygiene also called cough etiquettes and safe injection practices, the use of mask when performing certain high risk prolonged procedures involving spinal canal punctures (e.g myelography, epidural anaesthesia). Patients may also be assigned an additional category of isolation precaution depending upon the patients' clinical situation.

The staff shall follow standard precautions for infection prevention and control, when they come in contact with mucous membrane, non-intact skin, blood and or other body fluids, secretions and excretions.

Standard precautions consists of following elements:

- Hand hygiene.
- Respiratory hygiene.
- Personal protective equipments – gloves, caps, gowns, masks, goggles, face shields etc.
- Safe injection practices – prevention of needle stick/sharp injuries.
- Occupational health and employee safety.
- Patient care equipments.
- Environmental controls.
- Patient placement.
- Patient resuscitation.
- Linen.

2.2 HAND HYGIENE

Proper hand hygiene before and after contact with every patient is the single most important, simplest and least expensive means of reducing transmission of infectious agents in Health Care Facility (HCF). Body secretions, excretions, environmental surfaces and hands of all Health Care Workers (HCW) can carry microorganisms (bacteria, viruses and fungi) that are potentially infectious to them and others. Hand washing aims to reduce patient morbidity and mortality from Health Care Associated Infections (HCAI). It causes a significant decrease in the carriage of potential pathogens on the hands. Treating all patients in the HCF with the same basic level of "standard precautions'' involves work practices that are essential to provide a high level of protection to patients, health care workers and visitors which includes hand washing.

Nail and Skin Care

- Nails are the area of greatest contamination. Short nails are easier to clean and are less likely to tear gloves. Remove all the jewellery from hands for efficient hand washing.

- Nail varnish/ polish/ extensions/ art and acrylic nails are prohibited, regardless of colour, for staff with direct patient contact or who work in direct patient care area.

- Ensure the skin on your hands does not become dry or damaged. In these conditions the hands show a higher bacterial load and are difficult to remove than with intact skin. Hand lotion may be used to prevent skin damage from frequent hand washing.

"Five Moments for Hand Hygiene" Approach

The newly developed "Five Moments for Hand Hygiene" approach has emerged from the WHO guidelines on hand hygiene in health care to add value to any hand hygiene improvement strategy.

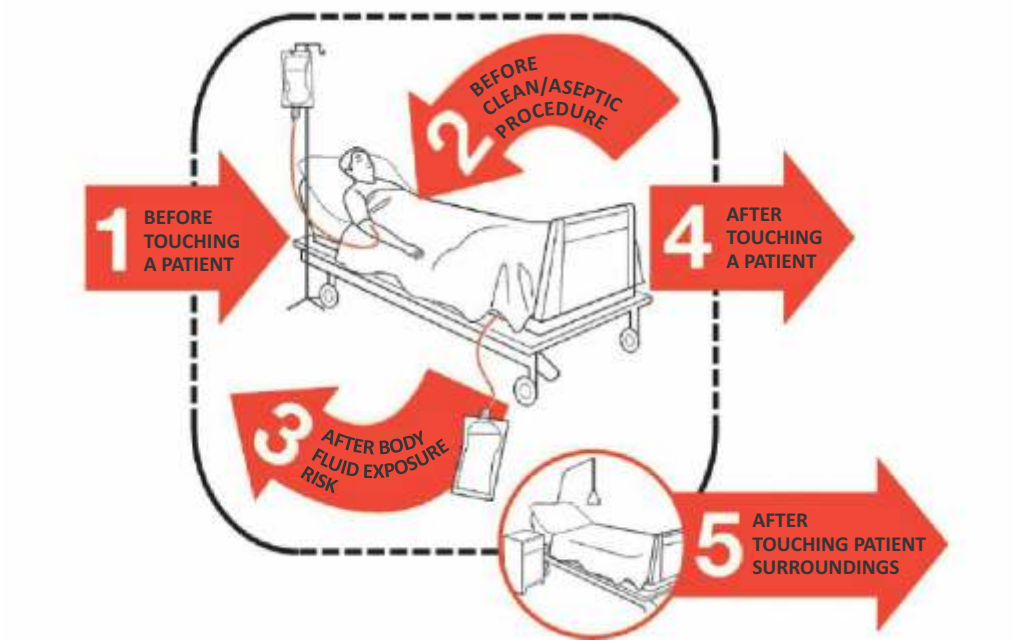


Figure-1: Five moments of hand hygiene

Table- 1: Five moments of hand hygiene

Moment	When?	Why?
1. Before touching a patient	Clean your hands before touching a patient.	To protect the patient against harmful microorganisms carried on your hands.
2. Before clean or aseptic procedure	Clean your hands immediately before performing a clean or aseptic procedure.	To protect the patient against harmful microorganisms, including the patient's own.
3. After body fluid exposure risk	Clean your hands immediately after an exposure risk to body fluids (and after glove removal).	To protect yourself and the healthcare environment from harmful microorganisms of the patient.
4. After touching a patient	Clean your hands after touching a patient and patient's immediate surroundings.	To protect yourself and the healthcare environment from harmful microorganisms from the patient.
5. After touching patient surroundings	Clean your hands after touching any object or furniture in the patient's immediate surroundings even if the patient has not been touched.	To protect yourself & healthcare environment from harmful microorganisms from patient.

Hand Washing Technique

A brief wash removes the majority of transient microorganisms, the technique shall aim to cover all surfaces of the hands. When soap or a surgical scrub has been used, hands shall be rinsed under running water and thoroughly dried with a single use towel/ tissue paper.

Routine hand washing is accomplished by vigorously rubbing together all surfaces of lathered hands followed by thorough rinsing under a stream of running water. This shall at least take 40 to 60 seconds to complete. Hands shall be dried with single use towel/ tissue paper.

Types of Hand Hygiene

- Hand washing with soap and running water
- Alcohol based hand rub
- Surgical hand scrub

- **Hand washing with soap and running water:** removes transient microorganisms, soil, blood and other organic material from hands.

Wash hands with soap and water when

- Visibly dirty/contaminated with blood, body fluids etc.
- After using a rest room.
- Before and after having food.
- After arriving and before leaving work place.

Figure-2: How to hand wash?

- **Alcohol Based Hand Rub (ABHR):** It is an antiseptic hand rub. It kills or inhibits the growth of most transient and resident microorganisms but ineffective if hands are visibly soiled.

Use an ABHR when:

- Hands are not visibly soiled.
- Before having direct contact with patients.
- Before putting on gloves.
- After contact with patient's intact skin (e.g. after taking pulse, BP, lifting a patient etc.).
- After contact with inanimate objects (e.g. medical equipment) in the immediate vicinity of the patient.
- After removing gloves.
- Hand washing with soap and water is not possible, as long as hand are not visibly soiled.

Figure-3: How to hand rub?

Note: Do not wipe or wash off. Allow to air dry.
Source: WHO guidelines on hand hygiene in health care.

- **Surgical hand scrub:** scrubbing with antiseptic before beginning surgical or invasive procedures. The aim of surgical hand scrubbing with an antiseptic agent is to minimize the number of microorganisms on hands under the gloves. This reduces the risk of infection to a patient if gloves develop a small hole, tears or nicks durng the procedure. The steps of surgical hand scrub are as follows:

Figure-4: Surgical hand scrub
Duration of the procedure 2-3 minutes for each hand

Surgical hand scrub consists of:

- Remove all jewellery (rings, watches, bracelets).
- Wash hands and arms with hand wash gel. Take 5 to 10 ml of gel.
- Scrub each side of each finger, between the fingers and the back and front of the hand.
- Proceed to scrub the arms, keeping the hand higher than the arm at all times. This prevents bacteria-laden soap and water from contaminating the hand.
- Wash each side of the arm little above the elbow.
- Repeat the process on the other hand and arm, keeping hands above elbows at all times.
- Rinse hands and arms by passing them through the running water in one direction only, from fingertips to elbow. Do not move the arm back and forth through the water.
- Hands shall be thouroughly dried with single use towel/ tissue paper.
- Proceed to the operating room suite holding hands above elbows.

Points to note:

- Do not dip hands into basins containing standing water even if antiseptic agents have been added. Microorganisms can survive and multiply in the solutions.
- Liquid soap shall be used.
- Ensure hand hygiene facilities in or adjacent to rooms where invasive procedures are performed.

Refer Annexure 1 and 2 for Monitoring Adherence to Hand Hygiene Practices

2.3 RESPIRATORY HYGIENE

Also called cough etiquette

- Cover the nose and or mouth and use handkerchief/ tissue paper while coughing or sneezing.
- Perform hand hygiene when having contact with respiratory secretions and contaminated objects/ materials.

2.4 PERSONAL PROTECTIVE EQUIPMENTS (PPE)

Personal Protective Equipments (PPE) refers to a variety of barriers and respirators used alone or in combination to protect the skin, mucous membranes, airways and clothing from contact with infectious agents. PPE shall be worn only during patient care. Before leaving the patient's room or cubicle, the HCW must remove and discard the PPE.

PPE Should be Used by:

- HCW (Doctors & Nurses) who provide direct care to patients and who work in situations, where they may have contact with blood, body fluids, excretions or secretions.
- Support staff including cleaners and laundry staff in situations where they may have contact with blood, body fluids, excretions or secretions.

PPE includes

i. Gloves
ii. Protective eye wear (goggles)
iii. Mask
iv. Apron, Gown
v. Cap/ Hair cover
vi. Face shield
vii. Boots/ Shoe covers

- Laboratory staff, who handle patient specimens.
- Family members who provide care to patients and are in a situation where they may have contact with blood, body fluids, secretions and excretions.
- Housekeeping staff.

Principles for use of PPE

- PPE shall be chosen according to the risk of exposure. HCW shall assess whether they are at risk of exposure to blood, body fluid excretions or secretions and choose their items of personal protective equipment according to the risk.
- Avoid any contact between contaminated (used) PPE and surfaces, clothing or people outside the patient care area.
- Discard used PPE in appropriate disposal bags and dispose off as per current Bio-medical Waste (BMW) Management guidelines.
- Do not share PPE.
- Change PPE completely and thoroughly wash hands each time you leave a patient to attend to another patient or another duty.
- PPE reduces but does not completely eliminate the risk of acquiring an infection. It has to be used effectively, correctly and at all times where contact with blood and body fluids of patients may occur.
- Adequate supply of PPE and training for its proper use are essential.
- Staff must also be aware that use of PPE does not replace the need to follow basic infection control measures such as hand hygiene.

i. Gloves

Staff must ensure that the appropriate type of glove is selected for particular procedures with the purpose to ensure safety and protection for staff and patients. There are three types of gloves:

- Sterile surgical single use gloves used for invasive procedures.
- Single use non-sterile gloves used for:
    - Direct contact with patient's mucous membrane, blood, body fluids, moist body surfaces and non-intact skin.
    - For handling potentially infectious materials or when coming in contact with contaminated items and surfaces.
    - For performing venipuncture, insertion of suppositories, patient examination, non-invasive patient care activities etc.
- Heavy duty/ utility gloves shall be used for decontamination of large equipment, housekeeping activities, handling of biomedical waste etc. These gloves can be reused after cleaning.

  While considering the nature of the task, the need for sterile or non-sterile gloves shall be assessed.

Table-2: Indications for use of gloves

Indications for using glove	Indications for changing glove
Before contact / anticipated contact with: • Blood and body fluids. • Mucous membranes. • Non-intact skin. • Visibly or potentially contaminated patient care equipments and environmental surfaces. • Patients infected with contact transmitted pathogens (e.g. MRSA, VRE etc.).	• Between contact with different patients. • Between tasks/procedures on the same patient to prevent cross contamination between different body sites. • Wash hands immediately after removing gloves. • Use a liquid soap or ABHR. • Disposable gloves shall not be reused but shall be disposed off as per current Bio-medical Waste (BMW) Management guidelines.

Figure-5: Steps for wearing gloves

Figure-6: How to remove gloves?

ii. Masks

There are two types of masks:

- Surgical tie-back mask: These masks are adequate for most procedures and isolation precautions where use of mask is indicated.
- N 95 mask: This certified respirator meets the minimum filtration performance for respiratory protection in areas in which patients with suspected or confirmed open tuberculosis (TB), SARS or H1N1 is anticipated.

Points to note:

- Mask shall be worn during procedures and patient care activities that are likely to generate droplets from blood, other body fluids or tissue to prevent exposure of mucous membranes of the mouth, nose and eyes.
- Do not wear masks around the neck or keep it in the pocket.

iii. Protective Goggles/ Face Shield

Protective goggles must be worn if blood or body fluid contamination to the eyes, face is anticipated and always during aerosol generating procedures. Wear protective goggles/ face shields to protect the mucous membranes of the eyes when conducting procedures that are likely to generate splashes of blood, body fluids, secretions or excretions. If they are reusable, decontaminate them according to the manufacturer's instructions. If they are disposable, discard appropriately.

iv. Gowns and Plastic Aprons

- Unnecessary use of gown is not recommended.
- Do not wear gown outside the area for which it is intended.
- Wear a gown (clean, non-sterile) to protect the skin and prevent soiling of clothing during procedures which generate splashes of blood, body fluids, secretions and excretions.
- Remove a soiled or wet gown as soon as possible.
- A plastic apron may be worn on top of the gown to protect exposure to blood, body fluids, secretions and excretions.
- Launder gowns and aprons appropriately if they are reusable as per the protocol.
- Do not reuse disposable gowns and aprons. Dispose them as per the protocol.

v. Caps

- Wear disposable caps where there is a likelihood that the patient's blood, body fluids, secretions and excretions may splash, spill or leak on to the hair.
- Do not reuse disposable caps. Discard them according to the protocol.

vi. Boots/ Shoe Cover

- Use if there is likelihood of splashes of blood, body fluids, secretions and excretions on to shoes.
- Decontaminate reusable boots as per the protocols.

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 isolation 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

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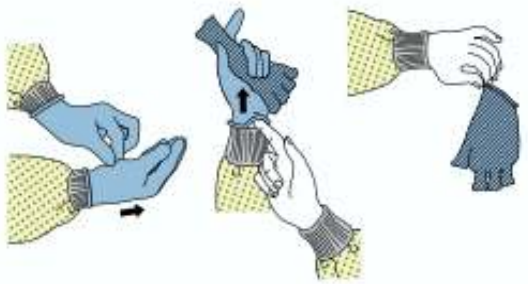
Figure-7: Sequence for putting on PPE - donning

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 peel off first glove
- Hold removed glove in gloved hand
- Slide fingers of ungloved hand under remaining glove at wrist and peel off second glove over first glove
- Discard gloves in a waste container

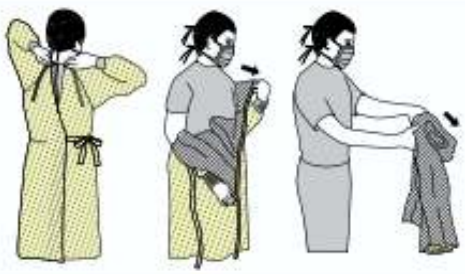


2. GOGGLES OR FACE SHIELD

- 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

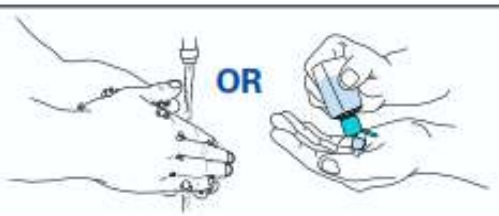
- Gown front and sleeves are contaminated!
- If your hands get contaminated during gown removal, immediately wash your hands or use an alcohol-based hand sanitizer
- Unfasten gown ties, taking care that sleeves don't contact your body when reaching for ties
- Pull gown away from neck and shoulders, touching 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

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Figure -8: How to safely remove PPE- doffing?

PPE for Standard and Transmission Based Precautions

Standard precautions:

Perform hand hygiene before wearing PPE, immediately after removing PPE, during PPE changes and between patient contact.

1. **Gown/ Apron**
   Wear a gown during procedure and patient care activities when contact of clothing or exposed skin with blood body fluid or excretions is anticipated.
2. **Mask/ Respirator**
   Use during patient care activities that are likely to generate splashes and sprays of blood.
3. **Goggles / Face shield**
   Use during patient care activities that are likely to generate splashes and sprays of blood on face.
4. **Gloves**
   Wear Gloves when touching blood, body fluids, secretions, excretions, tissues, or contaminated and potentially infected items and for touching non intact skin and mucous membrane.

Transmission based precautions

Contact precautions requires gloves and gown for contact with the patient.
Droplet precautions requires surgical mask within three feet of the patient.

Airborne infection isolation

Requires particulate respirator.
Eg: N95 be worn and use of a negative pressure isolation room.

2.5 SAFE INJECTION PRACTICES

Rationale Use of Injections

Injection

An injection is only a medium to administer a drug / medicine into the body for prophylactic and or curative purposes.

Safe Injection

A safe injection is an injection that:

- does no harm to the recipient (e.g. no abscess formation),
- does not expose the HCW to any risk (e.g. needle stick injuries) and
- does no harm to the community (e.g. unsafe disposal of waste).

"Safe Injection practices shall not be sacrificed in efforts to save time or money."

Unsafe Injection

Unsafe injection is any such practice which cause harm to patients, providers or the community.

Table-3: Unsafe injection practices

Reuse 1. Using the same syringe or needle to administer medication to more than one patient. 2. Using cannula's with a needle that has already been used for a patient.	
Unhygienic practices 1. Not washing hands, not wearing gloves by provider. 2. Not cleaning the injection sites. 3. Touching the needles with hands or with any objects before and after injections. 4. Flushing the syringes or needles before injections. 5. Administering injections over clothes. 6. Leaving the needles in a multidosevial.	
Wrong techniques: 1. Wrong selection of injection sites. 2. Using medications without checking labels or expiry dates. 3. Using medicines packed as single-dose or single-use for more than once. 4. Recapping the syringes after injections.	
Waste management mechanism 1. Not segregating the injection related waste at source. 2. Not cutting hub (needles and plungers) after every injections. 3. No sharp containers for needle storage. 4. No adequate storage sites. 5. No terminal disposal mechanism.	

Procedures Associated with Unsafe Injection Practices

Unsafe injection practices that put patients at risk for Hepatitis B Virus (HBV), Hepatitis C Virus (HCV), Human Immunodeficiency Virus (HIV) and other infections have been identified during various medical procedures. Examples include:

- Administration of sedatives and anesthetics for surgical, diagnostic and pain management procedures.
- Administration of Intra Venous (IV) medications for chemotherapy, cosmetic procedures and alternative medicine therapies.
- Administration of vaccines through Intra Muscular (IM) and Subcutaneous routes.
- Use of saline solutions through IV lines and catheters.
- Administration of Subcutaneous injections for insulin and insulin like drugs, growth hormones or for any other indication either by health care provider or self-administration.
- Tattooing procedures, where skin punctures are necessary.

Outcome of Unsafe Injection Practices

Outcomes of unsafe injections could be grouped as:

- Short term - Abscess formation, skin rashes, irritation, pain, disabilities.
- Long term - HBV, HCV and HIV infections.

Unsafe injection practices are a powerful means to transmit bloodborne pathogens, including HBV, HCV and HIV. Because infection with these viruses initially presents no symptoms, the infections remain as a silent epidemic. However, the consequences of this silent epidemic are increasingly recognized. While HIV has been well recognized for more than three decades as a pandemic; WHO has recently raised an alert to be watchful of the silent transmission of hepatitis group of viruses as the morbidity and mortality burden due to direct and indirect causes of hepatitis transmission is rising alarmingly.

Hepatitis B Virus (HBV)

HBV is highly infectious, the risk from a single needlestick or a cut exposure to HBV-infected blood ranges from 6%–30% .

Hepatitis C Virus (HCV)

The estimated risk for infection after a needlestick or cut exposure to HCV-infected blood is approximately 1.8%

Human Immunodeficiency Virus (HIV)

The average risk for HIV infection after a needlestick or cut exposure to HIV-infected blood is 0.3%.

Injection Safety

Injection safety or safe injection practices, is a set of measures taken to protect patients, HCW, bio medical waste handlers and general community. Injection safety includes practices intended to prevent transmission of infectious diseases between one patient and another or between a patient and healthcare provider, and also to prevent harms such as needle stick injuries.

To ensure injection safety, the following Five "A" are recommended while administering injections:

- Appropriate indication.
- Appropriate molecule/drug.
- Appropriate patient.
- Appropriate patient information.
- Appropriate evaluation.

Aseptic Technique for Injections

Aseptic technique refers to the manner of handling, preparing and storing of medications and injection equipment/ supplies (e.g., syringes, needles and IV tubing) so as to prevent microbial contamination.

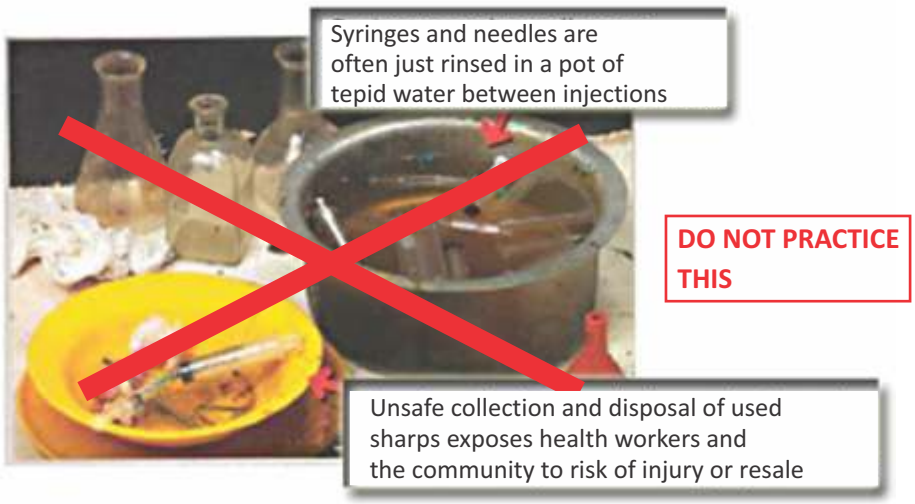


Figure-9: Unsafe injection practices

The best practices for safe injections include:

- Use sterile injection equipment preferably Auto Disable (AD) injection equipment one time use.
- Prevent contamination of injection equipment and medication.
- Prevent Needle Stick Injuries (NSI) to the provider.
- Prevent access to used syringes and needles to avoid reuse.
- Use of Safety Engineered Medical Devices (SEMD) - Re Use Prevention (RUP) syringes, safety syringes and safety needles.
- Maintaining hand hygiene all the times.
- Ensuring skin integrity of the provider.
- Using gloves.
- Swabbing vial tops or ampoules.
- Adequate site preparation of patient.

Injection Devices and Medications

Injection devices

HCF shall ensure that an adequate supply of single-use injection devices is available, to allow providers to use a new device for each procedure. In addition of adequate supply of syringes and needles it is also important to ensure availability of hub cutters and bio-medical waste segregation bags, buckets and puncture proof containers.

There are 3 parts of a syringe: the needle, the barrel and the plunger.

The catheter shall be small in diameter as possible so it takes a less space in the vein. This reduces the risk of phlebitis as it reduces the mechanical and chemical irritation to the vein wall.

The recommended needle gauge for routine injection and phlebotomy procedures for different age groups are:

- 26-24 gauge for infants and children.
- 24- 22 gauge for children and elderly patients.
- 24- 20 gauge for medical patients and post -operative surgical patients.
- 18 gauge for surgical patients and for rapid blood administration.
- 16 gauge for trauma patients and those requiring large volume of fluid rapidly.

Practical guidance on use of injection devices

When using a sterile single-use device:

- Use a new device for each procedure, including for the reconstitution of a unit of medication or vaccine.
- Inspect the packaging of the device to ensure that the protective barrier has not been breached.
- Discard the device if the package has been punctured, torn or damaged by exposure to moisture or if the expiry date has passed.

Table-4: Types of medication containers and recommendations on their use

Type of container	Recommendations	Reason
Single-dose vial	Preferred	Low likelihood of contamination
Multiple-dose vial	Only if unavoidable	High likelihood of contamination if aseptic technique is not followed

Type of container	Recommendations	Reason
Ampoules	Pop-open preferred	Breaking a glass ampoule may result in particulate matter escaping from the vial, it may also injure the person opening the ampoule
Fluid or solution bags (100—1000 ml) for reconstitution	Not recommended for routine injection	High likelihood of contamination
Pre filled saline flush syringes	Preferred for all types of flushing needs	Specially developed for flushing

Practical guidance on giving medications

When giving medication:

- DO NOT use a single loaded syringe to administer medication to several patients.
- DO NOT change the needle in order to reuse the syringe.
- DO NOT use the same mixing syringe to reconstitute several vials.
- DO NOT combine leftover medications for later use.

Single-dose vials: Whenever possible, use a single-dose vial for each patient.

Multidose vials: Only use multidose vials if there is no alternative.

- Open only one vial of a particular medication at a time in each patient-care area.
- If possible, keep one multidose vial for each patient and store it with the patient's name on the vial in a separate treatment or medication room.
- Always clear the rubber cap before loading injections.
- DO NOT leave needles in a multi dose vial after use.

Discard a multidose vial:

- If sterility or content is compromised.
- If the expiry date or time has passed (even if the vial contains antimicrobial preservatives).
- If it has not been properly stored after opening.

- Within 24 hours of opening or after the time recommended by the manufacturer, if the vial does not contain antimicrobial preservatives.
- If found to be undated, improperly stored, inadvertently contaminated or perceived to be contaminated, regardless of expiration date.

Pop-open ampoules: Whenever possible, use pop-open ampoules rather than ampoules that require use of a metal file to open. If using an ampoule that requires a metal file to open, protect your fingers with a clean barrier (e.g. a small gauze pad) when opening the ampoule.

DO NOT use hard objects to open the ampoules. Doing so may spill the content of vials reducing the prescribed dose.

Preparing injections

Injections shall be prepared in a designated clean area where contamination by blood and body fluids is unlikely.

The steps to be followed while preparing injections:

- Keep the injection preparation area free of clutter so all surfaces can be easily cleaned.
- Before starting the injection session and whenever there is contamination with blood or body fluids, clean the preparation surfaces with 70% alcohol (isopropyl alcohol or ethanol) and allow to air dry.
- Assemble all equipments needed for the injection:
  - Sterile single-use needles and syringes.
  - Reconstitution solution such as sterile water or specific diluent.
  - Alcohol swab or cotton wool.
  - Hub cutter/Sharps container.

Practical Guidance in Administering Injections

When administering an injection:

- Check the drug chart or prescription for the medication and the corresponding patient's name and dosage.
- Check for expiry dates and labels and match with prescription.
- Reconfirm the route of administration in the label and prescription.
- Perform hand wash using liquid soap and running water before and after a injection session. Use ABHR in between injections in a busy OPD.
- Wear gloves for self protection.
- If using a vial, wipe the top of the vial with 60-70% alcohol (isopropyl alcohol or ethanol) using a swab or cotton-wool ball.
- Always clean the injection site using a alcohol swabs.
- Check the packet of syringes and needle and please do not use if the packet is punctured or damaged.
- Open the injection package in front of the patient to reassure them that the syringe and needle have not been used previously.

- Using a sterile syringe and needle, withdraw the medication from the ampoule or vial.
- After reconstituting the contents of a multidose vial, remove the needle and syringe and discard them immediately as per recommendations.

Key points to remember for injection administration

- DO NOT allow the needle to touch any contaminated surface.
- DO NOT reuse a syringe, even if the needle is changed.
- DO NOT touch the needles.
- DO NOT touch the diaphragm of the injection vial after disinfection with the 60—70% alcohol (isopropyl alcohol or ethanol).
- DO NOT use same needle more than once in multidose vials.
- DO NOT re-enter a vial with a needle or syringe used on a patient to withdraw medication again.
- DO NOT use bags or bottles of intravenous solution as a common source of supply for multiple patients.

Newer Technologies for Safer Injections

Technology helps the health care professionals immensely in their endeavor to achieve the desired standards of health care. Technology has evolved significantly in the last decade or so to make injection and related processes much safer for patients, health care workers and the community. It is worth knowing and practicing the technological solutions, as and when they are available in your settings.

Auto Disable (AD) and Re Use Prevention (RUP) Syringes: These syringes imbibe the basic mechanism of getting locked after their single intended use.

Advantages of AD/RUP syringes:

- AD and RUP syringes are locked after injection, this syringe is thus not available for repacking, thereby ensuring use of fresh syringe each time.
- AD/RUP syringes ensure proper disposal of syringes since it is being locked after injection & breakable plunger. In other words, the syringe cannot be put to any further clinical use.

Prefilled Injection Devices: These are the syringes having prefilled medication in the exact dose which is required to be given to a patient. After administration, the syringe gets locked. Thus, a sterile dose is delivered safely without posing risk to the provider as well.

Safety Syringes : The needle in these syringes is locked through a luer lock mechanism. Thus accidental spillage of medication or the needle is avoided.

Vacuum Based Technology for drawing blood, instead of normal syringes, this is a better, safe and sterile technology for drawing the blood from the patients. The blood is collected directly into small tubes as per need for a particular investigation through a small plastic chamber.

Safety Needles and Cannulas: These needles have a plastic sheath which is used for covering the needle immediately after use. Similarly, in the cannulas, the plastic sheath covers the stellate automatically after the cannula is inserted into vein and stellate is removed.

Table-5: Surveillance of injection safety

Level	Information
No harm to patient	Abscess at injection site? Has the injection provider taken all universal precautions?
No harm to provider	Did the provider wash his/her hands or wear gloves? Did the provider recap the needle after use? Is there any needle stick injury? What is the percentage of needle stick injury over a period of time in the hospital?
No harm to community	Has the plunger of the syringe been broken how has the needle been destroyed? Has the final disposal of injection device been randomly monitored by health care workers?

Key points to remember for injection delivery

- Wash hands before and after injection procedures.
- Select appropriate site, depending upon the age.
- All immunization vaccines except BCG, to be given on the antero- lateral aspect of thigh or deltoid.
- If more than one injection is to be given at same time, then use different sites and/or limbs.
- If the same limb is to be used in special conditions, 2nd injection shall be given at least 1 inch apart.
- Proper cleaning of injection site reduces the risk of infection.
- Needle size and bore depend on consistency of liquid to be injected (viscous vaccines like DPT and Hepatitis B require longer needles with larger bore).
- The use of Auto Disables (AD)/ Re Use Prevention (RUP) syringes for immunization and in therapeutic care, if possible. Use separate syringe and needle for each injection.

Techniques of Safe Injections

Proper techniques shall be followed for delivery of injections

Right methods of injection delivery: seven rights for safe injection delivery

- Right medicine
- Right dose
- Right patient and site
- Right time
- Right route of administration
- Right documentation
- Right disposal

Injections can be Delivered Through Different Methods

The injections are commonly classified by the target tissue (e.g. intradermal, subcutaneous, intramuscular, intravenous, intraosseous, intra-arterial, peritoneal).

Intradermal injection

A shallow injection given between the layers of the skin, creating a "weal" on the skin.

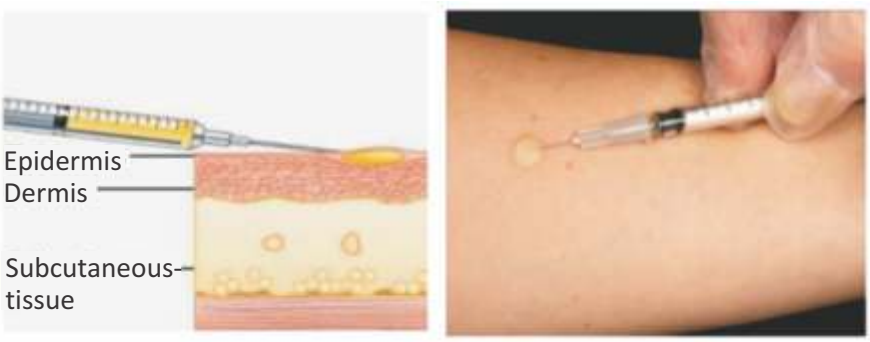


Figure-10: Intradermal injection

Intramuscular Injection

An intramuscular (IM) injection is a shot of medicine given into a muscle.

The following are safe areas to give an IM injection:

- Vastus lateralis muscle (thigh).
- Ventro gluteal muscle (hip).
- Deltoid Muscle (upper arm muscle).
- Dorso gluteal muscle (buttocks).

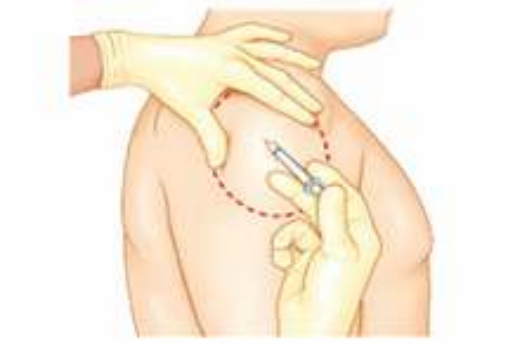


Figure-11: Intramuscular injection

Steps of IM Injection

Use an alcohol swab to clean the skin where you will give the shot.

↓

Hold the muscle firmly and insert the needle into the muscle with a quick firm motion.

↓

After you insert the needle completely, release the grasp of the muscle.

↓

Gently pull back on the plunger of the syringe to check for blood. (If blood appears when you pull back on the plunger, withdraw the needle and syringe and gently press the alcohol swab on the injection site. Start over with a fresh needle.)

↓

If no blood appears, inject all the solution by gently and steadily pushing down the plunger.

↓

Withdraw the needle and syringe and press an alcohol swab gently on the spot where the shot was given.

Consequence of unsafe intramuscular injection

An intramuscular injection can cause an infection, bleeding, numbness, swelling or pain.

Intravascular: is an injection given in a blood vessel.

Intravenous injection: is an injection given into a vein.

IV Cannulation

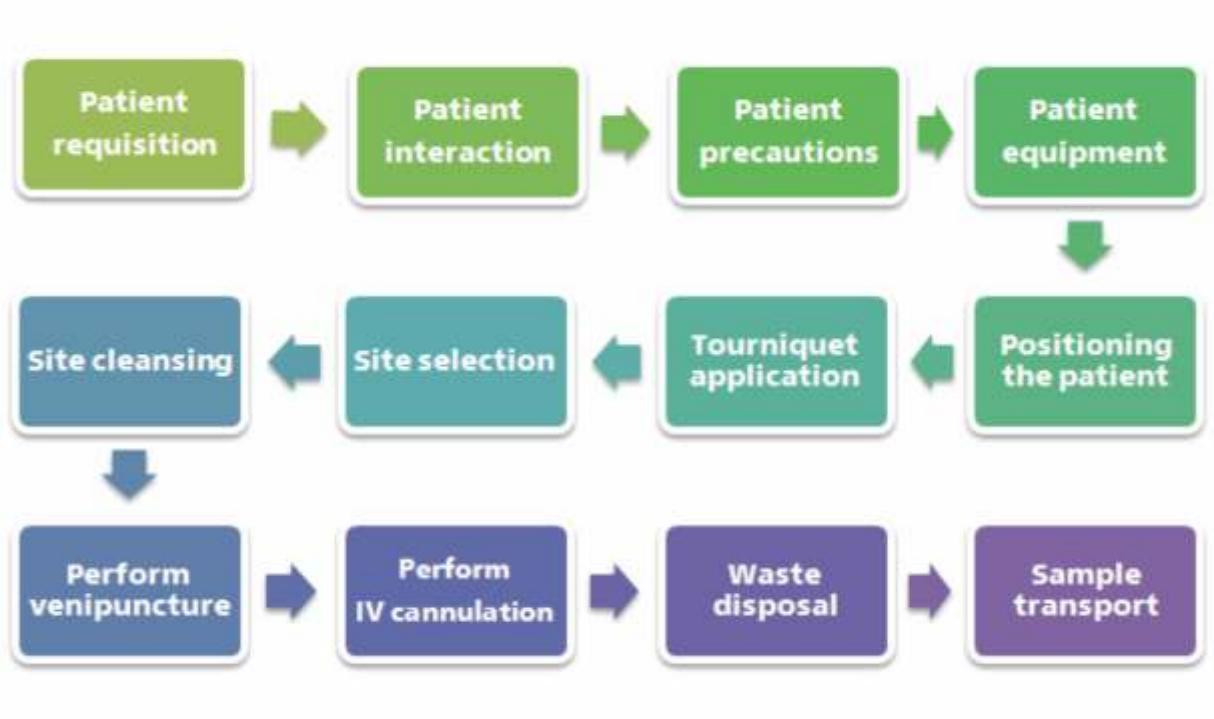
IV cannulation is an intravenous infusion (via a catheter placed in peripheral veins of upper limb) and is one of the commonest invasive procedures performed in acute care hospitals.

The main indications of IV cannulation are:

- Fluid and/or electrolyte replacement.
- Route for drug administration.
- Route for nutritional support.
- Transfusion of blood and blood products.
- Venous access for diagnostic blood draws.

Essentials of IV Cannulation

The steps to be followed in for IV cannulation are-



Equipments required are:

- Tourniquet
- Gauze pieces
- Adhesive tapes
- Clear permeable dressing
- Site Label(to record time of insertion)
- IV sets
- IV bottles
- Examination gloves
- Sterile drapes
- Surgical scissors
- Antiseptics
- Swabs
- IV Catheters

Key aspects in IV Cannulation are

- Selecting a right vein.
- Selecting the right site.
- Selecting the right size of IV catheter.
- Preparing the site, inserting the catheter and right technique for its fixation
    - Steps of inserting catheter.
    - Applying a tourniquet.
    - Inserting the cannula.
- Securing and dressing the cannula.
- Flushing IV cannula.
- Care of the catheter after insertion.
- Complications management as per need.

Table-6: IV set change frequency

Type	Set change
Primary continuous	Every 48 hours
Secondary	Every 48 hours
Primary intermittent	Every 24 hours
Total Parenteral Nutrition (TPN)	Every 24 hours
Lipid emulsion	Every 24 hours
Blood / blood components	After each unit or after 4 hours
Haemodynamic & arterial pressures	Every 48 hours

Blood Collections

They are of two types- venous and capillary

- **Venous blood collection**

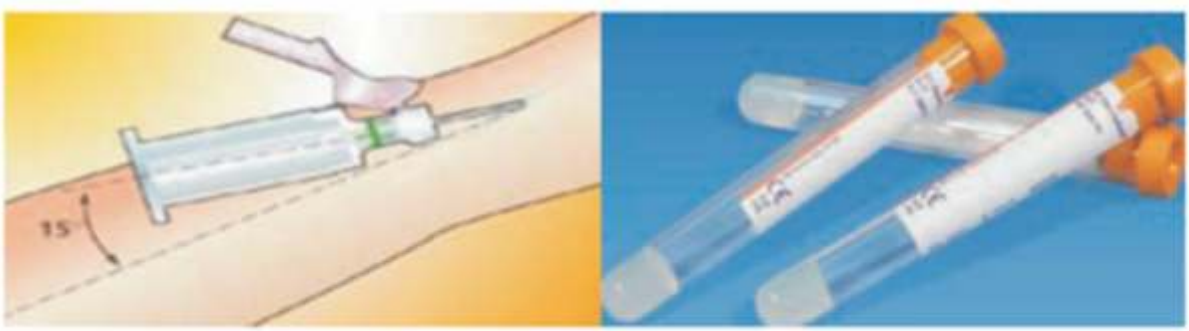


Figure-12: Venous blood collection

- **Capillary blood collection**

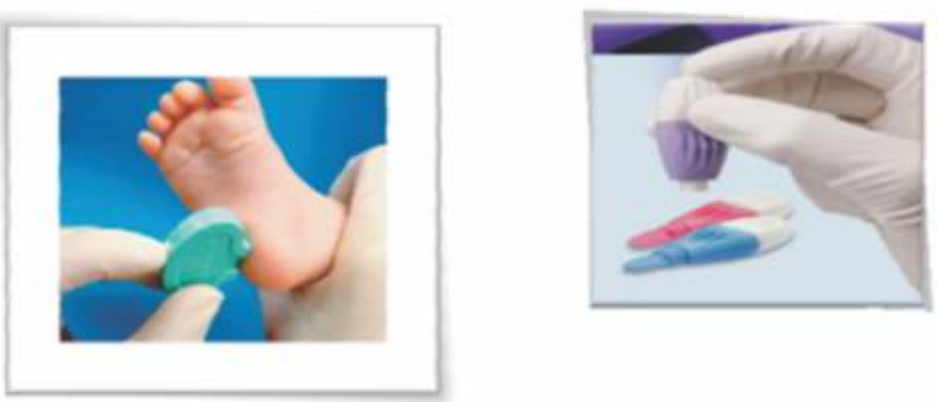


Figure-13: Capillary blood collection

Guidelines for the Prevention of Intravascular Catheter Associated Infection

Table-7: Parenteral catheters and its routine replacement

Types of parenteral catheters	Routine replacement
Peripheral intravenous catheters	Do not routinely replace catheters before 96 hours unless there are signs of phlebitis, infection or malfunction. In the absence of phlebitis, infection or malfunction, IVs may be left for longer periods with close surveillance of the site. In children, IVs may be left in place as long as clinically necessary, unless there are signs of phlebitis infection or malfunction.
Central venous catheters	Routine (timed) replacement of CVCs is not recommended. When a CVC has been placed with less than maximal sterile precautions (e.g. in an emergency) it should be replaced as soon as possible, and in any case, not later than 48 hours after insertion.
Arterial catheters	Arterial catheters can safely be left in situ for 96 hours. Catheters may be left in place longer if clinically required with ongoing surveillance of the site.

Health Care Worker Safety

Unsafe disposal	Unsafe collection	Reuse of equipments
		

Figure-14: Unsafe practices- handling needles and syringes

Table-8: Do's and Don'ts for injection administration

Do's	Don'ts
• Maintain hand hygiene (use liquid soap and water or ABHR). • Use alcohol swab to clean the site for injection and plain sterile swab for vaccinations. • Use a single-use device for blood sampling and drawing. • Do disinfect the skin at the venipuncture site. • After giving injection, if using reuse prevention syringe, break the plunger of syringe and needle through hub cutter. • where recapping of a needle is unavoidable, do use the one-hand scoop technique. • Seal the sharps container with a tamper-proof lid. • Ensure One needle, One syringe and One patient. • Take post exposure prophylaxis, in case of needle stick injuries and blood & body fluid splash. • Do report to higher authority for PEP.	• Don't forget to clean your hands. • Don't pre soak cotton wool in a container. • Don't re use a syringe, needle or lancet for more than one patient. • Don't use a single loaded syringe to administer medication to serial patients. • Don't touch the puncture site after disinfecting it. • Don't change the needle in order to reuse the syringe. • Don't use the same mixing syringe to reconstitute serial vials. • Don't leave an unprotected needle lying outside anywhere. • Don't recap a needle using both hands. • Don't overfill or decant a sharps container. • Don't delay PEP for HIV beyond 72 hours, after that PEP for HIV is NOT effective • Don't suck blood from the site of needle prick and don't squeeze out the blood.

2.6. OCCUPATIONAL HEALTH AND EMPLOYEE SAFETY

Occupational safety is an area concerned with the safety, health and welfare of people engaged in work or employment. The goal of the occupational safety and health program include to foster a safe and healthy work environment. As defined by the World Health Organization (WHO), the occupational health deals with all aspects of health and safety in the work place and has a strong focus on primary prevention of health hazards.

- The objective of the health and safety policy is to ensure a healthy work force in a clean and safe environment.
- To prevent all downgrading incidents, which could result in personal injuries, fire, property damages and waste. To create and maintain a safe and healthy working environment for all employees.
- To promote and maintain the highest possible degree of mental and social wellbeing of all employees.
- To promote and maintain good working conditions, so as to safeguard employees against injuries and occupational health and safety hazards and to conduct operations with due consideration to the protection of the environment.
- To train employees at the workplace, so that they are well equipped to participate fully in the identification, reporting and management of unsafe acts and conditions.
- To strive for maximum employee participation in creating a healthy and safe working environment at all hierarchical levels through effective communication.

Transmission of HBV, HCV and HIV virus in the work place occurs in the following ways:

- **Accidental Exposure to Blood (AEB):** Any contact with blood or body fluids as a result of injury with a needle or any other sharp instruments or via mucous membrane (eye, mouth), or contact via damaged skin (eczema, wounds).
- **Percutaneous Exposure (PE):** Exposure to blood or body fluids through non-intact skin.
- **Needle Stick Injury NSI or Sharps injury:** Puncture with a needle or sharp instrument that is contaminated or potentially contaminated with blood or body fluids.
- **Blood splash:** Skin or mucus membrane exposed to blood or body fluids.

Preventing transmission of HBV, HCV and HIV in the work place, therefore, means:

- Preventing the occurrence of these types of exposure to them.
- Complying with standard precautions.

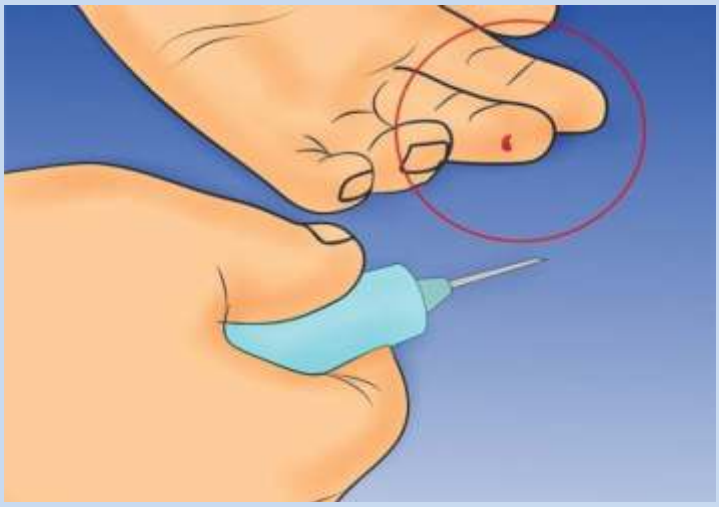
The following work practice controls are part of the standard precautions for blood-borne pathogens compliance guidelines:

- Eating, drinking, smoking, applying cosmetics and handling contact lenses are prohibited in the work areas and/or work surfaces that carry an inherent potential for contamination. Food and drink shall not be stored in refrigerators, freezers, or cabinets where blood or other potentially infectious material is stored. Such storage equipment must be clearly labelled to prevent this possibility.

- All health care workers shall use engineering controls and comply with standard precautions and work practice controls.
- All health care facilities shall have in place Post Exposure Prophylaxis (PEP) guidelines. These guidelines shall be consistent with procedures for other work place accidents/incidents and shall utilise existing mechanism for treatment, compensation, rehabilitation, retraining and long-term follow-up of employees injured at work.
- All health care workers shall immediately report an incident of contact with blood or Other Potentially Infectious Material (OPIM) sustained during the course of occupational duties, according to the PEP guidelines. Supervisors are responsible for posting these guidelines.
- Health care workers who experienced injuries and exposures to blood or OPIM shall be given first aid immediately after occurrence.
- HBV vaccine shall be offered at healthcare facility's expense, to all health care workers whose occupational tasks place them at risk of exposure to blood or other potentially infectious material.
- Susceptible, including pregnant women, shall not care for patients with chicken pox, herpes zoster or rubella. Pregnant women shall be especially familiar with and strictly adhere to standard precautions. Infection in mother, places the foetus at risk of acquiring the infection.
- HCW with dermatitis shall not be involved in direct patient care and processing of instruments.
- Infectious workers shall not be involved in direct patient care.
- Responsibility for compliance with the infection prevention and control policies and guidelines including the PEP lies with the supervisor and individual employee.
- There shall be provision made for immunization against Hepatitis B.
- All health care workers shall comply with these guidelines.

Prevention of Sharp / Needle Stick Injuries (NSI)

The term - sharps, includes items such as needles, scalpel blades, scissors, broken glass and other items that may cause laceration or puncture to the skin. Sharps are responsible for a significant number of injuries to staff. Safe management of sharps can help to reduce the risk of injury and therefore the acquisition of infections such as blood borne viruses by both staff and patients. A high proportion of sharps injuries occur during bio-medical waste collection and its disposal. The prevention of sharps injuries is an essential part of routine practices, including handling and disposing of sharps in a manner, that will prevent injury to the user and others. It is the responsibility of the user to ensure the safe disposal of a sharp.



- Do NOT recap after use.
- Do NOT bend after use.
- Do NOT remove with hand.
- Do NOT transport.
- Do NOT reuse.
- Recap only when necessary.
- Report needle stick injury.
- Use puncture proof and leak proof containers to discard needles.
- Do not fill the container more than 3/4th.
- Do not leave needle protruding from containers.

Figure-15: Be needle smart

2.7 POST EXPOSURE MANAGEMENT

Occupational exposures to blood borne pathogens such as HBV, HCV and HIV are common. Prevention of exposures to blood and body fluids is the primary means of preventing occupationally acquired blood borne pathogens. Post exposure management is an essential element of hospital safety programme.

Definition

An exposure that might place HCW at risk for HBV, HCV or HIV infection is defined as "a percutaneous injury (e.g. a needle stick or cut with a sharp object) or contact of mucous membrane or non-intact skin (e.g. exposed skin that is chapped, abraded or afflicted with dermatitis) with blood, tissue or other body fluids that are potentially infectious".

Management of Exposure Site - First Aid

After a splash of blood or body fluids: To un-broken skin:

- Wash the area immediately.
- DO NOT use antiseptics.

For broken skin

After a needle-stick or sharp instrument injury.

- Immediately wash the wound and surrounding skin with water and soap, and rinse.
- DO NOT scrub or squeeze.
- DO NOT use antiseptics or skin washes (bleach, chlorine, alcohol, betadine).

For eyes

- Irrigate exposed eye immediately with water or normal saline.
- Sit in a chair, tilt head back and ask a colleague to gently pour water or normal saline over the eye.
- If wearing contact lens, leave them in place while irrigating, as they form a barrier over the eye and will help protect it. Once the eye is cleaned, remove the contact lens and clean them in the normal manner.
- DO NOT use soap or disinfectant on the eye.

For mouth

- Spit fluid out immediately.
- Rinse the mouth thoroughly, using water or saline and spit again. Repeat this process several times.
- DO NOT use soap or disinfectant in the mouth.
- Consult the Casualty Medical Officer (CMO) for management of the exposure immediately.

Table-9: Do's and Don'ts for sharps injury

Do's	Don'ts
Remove gloves.	**Do not** panic.
Wash the exposed site thoroughly with running water.	**Do not** put the pricked finger in mouth.
Irrigate with water or saline if eyes or mouth have been exposed.	**Do not** squeeze the wound to bleed it.
Wash the skin with soap and water.	**Do not** use bleach, chlorine, alcohol, betadine, iodine or other an antiseptics/detergents on the wound.

Injury or Exposure	Management
Needle-stick or other sharps injury 	• Immediately wash the affected area with soap and water. • Allow injury to bleed freely and report immediately to higher authority. • Report to the highter authority where PEP is available. • Do not suck blood from the site. • Do not squeeze out blood
Splash of blood and/or body fluids on non-intact skin 	• Splash of blood and/or body fluids on non-intact skin. • Do not use disinfectant on skin. • Do not scrub or rub the area. • Do not squeeze or press the area.
Splash of blood or body fluids to eyes 	• Flush the area gently but thoroughly with running water or saline for at least 15 minutes while the eyes are open. • Keep eyelid gently inverted.
Splash of blood or body fluids to mouth or nose 	• Immediately spit out the blood or fluids and rinse the mouth with water several times. • Blow the nose and clean the affected area with water several times. • Do not use disinfectant.
Splash of blood or body fluids on intact skin 	• Immediately wash the affected area with soap and water. • Do not rub the area.

Figure-16: Management of exposure site- First aid

Assessment of Infection Risk

It is done by the clinician for the HIV and HBV transmission following an Accidental Exposure to the Blood (AEB). The assessment must be quick so as to start treatment/ prophylaxis without any delay.

The risk of transmission is directly proportional to the amount of exposure , nature of exposure and the status of the source patients.

Table-10: Assessing nature of exposure

Category	Definition and example
Mild exposure	Mucus membrane/ non-intact skin with small volume, e.g. a superficial wound (erosion of the epidermis) with a plain or low caliber needle, contact with the eyes or mucus membranes, subcutaneous injections following small bore needles.
Moderate exposure	Mucus membrane/ non-intact skin with large volumes or percutaneous superficial exposure with solid needle (e.g., a cut or needle stick injury penetrating gloves).
Severe exposure	Percutaneous with large volume, e.g., an accident with wide bore needle (>18G) visible contaminated with blood, a deep wound (haemorragic wound and/or very painful), transmission of a significant volume of blood, an accidental injury with material, which has previously been used intravenously or intra-arterially.

Table-11: Assessing the HIV status of source of exposure

HIV status of the source	Definition of risk in source
HIV negative	Source is not HIV infected (but consider HBV and HCV)
Low risk	HIV positive and clinically asymptomatic
High risk	HIV positive and clinically symptomatic
Unknown	Status of the patient is unknown and neither the patient nor his/her blood is available for testing

Informed consent and counselling

All the exposed person must be counseled and informed about the PEP. Exposed persons must receive the information abut the risk and benefits of the PEP medications. PEP is not essential. The documentation of the exposure is essential. For the PEP the consent form must be signed . If refused then must be documented. The document of PEP and follow ups are to be maintained. It shall be clear that PEP is not mandatory.

Post Exposure Prophylaxis (PEP) - NACO Guidelines

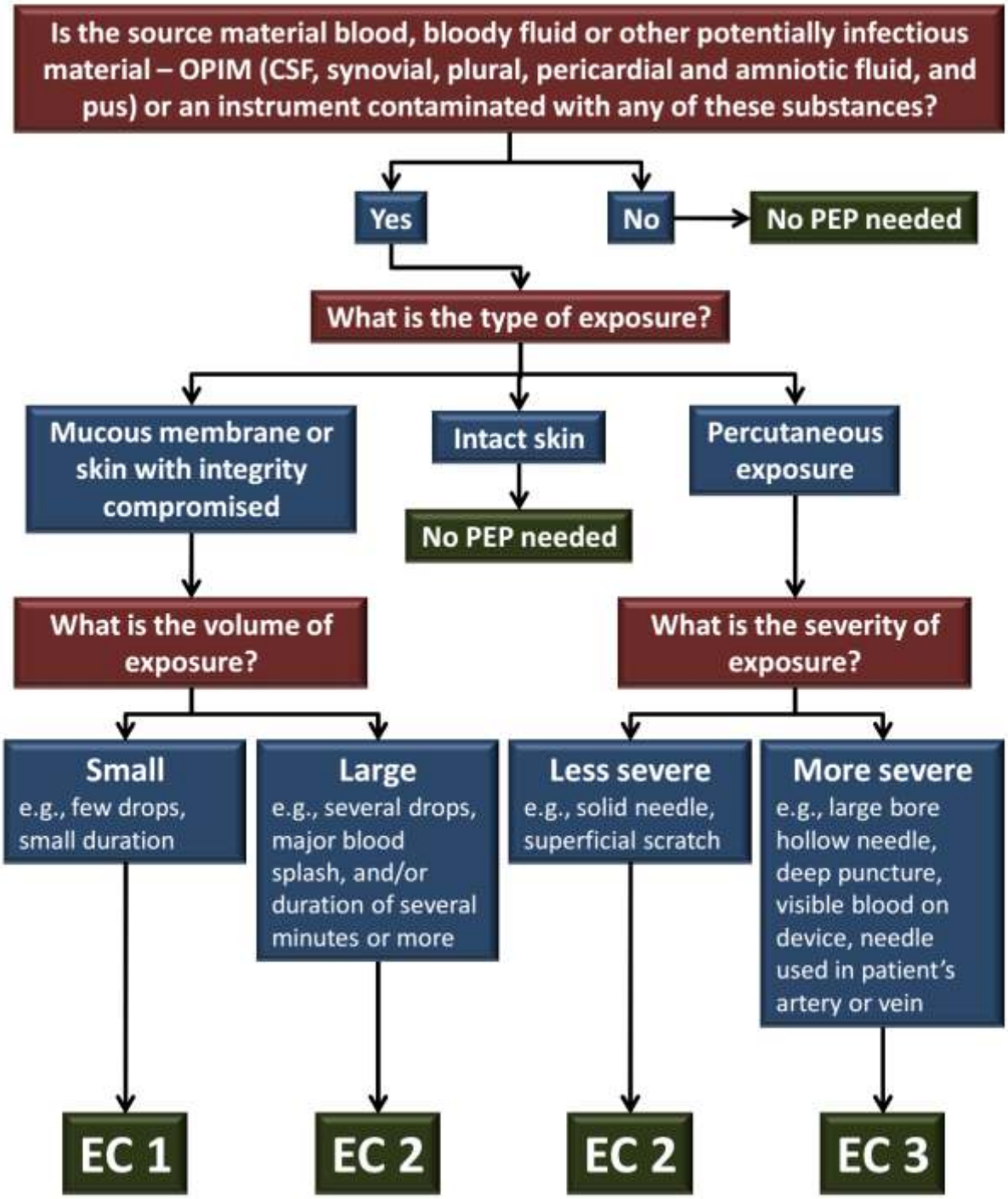


Figure-17: Determination of Exposure Code (EC)

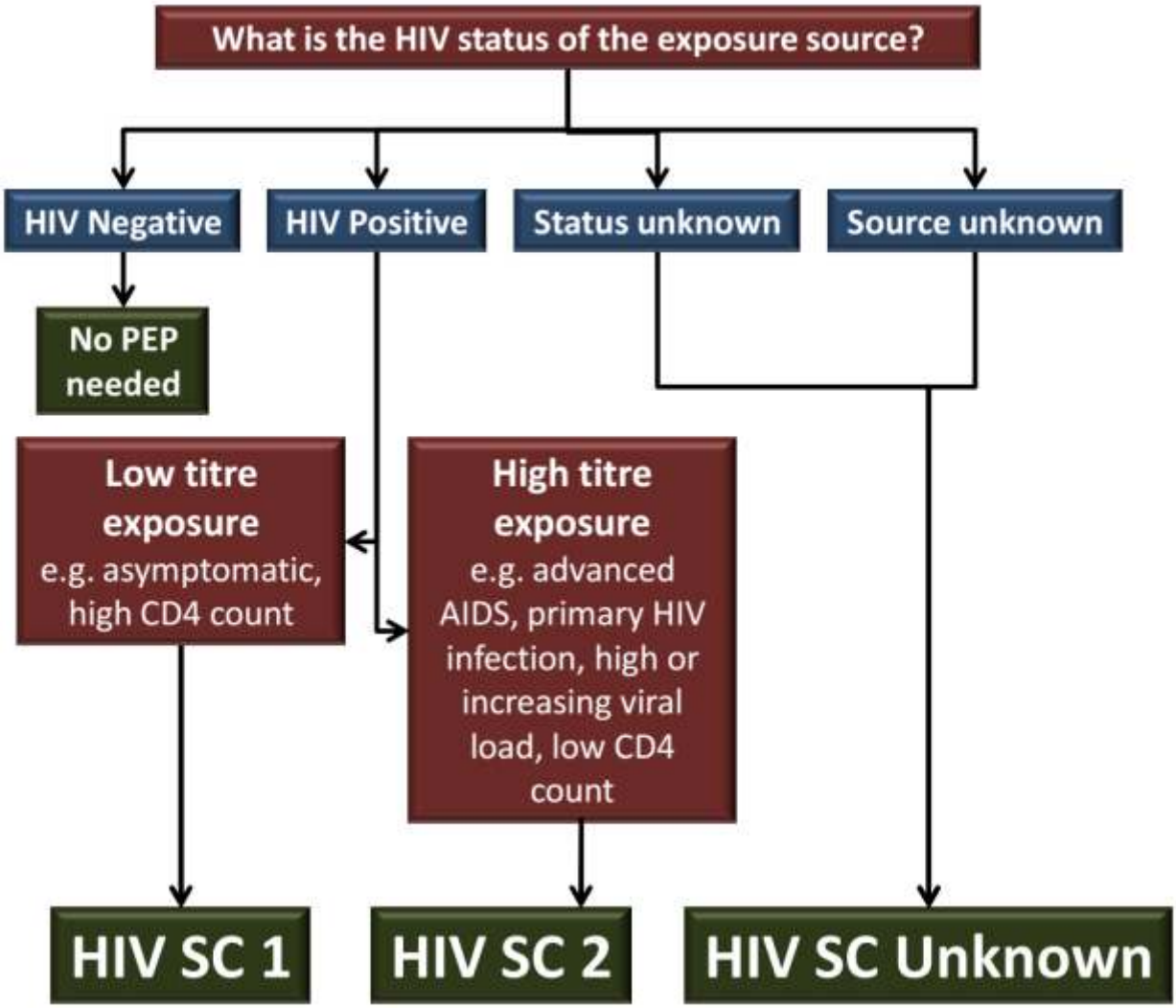


Figure-18: Determination of HIV Status Code (SC)

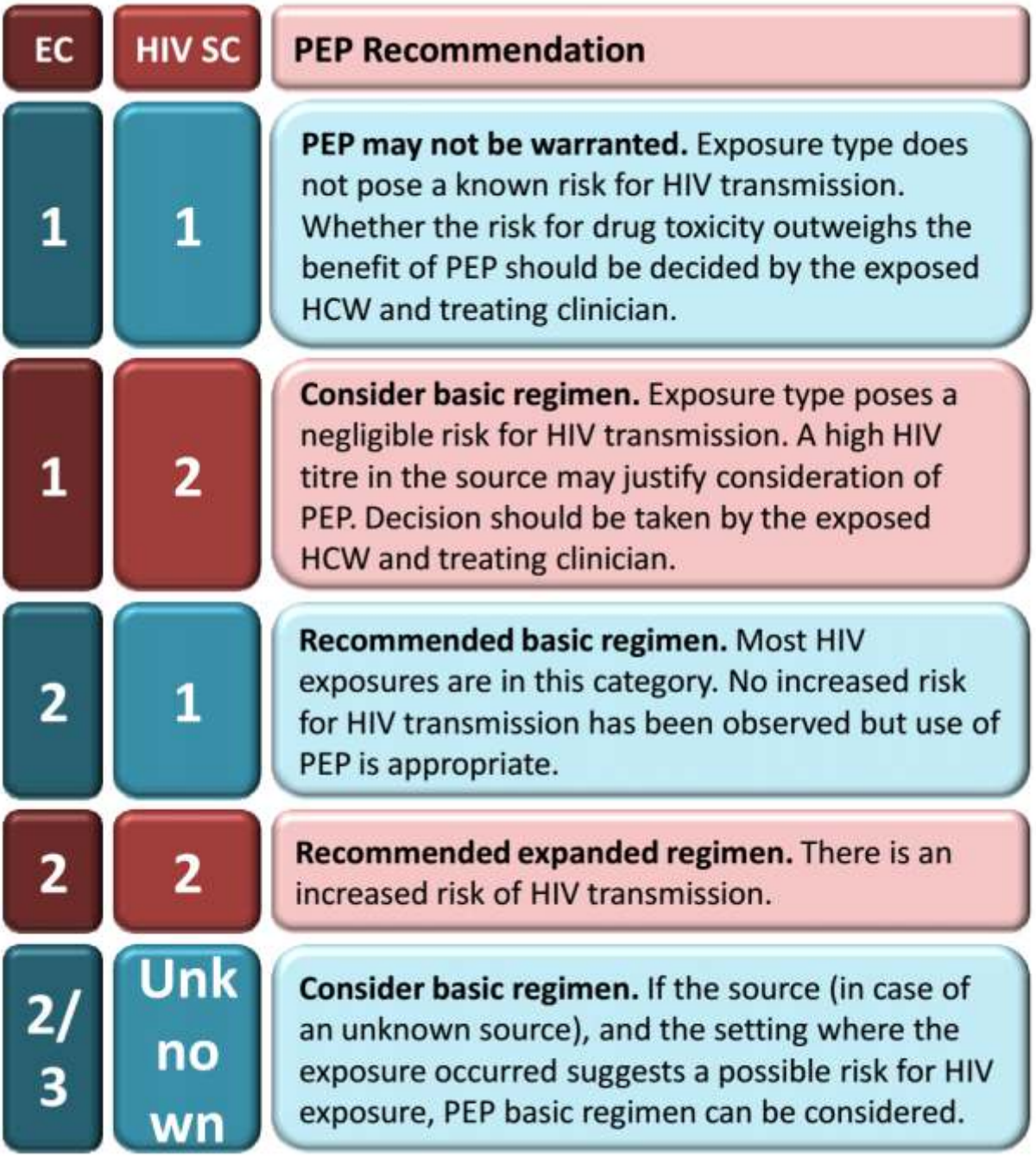


Figure-19: Determining PEP recommendations

PEP must be initiated as soon as possible, preferable within 2 hours but not later than 72 hours. PEP drugs shall be taken for 28 days.

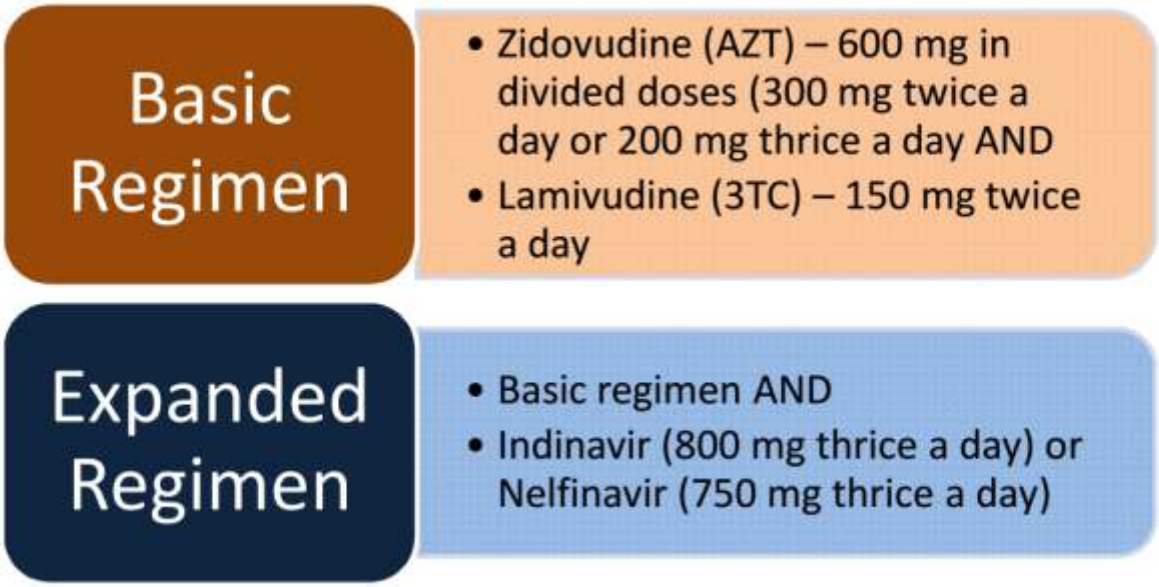


Figure-20: PEP regimens

HIV testing and PEP regimen

Baseline HIV testing of the HCW shall be done at the time of exposure and repeated at 6 weeks following exposure. If second test is also negative, HIV testing is to be repeated 12 weeks and 6 months following the exposure.

Steps for Managing Occupational Exposure

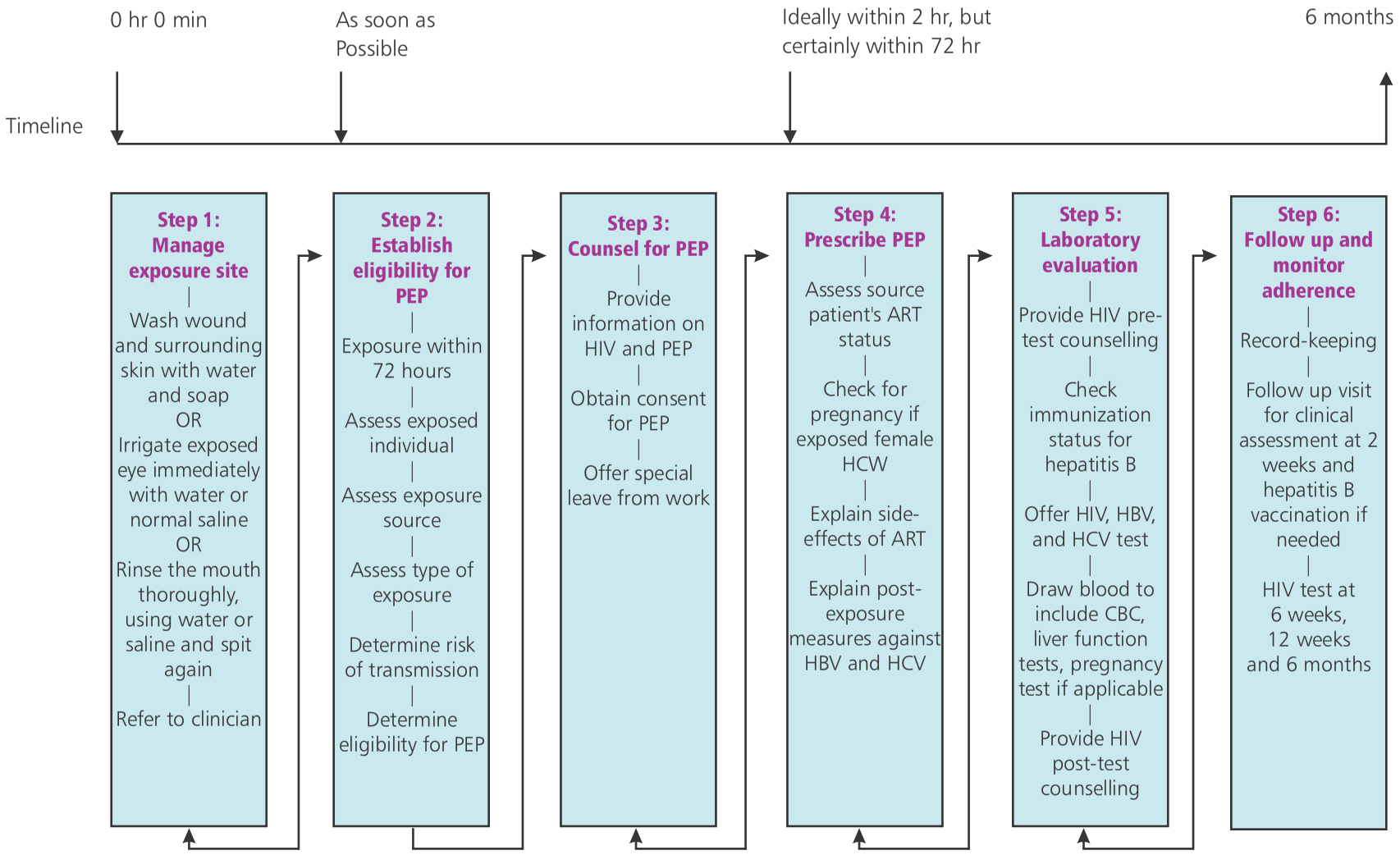


Figure-21: Steps for managing occupational exposure

Table-12: Prophylaxis for Hepatitis B

Vaccination status of HCW	HBsAg positive source	Source HBsAg status unknown
Unvaccinated	HBIG(0.06 ml/kg IM) + Vaccine series*	HBV vaccine Series
Vaccinated responder**	No Rx	No Rx
Vaccinated non responder	HBIG x 1 + vaccine series OR HBIG x 2	Treat as source positive if high risk***

*Immediate Vaccine – (within 7 days) along with HBIG (0.06 ml/Kg), Vaccine series (3 doses at 0,1 and 6 months+ Booster Dose), **Vaccinated responder-antibody for Hepatitis B >10 iu/ml,** *Treat as HBsAg positive source.

If health care worker has adequate anti HBs titre ->100 MIU- only reassurance needs to be given.

If titre is <10 give first dose of vaccine and immunoglobulin 1000 units. Advise to complete vaccination, If titre is between 10 and 100 MIU, give booster. In case patient is negative, check anti HBs titre and proceed accordingly.

Hepatitis C Prophylaxis

In case source is HCV positive, test HCW for anti HCV antibodies and baseline serum ALT. Follow up is recommended at 1, 3 and 6 months for anti HCV and ALT activity (if earlier diagnosis of HCV infection is desired , testing for HCV RNA may be performed at 4-6 weeks) .

Confirm all anti HCV results reported positive results by enzyme immunoassay using supplemental anti HCV testing and refer to a hepatologist .

All the exposures shall be reported in NSI reporting form – Annexure-3

2.8 PATIENT CARE EQUIPMENTS

Reusable equipment that has been in contact with the patient shall be cleaned and reprocessed before use in the care of another patient. Items that are routinely shared shall be cleaned and disinfected between patients. A routine cleaning schedule shall be established and monitored for items that are in contact only with intact skin, if cleaning between patients is not feasible.

For details, **please refer section-4 on Disinfection and Sterilization.**

2.9 ENVIRONMENTAL CONTROLS

The health care environment contains diverse population of microorganisms. The CDC guideline for environmental infection control in HCF is a compilation of recommendations for the prevention and control of infectious disease that are associated with health care environment. It describes measures for preventing infections associated with air, water and other elements of environment.

For details, **please refer section-4 on Disinfection and Sterilization**.

2.10 PATIENT PLACEMENT AND ASSESSMENT FOR INFECTION RISK

The potential for transmission of infection or infectious agents must be assessed at the time of patient's admission itself and shall be continuously reviewed throughout their stay. Patients who may present a cross infection risk shall be isolated.

Diseases Requiring Isolation:

- Severe influenza cases
- SARS
- Open case of tuberculosis
- Anthrax
- Diphtheria
- Pertussis
- Chicken pox
- Pneumonic plague
- Patients suffering from multidrug resistant pathogen
- Patients with low immunity

Isolation policy for certain groups of organisms

- **Methicillin Resistant Staphylococcus aureus (MRSA)**

  When MRSA is isolated in the laboratory, the Microbiology Department shall send an alert to the head of the concerned unit and to the ICT.

  Patient is isolated and barrier nursed. Hand washing is strictly adhered to by all concerned. Accommodate this patient away from those with open wounds or immuno compromised. Linen is changed on a daily basis. Any contamination of linen requires to be decontaminated before sending to the laundry.

- **Multi Drug Resistant Organism (MDRO)**

  The aim is to curtail the spread of such bacteria. Hence patient is to be placed on strict barrier nursing precautions irrespective of whether the organism is a colonizer or the cause of infection e.g. imipenem resistant Acinetobacter, multi drug resistant Pseudomonas aeruginosa.

- **Pulmonary tuberculosis**

  Masks shall be used during the care of all patients with sputum positive pulmonary tuberculosis. Isolation precautions are to be followed till the patient are diagnosed culture negative.

- **HIV/HBV/ HCV infected patients**

  Standard precautions shall be followed. Such patients can be admitted in any ward as per as per the existing rules. Confidentiality shall be maintained with appropriate precautions to prevent HCAI transmission.

2.11 PATIENT RESUSCITATION

During the resuscitation, there is a chance for risk for pathogens to be transmitted to the healthcare worker or other patients in the vicinity by contact droplet and air borne. All staff who participate in resuscitation shall adhere to standard precautions throughout the resuscitation. Standard precautions required during the resuscitation include gown, gloves, mask and eye protection.

2.12 LINEN

Soiled linen with blood, body fluids, secretions or excretions shall be handled in a manner that prevents skin or mucous membrane exposure, contamination of clothing and transfer of microorganisms to other patients and the environment. Commercial laundries used for laundering HCF's linen shall comply with the infection prevention and control policies and guidelines.

For details **please refer Section-9 on Linen Management**

Section 3

Additional Precautions

3.1 INTRODUCTION

Additional precautions are necessary in addition to routine practices for certain pathogens or clinical presentations. These precautions are based on the method of transmission (contact, droplet, airborne).

The categories of transmission based precautions are contact precautions, droplet precautions, Airborne Infection Isolation (AII). More than one category of precaution may be used for diseases that have multiple routes of transmission (e.g. SARS).

3.2 TRANSMISSION BASED PRECAUTIONS

Transmission based precautions are followed based on the isolation category.

The transmission based isolation precautions are classified as:

- Airborne precautions
- Droplet precautions
- Contact precautions

Airborne Precautions

Airborne precautions are used in addition to routine practices for clients/patients/residents known or suspected of having an illness transmitted by the airborne route. Airborne precautions are designed to reduce the transmission of diseases spread by the airborne route. Airborne transmission occurs when droplet nuclei (evaporated droplets) <5 micron in size are disseminated in the air. These droplet nuclei can remain suspended in the air for long period of time. Diseases which spread by this mode include open/active Pulmonary Tuberculosis (PTB), measles, chicken pox, pulmonary plague and haemorrhagic fever with pneumonia.

The following precautions shall be taken when suspecting airborne transmission:

- Implement standard precautions.
- Anyone who enters the room must wear appropriate PPE.
- Airborne infection isolation.
- Requires particulate respirator e.g. N95 shall be worn and use of a negative pressure isolation room.
- Place patient in a single room that has a monitored negative airflow pressure and is often referred to as a "negative pressure room".

Negative pressure room

This is a term used for an isolation area which receives many air changes per hour (ACH) (preferably >12 ACH) and is under negative pressure. In other words, the direction of the air flow is from the outside adjacent space (e.g. the corridor) into the room. If the Health Care Facility (HCF) does not have negative pressure room, ventilation system shall provide a means to discharge air from the room to the outside, such as an exhaust fan.

- The air shall be discharged to the outdoors or specially filtered through a High Efficiency Particulate Arrester (HEPA) filter before it is circulated to other areas of HCF.

- Limit the movement and transport of the patient from the room for essential purposes only. If transport is necessary, minimize spread of droplet nuclei by masking the patient.
- Keep isolation room doors closed.

Droplet Precautions

Droplet precautions are used in addition to routine practices for clients/ patients/ residents known or suspected of having an infection that can be transmitted by large infectious droplets. Diseases which are transmitted by this route include pneumonia, pertussis, diphtheria, influenza type B, mumps, meningitis etc. Droplet transmission occurs when there is an adequate contact between the mucous membranes of the nose and mouth or conjunctivae of a susceptible person and large particle droplets (> 5 microns). Droplets are usually generated from the infected person during coughing, sneezing, talking or when Health Care Workers (HCW) undertake procedures such as suctioning.

The following precautions shall be taken when suspecting droplet transmission:

- Implement standard precautions.
- Place patient in a single room/ in a room with a similarly infected patients.
- Wear a mask when working within 1-2 meters of the patient.
- Place a mask on the patient if transport is necessary.
- Special air handling and ventilation are not required to prevent droplet transmission of infection.

Contact Precautions

Contact precautions are additional practices to reduce the risk of transmitting infectious agents via contact with an infectious person. Diseases which are transmitted by this route include colonization or infection with Multi Drug Resistant Organisms (MDRO), enteric infections and skin infections.

The following precautions shall be taken when suspecting contact transmission:

- Implement standard precautions.
- Place patient in a single room/ in a room with another similarly infected patients. Consider the epidemiology of the disease and the patient population when determining patient placement.
- Wear clean, non-sterile gloves and gown when entering the room if substantial contact with the patient, environmental surfaces or items in the patient's room are anticipated.
- Limit the movement and transport of the patient from the room for essential purposes only. If transportation is required, use precautions to minimize the risk of transmission.

3.3 MANAGEMENT OF AN OUTBREAK

An outbreak is defined as an unusual or unexpected increase of cases of a known HCAI or the emergence of cases of a new infection. Outbreaks of HCAI shall be identified and promptly investigated because of their importance in terms of morbidity, costs and institutional image. Outbreak investigation may also lead to sustained improvement in patient care practices.

Outbreak Investigation

Usually carried out when more number of cases occur than expected.

Step 1:

An outbreak investigation team shall be constituted as soon as information about the outbreak is received. The team shall be led by the Infection Control Officer (ICO) and he/she can form the team with various specialities depending upon the type of cases.

Step 2:

Verify the diagnosis, developing a case definition, define the outbreak in terms of time, person and place.

Step 3:

Determine the magnitude of the problem and if immediate control measures are required, such as isolation or cohorting of infected cases, strict hand washing and asepsis shall be applied.

Step 4:

Notify and involve the appropriate departments, personnel and the hospital administration. Document each of the activities carried out during investigation and present the same at Hospital Infection Control Committee (HICC) meeting.

Step 5:
Line list the cases

Search additional cases by examining the clinical and microbiological records. Patient details, place and time of occurrence and infection details shall be noted. An epidemic curve based on place and time of occurrence shall be developed, the data shall be analyzed, the common features of the cases e.g. age, sex, exposure to various risk factors, underlying diseases etc. shall be identified.

Step 6:
Identify the cause/source

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

Step 7:
Implement specific control measures immediately with general measures

As soon as the cause of outbreak is identified, implement specific measures to break the chain of transmission. Monitoring of further cases and effectiveness of control measures shall be done. A report shall be prepared for presentation in HICC meeting.

Immediate control measures:

- Strict hand washing and asepsis.
- Intensification of environmental cleaning and hygiene.
- Strengthening of sterilization and disinfection.

Step 8:
Evaluation of efficacy of control measures

The efficacy of control measures shall be evaluated by a continued follow-up of cases after the outbreak, clinically as well as microbiologically. Control measures are effective if cases cease to occur or return to the endemic level. Many times, outbreaks decline on its own.

Table-13: Specific control measures for managing outbreaks

Mode of transmission	Specific control measures
Transmission by hands	Improve hand washing and cohorting.
Cross transmission (transmission between patients)	Isolation and barrier precautions.
Air borne agent	Patient isolation with proper ventilation.
Water borne agent	Check water supply and all liquid containers (tanks, filters etc).
Food borne agent	Elimination of the food at risk and use of disposable cutlery.
Other measures	• Identification and treatment of carriers. • Modification of nursing procedures. • Identification and elimination of the contaminated products. • Rectification of lapses in techniques or procedures. • Isolation/ cohorting of infected patients. • No admission of new patients and discharging patients, if possible. • Prevention of movement of staff and patients to other wards. • Treatment of close contacts (e.g. diphtheria). • Introduction of newer measures or procedures. • Closure of the wards.

3.4 REQUIREMENTS OF ISOLATION

- Accomodation for the suspected or confirmed patient, in a room or area designated for infectious diseases.
- Adequate personnel assigned to the area.
- Appropriate provision of equipments and supplies.
- A schedule for the daily routine cleaning and maintenance of the isolation area.
- A system for the education of the HCW, patients and family members regarding the illness and the preventive measures to be observed.
- Cohort patients when necessary.
- All personnel accessing the isolation area shall observe standard and transmission based precautions.

3.5 NOTIFIABLE DISEASES

Notifiable diseases: Diseases where steps are needed to be taken to prevent them from taking the form of an epidemic or spreading from one person to another, shall be characterized as notifiable diseases.

Any notifiable disease noticed in the HCF shall be notified to the concerned department of Government by the medical records department of that HCF.

As per state's policy following diseases shall be notified to state authorities in the prescribed format.

- Dengue
- JE
- Typhoid fever
- Cholera
- Viral hepatitis
- Malaria
- H1N1 Flu
- Syphillis
- Chikungunya
- Meningococcal meningitis
- Diptheria
- Shigella
- Leptospirosis
- TB
- HIV
- Others

These are reported weekly, in the prescribed format of IDSP, also the line listing of the cases are done.

Section 4

Disinfection and Sterilization

4.1 INTRODUCTION

Disinfection

Disinfection is used to destroy microorganisms present on delicate or heat-sensitive instruments which cannot be sterilized or when single use items are not available. Disinfection removes microorganisms without complete sterilization. Disinfectants are chemicals used to kill microorganisms on instruments.

Sterilization

Sterilization refers to a set of operations that are developed to eliminate or kill all forms of living organisms that are contained in an object or substance and can be achieved by either physical or chemical methods.

Levels of Disinfection

- **High-level disinfection (Critical):** Destroys all microorganisms including bacterial spores.
- **Intermediate level disinfection (Semi-critical):** Inactivates mycobacterium tuberculosis, vegetative bacteria, most viruses and most fungi, but does not kill bacterial spores.
- **Low-level disinfection (Non-critical):** Can kill most bacteria, some viruses and some fungi, but cannot be relied on to kill more resistant bacteria such as mycobacterium tuberculosis or bacterial spores.

Disinfection is not a sterilizing process and must not be used as a convenient substitute for sterilization.

4.2 DISINFECTION - AFFECTING FACTORS

- Nature of the item to be disinfected.
  The rougher the surface, the longer the contact time required for disinfection. e.g. crevices, hinges, lumen.
- Number of microorganisms present.
  The number of microorganisms present will lengthen the time for effective disinfection. In general, higher bioburden requires more time for disinfection.
- Resistance of microorganisms.
  Some microorganisms are more resistant to disinfection than others. The generally accepted order from the most resistant to the least resistant is: bacterial spores, mycobacteria, hydrophilic viruses, fungi, vegetative bacteria, lipid enveloped viruses.
- Presence of organic material.
  The presence of organic material will compromise disinfection. Blood, blood products, body fluids and faeces contain significant amounts of proteins and protein will bind and inactivate some disinfectants or slow their action. Therefore, in the presence of large amounts of protein, a higher concentration of disinfectant and longer contact time will be necessary to achieve maximal disinfection.
- Duration of exposure and temperature.

- Duration of exposure and temperature influences the disinfection process. The longer the duration of exposure, the higher the degree of disinfection achieved.
- Some disinfectants require a longer contact time to achieve killing and some microorganisms need longer exposure to be killed.
- Higher temperature increase the killing power of most disinfectants, whereas lower temperature may slow the killing power of most disinfectants.

4.3 ENVIRONMENTAL CLEANING

Cleaning of Hospital Surfaces of Health Care Facility (HCF)

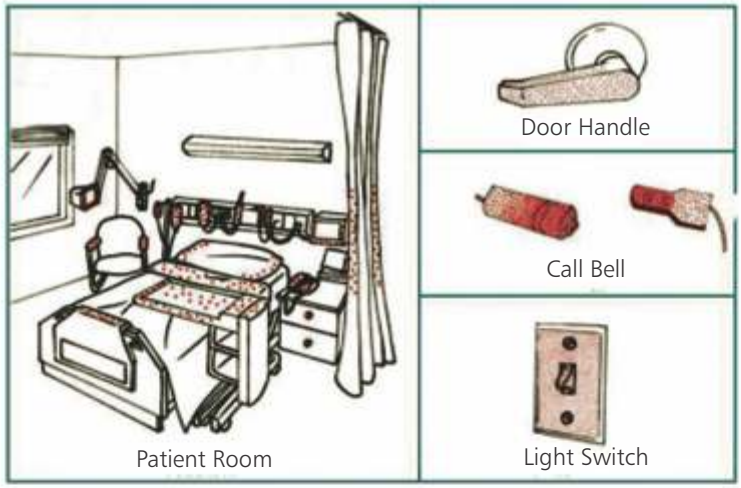
Proper and regular cleaning of surfaces of HCF (non-critical) also called housekeeping surfaces reduces a major reservoir of potentially pathogenic and resistant microorganisms and ensures an aesthetically pleasant environment. The frequency of cleaning and disinfecting the environmental surfaces may vary according to the type of patient care area the types of surface, the amount of movement of personnel and the soiling.

Regardless of the agent used for cleaning, adhere to the following protocol:

- Properly train the staff regarding practices of cleaning and decontamination of surfaces.
- Wear appropriate PPE at all times and maintain a proper log of all cleaning procedures.
- Clean the housekeeping surfaces (floors, table tops, counters etc.) on a regular basis, when visibly soiled and when spills occur. Clean with detergent and hot water or any approved disinfectant for housekeeping purposes.
- Use a low/ intermediate level disinfectant in specific high risk areas (ICUs, isolation rooms, burns ward, OTs, emergency rooms, surfaces of dialysis machines). Avoid use of high level disinfectants for environmental surfaces in any area of the HCF.
- Prepare fresh detergent/ disinfectant solutions every day according to the manufacturer's instructions and as and when required.
- Avoid dry dusting which generate dust aerosols.
- Mops shall be washed and dried daily.
- Designated storage area for housekeeping materials shall be available to enable easy accessibility to the housekeeping staff.

Tabel-14: Classification of hospital areas into risk categories

High risk areas	Moderate risk areas	Low risk areas
Operation Theatre (OT) units including recovery area- major and minor	In Patient Department (IPD) - wards, Out Patient Department (OPD)	Departmental areas/ office areas
Intensive Care Units (ICU)/ Cardiac Care Units (CCU)/ Neonatal ICU (NICU) etc.	Laboratory areas	Out Patient Department
High Dependency Units (HDU)	Blood bank	Nonsterile 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 (CSSD)/ Theatre Sterile Supply Unit (TSSU)	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 units		
Isolation wards/ rooms and attached internal areas like bathrooms/ toilets		



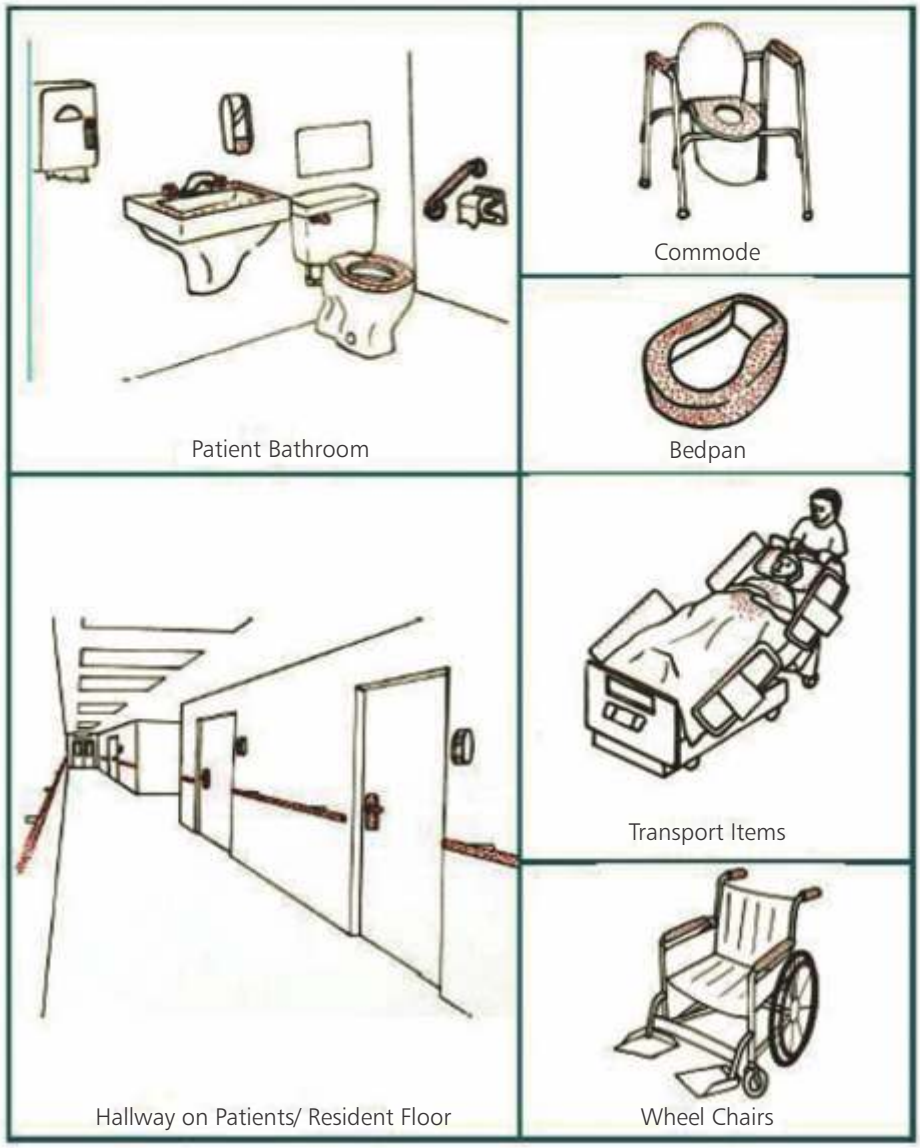


Figure-22: High touch surfaces in health care environment

Table-15: Common disinfectants used for environmental cleaning

Disinfectants	Recommended use	Precautions
Sodium hypochlorite 1%	Disinfection of material contaminated with blood and body fluids.	• Shall be used in well-ventilated areas. • Protective clothing required while handling and using undiluted. • Do not mix with strong acids to avoid release of chlorine gas.
Bleaching powder 70%	Toilets/ bath rooms may be used in place of liquid bleach if this is unavailable.	• Same as above.
Alcohol (70%)	Smooth metal surfaces, table tops and other surfaces on which bleach cannot be used.	• Flammable, toxic, to be used in well-ventilated area and avoid inhalation. • Keep away from heat source, electrical equipment, flames and hot surfaces. • Allow it to dry completely, particularly when using diathermy as it can cause diathermy burns.
Detergent with enzyme	Cleaning endoscopes, surgical instruments before disinfection is essential.	• Manual cleaning is an essential part of the cleaning process.

Table-16: Preparation of dilute solution using hypochlorite solution

Concentration of commercially available hypochlorite solution	Required chlorine concentration	To prepare 1000 ml	
		Solution in ml	Add water in ml
20%	0.50%	400	600
	1%	200	800
	2%	100	900
10%	0.50%	50	950
	1%	100	900
	2%	200	800

Concentration of commercially available hypochlorite solution	Required chlorine concentration	To prepare 1000 ml	
		Solution in ml	Add water in ml
5%	0.50%	100	900
	1%	200	800
	2%	400	600

Table-17: Preparation of chlorine solution using bleaching powder

Preparation of dilute solutions of bleaching powder			
Strength of SBP (stable bleaching powder)	**Volume of water**	**Desired concentration**	**Bleaching powder in grams per litre**
20%	1 litre	0.50%	25
		1%	50
		2%	100
		5%	250
		10%	500
25%	1litre	0.50%	20
		1%	40
		2%	80
		5%	200
		10%	400
30%	1 litre	0.5%	17
		1%	33
		2%	67
		5%	167
		10%	333

Note: Bleach solution becomes unstable rapidly, hence it needs to be freshly prepared every 8 hourly or changed on becoming dirty/turbid. Chlorine bleach can be corrosive.

Table-18: Cleaning of high risk areas- OT, ICU, labour room, SNCU, isolation wards.

Sr.No.	Activity	Frequency	Agents Used
OT/ ICU/ LABOUR ROOM/ SNCU/ ISOLATION WARDS			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per the current BMW Management and Municipal Solid Waste (Management and Handling) guidelines.
2	Cleaning of instruments.	After every procedure	Soap and water followed by sterilization.
3	Cleaning of clean areas and corridors of complex.	Twice a day/as and when required.	Damp (wet) mop with detergent and water and or 0.5% chlorine.
4	Mopping (care to be taken in case of special epoxy flooring).	Thrice a day and after each procedure.	Damp (wet) mop with detergent and water and or 0.5% chlorine.
5	Cleaning of equipments like anesthesia machines, monitors, ventilators, infant warmers/ baby cribs.	Twice a day/as and when required.	Damp (wet) mopping, dry, disinfect with 70% isopropyl alcohol/ 2% glutaraldehyde (for endoscopes and reusable items).
6.	Fumigation.	Once a month/ after infected case surgery.	Thorough washing and disinfection of surfaces every day after every surgery is more beneficial than fumigation. If fumigation has to be done non formalin compounds for fumigation are recommended.
7	Cleaning of OT table and OT stretcher.	Twice a day/after each surgery.	0.5% chlorine/ 70% isopropyl alcohol.
8	Doctor's/ nurse's / technician's room.	Twice a day.	Detergent and water.
9	Washroom & wash basins cleaning.	Thrice a day and as & when required.	Wash with soap and water, then dry, wipe 0.5% chlorine.
10	Washing of slippers.	once a week and when required.	Soap and water.
11	Collection of soiled linen and sluicing.	As and when required.	Soak in clean water with bleaching powder 0.5% for 30 minutes. Wash again with detergent and water to remove the bleach or launder in hot water (70-80°C) if possible.
12	Cleaning of mops.	After every use.	Soak in clean water with bleaching powder 0.5% for 30 minutes. Wash again with detergent and water to remove the bleach.

Table-19: Cleaning of moderate risk area

Sr.No.	Activity	Frequency	Agents Used
MODERATE RISK AREA			
1	Garbage removal.	Thrice a day and more/ when bags are 3/4th full.	As per the current BMW Management and Municipal Solid Waste (Management and Handling) guidelines.
2	Mopping of floor.	Twice a day.	Damp (wet) mop with detergent.
3	Wash room and wash basin.	Thrice a day and as and when required.	Wash with soap and water, then dry, wipe with 0.5% chlorine.
4	Dusting/ cleaning of equipments.	Once a day.	Damp (wet) mopping, dry, disinfect with 70% isopropyl alcohol.
5.	Collection of soiled linen and sluicing.	As and when required.	Soak in clean water with bleaching powder 0.5% for 30 minutes. Wash again with detergent and water to remove the bleach or launder in hot water (70-80 degree C) if possible.
CANTEEN AND KITCHEN			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per the current BMW Management guidelines.
2	Mopping of floor.	Twice a day and as and when required.	Damp (wet) mop with detergent and water.
3	Wash rooms and wash basin.	Twice a day and as and when required.	Wash with soap and water, then dry, wipe with 0.5% chlorine.
4	Dusting.	Once a day.	Duster.
PUBLIC WASH ROOM			
1	Cleaning.	Thrice a day.	Damp (wet) mop with detergent and water.
2	Wash rooms and wash basin.	Thrice a day.	Wash with soap and water, then dry, wipe with 0.5% chlorine.

Table-20: Cleaning of general areas

Sr.No.	Activity	Frequency	Agents Used
PATIENT WAITING AREA & OPD AREA			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per the current BMW Management and Municipal Solid Waste (Management and Handling) guidelines.
2	Mopping of floor.	Twice a day	Damp (wet) mop with detergent and water.
3	Wash rooms and Wash basin.	Twice a day.	Wash with soap and water, then dry, wipe with 0.5% chlorine.
4	Dusting.	Once a day.	Duster.
STORES (MEDICAL SURGICAL, NON-MEDICAL)			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per the current BMW Management guidelines.
2	Dusting.	Once a day.	Duster.
3	Mopping of floor.	Once a day.	Damp (wet) mop with detergent and water.
MORTUARY			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per the current BMW Management guidelines.
2	Dusting.	Once a day.	Duster.
3	Mopping of floor.	Twice a day.	Damp (wet) mop with detergent and water.
4	Cleaning of autopsy table.	Once a day and after every procedure.	0.5% chlorine / 70% isopropyl alcohol.
5	Drains.	Once a day.	Soap and water.
ADMINISTRATIVE OFFICES			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per current Municipal Solid Waste (Management and Handling) guidelines.
2	Dusting.	Once a day.	Duster.
3	Mopping of floor.	Once a day.	Damp (wet) mop with detergent and water.
4	Dry mopping	Once a day.	Soft brush.
5	Wash rooms and wash basin.	Once a day.	Wash with soap and water, then dry, wipe with 0.5% chlorine.

Table -21: Cleaning of CSSD, laundry, radiology and laboratory

Sr.No.	Activity	Frequency	Agents used
CSSD / LAUNDRY			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full.	As per the current BMW Management and Municipal Solid Waste (Management and Handling) guidelines.
2	Dusting.	Twice a day.	Damp (wet) duster, dry, then wipe.
3	Mopping and washing of floor.	Twice a day.	Damp (wet) mop with detergent and water.
4	Mopping (CSSD) sterile areas.	Once a day.	0.5% chlorine/ 70% Isopropyl alcohol.
5	Fumigation.	Once a month/ as and when required.	Fumigation is recommeded with non formalin compounds.
6	Wash rooms and wash basin.	Once a day.	Wash with soap and water, then dry, wipe with 0.5% chlorine.
RADIOLOGY & LABORATORY			
1	Garbage removal.	Thrice a day and more when bags are 3/4th full	As per the current BMW Management and Municipal Solid Waste (Management and Handling) guidelines.
2	Dusting of infrastructure.	Once a day.	Damp duster, dry, then wipe.
3	Cleaning of equipment.	Once a week.	Damp cleaning, dry, 70% isopropyl alcohol.
4	Mopping and washing of floor.	Twice a day.	Damp (wet) mop with detergent and water.
5	Washing of slippers.	Once a week.	Detergent and water.
6	Wash rooms and wash basin.	Once a day.	Wash with soap and water, then dry, wipe with 0.5% chlorine.

Additional Cleaning Activities

The following additional cleaning shall be scheduled:

- High dusting using damp (wet) mop (weekly).
- Clean corners (weekly).
- Removal and laundering privacy curtains/screen (monthly).
- Clean window curtains/ coverings when soiled or atleast monthly.
- Dust window blinds at least monthly.

High dusting includes all surfaces and fixtures above shoulder height, including vents. Ideally, the patient/ resident shall be out of the room during high dusting to reduce the risk of inhaling spores from dust particles. Avoid the use of carpets and upholstered furnishings in high risk patient care areas if used, vacuum regularly to minimize the level of dust and allergens.

Cleaning of Bedding, Mattresses and Pillows

- Cover the mattress and pillows with protective water-proof plastic material like rexin.
- Keep the mattress and pillow rexin covers dry.
- Clean the mattress and pillow rexin covers with soap solution and dry. Avoid excessive wetting during cleaning.
- In case of blood spill over the mattress/ pillow cover, clean with 1% chlorine solution, wash and dry.

Refer Annexure-4: Environment Audit Tool

4.4 PEST CONTROL

Pest control is an integral component of sanitation services. Pests such as cockroaches, flies, and mosquitoes can serve as agents for transmission of microbes or may serve as biological vectors of disease. They typically thrive in moist and warm conditions and feed on food waste, human and medical waste, dressings, and solid waste. Ensure windows are sealed by installing screens, apply pesticide as required, install fly catchers if available and avoid water stagnation in and around the HCF.

The pest control activities depends on the total floor area of HCF. Chemical agents used for pest control activities should be suitable for health care setting. The agency for pest control should provide details of chemicals like- name of chemical, name of company, concentration, chemical composition, quantity consumed, size of packing, batch no, manufacturing and expiry date. Keep a small stock of antidote also available.

Quality assurance of pest control activities:

- Records of application if outsourced.
- Emergency calls and its response time.
- Monthly feedback.
- Application of chemicals.

Table-22: Sample checklist for pest control activities

Sr. No.	Department	Date and time	Identification of problem	Details of action taken	Name and signature of staff	Name and signature of supervisor

4.5 FUMIGATION

Circumstances for Fumigation

Fumigation of high risk areas -OT/ ICU/ labour room/ SNCU/ isolation wards shall be done in the following circumstances:

- Newly constructed / repair activity undertaken recently in that area.
- In any other circumstances where fumigation is required e.g. after surgery on infectious cases or major spills of faecal matter.
- Routinely: Once a month depending on the nature of civil infrastructure, no of surgical cases and movement of staff and equipments.
- Area not used for long duration before its usage needs to be fumigated.
- High occupancy areas like ICU, labour room etc. when found vacant needs to be fumigated.

Method of Fumigation

Precautions

- Adequate care must be taken by wearing various Personal Protective Equipment (PPE) like cap, mask, foot cover, spectacle etc.
- Paste a warning notice on the front door indicating fumigation/fogging is in progress.

Pre-fumigation procedures

- Remove any contamination with 0.5 % chlorine solution and any other article that is likely to be damaged by fumigation.
- Clean the area (windows, doors, floor, walls, surgery table and all washable equipments) thoroughly with soap and water.
- Close windows and ventilators tightly. If any openings found, seal it with cellophane tape or other material to avoid the leak of fume.
- Switch off all lights, Air Conditioner (AC) and other electrical and electronic items.

- Calculate the room size (surgical theatre only) in cubic feet (LxBxH) and calculate the required amount of environmental disinfectant preferably non formalin compounds like hydrogen peroxide + silver nitrate solutions as per the manufacturer's instructions. Formaldehyde is irritant to eyes and nose and it has also been recognized as a potential carcinogen.

Fumigation procedure

It is to be carried out as per the manufacturer's instructions depending the size of room and the type of environmental disinfectant used e.g. Hydrogen peroxide + Silver nitrate solution.

Table-23: Preparation of chemicals for fumigation

Agent and method	Preparation
Hydrogen peroxide + Silver nitrate solution Contains stabilized Hydrogen peroxide 11% w/v with 0.01% w/v diluted Silver nitrate solution.	200 ml Hydrogen peroxide + Silver nitrate solution + 800ml water for 1000 cubic feet Process time – 1 hour

4.6 CLEANING OF INSTRUMENTS AND EQUIPMENTS

Cleaning is a form of decontamination which renders the equipments safe to handle and remove the organic and inorganic matter, salts and visible soils. If not properly cleaned these organic and inorganic matters and salts will shield the microorganisms leading to ineffective sterilization or disinfection. If items have not first been cleaned further processing might not be effective because :

- Microorganisms trapped in organic material may be protected and survive further processing.
- Organic material and dirt can make chemical used in some processing techniques less effective.

For Effective Cleaning

Ensure the following steps:

- Train the staff properly and ensure they wear the PPE appropriately.
- Follow manufacturer's instructions for cleaning and disinfection procedure.
- Cleaning can be done manually by scrubbing or rubbing with friction using a brush and rinsing in water under pressure.
- Cleaning can also be done by automated machines such as ultrasonic cleaners, washer disinfectors etc.
- Use a detergent or soap and water for cleaning. Enzymes are added to assist the removal of organic material.

There is no substitute for proper cleaning. Steam sterilization, Ethylene Oxide (ETO) or disinfectants do not penetrate debris. **Sterilization/ disinfection processes may not be effective when instruments are not cleaned properly.**

Table-24: Spaulding's classification of devices/items

Item / device	Definition / intended use	Risk of infection	Reprocessing method	Example
Critical items.	Medical device that is intended to enter a normally sterile tissue or vasculature.	High.	Sterilization.	Surgical instruments, implants, needles etc.
Semi-critical items.	Devices that are intended to come in contact with mucous membrane or non-intact skin.	High or intermediate.	Sterilization desirable or high level disinfection acceptable.	Respiratory therapy equipment, endoscopes, probes etc.
Non-critical items.	Devices that come in contact with intact skin.	Low.	Intermediate or low level disinfection.	BP cuff, stethoscope etc.

4.7 DISINFECTION AND STERILISATION OF INSTRUMENTS AND EQUIPMENTS

Common Disinfectants Used in HCF

Glutaraldehyde:

- Rapid acting -can be used up to 14 days after activation.
- Long acting - can be used up to 28 days after activating
- Contact time- for disinfection 15-30 minutes.
- For sterilization 8-10 hours

Alcohol Based Hand Rub (ABHR)

Sterilium :

- Contains 2-propanol,1-propanol ,macetronium ethyl sulfate.
- Contact time for patient care hand wash: 1.5ml for 30 secs.
- Contact time for surgical hand wash: 9 ml for 3minutes for each hand.

Chlorehexidine gluconate:

- 2.5% hand rub and hand gel
- Contact time for patient care hand wash: 1.5ml for 30 secs.
- Contact time for surgical hand wash: 9 ml for 3minutes for each hand.

Povidone iodine solution 10%

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

OPA (Ortho-Phthalaldehyde)

- Used as high level disinfectant for endoscopes .Its advantages are reduced exposure times at ambient temperatures, superior microbicidal activity and less toxic fumes .

Alcohol -70%

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

Alcohol -99%

- Used for preparation of cotton swabs in phlebotomy cell etc.

Table-25: Disinfection techniques for equipments and patient care items

Item	Disinfection guideline
Thermometer	Never be soaked in disinfectants shall always be cleaned and kept DRY. After each use wash with water, dried and then wiped over with a swab soaked in 70% alcohol put in dry cover.
Digital thermometer	Wipe probe with with 70% alcohol swab after each use.
Stethoscope	Shall be wiped with 70% alcohol swab daily (ear plugs, diaphragm etc.).
B P Cuff	Rubber tubing cleaned with and 70% alcohol daily or when visibly soiled.
Ambu bags	• Wear protective gloves. • Separate the face mask, valves, self inflating bag, oxygen reservoir bag, tubings. • Clean with soap and water removing all the visible contaminants such as mucous, blood, secretions etc. • Dry thoroughly, assemble all parts except the oxygen reservoir bag. • Inspect the device for complete dryness, any evidence of damage before sending for ETO/ Plasma sterilization.

Item	Disinfection guideline
Oxygen mask	Disposable, discarded after use in the red bag as per current BMW Management guidelines. If to be reused clean with soap and water removing all the visible contaminants such as mucous, blood, secretions etc. Dry it. ETO/ Plasma sterilization after each patient use.
Laryngoscope	After each use, clean the blade with water then dry and then shall be kept in glutaraldehyde for at least 45 min for high level disinfection. Don't remove the bulb only blade to be kept in glutaraldehyde. The holder is cleaned by the 70% alcohol swab or ETO sterilization/ Plasma sterilization.
ECG machine	Clean and disinfect with 0.5% sodium hypochlorite/ 70% alcohol daily.
ECG trolley	Clean and disinfect with 70% alcohol daily.
Defibrillator	Clean and disinfect with 0.5% sodium hypochlorite/ 70% alcohol daily.
Humidifiers	The humidifier shall be cleaned thoroughly, dried and filled daily with distilled water. Routine disinfection: • Clean with soap and water. • Fill it with 1% sodium hypochlorite for 30 minutes. • Then wash with distilled water and dried thoroughly/ or ETO / Plasma sterilization after each patient use.
Endoscope	Soak in glutaraldehyde for a minimum of 45 minutes or glutaraldehyde OPA for 10 min or ETO/ Plasma sterilization.
All catheter hubs and injection ports	All catheter hubs and injection ports shall be disinfected with (2% chlorhexidine and 70% alcohol) before and after access of the system.
Suction bottle	Add 1% sodium hypochlorite to the bottle containing secretions for 30 minutes, empty the contents and then rinse with water and then dry. Label the date and time of disinfection.
I V Stand	Clean thoroughly with detergent and water. Disinfect with 70% alcohol after patient's discharge.
Dressing/ Procedure Trolley-	Clean and disinfect daily with 70% alcohol. Surface must be dry before placing sterile packs.
Speculum	Shall be autoclaved. After each use wash with soap and water then dry or shall be kept in glutaraldehyde for 45 mins.

Item	Disinfection guideline
Sputum mug	Wash with water and use dried mug. Disinfect with 1% sodium hypochlorite or glutaraldehyde for 30 minutes.
Urinal/ bed pan	Wash with hot water and detergent. Disinfect with lysol and let it dry.
Kidney tray (steel and plastic)	Wash with hot water and detergent. Disinfected with glutaraldehyde for stainless steel and with 1% sodium hypochlorite for 30 minutes for plastic and let it dry. Kidney tray used in operation theatre are cleaned and autoclaved.
Mattresses and pillows	Clean with hospital approved detergent and water after transfer/ discharge/ death. In case of spill, soak it in 1% sodium hypochlorite for 30 minutes, wash and dry.
Curtains	Change and wash when visibly soiled and after every 15 days.
Bed/ bed rails	Clean with hospital approved detergent and water after discharge/death/ In case of infectious patient clean with 70% alcohol.
Air bed	Clean with 0.5% sodium hypochlorite.
Furniture (lockers, table, bed, wooden racks, chair etc.)	Clean with 0.5% sodium hypochlorite daily Iron racks are cleaned by 70% alcohol.
Telephone, computer/ keyboard, central monitor	Clean with 0.5% sodium hypochlorite daily.
Nursing station	Clean with 0.5% sodium hypochlorite in every shift.
All physiotherapy instruments	Clean with 70% alcohol daily.

4.8 STERILIZATION

Sterilization is necessary for medical devices penetrating sterile body sites. Cleaning to remove visible soiling in reusable equipments shall precede sterilization. All materials must be wrapped before sterilization. Only wrapped/ packed sterilized materials shall be described as sterile.

Methods of Sterilization

- **Autoclave (Moist heat)**: This is by far the most commonly used process and the most reliable. Moist heat penetrates and kills bacteria at temperatures lower than that required by dry heat. Steam penetrates best when air has been removed. The air is removed by mechanical means, downward displacement and pulse prevacuum, the latter of which is now the most commonly used method. The moisture content of the steam is very important, the optimum conditions for steam sterilization occurs when the steam is saturated (Relative Humidity = 100%). The packs of equipment shall come out of the autoclave dry, if not, then the packs cannot be considered as sterile.
- **Ethylene Oxide (ETO)**: Ethylene oxide can be used to sterilize most articles that can withstand temperatures of 37°C and 55°C. However it must be used with extreme caution as it is extremely toxic and explosive. A long period of aeration is required to remove all traces of ethylene oxide.
- **H_2O_2 Plasma Sterilizer**: Plasma Sterilizer is especially used for fibre optics, sharps (scissor, surgical blades), micro and vascular instruments. It has low temperature.

ETO sterilizer and plasma sterilisers are used in bigger HCF.

Steam under Pressure (Moistened) Sterilization/ Autoclaving

Before any instrument or equipment goes under the process of steam sterilization.

The following shall be checked:

- Ensure that the instrument can withstand the process (e.g. steam under pressure).
- Ensure that the instrument has been adequately cleaned.
- Ensure that the instrument does not require any special treatment.
- Ensure that records are kept of the sterilization and traceability of the instrument.

This is the most efficient and reliable way of achieving sterility of instruments and equipments. This method sterilizes and dries the packages. The sterilization is achieved at 121°C,15 lbs pressure and holding time for 30 minutes.

Pressure cooker cannot be used for sterilization of instruments as 15 pounds of pressure is required for sterilization whereas only 5 pounds pressure is generated in pressure cooker.

4.9 QUALITY ASSURANCE OF STERILIZATION PROCEDURES

Systematic and sustained monitoring of the sterilization process is must. The use of checklist and proper documentation shall ensure that work done is appropriate and in time. Sterilization is carried out by trained personnel, on sterilizers in good state of maintenance.

Validation / Verification of sterilization process:

- Class-I indicator - Indicator tape - each load (daily) as external or internal control or exposure control or pack control.
- Class-II indicator - Bowie Dick test as equipment control (daily) for vacuum type steam sterilizer.
- Class-V integrator - Each load (daily) as pack controls.
- Class-VI indicator - Biological indicator with each load (daily/ weekly).

Biological Indicator: A tube containing a population of Geobacillus stearothermophillus spores about 1 million soaked on a strip of paper and it has a growth indicator media of purple colour contained in ampoule.

- This shall be autoclaved at 121° C for at least 30 mins.
- Place the biological indicator along with the load in an appropriate manner. Generally it has to be placed in the centre of the load.
- Change from purple to yellow colour indicates growth and sterilization process failure has occurred.
- If no colour change, result is valid.

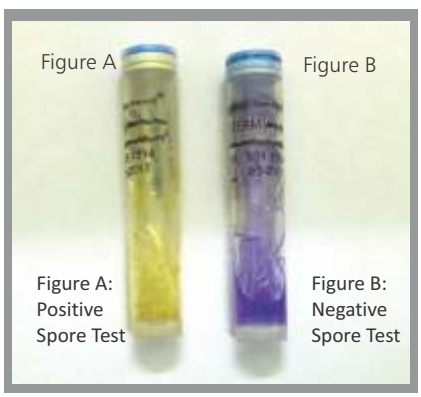


Figure-23: Biological indicator

Bowie Dick Test

The Bowie Dick test was developed to detect air leaks and to evaluate the ability of the air removal system to reduce air residuals within the sterilization chamber to an acceptable level. It is not an absolute air measurement system. The Bowie Dick test is a visual indicator test that may be used as a predictor of future problems in that system, any unsatisfactory outcome may be anticipated to get worse with continued use of the sterilizer. The Bowie Dick test is a standard class-II indicator having the special purpose of evaluating the efficacy of dynamic air removal sterilizer systems like vacuum type steam sterilizer .

Figure-24: Bowie Dick test

- Regular engineering maintenance on sterilization equipment must be performed and documented.
- The test is used only in the vacuum type steam sterilizer, every day before the first load is processed.

Class V Indicator – Chemical Integrator

These are to be used as daily as pack controls.

Figure-25: Chemical integrator

Sterilization Documentation Procedure

All documentation shall be dated and signed by the person completing the documentation and/or verifying the test results.

Documentation of the sterilization process shall include:

- **Package label:** Name and number of content, inspection of each item for functionality, defects and breakages, sterilization method, sterilizer number, cycle number, initials of technician performed the packaging, initials of technician performed sterilization, the date and time of sterilization and its shelf life.
- Detailed list of sterilizer load contents.
- Date, time and results of all tests performed (for example chemical indicator, biological indicator, Bowie Dick test etc.).
- Sterilizer physical parameters shall be verified by the individual responsible for releasing the load prior to the load release.
- If any indicator fails, the failure shall be investigated. Loads shall be recalled. All actions associated with the investigation shall be documented.

Table-26: Sterilization documentation

Date	Time	Sterilizer Number	Batch Number	Load number	Load content	Cycle temperature	Cycle Pressure	Quality check Physical/ Chemical/ Biological tests	Remark	Name and Sign

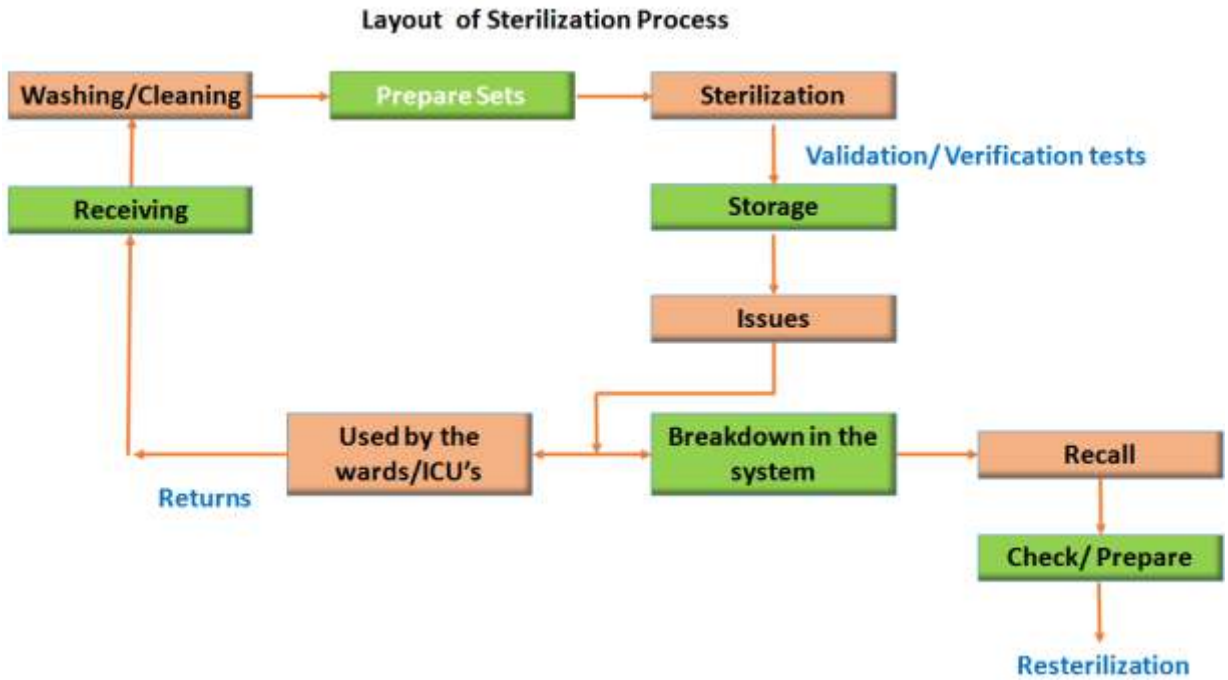


Figure-26: Layout of sterilization process

Preparation of items for sterilization

- Rinsing
- Cleaning
- Drying
- Inspection and assembly
- Packaging
- Labeling

- Sterilization
- Storage
- Distribution

Recall Procedure in Sterilization

In case of failure of quality check of sterilization the load is not issued and resterilised, the root cause analysis is done and corrective preventive actions are taken.

If the load issued, following actions are to be taken:

- Inform the ICN/ Departmental Head.
- Check the autoclave number, batch number and expiry date.
- Trace out the department to which items are issued and the specific date.
- Inform the ward incharge regarding the QC failure.
- Take back the items to the CSSD.
- Rewash the items and repack for resterilisation.
- Wait for the QC results, if the results are satisfactory, issue the items to wards and update the document.
- Root cause analysis is done and corrective preventive actions shall be taken.

Refer Annexure-5: Sterilization Audit Checklist - CSSD

Section 5

Management of Dietary Services

5.1 INTRODUCTION

Food can be a potential source of infection and disease, right from the point of procurement to the point of consumption. It is more likely in the food service establishments where mass food is prepared. Hygienic practices at procuring, preparing and serving are essential. Food handlers specially play a major role .

Quality and quantity of food are key factors for patient convalescence. Ensuring safe food is an important aspect of service delivery in health care.

All staff involved in the storage, preparation, transportation and serving of food need training in food hygiene practices to minimise the transmission of gastrointestinal infections to patients, the general public and staff of the Health Care Facility (HCF). Patients in HCF are particularly vulnerable to the effects of food poisoning.

Any lapses in hygiene during the food service is likely to put a large number of patients at risk of food borne illnesses. Food preparation and distribution has to be centralized.

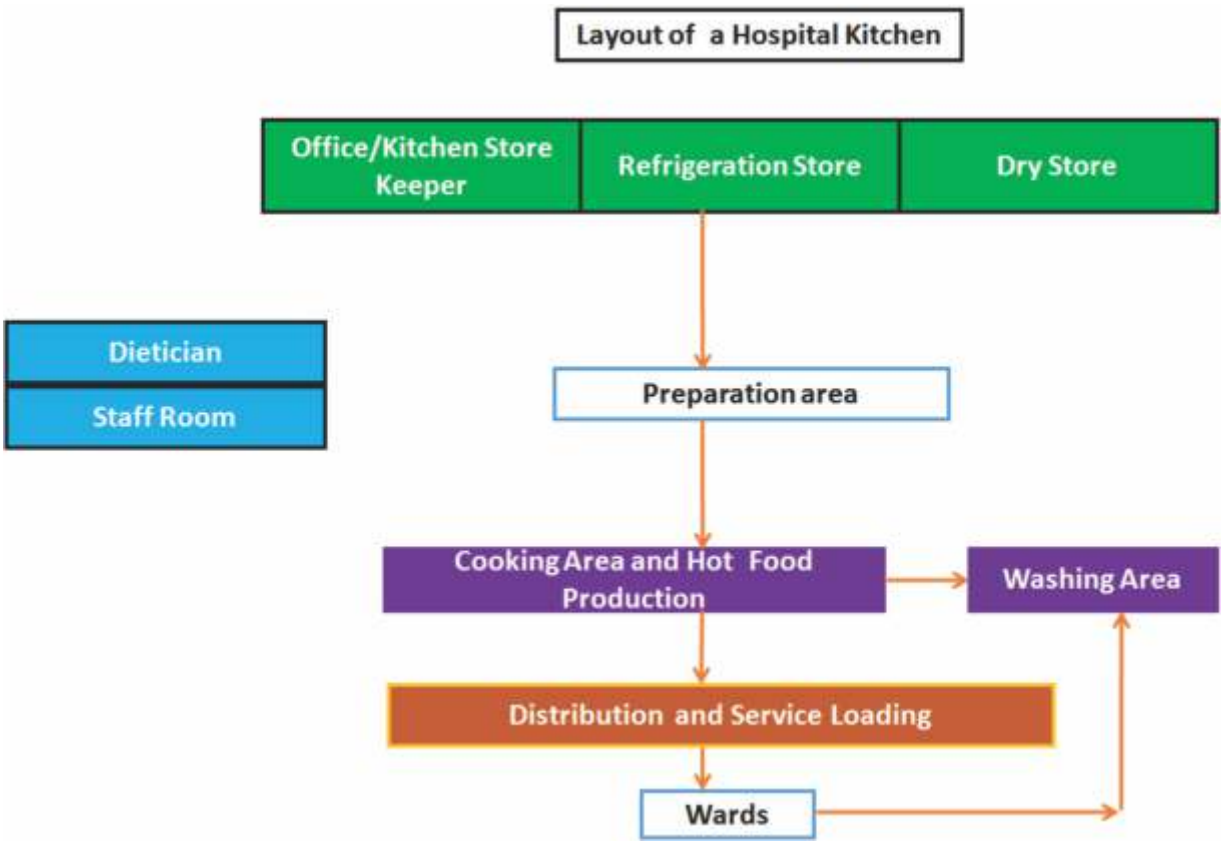


Figure-27: Layout of hospital kitchen

5.2 FOOD HANDLING PRACTICES

The following food preparation practices shall be rigorously adhered to:

- Maintain a clean work area.
- Separate raw and cooked food to avoid cross contamination.
- Use appropriate cooking techniques and follow recommendations to prevent growth of microorganisms in food.
- Maintain scrupulous personal hygiene among food handlers, especially handwashing, as hands are the main route of contamination.
- Staff shall use PPE. Staff shall change work clothes at least once a day, and keep hair covered.
- Avoid handling food in the presence of an infectious disease (like cold, influenza, diarrhoea, vomiting, throat and skin infections, typhoid) and report all infections.

Other factors important for quality assurance are:

- Purchased food must be of good quality and bacteriologically safe.
- Storage facilities must be adequate and correspond to requirements for the food type.
- All food products are stored off the floor.
- The quantity of perishable goods shall not exceed an amount corresponding to one day's consumption.
- Dry goods, preserves and canned food shall be stored in dry, well ventilated store rooms and stocks are rotated.
- Frozen food storage and preparation must follow manufacturer's instructions and shall be kept at temperature of at least minus 18 °C to minus 20 °C, do not refreeze.
- The catering system environment must be washed often and regularly with tap water and with appropriate detergents (and/or disinfectants).
- Samples of prepared food shall be stored for a specified time period, to allow retrieval for testing when an outbreak occur.
- Food handlers shall receive continuing education in safe food handling practices.

Food poisoning can be avoided by basic principles of food care:

- Limiting contamination from source, hands, raw food and environment.
- Purchasing
- Storage
- Refrigeration
- Cooking
- Personal hygiene
- Clean up
- Pest control

Additional precautions

- Restrict entry to the food preparation area.
- Unidirectional / non cross-over of flow of activities (clean/dirty).
- Cleaning supplies stored in a separate location away from food.
- Separate dedicated food preparation areas.

- Maintenance plan of machinery-like refrigerators, freezers etc daily check of temperature and its documentation.
- Ensure provision of adequate supply of clean and potable water.
- Ensure adequate hand washing facility.
- The food preparation area shall have a sink with running hot and cold water, working drainage system and windows with screens.
- Prohibit smoking in the kitchen.
- Ensure sufficient storage area (shelves, cupboards etc.).
- Ensure electrical safety and fire safety.

5.3 FOOD PREPARATION AND DISTRIBUTION

- Food is prepared and served into covered containers and set into trays in the main kitchen and then sent to wards. This activity is supervised by the trained personnel.
- Serve food as soon as possible after preparation. Discard left over food.
- Ensure that flies and insects do not come in contact with prepared/ stored food.
- Food distribution to patients occurs where possible in temperature appropriate food service trolleys (hot food kept hot and cold food kept cold).
- Food returned to the kitchen is discarded into black/ green bags for (general waste as per current Municipal Solid Waste - Management and Handling guidelines). Mouths of bags are tied before disposal.
- Maintain proper housekeeping procedures.
- The arrangement of work stations in the kitchen shall be such that there is no contamination of cooked food from raw food.
- Hair shall be covered while on duty.
- Clean utensils shall be used to handle food. Clean gloves shall be used.

5.4 DIETARY SERVICES - STAFF

- The workers handling food shall be trained about personal hygiene, food safety and food borne diseases.
- They shall wear clean clothes and change work clothes at least once daily.
- They shall wear protective aprons and keep hair covered during the food preparation.
- They shall clean their hands, face, hair and trim their nails.
- They are instructed not to touch their nose, lips and hair while food preparation.
- They shall wash hands before handling food, after using toilet, after contact with unclean equipments or work surfaces and after handling raw food.
- They shall handle food preferably with disposable gloves. They must cover all injuries or cuts with waterproof dressings.
- Workers suffering from acute diarrhoea, enteric fever, draining abscess or skin infections shall not handle food.
- The staff shall be preferably immunised against Typhoid and Hepatitis A apart from Hepatitis B and Tetanus.

- The periodic screening of kitchen workers and food handlers for carriage of parasites and Salmonella typhi shall be done every six monthly or if the staff rejoins after leave of 15 days or more and is to be doucmented.

5.5 PEST CONTROL - DIETARY SERVICES

- Cover all the food items always.
- Discard waste promptly and appropriately.
- Avoid accumulation of stagnant water.
- Adopt appropriate pest control measures.
- Ensure proper maintenance of equipment and structures.
- Fix window screens/mesh on kitchen windows.
- Discard waste into the containers immediately and store garbage containers outside after use.
- Ensure frequent emptying and washing of garbage containers.

5.6 QUALITY ASSURANCE FOR DIETARY SERVICES

- Patient satisfaction surveys / feed back.
- Number of complaints received from patients/ visitors and staff and the type of complaints(regarding quality, quantity, freshness/ staleness, taste, odour or presentation/ service).
- Instances of serving wrong diet and inadequate quantity of diet to the patients.
- Food wastage rate.
- Variety of menu.
- Instances of food poisoning.
- Theft and pilferage of food.
- Pest rodent menace.
- Kitchen hygiene/ sanitation.

Refer Annexure-6: Dietary Services Audit Tool

Section 6

Hospital Waste Management

6.1 INTRODUCTION

Hospital Waste

Hospital waste means all waste coming out of hospital, out of which around 85% are actually non hazardous waste, around 10% are infectious waste and around 5% are non infectious but hazardous waste. These waste have the potential to transmit various viral, bacterial or parasitic diseases to the Health Care Workers (HCW), patients and general population at large.

Bio-medical Waste

Solid and liquid waste including its container and any intermediate product which is generated during the diagnosis, treatment or immunization of human beings or animals in research pertaining thereto or in the production or testing biological and the animal waste from slaughter houses or any other similar settings.

Health Hazards Associated with Poor Bio-medical Waste Management

Infected waste has the potential to transmit communicable diseases. Diseases that have the potential for transmission include hepatitis B and C, HIV , cholera, staphylococcal infection etc. Injury from sharp to all categories of HCW, risk of HCAI to the waste handlers, scavengers and general public etc. are other health hazards associated with bio-medical waste.

6.2 BIO-MEDICAL WASTE MANAGEMENT REGULATIONS

The Bio-medical Waste (Management and Handling) Rules, 1998 was published vide notification number S.O. 630 (E) dated the 20th July, 1998, by the Government of India in the erstwhile Ministry of Environment and Forests, provided a regulatory framework for management of bio-medical waste generated in the country.

To implement these rules more effectively and to improve the collection, segregation, processing, treatment and disposal of these bio-medical waste in an environmentally sound manner, reducing its generation. Central Government reviewed the existing rules and came out with the Government of India, Ministry of Environment, Forest and Climate Change Notification on 28th March, 2016.

Legal Aspects of Waste Management

- The Air (Control of Pollution and Prevention) Act, 1981.
- The Environment (Protection) Act 1986.
- The Hazardous Waste (Management and Handling) Rules, 1989.
- The National Environmental Tribunal Act, 1995.
- Bio-medical Waste (Management and Handling) Rules, 1998.
- Bio-medical Waste Management Rules, 2016.

6.3 SALIENT FEATURES OF BIO-MEDICAL WASTE (BMW) MANAGEMENT RULES, 2016

BMW management rules, 2016 have been adopted and notified with the objective to stop the indiscriminate disposal of bio-medical waste and ensure that such waste is handled without any adverse effect on the human health and environment.

- Published by Government of India, Ministry of Environment, Forest and Climate Change and published in the Gazette of India, Extraordinary, Part II, Section 3, Sub-section (i) on 28th March, 2016.
- Deals with generation/ handling/ treatment/ disposal of bio-medical waste.
- These rules apply to all persons who generate, collect, receive, store, transport, treat, dispose or handle bio-medical waste in any form.
- **Rule 4:** Duties of the Occupier- It shall be the duty of every occupier to take all necessary steps to ensure that bio-medical waste is handled without any adverse effect to human health and the environment and in accordance with these rules.
- **Rule 5:** Specifies the duties of the operator of a common bio-medical waste treatment and disposal facility.
- **Rule 6:** Specifies the duties of authorities.
- **Rule 7:** Is about the treatment and disposal of BMW.
- **Rule 8:** Is about segregation, packaging, transportation and storage.
- **Rule 9:** Is about prescribed authority that shall implement these rules.
- **Rule 10:** Is the procedure for authorisation. Every occupier or operator handling bio-medical waste, irrespective of the quantity has to apply to the prescribed authority i.e. State Pollution Control Board and Pollution Control Committee for authorization.
- **Rule 11:** Advisory Committee- Every State Government or Union territory administration shall constitute an Advisory Committee for the respective State or Union territory under the chairmanship of the respective Health Secretary to oversee the implementation of the rules in the respective state and to advice any improvements.
- **Rule 12:** Monitoring of implementation of the rules in health care facilities. The Ministry of Environment, Forest and Climate Change shall review the implementation of the rules in the country once in a year through the State Health Secretaries and Chairmen or Member Secretary of State Pollution Control Boards and Central Pollution Control Board and the Ministry may also invite experts in the field of bio-medical waste management.
- **Rule 13:** Annual report. Every occupier or operator of common bio-medical waste treatment facility shall submit an annual report to the prescribed authority in Form-IV, on or before the **30th June of every year**. The prescribed authority shall compile, review and analyse the information received and send this information to the Central Pollution Control Board on or before the **31st July of every year**.

- **Rule 14:** Maintenance of records- Every authorized person shall maintain records related to the generation, collection, reception, storage, transportation, treatment, disposal or any other form of handling of bio-medical waste, for a period of **five years**.
- **Rule 15:** Accident reporting- In case of any major accident at any institution or facility or any other site while handling bio-medical waste, the authorised person shall intimate immediately to the prescribed authority about such accident and forward a report within twenty-four hours in writing regarding the remedial steps taken in Form I.
- **Rule 16:** Appeal- Any person aggrieved by an order made by the prescribed authority under these rules may, within a period of thirty days from the date on which the order is communicated to him, prefer an appeal in Form V to the Secretary (Environment) of the State Government or Union territory administration .
- **Rule 17:** Is about selection of site for common bio-medical waste treatment and disposal facility.
- **Rule 18:** Liability of the occupier and or operator of a facility- The occupier or an operator of a common bio-medical waste treatment facility shall be liable for all the damages caused to the environment or the public due to improper handling of bio-medical waste and for action under section 5 and section 15 of the Act, in case of any violation.

6.4 CATEGORIES OF BIO-MEDICAL WASTE

SCHEDULE I
[See rules 3 (e), 4(b), 7(1), 7(2), 7(5), 7(6) and 8(2)]
Part-1
Bio-medical wastes categories and their segregation, collection, treatment, processing and disposal options

Category	Type of Waste	Waste content	Type of Bag or Container to be used	Treatment and Disposal options
Yellow	(a) Human Anatomical Waste	Human tissues, organs, body parts and fetus below the viability period (as per the Medical Termination of Pregnancy Act 1971, amended from time to time).	Yellow coloured non-chlorinated plastic bags	Incineration or Plasma Pyrolysis or Deep burial *
	(b) Animal Anatomical Waste	Experimental animal carcasses, body parts, organs, tissues, including the waste generated from animal used in experiments or testing in veternary hospitals or colleges or animal houses.		
	(c) Soiled Waste	Items contaminated with blood, body fluids like dressings, plaster casts, cotton swabs and bags containing residual or discarded blood and blood components.		Incineration or Plasma Pyrolysis or Deep burial * In absence of above facilities, autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery.
	(d) Expired or Discarded Medicines	Pharmaceutical waste like antibiotics, cytotoxic drugs including all items contaminated with cytotoxic drugs along with glass or plastic ampoules, vials etc.	Yellow coloured non-chlorinated plastic bags or containers	Expired `cytotoxic drugs and items contaminated with cytotoxic drugs to be returned back to the manufacturer or supplier for incineration at temperature >1200° C or to common bio-medical waste treatment facility or hazardous waste treatment, storage and disposal facility for incineration at >1200°C Or Encapsulation or Plasma Pyrolysis at >1200°C. All other discarded medicines shall be either sent back to manufacturer or disposed by incineration.

Category	Type of Waste	Waste content	Type of Bag or Container to be used	Treatment and Disposal options
Yellow	(e) Chemical Waste	Chemicals used in production of biological and used or discarded disinfectants.	Yellow coloured containers or non-chlorinated plastic bags	Disposed of by incineration or Plasma Pyrolysis or Encapsulation in hazardous waste treatment, storage and disposal facility.
	(f) Chemical Liquid Waste	Liquid waste generated due to use of chemicals in production of biological and used or discarded disinfectants, Silver X-ray film developing liquid, discarded Formalin, infected secretions, aspirated body fluids, liquid from laboratories and floor washings, cleaning, housekeeping and disinfecting activities etc.	Separate collection system leading to effluent treatment system	After resource recovery, the chemical liquid waste shall be pre-treated before mixing with other wastewater. The combined discharge shall conform to the discharge norms given in Schedule-III.
	(g) Linen & blood or body fluid	Discarded linen, mattresses, beddings contaminated with blood or body fluid.	Non-chlorinated yellow plastic bags or suitable packing material	Non-chlorinated chemical disinfection followed by incineration or Plasma Pyrolysis or for energy recovery. In absence of above facilities, shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent for energy recovery or incineration or Plasma Pyrolysis.
	(h) Micro-biology, Biotechno-logy and other clinical laboratory waste	Blood bags, Laboratory cultures, stocks or specimens of micro-organisms, live or attenuated vaccines, human and animal cell cultures used in research, industrial laboratories, production of biological, residual toxins, dishes and devices used for cultures.	Autoclave safe plastic bags or containers	Pre-treat to sterilize with non-chlorinated chemicals on-site as per National AIDS Control Organisation or World Health Organisation guidelines thereafter for Incineration.

Category	Type of Waste	Waste content	Type of Bag or Container to be used	Treatment and Disposal options
Red	Contaminated Waste (Recyclable)	(a) Wastes generated from disposable items such as tubing, bottles, intravenous tubes and sets, catheters, urine bags, syringes (without needles and fixed needle syringes) and vaccutainers with their needles cut) and gloves.	Red coloured non-chlorinated plastic bags or containers	Autoclaving or micro-waving/ hydroclaving followed by shredding or mutilation or combination of sterilization and shredding. Treated waste to be sent to registered or authorized recyclers or for energy recovery or plastics to diesel or fuel oil or for road making, whichever is possible. Plastic waste should not be sent to landfill sites.
White (Translucent)	Waste sharps including Metals	Needles, syringes with fixed needles, needles from needle tip cutter or burner, scalpels, blades, or any other contaminated sharp object that may cause puncture and cuts. This includes both used, discarded and contaminated metal sharps	Puncture proof, Leak proof, tamper proof containers	Autoclaving or Dry Heat Sterilization followed by shredding or mutilation or encapsulation in metal container or cement concrete; combination of shredding cum autoclaving; and sent for final disposal to iron foundries (having consent to operate from the State Pollution Control Boards or Pollution Control Committees) or sanitary landfill or designated concrete waste sharp pit.
Blue	(a) Glassware	Broken or discarded and contaminated glass including medicine vials and ampoules except those contaminated with cytotoxic wastes.	Cardboard boxes with blue colored marking	Disinfection (by soaking the washed glass waste after cleaning with detergent and Sodium hypochlorite treatment) or through autoclaving or microwaving or hydroclaving and then sent for recycling.
	(b) Metallic Body Implants	Metallic Body Implants	Cardboard boxes with blue colored marking	

Figure-28: Categories of Bio-medical waste

*Disposal by deep burial is permitted only in rural or remote areas where there is no access to common biomedical waste treatment facility. This will be carried out with prior approval from the prescribed authority and as per the Standards specified in Schedule-III. The deep burial facility shall be located as per the provisions and guidelines issued by Central Pollution Control Board from time to time.

6.5 SEGREGATION OF BIO-MEDICAL WASTE

Segregation refers to the basic separation of different categories of waste generated at source and thereby reducing the risks as well as cost of handling and disposal. Segregation is the most crucial step in bio-medical waste management. Effective segregation alone can ensure effective bio-medical waste management.

Approximately 75 to 90 percent of the biomedical waste is non hazardous and harmless as any other municipal waste. The remaining 10-25% is hazardous to humans or animals and deleterious to the environment. **Segregation, which begins at the point of generation is the responsibility of waste generator.** The waste shall be segregated and discarded in specified color coded bags or containers.

6.6 COLLECTION OF BIO-MEDICAL WASTE

The collection of biomedical waste involves use of different types of container. Collection can be done in waste bins which shall be covered and preferably foot operated. The size may differ as per the quantity of waste generated at Health Care Facility (HCF). The plastic bags shall be sealed once filled ¾ only. The bins shall be placed at approachable points so that 100% collection is achieved. Depending on the amount of the waste generated in each shift, the facility shall plan their own schedule for removal of waste. All bags shall be labeled with information on their point of generation (Ward/ Dept. and HCF) and contents with appropriate symbols.

6.7 HANDLING AND TRANSPORT OF BIO-MEDICAL WASTE

There are two types of transport :

- Intramural (internal)
- extramural (external)

Intramural transport: It involves the movement of waste bag inside the HCF premises. Separate closed type trolleys shall be used for transporting waste. These trolleys shall be cleaned and disinfected daily with an appropriate disinfectant. There must be a designated waste transportation route to avoid passage of waste through the patient care area. The timing of transportation is preferably the low activity timings in the HCF (like post OPD, post round in wards etc.). General waste must be transported in separate closed trolley.

Extramural transport: It involves movement of waste for offsite treatment and/or disposal. The contractor is authorized for transport and disposal of waste. Handling and transfer leads to closer contact with wastes, leading to high hazards. The transportation of clinical waste offsite shall be carried out in specially designed vehicles with a fully enclosed body and a bulk head separating the drivers compartment from the local compartment vehicle trolley. The general waste shall not be transported with bio-medical waste.

6.8 STORAGE OF BIO-MEDICAL WASTE

The storage area shall be in a secured HCF location, with limited access. It shall be easy to clean, roofed, properly drained and rodent and insect proof. Water supply must be provided. There shall be good lighting and at least passive ventilation. It shall not be situated near the food stores or food preparation area. Adequate supply of cleaning equipment, protective clothing and waste bags or bins shall be located conveniently closed to the storage area. The storage area shall be marked with a biohazard symbol. Prior to transport for offsite treatment and/ or disposal, clinical waste is required to be stored treated separately from general waste storage area and shall be clearly identified with clear warning signs. This area shall be kept locked with key available to staff throughout 24 hours.

Only authorized personnel are allowed to enter. It shall be easily accessible to internal transport and office transport. Once collected occur then bio-medical waste is stored in a proper place. Segregated waste of different categories needed to be collected in identifiable containers. The duration of generation of bio-medical waste to the final disposal shall not exceed 48 hours including the temporary storage at the HCF. Each container may be clearly labeled to show the Ward/Dept. and HCF. The reason for this labeling is that it may be necessary to trace the waste back to its source besides this the storage area shall be marked with a caution sign.

Location: It shall be constructed away from food preparation, food storage area and public places.

6.9 TREATMENT AND DISPOSAL OF HOSPITAL WASTE

Non hazardous general waste (general waste) may be disposed off in municipal dumps. Only the color coded bags (e.g green/ black) approved by the corporation/ local municipal authorities are to be used for this purpose which shall be other than the color coding of bio-medical waste management. Hazardous waste are treated as per the protocols by the contractors at the Common Bio-medical Waste Treatment Facility (CBWTF).

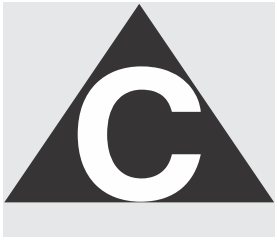
SCHEDULE IV
[See rule 8(3) and (5)]
Part A

LABEL FOR BIO-MEDICAL WASTE CONTAINERS OR BAGS

BIOHAZARD

HANDLE WITH CARE

CYTOTOXIC HAZARD SYMBOL



HANDLE WITH CARE

PART B
LABEL FOR TRANSPORTING BIO-MEDICAL WASTE BAGS OR CONTAINERS

Day..... Month .....

Year.....

Date of generation .....

Waste Category Number....

Waste quantity……

Sender's Name and Address

Phone Number .....

Fax Number.....

Contact Person .....

Receiver's Name and Address:

Phone Number .....

Fax Number .....

Contact Person .....

In case of emergency please contact :

Name and Address :

Phone No.

Note: Label shall be non-washable and prominently visible.

Figure-29: Label for bio-medical waste bags, containers and its transport

Table-27: Record sheet for the final disposal of Health Care Facility (HCF) waste

Bag color	Number collected from HCF	Weight of the BMW bag	Signature of staff I/C/SI HCF	Name and signature of the transport vehicle driver
Yellow Bags				
Red Bags				
White Translucent Bags				
Blue Bags				
Green Bags				
Other Bags (Specify)				

Name of the HCF:

Date and Time of Collection:

Vehicle Number:

Remarks:

Name and Signature of the Supervisor:

Comments:

Note: This format shall be filled up and duly signed by the supervisor in duplicate.

CERTIFICATE FOR DISPOSAL OF BODY PARTS

Name	IPD/ OPD No:
Age:	Sex:
Ward/Dept.:	Unit:
Diagnosis:	Anatomical Part:
Signature:	Date & Time
Hospital Seal:	

Figure-30: Certificate for disposal of body parts

6.10 TREATMENT AND DISPOSAL OPTIONS

Solid

- Land filling
- Deep burial
- Manure pits
- Incineration
- Autoclaves (For discard only)
- Microwaving
- Plasma pyrolysis

Liquid

- Sewage Treatment Plant (STP)
- Effluent Treatment Plant (ETP)

6.11 STANDARDS FOR TREATMENT AND DISPOSAL OF BIO-MEDICAL WASTE

SCHEDULE-II

[See rule 4(t), 7(1) and 7(6)]

1. Standards for Incineration

All incinerators shall meet the following operating and emission standards-

A. Operating Standards

1) Combustion Efficiency (CE) shall be at least 99.00%.
2) The Combustion efficiency is computed as follows:

$$C.E. = \frac{\%CO_2}{\%CO_2 + \%\ CO} \times 100$$

3). The temperature of the primary chamber shall be a minimum of 800 °C and the secondary chamber shall be minimum of 1050°C + or - 50°C.
4). The secondary chamber gas residence time shall be at least two seconds.

B. Emission Standards

Table-28: Emission standards for incinerator

Sr.No.	Parameter	Standards	
(1)	(2)	(3)	(4)
		Limiting concentration in mg Nm^3 unless stated	**Sampling Duration in minutes, unless stated**
1.	Particulate matter	50	30 or 1NM^3 of sample volume, whichever is more
2.	Nitrogen Oxides NO and NO_2 expressed as NO_2	400	30 for online sampling or grab sample
3.	HCl	50	30 or 1NM^3 of sample volume, whichever is more
4.	Total Dioxins and Furans	0.1 ngTEQ/Nm^3 (at 11% O_2)	8 hours or 1NM^3 of sample volume, whichever is more
5.	Hg and its compounds	0.05	2 hours or 1NM^3 of sample volume, whichever is more

C. Stack Height: Minimum stack height shall be 30 meters above the ground and shall be attached with the necessary monitoring facilities as per requirement of monitoring of 'general parameters' as notified under the Environment (Protection) Act, 1986 and in accordance with the Central Pollution Control Board Guidelines of Emission Regulation Part-III.

Note:

(a) The existing incinerators shall comply with the above within a period of two years from the date of the notification.

(b) The existing incinerators shall comply with the standards for Dioxins and Furans of 0.1ngTEQ/Nm^3, as given below within two years from the date of commencement of these rules.

(c) All upcoming common bio-medical waste treatment facilities having incineration facility or captive incinerator shall comply with standards for Dioxins and Furans.

(d) The existing secondary combustion chambers of the incinerator and the pollution control devices shall be suitably retrofitted, if necessary, to achieve the emission limits.

(e) Wastes to be incinerated shall not be chemically treated with any chlorinated disinfectants.

(f) Ash from incineration of biomedical waste shall be disposed of at common hazardous waste treatment and disposal facility. However, it may be disposed of in municipal landfill, if the toxic metals in incineration ash are within the regulatory quantities as defined under the Hazardous Waste (Management and Handling and Transboundary Movement) Rules, 2008 as amended from time to time.

(g) Only low Sulphur fuel like Light Diesel Oil or Low Sulphur Heavy Stock or Diesel, Compressed Natural Gas, Liquefied Natural Gas or Liquefied Petroleum Gas shall be used as fuel in the incinerator.

(h) The occupier or operator of a common bio-medical waste treatment facility shall monitor the stack gaseous emissions (under optimum capacity of the incinerator) once in three months through a laboratory approved under the Environment (Protection) Act, 1986 and record of such analysis results shall be maintained and submitted to the prescribed authority. In case of dioxins and furans, monitoring should be done once in a year.

(i) The occupier or operator of the common bio-medical waste treatment facility shall install continuous emission monitoring system for the parameters as stipulated by State Pollution Control Board or Pollution Control Committees in authorisation and transmit the data real time to the servers at State Pollution Control Board or Pollution Control Committees and Central Pollution Control Board.

(j) All monitored values shall be corrected to 11% Oxygen on dry basis.

(k) Incinerators (combustion chambers) shall be operated with such temperature, retention time and turbulence, as to achieve Total Organic Carbon content in the slag and bottom ashes less than 3% or their loss on ignition shall be less than 5% of the dry weight.

(l) The occupier or operator of a common bio-medical waste incinerator shall use combustion gas analyzer to measure CO_2, CO and O_2.

2. Operating and Emission Standards for Disposal by Plasma Pyrolysis or Gasification:

A. Operating Standards:

All the operators of the Plasma Pyrolysis or Gasification shall meet the following operating and emission standards:

1) Combustion Efficiency (CE) shall be at least 99.99%.
2) The Combustion Efficiency is computed as follows:

$$C.E = \frac{\%\ CO_2}{(\%\ CO_2 + \%\ CO)} \times 100$$

3) The temperature of the combustion chamber after plasma gasification shall be 1050 ± 50 °C with gas residence time of at least 2(two) second, with minimum 3 % Oxygen in the stack gas.
4) The Stack height shall be minimum of 30 m above ground level and shall be attached with the necessary monitoring facilities as per requirement of monitoring of 'general parameters' as notified under the Environment (Protection) Act, 1986 and in accordance with the CPCB Guidelines of Emission Regulation Part-III.

B. Air Emission Standards and Air Pollution Control Measures

(i) Emission standards for incinerator, notified at Sl. No.1 above in this Schedule, and revised from time to time, shall be applicable for the Plasma Pyrolysis or Gasification also.

(ii) Suitably designed air pollution control devices shall be installed or retrofitted with the 'Plasma Pyrolysis or Gasification to achieve the above emission limits, if necessary.

(iii) Wastes to be treated using Plasma Pyrolysis or Gasification shall not be chemically treated with any chlorinated disinfectants and chlorinated plastics shall not be treated in the system.

C. Disposal of Ash Vitrified Material: The ash or vitrified material generated from the 'Plasma Pyrolysis or Gasification shall be disposed off in accordance with the Hazardous Waste (Management, Handling and Transboundary Movement) Rules 2008 and revisions made thereafter in case the constituents exceed the limits prescribed under Schedule II of the said Rules or else in accordance with the provisions of the Environment (Protection) Act, 1986, whichever is applicable.

3. Standards for Autoclaving of Bio-medical Waste

The autoclave shall be dedicated for the purposes of disinfecting and treating bio-medical waste.

1) When operating a gravity flow autoclave, medical waste shall be subjected to:
   (i) a temperature of not less than 121° C and pressure of 15 Pounds per Square Inch (PSI) for an autoclave residence time of not less than 60 minutes; or
   (ii) a temperature of not less than 135° C and a pressure of 31 psi for an autoclave residence time of not less than 45 minutes; or
   (iii) a temperature of not less than 149° C and a pressure of 52 psi for an autoclave residence time of not less than 30 minutes.

2) When operating a vacuum autoclave, medical waste shall be subjected to a minimum of three pre-vacuum pulse to purge the autoclave of all air. The air removed during the pre-vacuum, cycle should be decontaminated by means of HEPA and activated carbon filtration, steam treatment, or any other method to prevent release of pathogen. The waste shall be subjected to the following:
   i) a temperature of not less than 121°C and pressure of 15 psi per an autoclave residence time of not less than 45 minutes or
   ii) a temperature of not less than 135°C and a pressure of 31 psi for an autoclave residence time of not less than 30 minutes.
3) Medical waste shall not be considered as properly treated unless the time, temperature and pressure indicators indicate that the required time, temperature and pressure were reached during the autoclave process. If for any reasons, time temperature or pressure indicator indicates that the required temperature, pressure or residence time was not reached, the entire load of medical waste must be autoclaved again until the proper temperature, pressure and residence time are achieved.
4) **Recording of operational parameters:** Each autoclave shall have graphic or computer recording devices which will automatically and continuously monitor and record dates, time of day, load identification number and operating parameters throughout the entire length of the autoclave cycle.
5) **Validation test for autoclave:** The validation test shall use four biological indicator strips, one shall be used as a control and left at room temperature and three shall be placed in the approximate center of three containers with the waste. Personal protective equipment (gloves, face mask and coveralls) shall be used when opening containers for the purpose of placing the biological indicators. At least one of the containers with a biological indicator shall be placed in the most difficult location for steam to penetrate, generally the bottom center of the waste pile. The occupier or operator shall conduct this test three consecutive times to define the minimum operating conditions. The temperature, pressure and residence time at which all biological indicator vials or strips for three consecutive tests show complete inactivation of the spores shall define the minimum operating conditions for the autoclave. After determining the minimum temperature, pressure and residence time, the occupier or operator of a common biomedical waste treatment facility shall conduct this test once in three months and records in this regard shall be maintained.
6) **Routine test:** A chemical indicator strip or tape that changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste package at different locations to ensure that the inner content of the package has been adequately autoclaved. The occupier or operator of a common bio medical waste treatment facility shall conduct this test during autoclaving of each batch and records in this regard shall be maintained.
7) **Spore testing:** The autoclave shall completely and consistently kill the approved biological indicator at the maximum design capacity of each autoclave unit. Biological indicator for autoclave shall be Geobacillus stearothermophilus spores using vials or spore strips; with at least $1X10^6$ spores. Under no circumstances will an autoclave have minimum operating parameters less than a residence time of 30 minutes, a temperature less than 121° C or a pressure less than 15 psi. The occupier or operator of a common bio medical waste

treatment and disposal facility shall conduct this test at least once in every week and records in this regard shall be maintained.

4. Standards of Microwaving

1) Microwave treatment shall not be used for cytotoxic, hazardous or radioactive wastes, contaminated animal carcasses, body parts and large metal items.
2) The microwave system shall comply with the efficacy test or routine tests and a performance guarantee may be provided by the supplier before operation of the limit.
3) The microwave shall completely and consistently kill the bacteria and other pathogenic organisms that are ensured by approved biological indicator at the maximum design capacity of each microwave unit. Biological indicators for microwave shall be Bacillus atrophaeus spores using vials or spore strips with at least 1×10^4 spores per detachable strip. The biological indicator shall be placed with waste and exposed to same conditions as the waste during a normal treatment cycle.

5. Standards for Deep Burial

1) A pit or trench shall be dug about two meters deep. It shall be half filled with waste, then covered with lime within 50 cm of the surface, before filling the rest of the pit with soil.
2) It must be ensured that animals do not have any access to burial sites. Covers of galvanised iron or wire meshes may be used.
3) On each occasion, when wastes are added to the pit, a layer of 10 cm of soil shall be added to cover the wastes.
4) Burial must be performed under close and dedicated supervision.
5) The deep burial site shall be relatively impermeable and no shallow well should be close to the site.
6) The pits shall be distant from habitation, and located so as to ensure that no contamination occurs to surface water or ground water. The area shall not be prone to flooding or erosion.
7) The location of the deep burial site shall be authorised by the prescribed authority.
8) The institution shall maintain a record of all pits used for deep burial.
9) The ground water table level shall be a minimum of six meters below the lower level of deep burial pit.

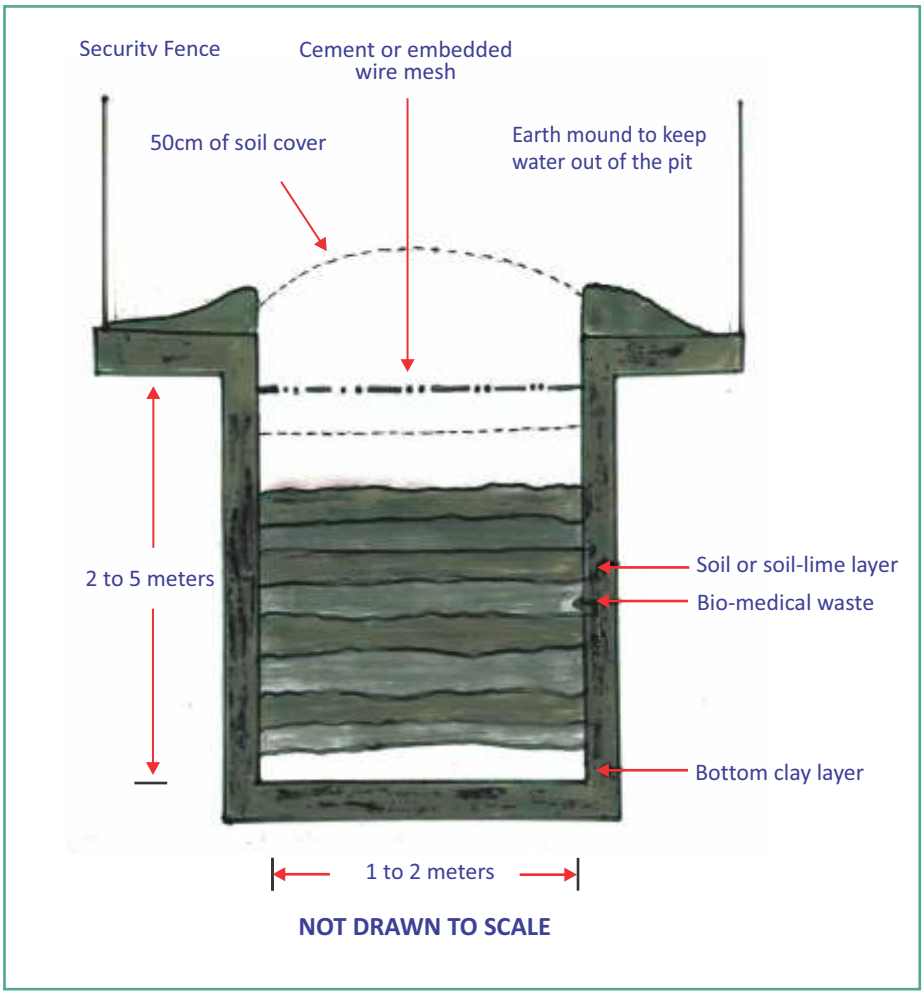


Figure-31: Deep burial

6. Standards for Efficacy of Chemical Disinfection

Microbial inactivation efficacy is equated to "Log10 kill" which is defined as the difference between the logarithms of number of test micro organisms before and after chemical treatment. Chemical disinfection methods shall demonstrate a 4 Log10 reduction or greater for Bacillus subtilis (ATCC 19659) in chemical treatment systems.

7. Standards for Dry Heat Sterilization

Waste sharps can be treated by dry heat sterilization at a temperature not less than 185°C, at least for a residence period of 150 minutes in each cycle, with sterilization period of 90 minutes. There should be automatic recording system to monitor operating parameters.

i) Validation test for sharps sterilization unit

Waste sharps sterilization unit shall completely and consistently kill the biological indicator Geobacillus stearothermophillus or Bacillus atropheaus spoers using vials with at least $\log_{10}$ 6 spores per ml. The test shall be carried out once in three months.

ii) Routine test

A chemical indicator strip or tape that changes colour when a certain temperature is reached can be used to verify that a specific temperature has been achieved. It may be necessary to use more than one strip over the waste to ensure that the inner content of the sharps has been adequately disinfected. This test shall be performed once in week and records in this regard shall be maintained.

8. Standards for Liquid Waste

Liquid wastes are disinfected with 1% sodium hypochlorite for 15 minutes and discharged into the drains or sewers.

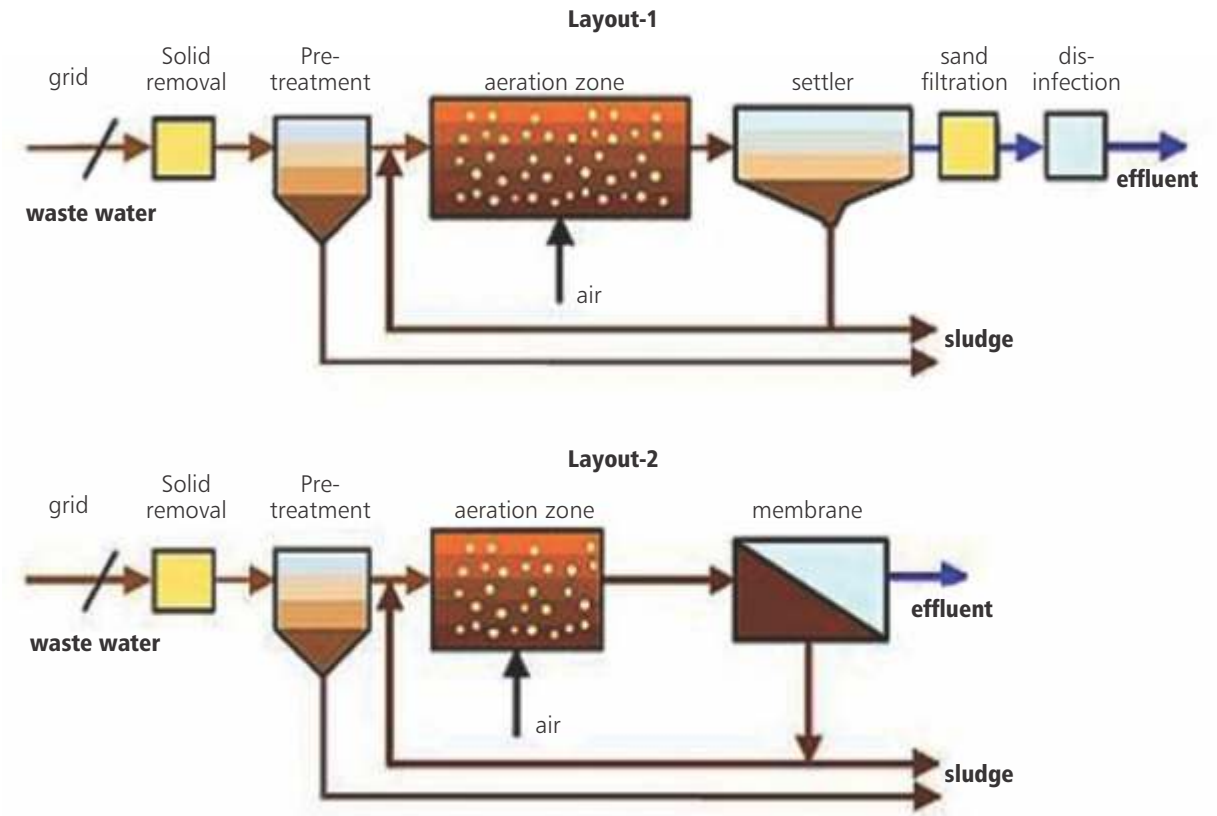


Figure-32: Layouts of Sewage Treatment Plant

1) The effluent generated or treated from the premises of occupier or operator of a common bio-medical waste treatment and disposal facility, before discharge into the sewer shall conform to the following limits.

The effluent generated from the HCF shall conform to the following limits:

Table-29: Permissible limits for effluents

Parameters	Permissible Limits
pH	6.5 - 9.0
Suspended solids	100 mg/l
Oil and grease	10 mg/l
Biochemical Oxygen Demand (BOD)	30 mg/l
Chemical Oxygen Demand (COD)	250/l
Bio-assay test	90% survival of fish after 96 hours in 100% effluent

These limits are applicable to those HCF which are either connected with sewers without terminal sewage treatment plant or not connected to public sewers. For discharge into public sewers with terminal facilities, the general standards as notified under the BMW Rules, 2016. Sludge from ETP shall be given to common bio-medical waste treatment facility for incineration or to hazardous waste treatment, storage and disposal facility for disposal.

2) Sludge from ETP shall be given to common bio-medical waste treatment facility for incineration or to hazardous waste treatment, storage and disposal facility for disposal.

6.12 FORMS AND FORMATS- BIO-MEDICAL WASTE MANAGEMENT RULES, 2016

FORM – I
[(See rule 4(o), 5(i) and 15 (2)]
ACCIDENT REPORTING

1 Date and time of accident :

2 Type of accident :

3 Sequence of events leading to accident :

4 Has the authority been informed immediately :

5 The type of waste involved in accident :

6. Assessment of the effects of the accidents on human health and the environment:

7. Emergency measures taken :

8. Steps taken to alleviate the effects of accidents :

9. Steps taken to prevent the recurrence of such an accident :

10. Does your facility has an Emergency Control policy? If yes give details:

Date : …… Signature ……

Place: …… Designation ……..

Figure-33: Forms and formats- Bio-medical Waste Mangement Rules 2016: Form-I

FORM -II

(See rule 10)

APPLICATION FOR AUTHORISATION OR RENEWAL OF AUTHORISATION

(To be submitted by occupier of health care facility or common Biomedical waste treatment facility)

To
The Prescribed Authority
(Name of the State or UT Administration)
Address.

1. Particulars of Applicant:
   - (i) Name of the Applicant:(In block letters & in full)
   - (ii) Name of the health care facility (HCF) or common bio-medical waste treatment facility (CBWTF) :
   - (iii) Address for correspondence:
   - (iv) Tele No., Fax No.:
   - (v) Email:
   - (vi) Website Address:

2. Activity for which authorisation is sought:

Activity	Please tick
Generation	
Segregation	
Collection	
Storage	
Packaging	
Reception transportation	
Treatment or processing or conversion	
Recycling	
Disposal or destruction	
Use	
Offering for sale, transfer	
Any other form of handling	

3. Application for ☐ fresh or ☐ renewal of authorisation (please tick whatever is applicable):
   (i) Applied for Consent to Operate (CTO)/ Consent to Establish (CTE) Yes/No
   (ii) In case of renewal previous authorisation number and date:
   (iii) Status of Consents:
      (a) under the Water (Prevention and Control of Pollution) Act, 1974
      (b) under the Air (Prevention and Control of Pollution) Act, 1981:

4. (i) Address of the health care facility (HCF) or Common Bio-medical Waste Treatment Facility (CBWTF):
   (ii) GPS coordinates of health care facility (HCF) or Common Bio-medical Waste Treatment Facility (CBWTF):

5. Details of health care facility (HCF) or Common Bio-medical Waste Treatment Facility (CBWTF):
   (i) Number of beds of HCF:
   (ii) Number of patients treated per month by HCF:
   (iii) Number healthcare facilities covered by CBWTF: _____
   (iv) No. of beds covered by CBWTF: _____
   (v) Installed treatment and disposal capacity of CBWTF:_____ Kg per day
   (vi) Quantity of biomedical waste treated or disposed by CBWTF:_____ Kg/ day
   (vii) Area or distance covered by CBWTF:_____(pl. attach map a map with GPS locations of CBWTF and area of coverage)
   (viii) Quantity of Biomedical waste handled, treated or disposed:

Category	Type of Waste	Quantity Generated or Collected, kg/day	Method of Treatment and Disposal (Refer Schedule-I)
(1)	(2)	(3)	(4)
Yellow	(a) Human Anatomical Waste		
	(b) Animal Anatomical Waste		
	(c) Soiled Waste		
	(d) Expired or Discarded Medicines		
	(e) Chemical Solid Waste		
	(f) Chemical Liquid Waste		
	(g) Discarded linen, mattresses, beddings contaminated with blood or body fluid.		
	h) Microbiology Biotechnology and other clinical laboratory waste		

Red	Contaminated Waste (Recyclable)		
White (Translucent)	Waste sharps including Metals		
Blue	Glassware		
	Metallic body implants		

6. Brief description of arrangements for handling of biomedical waste (attach details):

(i) Mode of transportation (if any) of bio-medical waste:

(ii) Details of treatment equipment (please give details such as the number, type & capacity of each unit)

	No of units	Capacity of each unit
Incinerators :		
Plasma Pyrolysis:		
Autoclaves:		
Microwave:		
Hydroclave:		
Shredder:		
Needle tip cutter or destroyer		
Sharps encapsulation or concrete pit:		
Deep burial pits:		
Chemical disinfection:		
Any other treatment equipment:		

7. Contingency plan of common bio-medical waste treatment facility (CBWTF) (attach documents):

8. Details of directions or notices or legal actions if any during the period of earlier authorisation:

9. Declaration

I do hereby declare that the statements made and information given above are true to the best of my knowledge and belief and that I have not concealed any information.

I do also hereby undertake to provide any further information sought by the prescribed authority in relation to these rules and to fulfill any conditions stipulated by the prescribed authority.

Date : Signature of the Applicant

Place : Designation of the Applicant

Figure-34: Forms and formats- Bio-medical Waste Mangement Rules 2016: Form-II

FORM -III
(See rule 10)
AUTHORISATION

(Authorisation for operating a facility for generation, collection, reception, treatment, storage, transport and disposal of bio-medical wastes)

1 File number of authorisation and date of issue……

2 M/s _____ an occupier or operator of the facility located at _____ is hereby granted an authorisation for;

Activity	Please tick
Generation	
Segregation	
Collection	
Storage	
Packaging	
ReceptionTransportation	
Treatment or processing or conversion	
Recycling	
Disposal or destruction	
Use	
Offering for sale, transfer	
Any other form of handling	

3. M/s _____ is hereby authorized for handling of biomedical waste as per the capacity given below;

(i) Number of beds of HCF:

(ii) Number healthcare facilities covered by CBWTF: _____

(iii) Installed treatment and disposal capacity:_____ Kg per day

(iv) Area or distance covered by CBWTF:_____

(v) Quantity of Bio-medical waste handled, treated or disposed:

Type of Waste Category	Quantity permitted for Handling
Yellow	
Red	
White (Translucent)	
Blue	

4. This authorisation shall be in force for a period of ……. Years from the date of issue.
5. This authorisation is subject to the conditions stated below and to such other conditions as may be specified in the rules for the time being in force under the Environment (Protection) Act, 1986.

Date ……. Signature……..

Place: …… Designation ……..

Terms and conditions of authorisation*

1 The authorisation shall comply with the provisions of the Environment (Protection) Act, 1986 and the rules made there under.
2 The authorisation or its renewal shall be produced for inspection at the request of an officer authorised by the prescribed authority.
3 The person authorized shall not rent, lend, sell, transfer or otherwise transport the bio-medical wastes without obtaining prior permission of the prescribed authority.
4 Any unauthorised change in personnel, equipment or working conditions as mentioned in the application by the person authorised shall constitute a breach of his authorisation.
5 It is the duty of the authorised person to take prior permission of the prescribed authority to close down the facility and such other terms and conditions may be stipulated by the prescribed authority.

Figure-35: Forms and formats- Bio-medical Waste Mangement Rules 2016: Form-III

Form -IV
(See rule 13)
ANNUAL REPORT

[To be submitted to the prescribed authority on or before 30 June every year for the period from January to December of the preceding year, by the occupier of health care facility (HCF) or Common Bio-medical Waste Treatment Facility (CBWTF)]

Sl. No.	Particulars		
1 .	Particulars of the Occupier	:	
	(I) Name of the authorised person (occupier or operator of facility)	:	
	(ii) Name of HCF or CBWTF	:	
	(iii) Address for Correspondence	:	
	(iv) Address of Facility		
	(v)Tel. No, Fax. No	:	
	(vi) E-mail ID	:	
	(vii) URL of Website		
	(viii) GPS coordinates of HCF or CBWTF		
	(ix) Ownership of HCF or CBWTF	:	(State Government or Private or Semi Govt. or any other)
	(x) Status of Authorisation under the Bio-Medical Waste (Management and Handling) Rules	:	Authorisation No.: ..... valid up to .....
	(xi) Status of Consents under Water Act and Air Act	:	Valid up to:
2.	Type of Health Care Facility	:	
	(i) Bedded Hospital	:	No. of Beds:.....
	(ii) Non-bedded hospital (Clinic or Blood Bank or Clinical Laboratory or Research Institute or Veterinary Hospital or any other)	:	
	(iii) License number and its date of expiry		
3.	Details of CBWTF	:	
	(I) Number healthcare facilities covered by CBWTF	:	
	(ii) No of beds covered by CBWTF	:	
	(iii) Installed treatment and disposal capacity of CBWTF:	:	_____ Kg per day
	(iv) Quantity of biomedical waste treated or disposed by CBWTF	:	_____ Kg/day

4.	Quantity of waste generated or disposed in Kg per annum	:	Yellow category :			
	(on monthly average basis)		Red category :			
			White category :			
			Blue category :			
			General solid waste:			
5	Details of the storage, treatment, transportation, processing and disposal facility					
	(i) Details of the on-site storage facility	:	Size :			
			Capacity :			
			Provision of on-site storage : (cold storage or any other provision)			
	disposal facilities		Type of treatment equipment	No. of units	Capacity Kg/ day	Quantity treated or disposed in kg per annum
			Incinerators Plasma Pyrolysis Autoclaves Microwave Hydroclave Shredder Needle tip cutter or destroyer Sharps encapsulation or concrete pit Deep burial pits Chemical disinfection Any other treatment equipment			
	(iii) Quantity of recyclable wastes sold to authorized recyclers after treatment in kg per annum		Red Category (like plastic, glass etc.)			
	(iv) No of vehicles used for collection and transportation of biomedical waste					
	(v) Details of incineration ash and ETP sludge generated and disposed during the treatment of wastes in Kg per annum			Quantity generated	Where disposed	
			Incineration ash ETP sludge			

	(vi) Name of the Common Bio-medical Waste Treatment Facility Operator through which wastes are disposed of		
	(vii) List of member HCF not handed over bio-medical waste		
6	Do you have bio-medical waste management committee? If yes, attach minutes of the meetings held during the reporting period		
7	Details trainings conducted on BMW		
	(i) Number of trainings conducted on BMW Management		
	(ii) Number of personnel trained		
	(iii) Number of personnel trained at the time of induction		
	(iv) Number of personnel not undergone any training so far		
	(v) Whether standard manual for training is available?		
	(vi) Any other information		
8	Details of the accident occurred during the year		
	(i) Number of accidents occured		
	(ii) Number of the persons affected		
	(iii) Remedial action taken (Please attach details if any)		
	(iv) Any facility occured, details.		
9	Are you meeting the standards of air pollution from the incinerator? How many times in last year could not met the standards?		
	Details of continuous online emission monitoring systems installed		
10	Liquid waste generated and treatment methods in place. How many times you have not met the standards in a year?		
11	Is the disinfection method or sterilization meeting the log 4 standards? How many times you have not met the standards in a year?		
12	Any other relevant information		(Air pollutiion control devices attached with the incinerator)

Certified that the above report is for the period from

……..……

……

Date: Name and Signature of the Head of the Institution

Place :

Figure-36: Forms and formats- Bio-medical Waste Mangement Rules 2016: Form-IV

FORM –V
(See rule 16)
APPLICATION FOR FILING APPEAL AGAINST ORDER PASSED BY THE PRESCRIBED AUTHORITY

1. Name and address of the person applying for appeal :

2. Number, date of order and address of the authority which passed the order, against which appeal is being made (certified copy of order to be attached):

3. Ground on which the appeal is being made:

4. List of enclosures other than the order referred in para 2 against which appeal is being filed:

Signature ……..

Date : Name and Address……..

Joint Secretary to the Government of India

Figure-37: Forms and formats- Bio-medical Waste Mangement Rules 2016: Form-V

6.13 SAFETY PRECAUTIONS

It is the responsibility of management to ensure safety.

The following are safety measures:

- Employee shall be provided with appropriate PPE.
- Training shall be imparted to drivers, collectors and other handlers, on risks and hazards of the hospital waste.
- Services of emergency telephone shall be made available.
- They shall be protected by immunization.
- Different labels for bio-medical waste containers and bags shall be required for identification and safe handling of the waste.

6.14 CODE OF PRACTICE FOR WASTE MANAGEMENT

All personnel working in HCF must be aware of points of generation of waste, types of wastes generated, precautions to be taken in collection, handling, transportation and disposal in their settings. A formal orientation and periodic training needs to be organized for all the staff including new recruits.

Administration

- Display of waste management cell board persons/ sanitary inspectors with phone number shall be displayed at the waste temporary storage area and at the hospital administration premises.
- Provision is made that all the infected waste is treated before its transport.
- All the infected liquid waste shall be mixed with equal amount of 1% hypochlorite for 15 minutes and disposed into the sluice.
- All the waste from isolation departments including general waste is considered as infected waste.
- Records of the waste handling are scrutinized and signed by HCF incharge/ sanitary inspector.

Care of Waste Handlers

- Provision of PPE, available at all the times and are easily accessible.
- They are considered as high risk employees.
- On recruitment, medical checkup and immunization for tetanus, typhoid, Hepatitis B shall be administered and recorded.
- Medical checkup every six monthly.
- Training / re- training regarding waste handling.
- Bathing facilities with soap and hot water.
- Work cloth shall be laundered regularly.
- Adherence to strict reporting of needle stick injuries.
- Practice of strict hand hygiene at all the times, especially before consuming food.

6.15 SPILL MANAGEMENT

Managing spills of blood /body fluid or other infectious materials require stringent measures. Staff must receive periodic training on management of blood/ body fluids spills. A biohazard caution board must be displayed immediately at the spill area. The staff cleaning the spill should ensure that they use the appropriate PPE. Sodium hypochlorite solutions are inexpensive and effective disinfectant solution.

Blood and body fluids spill must be managed by following actions:

- Wear gloves.
- Cover the spill with an absorbent such as newspaper/ tissue paper/ blotting paper/ paper towel.
- Pour freshly prepared 1% sodium hypochlorite solution (bleach) and wait for 30 minutes for contact.
- Discard the absorbent into the red bag.
- Wet mop the area with disinfectant.

Table-30: Contents of blood and body fluid spill kit

Sr. No.	Items	Quantity
1	Gloves	1 Pair
2	Apron (Plastic)	1 No
3	Goggles	1 No
4	Mask	1 No
5	Cap	1 No
6	Red waste bag	1 No
7	Measuring cylinder 1000ml	1 No
8	Measuring cylinder 200ml	1 No
9	Absorbent gauze	05 Pieces
10	Sodium hypochlorite solution 1% freshly prepared	In bottle

Handling of mercury spills

Mercury is a hazardous chemical used in different instruments like thermometers and blood pressure instruments within the HCF. It has to be managed properly to ensure it does not cause harm to the HCW and the community at large.

In the event of any mercury spillage due to breakage of instrument the following measures are to be taken:

Clean-up instructions–mercury spill management

- Remove other things at the mercury spill site and switch off fan.
- Remove ornaments.
- Wear PPE. (mask, cap, gloves, goggles)
- Collect broken glass in paper towel (tissue paper) and put it in zip lock bag. Label it "contaminated with mercury" handle it with care.
- Collect small particles of mercury with card board. If particles are not visible, use torch.
- Collect particles with syringe and drop it in plastic container with water. That container put in zip lock bag and label "contaminated with mercury".
- The material used for cleaning and gloves put in zip lock bag and label it. "contaminated with mercury".
- All bags are handed over to pharmacist in drug store.
- Wash the area with mercury neutralizing agents like 20% calcium sulphide or sodium thiosulphate solution (if the chemicals are available).
- Wash your hands, face and any other areas of your body exposed to the mercury.
- Keep the room well ventilated.

Method of final disposal of mercury: The mercury shall be disposed off by handing over to the appropriate agency.

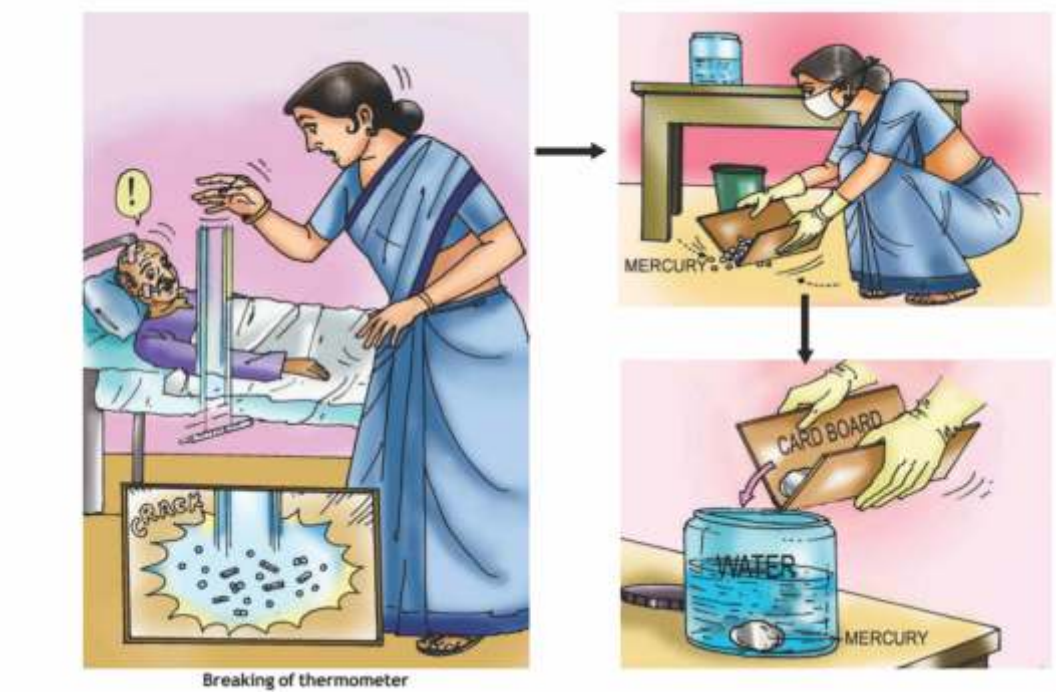


Figure-38: Mercury spills

Table-31: Contents of mercury spill kit

Sr.No.	Items	Quantity
1	Ziplock type plastic covers	5
3	Plastic container with lid that seals.	1
4	Latex gloves	1 pair
5	Tissue paper	10 nos
6	Cardboard strips	5
7	Eyedropper or syringe 10 ml (without needle)	2
8	Disposable apron	1
9	Cap	1
10	Face mask	1
11	Goggles	1
12	Torch	1
12	Label/ sticker	5 nos

Do's

1. Always wear personal protective equipments like gloves and masks while handling mercury spills from breaking of thermometers or leaking blood pressure equipments.
2. Always collect mercury droplets together by using two cardboard pieces.
3. Drop the collected mercury into a bottle having some water. Tightly cover the bottle's lid.
4. Send the bottle containing mercury back to the pharmacist.

Dont's

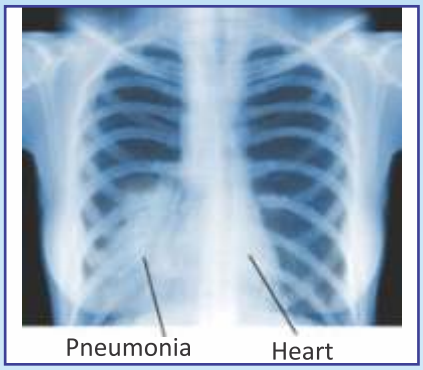
1. Never touch the mercury with bare hands.
2. Never throw the mercury in waste bins or drain.

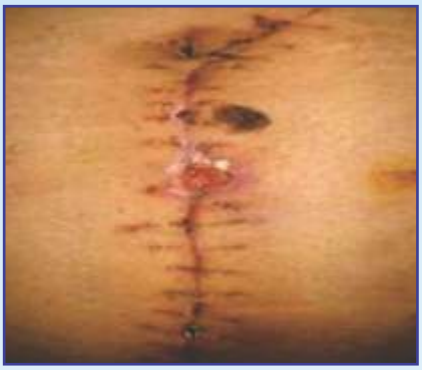
Figure-39: Do's and Dont's of mercury spill

6.16 QUALITY ASSURANCE FOR BIO-MEDICAL WASTE MANAGEMENT

1. Irregularities observed during periodic hospital rounds by the infection control team.
2. Incidence of needle stick injuries.
3. Observations by the Governmental agencies regarding disposal of infectious, chemically toxic or hazardous material.
4. Complaints from public regarding unhygeinic condition/ foul smell from the waste storage area.

Refer Annexure-7: Bio-medical Waste Management Checklist





Section 7

Health Care Associated Infections

7.1 INTRODUCTION

A Health Care Associated Infections (HCAI) is an infection that is not present or incubating at the time of admission to a Health Care Facility (HCF), which is observed during patient hospital stay or after the patients time of discharge. HCAI or nosocomial infection or hospital acquired infection, affect patients in HCF and are not present or incubating at the time of admission. They also include infections acquired by patients in the HCF but appearing after discharge. A clean environment plays an important role in the prevention of HCAI. Many factors, including the design of patient care areas, operating rooms, air quality, water supply, CSSD, laundry etc. can significantly influence the transmission of HCAI.

Most commonly occurring Health Care Associated Infections (HCAI) are:

- Catheter Associated Urinary Tract Infection (CAUTI)
- Ventilator Associated Pneumonia (VAP)
- Central Line Associated Blood Stream Infection (CLABSI)
- Surgical Site Infection (SSI)

Table-32: Surveillance definitions of Health Care Associated Infections (HCAI)

Catheter Associated Urinary Tract Infection (CAUTI)
1. Patient had an indwelling urinary catheter that had been in place for more than 48 hours 2. Patient has at least one of the following signs or symptoms: • fever (>38.0°C or >100.4°F) • suprapubic tenderness • costovertebral angle pain or tenderness • urinary urgency • urinary frequency • dysuria 3. Patient has a urine culture with no more than two species of organisms identified, at least one of which is a bacterium of $\geqslant 10^5$ CFU/ml.
Central Line Associated Blood Stream Infection (CLABSI)
1. Patient has indwelling vascular catheter for more than 48 hours. 2. Fever (>38.0°C or >100.4°F) or hypothermia (<36.5°C or <97.7°F) and/or chills. 3. Positive blood culture, both peripheral venous blood sample and sample drawn through the vascular catheter growing the same organism or Both peripheral venous blood sample and the catheter tip growing the same organism or Single positive blood culture in pediatric patients and is not related to an infection at another site

Ventilator Associated Pneumonia (VAP)

1. Patient mechanically ventilated for more than 48 hours
2. For these patient, at least one of the following:
   - Fever (>38.0°C or >100.4°F).
   - Leukopenia (⩽4000 WBC/mm^3) or leukocytosis (>12,000 WBC/mm^3).
   - For adults >70 years old, altered mental status with no other recognized cause.

   and
3. At least two of the following:
   - 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. O_2 desaturations (e.g., PaO_2/FiO_2 ⩽ 240), increased oxygen requirements or increased ventilator demand).

Imaging evidences

Two or more serial chest imaging test results with at least one of the following:

- New or progressive and persistent infiltrate.
- Consolidation.
- Cavitation.
- Pneumatoceles, in infants ⩽1 year old.

Lab evidence

At least one of the following:

- Organism identified from blood.
- Organism identified from pleural fluid.
- Positive quantitative culture from minimally-contaminated LRT specimen (e.g., BAL or protected specimen brushing).

Surgical Site Infection- SSI

1. Infection occurs within 30 days after operative procedure.
   and
2. Any one of the following:

- Involves only skin and subcutaneous tissue of the incision.
  and
- Patient has at least one of the following:
  - Purulent
  - Superficial incision that is deliberately opened by a surgeon considering it as SSI.

  and
- Patient has at least one of the following signs or symptoms:
  - Pain or tenderness, localized swelling, erythema or heat.

Superficial incisional SSIs are only followed up for a 30 days period for all procedure types.

Surgeries like cardiac, joint replacement, spinal, open reduction fracture, hernioraphy etc. are followed up for a 90-days period

7.2 SURVEILLANCE OF HEALTH CARE ASSOCIATED INFECTIONS

Surveillance of HCAI is the key for successful infection control program. The rates of HCAI serve as indicators of quality and safety of patient care at the HCF.

Surveillance is a process for monitoring specific outcomes of patient care delivery in relation to infection risk factors and infection prevention - control activities. It provides baseline and trend data for use in problem identification, monitoring and for assessment of outcomes related to interventions. It assists in targeting intervention and identifying educational needs.

HCF shall frame specific objectives (for different wards, services, patients etc.). The surveillance programme must report to the hospital administration, preferably through the HICC and shall have separate budget to support its operation.

Objectives of Surveillance

Surveillance is an ongoing process.

Surveillance helps in the following:

- To recognize any unusual level of incidence or outbreak.
- To judge the desirability of introducing special control measures.
- To assess the efficiency of regular preventive measures.
- To provide feedback.
- To reduce the level of preventable infection.
- To establish endemic baseline data.
- To identify highrisk patients.
- To notify and report, all notifiable diseases to the concern authorities.
- To collect accurate and complete epidemiological information on these diseases.
- To ensure prompt and appropriate control measures to prevent the spread of infection.

Surveillance can be **active** or **passive.**

Patient Populations

- Inpatient
- Outpatient
- Health Care Workers (HCW) and volunteers

Types of Surveillance

The optimal surveillance method is dependent on the HCF characteristics, desired objectives, resources available and level of support of the HCF staff,

The common methods of surveillance in hospitalized patients are as follows:

Passive surveillance

- Clinicians suspecting occurrence of HCAI may report this to the ICO of the HIC team. All details regarding the patient, procedures, medication etc. are made available.

- Infections Control Nurse (ICN) examines lab reports daily and discusses it with the Microbiologist.
- She/ He then visits the relevant patients and gathers necessary information. She determines whether it is Health Care Associated Infection (HCAI) and Community Acquired Infection (CAI) which helps in identifying cross infections and outbreaks.

Active surveillance

- Daily visit to all wards and high risk areas.
- ICN has to visit all the wards daily or several times a week and examine records of all clinical infections.

Area specific surveillance

- Focuses on high risk units such as (ICU, SNCU, trauma unit, operation theatre, burns units, surgical unit, oncology, CSSD, dialysis unit etc.)

Data Collection Methods

- Daily and monthly surveillance forms.
- Laboratory reports including the Microbiology laboratory reports.
- Patient records.

Methods for Reporting and Follow-up

- The goal of reporting and follow up is to focus on interventions that will improve patient outcomes.
- "Surveillance" reporting shall be an on-going component of the infection control programme.
- The surveillance activities are appropriately directed towards the identified high risk areas and procedures.

7.3 SURVEILLANCE ACTIVITIES- INFECTION PREVENTION AND CONTROL PROGRAMME (IP AND CP)

Table-33: Surveillance activities- Infection Prevention and Control Programme

Sr. No.	Surveillance activity	Frequency	Method of surveillance
1	Infection control activities surveillance	Daily	Observational checklist based audit
2	Housekeeping surveillance	Daily	Observational checklist based audit
3	PPE adherence surveillance	Monthly	Observational checklist based audit
4	Hand hygiene adherence surveillance	Monthly	Observational checklist based audit based on WHO hand hygeine checklist

Sr. No.	Surveillance activity	Frequency	Method of surveillance
5	Health Care Associated Infection Surveillance • Catheter Associated Urinary Tract Infection (CAUTI) • Ventilator Associated Pneumonia (VAP) • Central Line Associated Blood Stream Infection (CLABSI) • Surgical Site infection (SSI)	Monthly	Observational checklist based audit on CDC guidelines. Ongoing daily active surveillance.
6	Care bundle adherence surveillance	Monthly	Observational checklist based audit
7	Bed sore surveillance	Monthly	Observational checklist based audit
8	Surgical safety checklist adherence surveillance	Monthly	Observational checklist based audit
9	Antibiotic usage monitoring surveillance including the antibiotic prophylaxis and adherence to antibiotic policy	Monthly	Observational checklist based audit
10	MDRO/ MRSA/ VRE surveillance	Monthly	Surveillance based on laboratory reports
11	Sharp Injury and Post Exposure Prophylaxis Surveillance	Monthly	Incident monitoring and active surveillance
12	BMW management surveillance	Monthly	Observational checklist based audit
13	Environmental microbiological surveillance	Monthly	Surveillance based on lab reports
14	Infection control assessment of HCF by audit checklist based on CDC criteria	6 Monthly	Observational checklist based audit
15	Infection control risk assessment for construction activities if needed	SOS	Observational checklist based audit

All the surveillance are checklist based observational audit. The periodic surveillance activities are carried out in all patient care areas including identified high risk areas and procedures. It is conducted at above mentioned frequency and most of the time, active on going surveillance is carried out and passive surveillance is also done from laboratory reports as per the activity. The surveillance system adheres to the National/ International guidelines. Surveillance activities includes the areas of demolition, construction or repair in high risk areas.

Surveillance activities are as follows:

- The collection of surveillance data is an ongoing process. There shall be a system and process in place to collect surveillance data and also ensures that it is captured properly which is standardized checklist based.
- The Infection Control Team (ICT) verifies the data on a regular basis. The data collected is authenticated by ICT by random sampling for process validation. All the serious infection are verified as single case and reported.
- The surveillance activities tracks and analyzes the infection risks, rates and trends which is done on monthly basis and consolidated annual report is made. On the basis of surveillance and its analysis the action is taken accordingly.
- The risk factor analysis is done for bed sore patients, catheterized patients, high risk procedure, post operative patients and post operative infections. The risk adjusted rates are also to be calculated.
- The HCF shall monitor the compliance to the hand hygiene guidelines as a part of surveillance, on monthly basis and sample size is chosen as per categories of staff involved in direct patient care. It also communicates the hand hygiene adherence compliance level with the relevant concerned staff.
- HCF shall capture the occurrence of epidemiologically significant diseases, Multi Drug Resistant Organism (MDRO) and highly virulent infections. It shall monitor the occurrence of MDROs, MRSA etc. and monitors the suspected emergence and spread of infections with these organisms e.g. MRSA screening of the staff for source identification.
- HCF shall monitor the effectiveness of housekeeping as a surveillance activity on regular basis. Daily housekeeping checklist is filled and supervised by the sanitary inspector or incharge HCF.
- Whenever possible, indicators for infection prevention and control shall be expressed as rates while reporting data. Denominators shall vary based on appropriateness and availability (e.g. admissions, discharges, patient days, procedures, device days, at risk days).
- The ICT shall provide reports, feedback to the appropriate personnel, unit, department, service or committee in a timely manner for the issues related to staff and opportunities for improvement including data from other surveillance activities which also provides inputs to reduce HCAI.
- In case of the notifiable diseases the information is sent to the local authorities like Corporation, IDSP- Epidemic Cell, Gandhinagar as per Local/ State/ National laws, rules, regulations and notifications. It is sent as IDSP daily, weekly, monthly report along with line list. The line list includes the individual cases of diseases like malaria, tuberculosis, dengue etc. as per IDSP definitions.

7.4 ENVIRONMENTAL SURVEILLANCE

Operation Theatres

Post fumigation/ fogging both surface contamination and air quality needs to be investigated periodically. Culture swabs and air sampling plates can be sent from operation theatres periodically, at least once in a month. Fogging is also done after completion of any civil or engineering work. **Refer Section 4.5**

Parameter	Compliance
Surface swabs	Once in amonth
Air Sampling	Once in a month

Records are kept with nursing incharge OT and the results are discussed in HICC meetings. In case of unacceptable results, decisions on corrective measures are taken by HICC.

7.5 INTENSIVE CARE UNITS AND WARDS

Monitoring of device associated infections needs to be done on regular basis. The basic indicators required to be monitored are HCAI indicators **refer section 7.1 and 7.10.** Regular active surveillance with the laboratory based surveillance is recommended. Analyses of data are presented at the subsequent HICC meeting. Records are maintained by ICN.

Active surveillance is recommended whenever clustering of positive cultures from cases are seen in the laboratory. Sampling shall be done in consultation with ICO and clinicians by ICN .

7.6 FOOD HANDLERS

Screening of food handlers is recommended every six monthly. Samples include stool samples for ova, cyst and cultures for typhoid carriers. Records are to be maintained by the dietician and ICN. Also food handlers needs to be vaccinated against Typhoid and Hepatitis A apart from Hepatitis B and Tetanus.

7.7 DRINKING WATER

The HCF must provide clean potable water for drinking purposes at all points of use. Water storage tanks shall be cleaned once in 3 months and the same is documented. Water coolers must be kept clean and covered all the times. Follow the manufacturer's instructions for maintenance of the water filters/ coolers. Potable water surveillance is routinely carried out for microbiological and chemical analysis in laboratory from patient care units, hospital kitchen, public drinking water outlets, once in 3 months. If it is dialysis water, monthly microbiological and chemical analysis including the endotoxin level is to be done.

7.8 HAND HYGIENE

Regular training on hand hygiene practices for doctors, nurses, paramedicals and housekeeping staff shall be imparted and the compliance to hand hygiene practices needs to be monitored. Availibility of hand rubs, soaps, single use towels/ tissue paper and water shall be ensured.

7.9 ENGINEERING CONTROLS

Premises / Buildings

Hospital design and planning shall ensure:

- Adequate safe water supply.
- Appropriate cleaning practices.
- Adequate floor space for beds, adequate inter bed space etc.
- Adequate hand washing facilities.
- Adequate ventilation for isolation rooms and high risk areas like operation theatres, intensive care areas etc.
- Adequate isolation facilities for airborne, droplet, contact isolation and protective environment.
- Regulation of traffic flow to minimize exposure of high risk patients and facilitate patient transport.
- Measures to prevent exposure of patients to fungal spores during civil or engineering work.
- Precautions to control rodents, pests and other vectors.
- Appropriate bio-medical waste management facilities and practices.

General Engineering Controls

- Engineering personnel shall report to the ward sister prior to commence the work in a patient's room or area and follow her directions with regard to standard precautions.
- Engineering employees shall maintain a neat and clean appearance at all the times. Personel hygiene such as hand washing after using toilet facilities etc. shall be observed. All engineering personnel must be aware of the universal precautions.
- Prior to entry in areas requiring sterile attire such as the OT, engineering employees shall wear the prescribed PPE. Engineering personnel shall check in and out with the permission of the supervisor.
- Hand washing shall be followed before and after leaving the patient care area.
- Maintenance and services of machineries and equipments shall be done routinely. The maintenance also includes the breakdown of the equipments and its repair.
- Air Conditioners (AC) and suction points shall be checked, cleaned and repaired on a routine basis.
- Preventive maintenance of all OT equipments are to be carried out regularly.

Plumbing Job Guidelines

- Hospital water supply systems shall not be connected with any other piping system or fixtures that could allow contamination without the use of adequate air gaps or approved back flow preventers or vacuum breakers.
- When repairing faulty drains, wear rubber gloves.
- When working in main sewer lines or when exposed to gross contaminated wastes, wear rubber boots and rubber gloves.
- After exposure to sewer lines or gross contaminated waste, clean and wash exposed areas of the body with soap and water. Change uniform, if necessary. Do not return to patient care areas before cleaning up.

Physical Barriers between Repair Areas and Patient Care Facilities

- When any construction or repair work is carried out in patient care areas, the supervisors must inform the medical superintendent /concerned authorities, who will inform the heads of the concerned departments, so that patient may be shifted, if required.
- When work is carried out in areas where immunocompromised patients are located or that requires a sterile atmosphere, adequate physical barriers must be present to prevent the spread of fungus and other such microbes, through dust and debris generated.
- All areas that require a sterile atmosphere must be fumigated before use following the construction work.

Air Conditioning and Ventilation Systems

Air conditioning ventilation systems are designed and maintained to minimize microbial contamination.

The air conditioning and ventilation systems of high risk areas like OT, ICU etc. are categorized as follows:

Operation theatres

Operation theatres have been divided into groups:

- **Super specialty OT:** Super specialty OT means operation theatres for neurosciences, orthopaedics (joint replacement), cardiothoracic and transplant surgery (renal, liver etc.).
- **General OT:** This includes operation theatres for ophthalmology, district hospital OTs, FRU OT and all other basic surgical disciplines.
- **Day care centre:** Day care surgery is the admission of selected patients to the HCF for a planned surgical procedure, returning home on the same day. It falls under the category of General OT.

The following criteria are to be considered while designing the system :

- **Occupancy:** Standard occupancy of 5-8 persons at any given point of time inside the OT is considered.
- **Equipment load:** Standard equipment load of 5-7 kW and lighting load of 1 kW to be considered per OT. For super speciality OT the equipment load can be taken as 7 – 9 kW.
- **Ambient temperature and humidity**: At each location to be considered while designing the system.

Requirements – Super Specialty OT

Air changes per hour:

- Minimum total air changes shall be 20 based on International guidelines although the same will vary with biological load and the location.
- The fresh air component of the air change is required to be minimum 4 air changes out of total minimum 20 air changes.
- 100% outdoor ventilation air systems are not mandatory.
- If HCF chooses to have 100% fresh air system than appropriate energy saving devices like heat recovery wheel, run around pipes etc. shall be installed.
- The supply and return air ducts must be of non-corrosive material.
- No internal insulation or acoustic lining must be done on ducts as they can become breeding grounds.

Air velocity:

The vertical down flow of air coming out of the diffusers shall be able to carry bacteria carrying particle load away from the operating table. The airflow needs to be unidirectional and downwards on the OT table. The air face velocity of 25-35 FPM (Feet Per Minute) from non-aspirating unidirectional laminar flow diffuser/ ceiling array is recommended.

Positive pressure:

There is a requirement to maintain positive pressure differential between OT and adjoining areas to prevent outside air entry into the OT. Positive pressure needs to be maintained in OT at all the times (operational and non-operational hours).

Laminar flow boxes/diffusers shall be installed in the OT for supplying majority air and also majority return air shall be picked up at 75-150 mm above the floor level. The minimum positive pressure recommended is 2.5 Pascal (0.01 inches of water).

Outdoor air intakes: The location of outdoor air intake for an Air Handling Unit (AHU) must not be located near potential contaminated sources like DG exhaust hoods, lab exhaust vents, vehicle parking area.

Air handling in the OT including air quality: Air is supplied through terminal High Efficiency Particulate Arrester (HEPA) filters in the ceiling .The HEPA can be at AHU level if it is not feasible at terminal level inside OT. The minimum size of the filtration area shall extend one feet on each side of the OT table to cover the entire OT table and the surgical team. The minimum supply air volume to the OT in Cubic Feet per Minutes (CFM) shall be compliant with the desired minimum air change.

Air filtration : The AHU must be an air purification unit and air filtration unit. There must be 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. The necessary service panels needs to be provided for servicing the filters, motors and blowers. HEPA filters of efficiency 99.97% down to 0.3 microns or higher efficiency are to be provided.

Temperature and Relative Humidity (RH) for Super Specialty OT: It shall be maintained 21° C +/- 3°C (except for Ortho for Joints replacement as 18° C +/-2° C) with corresponding RH between 20 to 60% though the ideal RH is considered to be 55%. Appropriate devices to monitor and display these conditions inside the OT may be installed.

Requirements – General OT

Air change per hour:

- Minimum total air changes shall be 20 based on International guidelines although the same will vary with biological load and the location.
- The fresh air component of the air change is required to be minimum 4 air changes out of total minimum 20 air changes.

Air velocity : shall be same as per superspeciality OT.

Positive pressure : There is a requirement to maintain positive pressure differential between OT and adjoining areas to prevent outside air entry into the OT. The minimum positive pressure recommended is 2.5 Pascal (0.01 inches of water).

Air handling/filtration: It shall be same as previous. When not possible, the OTs shall be well ventilated with 2 levels of filtrations with efficiencies as specified previously (pre and micro vee filters shall be in position at the AHU).

Temperature and Relative Humidity (RH): The temperature shall be maintained at 21° C +/- 3° C inside the OT all the times with corresponding relative humidity between 20 to 60%. Appropriate devices to monitor and display these conditions inside the OT may be installed.

Design Considerations for Planning New Operation Theatres

OT construction:

- The AHU of each OT shall be dedicated one and shall not be linked to air conditioning of any other area for all OT constructed.
- Window and split AC shall not be used in any type of OT because they are pure recirculating units and have convenient pockets for microbial growth which cannot be sealed.
- Paint with antibacterial and or anti-fungal.
- OT door – automatic/ hermitically sealed/ touch free (preferable).
- General lights – clean room lights.
- Provision of safety against static charge.
- Separate power circuit for equipment like laser.
- The anti-static flooring, walls and ceiling shall be non-porous, smooth, seamless without corners (coving) and shall be easily cleanable repeatedly. The material shall be chosen accordingly.

Anti-static flooring – seamless, including skirting, shall not be of porous stone as it absorbs moisture and could be a source of bio-burden.

Maintenance of the System

During the non-functional hours AHU blower will be operational round the clock (may be without temperature control). Variable Frequency Devices (VFD) may be used to conserve energy. Air changes can be reduced to 25% during non-operating hours through VFD provided positive pressure relationship is not disturbed during such period.

Validation of system to be done as per ISO 14664 standards and shall include:

- Temperature and humidity check.
- Air particulate count.
- Air change rate calculation.
- Air velocity at outlet of terminal filtration unit / filters.
- Pressure differential levels of the OT with respect to ambient / adjoining areas.
- Validation of HEPA filters by appropriate tests like DOP (Dispersed Oil Particulate) / POA (Poly Alpha Olefin) etc., repeat after 6 months in case HEPA filters found healthy.

Preventive maintenance of the system

It is recommended that periodic preventive maintenance shall be carried out in terms of cleaning of pre filters, micro vee at the interval of 15 days. Preventive maintenance of all the parts of AHU is carried out as per manufacturer's recommendations.

Requirements – Other High Risk Areas like ICU

A protective environment may be required for intensive care due to the level of immunosuppression of the patients. To minimize airborne particles, air must be circulated into the room with a velocity of at least 0.25m/sec through a HEPA filter. The HEPA filter removes particles to a certain defined size. If particles 0.3 microns in diameter are removed, the air entering the room can be classified as being clean and free of bacterial contamination.

Requirements – Areas like Isolation Rooms

- Airborne infection isolation requires particulate respirator. e.g. N95 to be worn and use of a negative pressure isolation room.
- Place patient in a single room that has a monitored negative airflow pressure and it is often referred to as "negative pressure room".

Negative pressure room:

This is a term used for an isolation area which receives many Air Changes per Hour (ACH) (preferably >12 ACH) and is under negative pressure. In other words, the direction of the air flow is from the outside adjacent space (e.g. the corridor) into the room. If the HCF does not have negative pressure room, ventilation system shall provide, a means to discharge air from the room to the outside, such as an exhaust fan.

- The air shall be discharged to the outdoors or specially filtered through a HEPA filter before it is circulated to other areas of the HCF.
- Limit the movement and transport of the patient from the room for essential purposes only. If transport is necessary, minimize spread of droplet nuclei by masking the patient.
- Keep isolation room doors closed.

7.10 QUALITY ASSURANCE FOR SURVEILLANCE OF HEALTH CARE ASSOCIATED INFECTIONS(HCAI)

Key Performance Indicators/ Quality Indicators for HCAI are:

- Catheter Associated Urinary Tract Infection - CAUTI rate.
- Ventilator Associated Pneumonia - VAP rate.
- Central Line Associated Blood Stream Infection - CLABSI Rate.
- Surgical Site Infection- SSI rate.
- Incidence of needle stick injuries.
- Incidence of blood and body fluid exposures.
- Hand Hygiene compliance rate.
- Peripheral Line Associated Blood Stream Infection (PLABSI)- Thrombophlebitis Rate.
- MDRO infection surveillance .
- Vaccination monthly monitoring- pre and post exposure both.
- Percentage of cases who received appropriate prophylactic antibiotic within the specified time frame.
- Antibiotic usage monitoring surveillance including the antibiotic prophylaxis and adherence to antibiotic policy.
- PPE adherence rate.

Out of these 13 indicators minimum essential indicators to be captured are indicator no. 1 to 7

Refer Annexure 8 to 15 for Quality Indicator Forms

Section 8

Rational Use of Antibiotics in a Healthcare Facility

8.1 INTRODUCTION

Antimicrobial agents include antibacterial, antifungal agents and antivirals. Antimicrobial agents can be used either orally, systemically or topically and can be used as a prophylaxis or as treatment. Antimicrobial resistance (AMR) has emerged as a public health problem all over the world. Infections caused by resistant microbes fail to respond to treatment, resulting increased Average Length of Stay (ALOS), cost of therapy, morbidity, mortality and increased risk of transmission of infection in the community.

Antimicrobial Resistance in Health Care Associated Infections (HCAI)

Antimicrobial resistance in pathogens causing important infectious diseases is a matter of great public health concern globally, as well as in India. A major factor responsible for this is the widespread use and availability of practically all antimicrobials over the counter for human as well as animal consumption.

AMR has assumed greater importance in Health Care Facility (HCF). The presence of compromised individuals in an environment with a variety of infectious agents which are continuously under heavy antibiotics pressure results in the emergence and spread of resistant organisms to other patients by cross-infection leading to increased ALOS, cost of therapy, morbidity, mortality and increased risk of transmission of infection in the community.

Strategies to prevent the emergence and spread of health care associated antimicrobial resistant organisms are essential. An effective strategy to limit the effect of multidrug resistance must be multifaceted and must include the education of patients and consultants about appropriate drug, dose, duration and use of effective infection control practices to prevent transmission from infected to uninfected patients. Surveillance of antimicrobial resistance and antimicrobial use and improved use of immunization.

8.2 STRATEGIES FOR MANAGEMENT ANTIMICROBIAL RESISTANCE

Strategic objectives

- To develop a system to recognize and report trends in antimicrobial resistance within the HCF.
- To develop a system to rapidly detect and report resistant microorganisms in individual patients and ensure prompt treatment.
- To assure increased adherence to basic infection prevention and control policies and procedures.
- To incorporate the detection, prevention and control of antimicrobial resistance into HCF's strategic goals and provide the required resources.
- To establish policy and practices for rational use of antimicrobials.

Strategic Approaches

- Optimizing the choice, dose and duration of empiric therapy, developing and implementing an antibiotic policy and Standard Treatment Guidelines (STG) and antimicrobial stewardship.
- Optimizing antimicrobial prophylaxis for operative procedures.
- Monitoring and providing feedback regarding antibiotic resistance.
- Improving antimicrobial prescribing by educational and administrative means.
- To achieve these, a comprehensive approach through a HCF policy on the rational use of antibiotics is essential.

8.3 ANTIBIOTIC POLICY

The primary aim of the HCF antibiotic policy is to minimize the morbidity and mortality due to antimicrobial resistant infection and to preserve the effectiveness of antimicrobial agents in the treatment and prevention of communicable diseases.

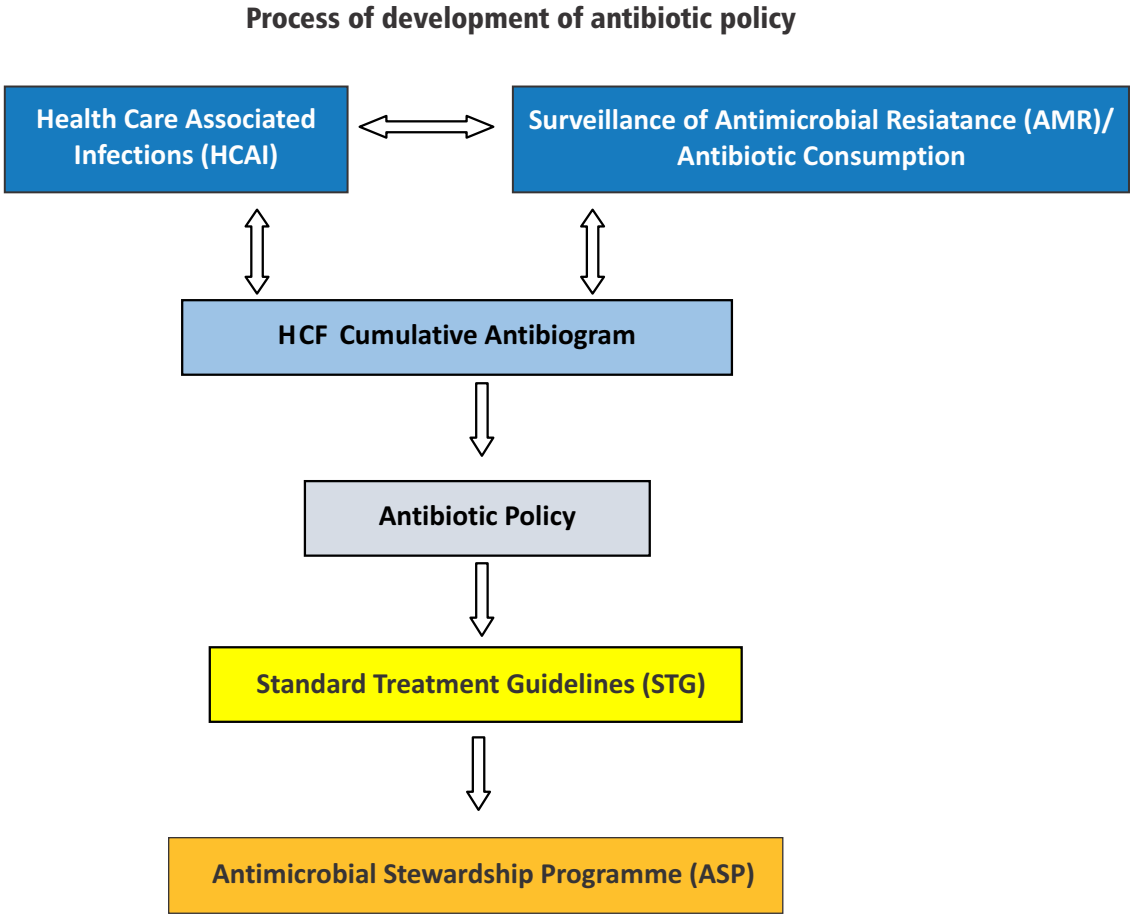


Figure-40: Process of development of antibiotic policy

Scope of Health Care Facility Antibiotic Policy

The antibiotic policy is essential for prophylaxis, empirical and definitive therapy. The policy shall incorporate specific recommendations for the treatment of different high risk/ special groups such as immunocompromised hosts and HCAI.

The health care facility antibiotic policy shall be based upon:

- Spectrum of antibiotic activity.
- Pharmacokinetics/ pharmacodynamics of these antibiotics.
- Adverse effects.
- Potential to develop resistance.
- Cost.
- Special needs of individual patient groups.

It shall also set the levels for prescribing antibiotics for example, first choice antibiotics can be prescribed by all doctors, while restricted choice antibiotics can only be prescribed after consulting the ICO. Reserve antibiotics, on the other hand, are prescribed only by the designated experts.

Development of Antibiotic Policy

Establish a Pharmaco Therapeutic Committee (PTC) to draft antibiotic policy

An efficient antibiotic policy in a HCF shall demand from the top management, their full commitment as well as their total support to the development and implementation of this policy. To develop an antibiotic policy, each HCF shall establish a PTC.

The team's step by step approach for development and implementation of antibiotic policy and STG shall include developing an antibiotic policy, monitoring the implementation of the antibiotic policy, receiving feedback, assessing outcome, discussion with clinicians and conduct a revision of the policy every year based on the experience of the prescribers and the antimicrobial susceptibility profiles.

The group developing the antibiotic policy shall be a multidisciplinary group with 6–10 members with expertise and experience in different subjects (usually Infectious Diseases, Medicine, Surgery, Pediatrics, Clinical Microbiology, Pharmacology and Hospital Pharmacy).

Review the available antibiotic policies and evidences

The available evidence based antibiotic policy from other institutes or the national policy if formulated, may be reviewed and if appropriate, adapted to suit local circumstances.

Draft the antibiotic policy based upon available evidence

The policy shall be based on a systematic review of scientific evidence which would minimize the risk of bias. When robust evidence is not available, a hybrid of a varying degree of evidence and expert opinion may contribute to develop antibiotic policy.

Attributes of antibiotic policy

The policy shall be simple, clear, clinically relevant, flexible, applicable for day to day practice and available in a user-friendly format. **The following are the attributes:**

- The recommended antibiotic shall be effective against pathogens often seen in that locality.
- Recommendations shall be provided for optimal selection, dosage, route of administration, duration, alternatives for allergy to first line agents and for adjusted dosage for patients with impaired liver or renal functions.
- Recommendation for prophylactic use shall specify procedures for which antibiotics are needed, optimal agents, dosage, timing, route and duration of administration, so that adequate antibiotic concentrations are available at the time of bacterial contamination.
- Prophylaxis recommendation shall mainly focus on clean as well as contaminated procedures. The prophylactic dose is recommended for a short duration, it shall be free of side effects and shall be relatively cheap. Also, the antibiotics selected for prophylaxis shall not be used therapeutically, as this may lead to emergence of antimicrobial resistance.

Monitoring and review of the antibiotic policy

The PTC shall review the antibiotic policy. Policy is not static. It is a living document. It shall be reviewed at periodic intervals, updated according to current medical knowledge, clinical practice and local circumstances.

Preparation of antibiotic policy at Health Care Facility (HCF)

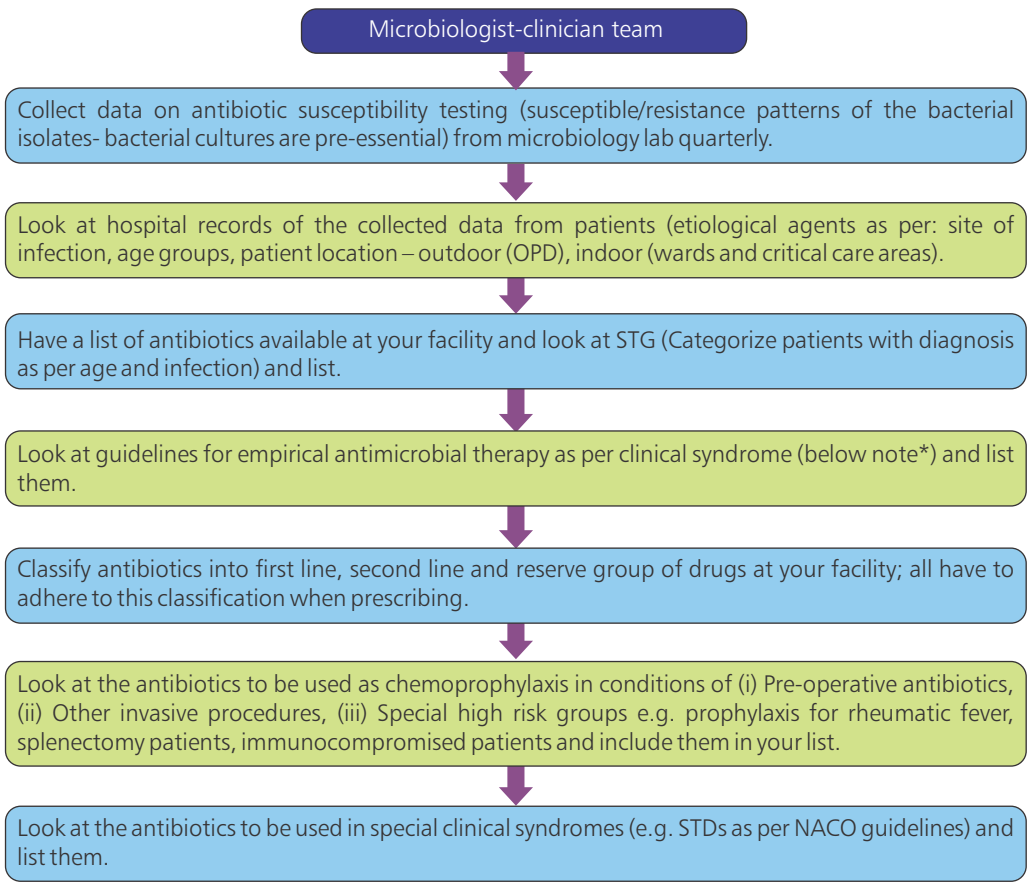


Figure-41: Preparation of antibiotic policy at Health Care Facility (HCF)

*Note: Empirical (starting) antibiotic therapy has to be based on the antibiotic policy

8.4 SURVEILLANCE OF ANTIMICROBIAL RESISTANCE

The purpose of AMR surveillance is to monitor antimicrobial susceptibility patterns of microorganisms so as to provide reliable data that can be utilized by the policy makers or health administrators to review and revise the recommendations for empirical treatment for community or HCAI. In addition, information on emerging and increasing AMR obtained from continuous surveillance will alert both clinician and health authorities, raise awareness and generate a common commitment to systematically combat the AMR crisis.

The antibiotic policy shall depend heavily on surveillance of antimicrobial resistance and antibiotic consumption in any setting. Hence, it is mandatory to establish an efficient surveillance system.

Antimicrobial resistance surveillance data will help to formulate, monitor and identify the prevailing and emerging problem, which can be solved by effective strategies.

The following features must be considered while establishing a antimicrobial resistance surveillance mechanism:

a. Use standards

Laboratories shall adopt the standards for antimicrobial susceptibility testing like CLSI, EUCAST etc. for detection and reporting of antimicrobial resistance. It is preferable if the laboratory test the antimicrobial susceptibility by Minimum Inhibitory Concentration (MIC) method, as it detects the emerging resistance and the decreased susceptibility.

b. Generate reliable numerator

It is crucial to avoid including duplicate results since a patient may have either consecutive cultures obtained from the same body site or cultures from different body sites yielding the same organism (e.g. urine and blood culture). Therefore, only the first positive culture from the patient for each disease episode shall be reported for surveillance purposes. This will be the reliable numerator for the antimicrobial resistance surveillance.

c. Express resistance as incidence rate

It is important to express antimicrobial resistance rates as incidence rates within a defined human population instead of using the number of isolates tested as denominators. This is imperative because the submission of microbiology specimens to the laboratory is inconsistent and varies broadly. In HCF, it is recommended to use the number of admissions and the number of days of hospitalization, which are particularly useful for inter or intra HCF comparison.

d. Participate in External Quality Assurance Schemes (EQAS)

The validity and reliability of laboratory surveillance data is deemed acceptable only when the clinical laboratories providing data for the surveillance program, participates in pertinent training and proficiency testing - EQAS programmes with good performance.

The other considerations for an effective antimicrobial resistance surveillance include:

- Clinical microbiologists shall be trained in health care epidemiology.
- The choice of microorganisms and antimicrobials to survey shall be based on their relative public health importance, using criteria such as expected numbers of cases, severity of the infectious disease as measured by its mortality rate and case fatality ratio, costs of such infections and preventability.
- Microbiologists shall collect not only laboratory data but also the clinical data that is often missing from surveillance reports.

8.5 SURVEILLANCE OF ANTIMICROBIAL CONSUMPTION

It is essential to have surveillance data on antibiotic use/consumption in the HCF. This is an indispensable tool in the strategy to contain antimicrobial resistance. Hence it is must that all the HCF shall generate a valid data on antibiotic prescriptions and usage to evaluate rational use of the antibiotic prescription. The same shall be circulated among treating consultants to formulate antibiotic policy and STG.

8.6 ANTIBIOGRAM

The surveillance for antimicrobial resistance/ antibiotic consumption and preparation of cumulative antibiogram helps in clinical decision making, design infection control interventions and antimicrobial resistance containment strategies.

Attributes of Cumulative Antibiogram

The major attributes of a reliable cumulative antibiogram includes:

- Analysis/ presentation of data regularly, at least annually.
- Inclusion of only final and verified results.
- Inclusion of only species with at least $\geq$ 30 isolates tested.
- Inclusion of diagnostic isolates only.
- Information only on drugs routinely tested.
- Inclusion of the first isolate per patient in the period analysed, irrespective of the body site from which the specimen was obtained or the antimicrobial susceptibility pattern.
- Calculation of the percentage susceptibility.
- Avoid the presentation of potentially misleading or confusing data.
- Utilizing statistical tools to analyse the data.
- Undertaking data stratification to encourage optimal antimicrobial therapy based on specimen type, infection site, clinical unit, site of care, organism's resistance and patient population.
- Reviewing the cumulative antibiogram data if clinical failure occurs after empiric therapy and the trend has to be followed.
- Ensuring the quality of the cumulative antibiogram.
- When comparing the cumulative antibiogram with National data, care must be taken to ensure that there is no variation in the drug panels of the comparing antibiograms.

Examples of antibiogram

Table-34: Blood stream infections - ICU antibiogram
Total isolates=129

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
Candida species	22	Voriconazole 100%, Fluconazole
Klebsiella species	21	Imipenem 96%, Amikacin 93%, Levofloxacin 89%, Chloramphenicol 85%, Ciprofloxacin 78%, Piperacillin Tazobactum 78%, Amoxycillin-Clavulanic acid 70%.
Acinetobacter	8	Imipenem 100%, Levofloxacin 90%, Amikacin 60%, Piperacillin 60%, Ceftazidime 60%, Piperacillin-Tazobactum 60%
Staphylococcus aureus	7	Linezolid 100%, Chloramphenicol 100%, Tetracycline 89%, Doxycycline 89%, Cotrimoxazole 67%, Gentamycin 56%, Amoxycillin-Clavulanic acid 44%
Enterococcus	7	Vancomycin 100%, Linezolid 100%, Gentamycin 44%, Penicillin 33%, Ampicillin 33%

Table-35: Blood stream infections - IPD antibiogram
Total isolates=11

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
Staphylococcus aureus	27	Vanomycin 100%. Linezolid 100%, Tetracycline 100, Doxycycline 100%, Chlorempheniol 100%, Gentamycin 67 %, Amoxycillin-clavulanic acid 67%, Clindamycin 67%
E. coli	27	Imipenem 100%, Amikacin 100%, Levofloxacin 100%, Chloramphenicol 100%, Piperacillin-Tazobactum 100%, Amoxycillin-Clavulanic acid 100%, Gentamycin 100%
Salmonella typhi	9	Sensitive to all antibiotics

Table-36: Urinary tract infections- ICU antibiogram
Total isolates=52

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
E. coli	37	Imipenem 100%, Nitrofurantoin 95%, Amikacin 89%, Gentamycin/ Tobramycin 84%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 74%, Levofloxacin 58%
Klebsiella pneumoniae	19	Imipenem 100%, Amikacin 80%, Gentamycin/ Tobramycin 80%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 50%, Levofloxacin 50%
Enterococcus	12	Vancomycin 100%, Linezolid 100%, Nitrofurantoin 67%, Penicillin 50%, Ampicillin 50%
Enterobacter species	6	Imipenem 100%, Nitrofurantoin 67%, Levofloxacin 67%, Ciprofloxacin 67%, Tetracycline 67%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 33%, Amikacin 33%

Table-37: Urinary tract infections- IPD antibiogram
Total isolates= 119

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
E. coli	55	Imipenem 98%, Nitrofurantoin 97%, Amikacin 92%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 70%,Gentamycin/ Tobramycin 67%, Levofloxacin 35%
Klebsiella pneumoniae	11	Imipenem 100%, Amikacin 85%, Gentamycin/ Tobramycin 69%, Levofloxacin 54%, Tetracycline 54%, Nitrofurantoin 46%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 38%,
Enterococcus	10	Vancomycin 100%, Linezolid 100%, Nitrofurantoin 92%, Ampicillin 50%, Penicillin 25%, Gentamycin 33%
Pseudomonas aeruginosa	6	Imipenem 86%, Piperacillin-Tazobactum 86%, Piperacillin 71%, Ceftazidime 71%, Levofloxacin 43%, Amikacin 43%

Table-38: Urinary tract infections- OPD antibiogram
Total isolates= 80

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
E. coli	56	Imipenem 100%, Amikacin 98%, Nitrofurantoin 96%, Gentamycin/ Tobramycin 84%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 76%, Levofloxacin 56%, Tetracycline 58%, Cotrimoxazole 47%
Pseudomonas aeruginosa	13	Imipenem 100%, Amikacin 100%, Piperacillin-Tazobactum 100%, Piperacillin 90%, Ceftazidime 90%, Levofloxacin 60%, Ciprofloxacin 60%
Klebsiella pneumoniae	11	Imipenem 100%, Amikacin 89%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 67%, Gentamycin/ Tobramycin 67%, levofloxacin 56%

Table-39: Skin and soft tissue infections- ICU antibiogram
Total isolates=139

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
E coli	23	Imipenem 100%, Amikacin 84%, Chloramphenicol 75%, Cotrimoxazole 69%, Gentamycin/ Tobramycin 69%, Piperacillin-Tazobactum /Amoxycillin-Clavulanic acid 47%, Levofloxacin 44%
Staphylococcus aureus	18	Linezolid 100%, Tetracycline 100, Doxycycline 100%, Chloramphenicol 96%, Gentamycin/ Tobramycin 92%, Clindamycin 88%, Amoxycillin-Clavulanic acid 76%, Erythromycin 68%
Enterococci	9	Vancomycin 100%, Linezolid 100%, Ampicillin 69%, Penicillin 62%, Gentamycin 54%
Acinetobacter	9	Imipenem 50%, Levofloxacin 50%, Tetracycline 50%, Cotrimoxazole 33%, Amikacin 33%,Gentamycin/ Tobramycin 33%, Ceftazidime 33%, Piperacillin 25%, Piperacillin-Tazobactum 25%

Table-40: Skin and soft tissue infections- IPD antibiogram
Total isolates=820

Most Common Organism	Prevalence %	Antibiotic Sensitivity (%)
Staphylococcus aureus	21	Linezolid 100%, Chloramphenicol 95%, Tetracycline 94%, Doxycycline 94%, Gentamycin/ Tobramycin 83%, Clindamycin 77%, Cotrimoxazole 64%, Amoxycillin-Clavulanic acid 59%, Erythromycin 53%
E coli	16	Imipenem 100%, Amikacin 89%, Piperacillin-Tazobactum/ Amoxycillin-Clavulanic acid 59%, Chloramphenicol 40%, Gentamycin/Tobramycin 37%, Levofloxacin 30%,
Pseudomonas aeruginosa	16	Imipenem 96%, Piperacillin-Tazobactum 77%, Ceftazidime 70%, Amikacin 70%, Levofloxacin 64%, Piperacillin 63%, Ciprofloxacin 60%, Gentamycin/ Tobramycin 57%,
Enterobacter	11	Imipenem 99%, Chloramphenicol 76%, Amikacin 75%, Levofloxacin 74%, Tetracycline 67%,Gentamycin/Tobramycin 62%, Ciprofloxacin 60%

8.7 GOOD ANTIBIOTIC PRACTICES

Antibiotics are essential treatments for serious infections. They are one of the most important and valuable discoveries of modern medicine. However, administration of antibiotics can lead to the selection of antibiotic resistant organisms including Methicillin Resistant Staphylococcus Aureus (MRSA) and VRE, MDRO GNB etc. The AMR can be transmitted in the HCF and outside in the community.

Antibiotics shall be judiciously used for each patient. Antibiotics usage shall be monitored for checking the sensitivity pattern amongst microorganisms. Microbiology department shall generate a report on sensitivity pattern of microorganisms towards antibiotics and this report shall be circulated to all clinicians annually.

Clinicians shall follow the antibiotic sensitivity report and recommendation circulated by Microbiology department for prescribing antibiotics. The copy of the report shall also be sent to the pharmacy. Pharmacy shall monitor the dispensing of antibiotics and keep a record of antibiotics usage. Any discrepancy in usage with the report generated by microbiology department shall be brought in to the notice of HICC. HICC shall monitor the implementation of this policy and rational use of antibiotics.

An effective strategy to contain the spread of AMR must be multifaceted and must include the education of patients and clinicians about appropriate drug, dose and duration, use of effective infection prevention and control practices to prevent transmission from infected to uninfected patients, surveillance of antimicrobial resistance and its use and improved use of immunization.

8.8 DEVELOPMENT OF STANDARD TREATMENT GUIDELINES (STG)

Effective STG improves patient care. The use of the STG can be an effective means of changing behavior, hence the STG shall be readily adaptable for local implementation. STG shall be prepared for all clinical departments for various treatment and procedures.

8.9 STRATEGIES FOR PROMOTING RATIONAL ANTIBIOTIC PRESCRIPTION

Prescription Auditing

Prescription auditing is an indispensable and effective tool to monitor antimicrobial prescription practices. If properly done, it can help treating clinicians to improve their antimicrobial prescription skills and help an organization to adhere to, monitor and improve compliance to antibiotic policy.

Prescription auditing can be done by a team of physician, infectious diseases specialists, clinical microbiologists and pharmacologists depending on their availability in the HCF.

Prescription auditing structure and process

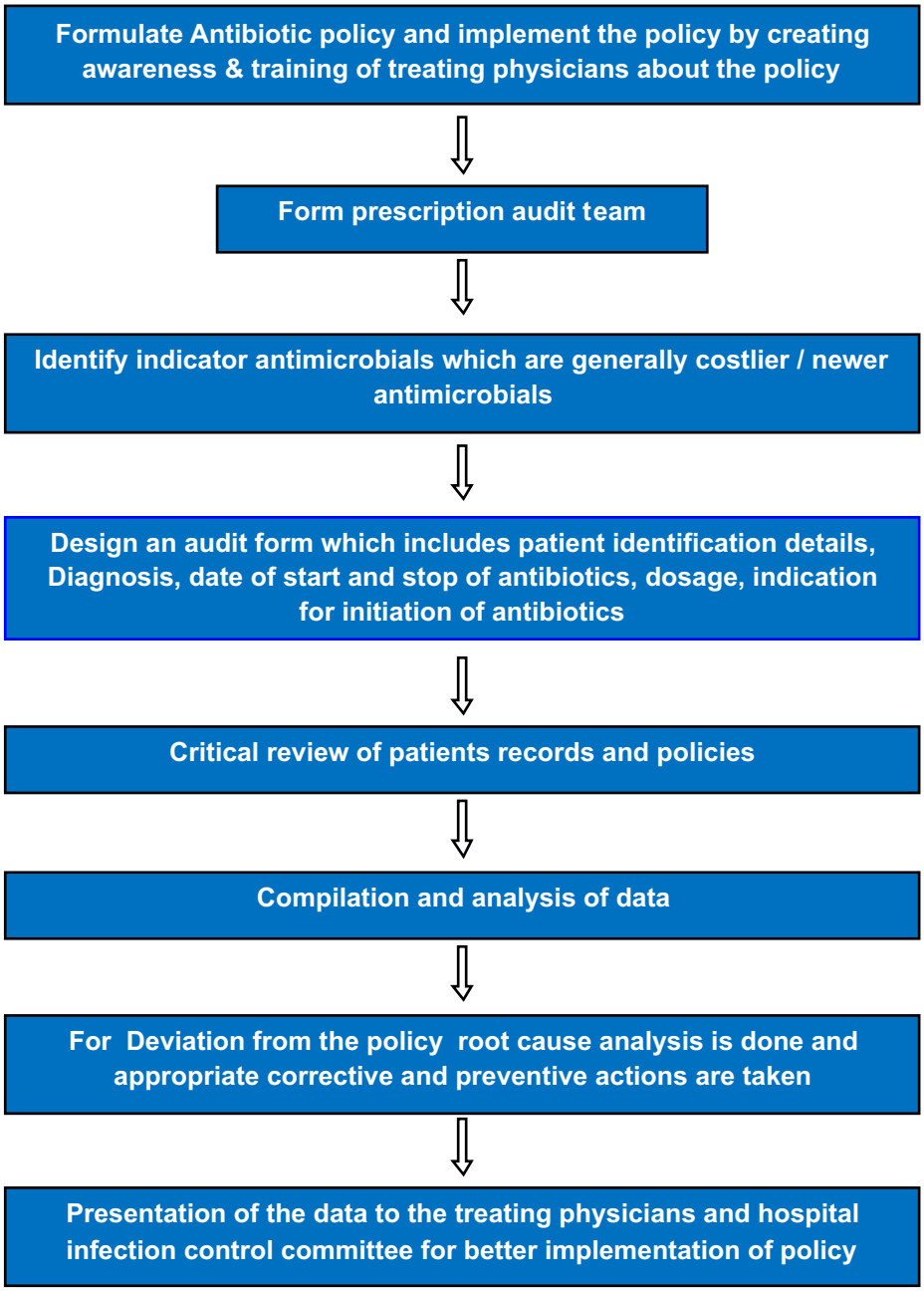


Figure-42: Prescription auditing structure and process

8.10 GENERAL PRINCIPLES FOR GOOD ANTIMICROBIAL PRESCRIPTION

- **Send for appropriate microbiology cultures** if suspecting an infection
- Start the **antibiotic after sending** appropriate cultures.
- **Take help from Microbiology lab and Microbiologist:** Rapid tests such as Gram stains guide therapeutic choices when empiric therapy (at start) is required.
- **Change the antibiotic** depending on the culture report received after. **Step down/ Narrow down** / **De-escalate** if growth is sensitive to a lower antibiotic.
- **Check with the availability** as per antibiotic policy when choosing antimicrobial therapy. If alternatives are chosen, document the reason in the case records.
- **Check for factors** which will affect **drug choice and dose** e.g. renal function, interactions and allergy.
- **Review the need for antimicrobial therapy daily.** For most infections 5 – 7 days of antimicrobial therapy is sufficient.
- **If IV antibiotics are continued beyond 48 – 72 hours,** review the need and consider oral alternatives.
- **Switch to oral or stop antibiotics** if fever defervescents for at least 24 hours, marked clinical improvement, low CRP and fresh culture reports with no growth.
- **Do not prescribe antibiotics** just in case for a potential infection. Observe, wait and watch.

8.11 ANTIMICROBIAL STEWARDSHIP PROGRAMME (ASP)

An ASP shall be designed to optimize antimicrobial therapy administered to patients, to ensure cost effective therapy, minimize collateral damage to other susceptible commensals causing a repopulation with drug resistant organisms and prevent other unintended consequences such as the toxicity of antimicrobial use. This would help to improve patient outcome, contain the problem of bacterial resistance and preserve the utility of the existing antimicrobials for a longer term.

The primary goal of ASP is to raise awareness among HCW about the rising problem of AMR in the HCF. For ASP to be effective, the development of ASP and implementation of antimicrobial clinical guidelines shall be comprehensive. ASP is a necessary element of a successful quality improvement program and measures the effectiveness of such program. The appropriate treatment options chosen need to be evidence based, with expert consultations and incorporation of local antibiograms, using the fewest formulary drugs that are necessary, with optimum dose, route, duration, side effects to provide cost effective, first and alternate line options. There are evidences to show that the reduction in the use of antimicrobials also brings down the incidence of resistance. It will help to reduce antimicrobial use without compromising patient safety.

Refer Annexure 15 and 16 Antibiotic Usage Form and Surgical Prophylaxis Monitoring Form

Section 9

Linen and Laundry Management

9.1 INTRODUCTION

Linen

Linen in healthcare facility generally includes bed sheets, blankets, towels, personal clothing, patient hospital dress, scrub suits , gowns and drapes for surgical procedures etc. Although soiled linen and textiles have been identified as source of large numbers of pathogenic microorganisms. The risk of actual disease transmission is negligible. Basic hygienic approaches for handling, processing and storage of linen are sufficient to reduce the risk of cross infections. The hospital linen shall be laundered between patients, when it is visibly soiled or as per the policy of HCF which shall be preferably daily.

Laundry Facility

The laundry area must not be located near the food preparation area.

It is divided into two separate areas

- Dirty area for receiving and handling of the soiled linen.
- Clean area for processing the laundered items and its storage.

The laundry areas must have adequate hand washing facility. The laundry equipments must be used and maintained according to the manufacturer's instructions. Damp (wet) linen shall not be left out in machines overnight.

The laundry staff shall be properly trained in the handling and processing of linen. All laundry workers shall be properly immunized. They shall wear appropriate PPE such as gloves, protective garments etc while sorting soiled linen. The staff must practice frequent hand washing.

9.2 TYPES OF LINEN

- **Clean linen:** It also includes the sterile linen used in aseptic procedures.
- **Dirty linen:** Linen without any stains used by patients.
- **Soiled and infected linen**: Infected with blood, body fluids and other secretions of patients.
- **Contaminated linen:** Contaminated with hazardous and radioactive material.

9.3 SOILED LINEN MANAGEMENT

Collection, sorting and transportation of soiled linen

- Do not sort or rinse contaminated linen at the point of generation.
- Soiled linens are collected so that agitation is minimized to prevent aerosolization and contamination of the environment and the personnel.
- The linen is appropriately packed at the site of generation. It shall be packed in suitable impermeable bags and the bags are sealed securely, to ensure transportation without spills or drips. The bags are properly labelled for easy identification of the ward/ department.
- Ensure that linen is free of bio-medical waste, sharps, instruments, and patient's personal belongings.
- Dirty linen is not to be placed on the bed side tables, floor or in the sink.

- Soiled linen is transported in a closed trolley.
- Trolleys used for transport of soiled linen shall not be used for transport of clean linens.

Soiled linen is to be handled as little as possible:

- Following removal from the patient bed space, linen must be immediately placed into a closed trolley/ laundry bag.
- To prevent staff exposure, the soiled linen trolley/ laundry bags shall not be overfilled. Seal the bag when 2/3 full.
- Linen that is heavily soiled, saturated or dripping shall be placed in a leak proof clear plastic bag and then placed inside the regular trolley/ laundry bag.
- The laundry trolley/ bags, particularly the large laundry bins shall be stored in a predetermined dirty area that is at least one meter from any clean item.

Impervious plastic used to cover mattresses and pillows are not to be sent to the laundry for cleaning and disinfecting as they can be effectively cleaned onsite using an appropriate disinfectant. Mattresses and pillows must also be monitored for wear and tear and replaced as and when required. Remove PPE after handling soiled linen and perform hand hygiene before handling clean linen.

Handling Soiled Linen Contaminated with Blood and Body Fluid

All soiled linen contaminated with blood and body fluid shall be transported in a closed leak proof bag with biohazard label. For decontamination of blood and body fluid soiled linen, all infected linen soiled with blood and body fluid shall be soaked in 0.5% hypochlorite solution for 30 minutes, then washed with water and detergent. The infected linen shall be washed separately.

Handling Soiled Linen Contaminated with Hazardous Materials

When hazardous materials are used, stored or disposed off, written safe work procedures must be developed and implemented for preparation, administration and waste handling. Departments intending to return soiled linens that are contaminated with hazardous materials must ensure that there is no potential risk to staff or patients.

Hazardous materials include, but are not limited to:

- Chemicals - due to being toxic, poisonous, carcinogenic, noxious, flammable, combustible, corrosive or reactive with other chemicals.
- Radioactive substances - that are present on soiled linen will be decontaminated at the site at which the patient resides. Linen contaminated by radioactive substances will not be sent to the laundry until it is decontaminated by removing the radioactive nucleotide contaminants or setting it aside for the appropriate time (i.e. ten half-lives).

Principles and key steps in processing soiled and infected linen

- Housekeeping and laundry personnel should wear gloves and other PPE as indicated when collecting, handling, transporting, sorting, and washing soiled linen.
- When collecting and transporting soiled linen, handle it as little as possible and with minimum contact to avoid accidental injury and spreading of microorganisms.

- Consider all cloth items (for example, surgical drapes, gowns, wrappers) used during a procedure as infectious. Even if there is no visible contamination, the item must be laundered.
- Carry soiled linen in covered containers or plastic bags to prevent spills and splashes and confine the soiled linen to designated areas (interim storage area) until transported to the laundry.
- Carefully sort all linen in the laundry area before washing.
- Infected or soiled linen shall be washed separately from all other linen. The machine shall not be overloaded.
- Hands shall be washed after any contact with dirty linen and gloves and apron worn for any contact with blood or body fluids.
- Machines used are regularly maintained.
- Hand washing facilities must be available for staff.
- Smoking and eating are not allowed in the laundry area.

9.4 CLEAN LINEN MANAGEMENT

- Clean linen shall be unpacked on return from the laundry and stored in a designated area within each department.
- The linen room shall have a door, which shall be kept closed. The linen trolley covers shall remain closed, when not being used.
- Clean linen must be stored in a dry area above the floor level. It must not be stored in bathrooms or sluices.
- Clean linen is to be handled as little as possible.
- Soiled linen must never come in contact with clean linen.
- Staff involved in the handling of linen shall ensure that there is no cross contamination of clean and soiled linens during transportation and storage.
- All staff dealing with laundry shall be aware of the policies and procedures in handing over and receiving the clean linen.

9.5 STORAGE OF LINEN

- Full laundry bags shall not be stored in public areas.
- Bags of dirty linen- used/ soiled/ infected linen shall be stored in a secure area.
- Used linen shall be kept separate from soiled linen at all the times.
- Clean linen shall be stored in a clean area.

9.6 PROTECTION OF LAUNDRY WORKERS

- Workers shall protect themselves from potential cross-infection from soiled linen by wearing appropriate PPE, such as heavy duty gloves and gowns or aprons, when handling soiled linens. Reusable gloves shall be washed after use, allowed to hand dry and discarded if punctured or torn.

- Hand washing facilities shall be readily available.
- Personnel shall wash their hands whenever gloves are changed or removed.
- Staff in patient care areas must be aware of sharps when placing soiled linen in bags.
- All care givers and laundry workers shall be trained in procedures for handling of soiled linen.
- Laundry workers, as other Health Care Workers (HCW), shall be offered immunization against Hepatitis-B and Tetanus.

9.7 DELIVERY OF WASHED LINEN

- The linen is returned to the user departments by the linen and laundry in charge and record of the same is entered in the concerned register.
    - The head nurse/ in charge of the ward/department is responsible for obtaining washed and dried linen from the linen and laundry dept.
- While collecting the linen, the head nurse/ in charge of the ward/ department is responsible for physical verification of the linen at the time of delivery by cross checking the same with the details are to be entered in the concerned register.
- This is done to ensure that there is no discrepancy with the number, type of linen and their condition etc.

9.8 QUALITY ASSURANCE IN LINEN AND LAUNDRY DEPARTMENT

- Patient's feedback- number of complaints/ comments received from the patient about the quality of linen and quality of the wash.
- Number of complaints received from the clinicians/ nursing staff/ technicians (internal customers) about:
    - The timeliness of linen supply.
    - Quality of linen supplied (worn out/ faded, stained, patched, smelling or poorly ironed).
    - The quantity of the linen supplied.
- Average monthly cost of linen replacement.
- Losses due to theft, pilferage or damage in the process.

Refer Annexure-17: Linen Management Audit Tool

Section 10

Training and Development

10.1 INTRODUCTION

In Health Care Facilities (HCF) continuous training of staff at all levels is extremely important activity which deserves full and serious attention of the management. This is to ensure that the workforce are competent to carry out their role. The HCF also has to ensure that Health Care Workers (HCW) remain competent by providing refresher training at an appropriate intervals. Prevention of infections is the common primary aim of HCW and need an understanding of how infections occur, how different microorganisms spread and the role they play in preventing the transmission of pathogenic microorganisms.

In addition, all HCW needs to be aware of the national regulatory or statutory requirements in order to meet the expected standards. They shall continually work to ensure that high standards of patient care are delivered.

10.2 STEPS OF EFFECTIVE TRAINING

- Identification of training needs in infection prevention and control practices.
- Outline and develop an effective training schedule which covers the important aspects of infection prevention and control practices.
- Conduct training by qualified personnel, preferably Infection Control Officer (ICO) and Infection Control Nurse (ICN).
- Document training details- attendance, training contents and feedbacks from the participants.
- Conduct pre and post training evaluation to know the effectiveness of the training.

Training flow Chart

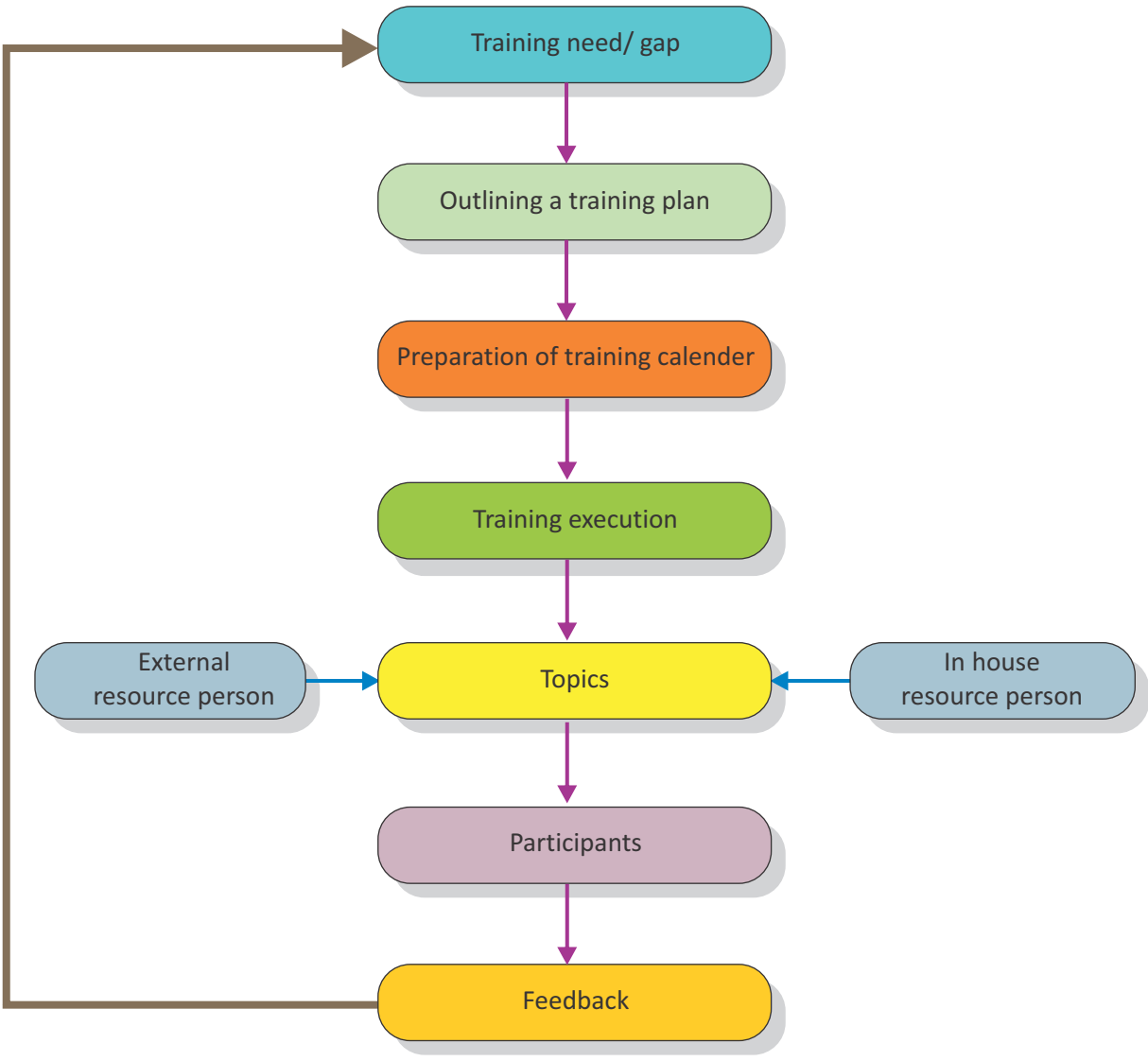


Figure-43: Training flow chart

Sample format for infection prevention and control training schedule

Name & Address of Health Care Facility

Infection Prevention and Control Training for Doctors and Nurses

Venue:

Date & Time	Topic	Resource Person
	Infection prevention and control - Introduction	
	Infection prevention and control programme	
	Standard precautions	
	Surveillance of Health Care Associated Infections	
	Hand hygiene and its compliance monitoring	
	Linen management	
	Bio-medical waste management	
	Antibiotic policy	
	CSSD - Cleaning, disinfection and sterilization practices	
	Good housekeeping practices	
	Immunization of Health Care Workers	

Figure-44: Sample format for infection prevention and control training schedule

Sample format for training attendance

Name & Address of Health Care Facility

Infection Prevention and Control Training for Doctors and Nurses

Date of Training: Time:

Venue:

Resource persons:

Attendance Sheet

Sr.No.	Name	Designation	Department	Signature

Figure-45: Sample format for training attendance

Training feedback form

Date:..... Name of Training:..... .....

Venue..... Resource person:.....

(Instructions: Please indicate your level of agreement with the statements listed below)

Sr. No.	Criteria	Strongly Agree	Agree	Not Sure	Disagree	Strongly Disagree
1	The purpose of the training was clearly stated.					
2	The topics covered were relevant to me.					
3	Training and presentations were well organized and clear.					
4	This training experience will be useful in my work.					
5	The time allotted for the training was sufficient.					
6	Visual aids and oral presentations clarified the contents.					
7	Clarified content in response to questions.					
8	Participation and interaction were encouraged.					
9	The training room and facilities were adequate and comfortable					
		Excellent	Good	Average	Poor	Very Poor
10	How do you rate the training overall?					

11. What aspects of the training needs improvement?
12. How does this training help you to bring change in your practice?
13. What additional trainings would you like to have in the future?
14. Any other feedback/ comments:

Date:

Participant Name (Optional):
Designation:

Note: The detailed feedback form also includes the feedback of all the trainer for all the sessions

Figure-46: Training feedback form

10.3 QUALITY ASSURANCE OF TRAINING PROGRAMME

- Level of attendance / participation in the training programme.
- Number of trainings conducted and the number of participants trained.
- Feedback analysis of training programme.
- Improvement in the level of proficiency of the trainee.

ANNEXURES

Annexure 1: Hand Hygiene Audit Tool

Policy: Hand hygiene is performed appropriately and in a timely manner to reduce the risk of transmission of infection.

Date of Audit: .....Ward / Department:.....

Audited by:.....

Sr. No.	Observations	Yes	No	NA	Remarks
1	The HCF has comprehensive procedures and a policy for hand hygiene.				
2	HCF structures are in place to ensure distribution, compliance and monitoring of the hand hygiene policy and procedures.				
3	Hand hygiene is an integral part of induction for all staff.				
4	Staff have received training in hand hygiene procedures.				
5	Nails of staff are short, clean and free from nail extensions and varnish.				
6	No wrist watches, stoned rings or other wrist jewellery are worn during clinical procedures.				
7	Hand hygiene is encouraged and alcohol based hand rubs are made available if nedeed.				
8	Posters promoting hand hygiene are available and are displayed.				
9	There is a hand wash basin in each patient care area.				
10	Hand washing facilities are clean and intact (check sinks, taps, splash backs, liquid soap and single use towel/ tissue rolls).				
11	Hand wash basins are dedicated for the hand wash use only.				
12	There is an easy access to the hand wash basin.				
13	The hand wash basin has no plugs, no overflows.				
14	Elbow-operated taps are available at all hand wash basins in patient care areas.				
15	Liquid soap is available at each hand wash basin.				
16	Alcohol Based Hand Rub (ABHR) is available at the point of care as per Local and National standards.				
17	Single use towels/ tissue rolls are available at all hand wash sinks.				
18	Nail brushes are available at hand wash sinks of Operation theatre complex.				
19	Foot-operated bins are available for waste towels / tissue rolls in close proximity to hand wash sinks are available				
20	Foot-operated bin for waste towels / tissue rolls are fully operational				

Compliance level

Using the compliance categories, as below, percentage scores can be allocated a level of compliance as follows:

Compliant : 85% or above

Partial compliance : 75% to 84%

Minimal compliance : 74% or below

Annexure 2: WHO Hand Hygiene Observation Form

World Health Organization | Patient Safety — A World Alliance for Safer Health Care | SAVE LIVES Clean Your Hands

Observation Form

Facility:		**Period Number*:**		**Session Number*:**	
Service:		**Date:** (dd/mm/yy)	/ /	**Observer:** (initials)	
Ward:		**Start/End time:** (hh:mm)	: / :	**Page N°:**	
Department:		**Session duration:** (mm)		**City**:**	
Country:**					

Prof.cat			Prof.cat			Prof.cat			Prof.cat		
Code			Code			Code			Code		
N°			N°			N°			N°		
Opp.	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**	**Opp.**	**Indication**	**HH Action**
1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	1	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	2	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	3	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	4	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	5	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	6	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	7	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves
8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves	8	☐ bef-pat. ☐ bef-asept. ☐ aft-b.f. ☐ aft-pat. ☐ aft.p.surr.	☐ HR ☐ HW ○ missed ○ gloves

Annexure 3: Needle Stick Injury Reporting Form

Sr. No.	Point	Answer	Remarks
1.	Name of Health Care Worker(HCW):		
2.	Name of the Unit & Department		
3.	Date and Time of Needle stick/Sharp Injury:		
4.	Date and Time of Reporting to: RMO, Microbiologist		
5.	Exposure Volume: Small, Large		
6.	**Nature of Exposure**: • **Mild Exposure**: Mucus membrane/non-intact skin with mall volume e.g. a superficial wound (erosion of the epidermis) with a plain or low caliber needle contact with the eyes or mucous membranes, subcutaneous injections following small bore needles. • **Moderate Exposure**: Mucus membrane/non-intact skin with large volumes or percutaneous superficial with solid needle (e.g. a cut or needle stick injury penetrating gloves) • **Severe Exposure:** Percutaneous with volume. e.g., An accident with wide bore needle (>18G) visibly contaminated with blood, a deep wound (hemorrhagic wound and /or very painful), transmission of a significant volume of blood, an accidental injury with material, which has previously been used intravenously or intra-arterially.		
7.	Status of infectious diseases of the patient(HIV, HBV, HCV)		
8.	Action taken-First Aid	Yes/No	
9.	History of Hepatitis B vaccination	Taken / Not taken	
10.	Test results of HBsAg , HIV and HCV		
11.	**Risk Assessment**		
	Exposure Code: EC1- Small volume exposure EC2- Large volume exposure EC2- Less severity EC3- More severity **Status Code:** HIV SC1-Low titer exposure HIV SC2- High titer exposure HIV SC3- Unknown		
12.	Post exposure prophylaxis & advice (Hepatitis B & C, HIV) By ART		
13.	Follow up schedule		

Annexure 4: Environment Audit Tool

Policy: The environment shall be maintained appropriately to reduce the risk of transmission of infection.

Date of Audit: ..... Ward / Department:.....

Audited by:.. **.....**

Sr. No.	General Environment	Yes	No	NA	Comments
1.	Adequate facilities for hand hygiene are available. (Refer to Hand Hygiene Audit Tool for details).				
2.	Bed frames are clean and free from dust.				
3. The following equipment are in a good state of repair:					
3a	Lockers.				
3b	Chairs and stools.				
3c	Tables.				
4. The following are free of dust and spillage:					
4a	Lockers.				
4b	Chairs and stools.				
4c	Tables.				
5.	Floors including edges and corners are free of dust and litter.				
6.	All high and low surfaces are free from dust and cobwebs.				
7.	Curtains and blinds are free from stains, dust and cobwebs.				
8.	There is evidence of an effective pre-planned programme for curtain changes.				
9.	Fans are clean and free from dust.				
10.	Work station equipments in patient care areas are visibly clean. e.g. phones, computer key boards etc.				
Clean Store					
11.	There is an identified area for the storage of clean and sterile equipments.				
12.	The area is clean				
13.	Hand hygiene facilities are available in the clean store.				
14.	Floors including edges and corners are free of dust and litter.				
15.	All high and low surfaces are free from dust and cobwebs.				
16.	Shelves, bench tops and cupboards are clean inside and out, free of dust and spillage.				
17.	All products are stored above floor level.				

Sr. No.	General Environment	Yes	No	NA	Comments
Bath rooms/ Toilets					
18.	Bathrooms/ toilets are clean.				
19.	Bathrooms / toilets are not used for equipments storage.				
20.	Sinks and accessories are clean.				
21.	Floors, wall tiles and wall fixtures (including soap dispensers and towel holders) are clean.				
22.	Hand rails (grab bars) are clean.				
23.	Hand washing facilities, liquid soap are available.				
24.	There is a facility for sanitary waste disposal.				
Dirty Utility					
25.	A dirty utility is available.				
26.	A separate sink is available for decontamination of patient equipment.				
27.	The integrity of fixtures and fittings are intact.				
28.	Hand washing facilities are available including liquid soap and single use towel/ tissue rolls .				
29.	The room is clean and free from inappropriate items , not used to store equipments.				
30.	Mops and buckets are stored in a clean manner.				

Annexure 5: Sterilization Audit Checklist - CSSD

Date: .....Auditor:.....Auditee:.....

Sr. No.	Parameters	Yes	No
Decontamination Area			
1.	Is the area restricted to authorized personnel only?		
2.	Are doors and/or pass-through windows kept closed when not being used?		
3.	Is the area clean and free of improper items, e.g. debris, carton boxes, fans, food, drinks?		
4.	Are floors, walls, ceilings and work surfaces made of material that can withstand frequent cleaning?		
5.	Are hand washing facilities conveniently located with liquid soap & single use towel/ tissue rolls?		
6.	Do personnel have and wear Personal Protective Equipment (PPE) properly?		
7.	Are sinks available for soaking, cleaning and rinsing soiled instruments?		
8.	Are instruments cleaned properly with approved chemicals?		
9.	Appropriate cleaning and decontamination solutions available?		
Packaging, Sterilization & Storage Areas			
10.	Are personnel properly dressed, i.e. hair completely covered, no jewellery or artificial nails?		
11.	Are the packaging done as per manufacturers instructions and equipment compatibility and appropriate chemical indicators being used with all packages?		
12.	Are packages loaded properly in sterilizer with adequate space for steam circulation?		
13.	Are sterilizer cycles run according to the sterilizer manufacturer s instructions?		
14.	Are processed loads allowed to cool properly, i.e. at least 30 minutes before stored or used?		
15.	Are wrapped trays placed single layer on clean, dust-free storage shelves?		
16.	All items are stored 18" below the ceiling.		
17.	All items are stored 8 - 10" above the floor.		
18.	All items are stored 2" away from walls.		
19.	Hand washing facility is readily available.		
Quality Control & Record Keeping			
20.	Are sterilization documentation maintained for each sterilization cycle?		
21.	Are dynamic air removal, i.e. pre-vacuum sterilizers tested daily for air removal (Bowie-Dick test)?		
22.	Are all sterilizers tested with biological indicators at least weekly once ?		
23.	Are steam biological indicators incubated correctly and results recorded after full incubation?		
24.	Are sterilizers tested for quality control after installation and major repairs ?		
25.	Is there a recall policy in place, in case of sterilization failure?		

Annexure 6: Dietary Services Audit Tool

Policy: Dietary services shall be maintained to reduce the risk of transmission of infection.

Date of Audit: ..... Audited by

Sr. No.	Description	Yes	No	NA	Remarks
1.	The floor is free of dust, litter, water or other liquids.				
2.	Inaccessible areas (edges, corners and around furniture) are free of dust, litter.				
3.	There are no inappropriate items or equipment in the kitchen.				
4.	Kitchen is free from rodents/ animals.				
5.	Fly screens are in place wherever required.				
6.	Cleaning materials used in the kitchen are identifiable and are stored separately and away from food storage area.				
7.	Hand wash sink, liquid soap and single use towel/tissue rolls are available.				
8.	Hands are decontaminated and a clean plastic apron is worn to serve meals.				
9.	Fixtures and fittings are functioning well.				
10.	Fixtures, surfaces and appliances are free of grease, deposits, stains and cobwebs.				
11.	Shelves, cupboards and drawers are clean and in order.				
12.	Refrigerators/freezers are clean and free of ice buildup.				
13.	All food products are stored off the floor				
14.	Dry goods, preserves, and canned food are stored in dry, well-ventilated store rooms				
15.	Raw and cooked food are separated to avoid cross contamination.				
16.	Milk is stored in visibly clean area/container.				
17.	Bread is stored in a clean area/container.				
18.	All food products are within their expiry date.				
19.	Cooked food is covered in containers.				
20.	food distribution to patients occurs wherever possible in temperature controlled food service trolleys (hot food kept hot and cold food kept cold).				
21.	Food distribution trolleys are cleaned regularly.				
22.	Quality check of food is done .				
23.	Water coolers are visibly clean and are under regular maintenance programme.				
24.	Waste bins are in good condition.				
25.	Waste bins are labelled F or General Waste.				

Annexure 7: Bio-medical Waste Management Checklist

Government of India

Quality Improvement Programme

Bio-Medical Waste Management Checklist

Name of the Health Care Facility: .....

No of beds:.....Date:..... Name and Signature of Observer:.....

Sr. No.	Check Give your Answers in Yes/No	OT/ Labour Room/ OPD/ Emergency/ Laboratory / ICU /NICU / Wards/ Dept (Yes / No)	Remarks
1.	Adequate number of BMW bins and bags as per BMW Guideline (Red, Yellow, Blue card board box and Translucent White) & Green bins for General waste.		
2.	Puncture proof containers for sharps - translucent white		
3.	Mutilators (needle /syringe cutters)		
4.	Calibrated weighing machine for waste generated as per colour coding including general waste		
5.	Personal Protected Equipments(PPE) like gloves, caps, masks, aprons and gum boots etc. used adequately as per BMW guideline.		
6.	1 % fresh Sodium hypochlorite or bleaching powder Solution as per BMW guideline.		
7.	BMW record register		
8.	Mercury spill management kit		
9.	Blood spill management kit		
10.	Post Exposure Prophylaxis Kit		
11.	BMW Storage Rooms with lock & Key		
12.	BMW licenses under Gujarat Pollution Control Board (GPCB)		
13.	Different forms & formats (Needle stick injury, BMW various forms etc.)		

Sr. No.	Check Give your Answers in Yes/No	OT/ Labour Room/ OPD/ Emergency/ Laboratory / ICU /NICU / Wards/ Dept (Yes / No)	Remarks
Man Power for BMW			
1.	Availability of a trained, skilled and dedicated person for BMW Management.		
2.	Dedicated and trained Infection Control Nurse(ICN)		
Training for BMW			
1.	Training of BMW for staff		
Generation & Segregation			
From Wards / O.T.s / ICUs / Labs / OPDs / Blood Bank / Radiology/ Dept etc.			
Generation			
1.	Is the waste segregated at the site of generation ?		
2.	Is the sharp infectious waste (needles, blades, broken glass etc)are to be disposed in White puncture proof containers/ Blue card board boxes ?		
3.	Is the non sharp infectious material: (infected plastics, syringe, dressing, gloves, masks, blood bags and urine bags)to be disposed in Red and or Yellow plastic bins/bags?		
4.	Is anatomical infectious waste (placenta, body parts) to be disposed in yellow plastic bins and bags?		
5.	Is non infectious (General)waste E.g. packing materials, cartons, fruit and vegetables, syringe and needle wrappers, medicine covers to be disposed in Green/ Black plastic bins or bags ?		
6.	Is the infectious waste and non infectious waste mixed at the source of generation?		
Collection and Storage			
1.	Are the waste covered in covered bins ?		
2.	Are the bins filled up to more than ¾ th level?		
3.	Are the bins cleaned with soap and disinfectant regularly ?		
4.	Are the bins overfilled?		
5.	Is the infectious and non infectious waste filled in same bins?		
6.	Is the stored waste kept beyond 48 hrs ?		

Sr. No.	Check Give your Answers in Yes/No	OT/ Labour Room/ OPD/ Emergency / Laboratory /ICU /NICU /Wards/ Dept (Yes / No)	Remarks
Transportation			
1.	Is the waste transported in closed containers?		
2.	Are the waste collection bins/trolleys/wheel barrow used for transporting waste ?		
3.	Is the predefined route available for transportation of waste within the health care facility ?		
4.	Is the waste transported in open container and bags?		
5.	Is the transportation done during the OPD time or emergency hours?		
Treatment and Disposal			
Give your answers in Yes/No			
1.	Is your bio medical waste disinfected and mutilated before final disposal?		
2.	Is the anatomical waste deep buried/incinerated?		
3.	Are the syringes cut and chemically disinfected with 1%sodium hypochlorite solution at the source of generation before final disposal?		
4.	Are the infected plastics chemically disinfected or autoclaved ,shredded and send for final disposal ?		
5.	Is the general waste chemically disinfected before final disposal?		
6.	Is the infectious waste and non infectious waste mixed at any point of time?		
Management of different waste streams			
Give your answers in Yes/No			
1.	Is the sharp injury reported and is it reported within 72 hrs ? If yes then please mention the count per month		
2.	Are the protective gears like gloves used while handling needles and syringes ?		
3.	Is the barrel and plunger detached before disinfecting the syringes ?		
4.	Is the sharp waste mixed with other waste ?		
5.	Is the practice of recapping or bending of needles done ?		
6.	Is the sharp discarded in poly bags ?		

Sr. No.	Check Give your Answers in Yes/No	OT/ Labour Room/ OPD/ Emergency / Laboratory /ICU /NICU /Wards/ Dept (Yes / No)	Remarks
Management of different waste streams			
Give your answers in Yes/No			
7.	Is the sharp disposed in open area?		
8.	Are the vials and ampoules disposed in card board boxes?		
9.	Is the anatomical waste disinfected before final disposal ?		
10	Is the anatomical waste disposed in unsecured open areas or in any water bodies ?		
11.	Is the PPE like mask and gloves etc. used while handling sputum containers and slides?		
12.	Are the sputum containers or slides disinfected with 1 % hypochlorite solution?		
13.	Are the sputum containers finally disposed inside the premises ?		
14.	Are the slides of the sputum test disposed in sharps container?		
15.	Are the blood bags discarded as per BMW guidelines ?		
16.	Is the plastic waste like IV set, bottles, syringes, latex gloves, catheters etc. cut by scissors before disinfection in 1% sodium hypochlorite solution?		
17.	Are the disposable gloves and masks reused?		
18.	Is liquid waste spillage (blood, body fluid pus or any discharge) disinfected by adding 1% sodium hypochlorite solution before cleaning?		
19.	Is the mercury spill cleaned with bare hands ?		
20.	Is the mercury disposed in waste bins and drains ?		
21.	Is the mercury collected into bottle having some water and tightly covered with the lid ?		
22.	Is the mercury droplet collected using 2 card board piece /syringe?		
23.	Is the hand washing done before and after any procedure.eg collecting lab sample, examination of the patient, handling blood and body fluid ?		
24.	Are all staff vaccinated against Hepatitis B and tetanus?		
25.	Does the HCF personnel visit the final disposal site even if outsourced or done outside the HCF?		

Annexure 8: Infection Control Checklist

Ward / Department: Date: Audited by:....

Sr. No.	Infection Control Practices	Status		NA	Remarks
		Yes	No		
I	**Personnel**				
1.	Uniform / Dress is neat & tidy.				
2.	Fingernails are clean and trimmed				
3.	Personnel follow strict clothing and linen handling procedures to avoid contaminating their clothes.				
4.	Adequacy of PPE gloves, mask, gown etc are available and are used appropriately.				
5.	Monitoring of all HCAI: Surgical site infection, respiratory tract infection, urinary tract infection, intravascular device infection.				
6.	Hands are washed / use hand rub:				
	a) Before touching a patient.				
	b) Before performing any procedure.				
	c) After body fluid exposure risk.				
	d) After touching a patient.				
	e) After touching patient surroundings.				
7.	Proper technique is used for:				
	a) Wound care.				
	b) Catheter procedures.				
	c) Tube feedings.				
	d) Obtaining cultures.				
	e) Other treatments.				
	f) Parenteral and fluid administration.				
	g) Handling oxygen equipment.				
8.	Staff aware of Needle stick injuries and post exposure prophylaxis.				
9.	Proper segregation of bio-medical waste at source of generation.				
10.	Needles are shredded in proper manner.				
II	**Bedside Lockers**				
11.	Bedside locker is clean.				
12.	All equipments are clean.				
13.	Soiled clothes are removed.				
14.	Perishable food is not kept inside the bedside locker				
15.	Medications are kept in a separate cover/container.				
16.	Non-perishable food is kept in a closed container.				
III	**Bed**				
17.	Bed rails are clean.				
18.	Mattress is intact with protective bed cover and odor free.				
19.	Food particles are removed.				
20.	Linen is clean untorn and not stained.				
21.	Supportive devices (restraints, pillows, foot end elevator etc.) are clean.				

Sr. No.	Infection Control Practices	Status		NA	Remarks
		Yes	No		
IV	**Linen**				
22.	Linens are clean and odor free.				
23.	Linens are labelled.				
24.	Soiled linen to be laundered outside the facility is stored in closed plastic container.				
V	**Other Equipments**				
25	IV stands are clean.				
26	Wheelchairs, stretchers and walkers are clean.				
27	Commodes are clean.				
28	A cleaning schedule is followed for all the above.				
29	Spill kits are adequately equipped with its contents.				
30	Spill kits are used appropriately.				
VI	**Bathrooms**				
31	Toilet seats and other equipments are clean and in good working condition.				
32	Cleaning schedule is followed.				
33	Bio-medical waste bins are in proper condition.				
VII	**Utility Room**				
34	Hand washing sinks are present and functional.				
35	Equipments are clean, dry and stored in an orderly fashion.				
36	Autoclaved items are not expired.				
37	Liquid soap and single towel/ tissue rolls are provided.				
38	Equipments are rinsed before washing.				
39	Cleaning, disinfecting and sterilizing solutions are available for all procedures.				
VIII	**Medication Management**				
40	Sharps are disposed of in puncture proof container.				
41	Internal and external medications are stored separately and appropriately.				
42	Refrigerator is clean.				
43	Supplies and equipments are stored above floor level.				
44	Sterile solutions are dated when opened and disposed of within 24 hours.				
IX	**Monitoring Quality Indicators**				
45	Monitoring of Ventilator Associated Pneumonia.				
46	Monitoring of Surgical Site Infection.				
47	Monitoring of Urinary tract infection.				
48	Monitoring of Intra vascular Device Infection.				
49	Monitoring of Hand Hygiene Compliance				

INFECTION CONTROL NURSE **INFECTION CONTROL OFFICER**

Annexure 9: Health Care Associated Infections (HCAI) Monitoring Form

HEALTH CARE ASSOCIATED INFECTION SURVEILLANCE FORM		
Patient id :	Gender : F / M	Age :
Patient Name :		
Date Of Admission (D.O.A) :	Ward/Unit : NICU/ PICU /TICU	
Birth Weight (grams) : (if applicable)		
Admission Diagnosis :	Final Diagnosis :	
Surgery performed : Yes / No If Yes Type of operation :	Date & Duration of Surgery :	
Elective/Emergency :	Major/Minor:	
OT:	Anaesthesia Type: General/Spinal/Local	
Shifted from other hospital : Yes / No	Date Of Discharge(D.O.D) :	
History of any chronic Illness		

INDWELLING DEVICES

Date	Urinary catheter put on	Central line put on	Ventilator through E.T/T.T put on

HEALTH CARE ASSOCIATED INFECTION MONITORING																							
	CAUTI					CLABSI		VAP					SSI					Lab Reports					
Date	Fever/ Hypothe-rmia	Burning urine	Urgency/ Frequency	pain at renal angle or suprapubic	Turbid Urine	Tachyca-rdia	Hypoten-sion	RR- Tachy/ Dyspnoea	Worsening gas exchange	New onset / change in sputum/ hemoptysis	Secretion amount & Suctioning episodes in 8 hours	Rales or Ronchi and for nfants /pedia Apnea, Nasal flaring with retraction of chest wall or grunting	BT: Yes/ No	ICU Stay (Post op day)	**Wound Type:-** clean/ contamina ted/Dirty	**Wound Dressing** Pus/ Discharge (Post Operative Day): Yes /No	**Type of SSI:** Superficial/ Deep/ Organ/ Space Involvement	Urine CS	Blood CS	Swab/ Pus CS	Radiol ogy	Anti-biotics taken	Remarks

Annexure 10: Catheter Associated Urinary Tract Infection (CAUTI) Rate Capturing Format

Ward / Department: Month..

Sr. No.	Name of the patient with catheter	IP / UHID No.	D.O.A	D.O.D	Date of insertion of catheter	Date of removal of catheter	Number of days patient was on catheter	CAUTI 1/0 1= Positive 0=Negative	Remarks with signature of Doctor / SN
	Total								

CAUTI rate in catheter days	Total number of patients who developed CAUTI in a month	X 1000	
	Total number of urinary catheter days in that month		

Annexure 11: Ventilator Associated Pneumonia (VAP) Rate Capturing Format

Ward / Department: Month..

Sr. No.	Name of the patient on ventilator	IP / UHID No.	D.O.A	D.O.D	Intubation date	Extubation date	Number of days patient was on ventilator	VAP 1/0 1= Positive 0= Negative	Remarks with signature of Doctor / SN
	Total								

VAP rate in ventilator days	Total number of patients who developed VAP in a month Total number of Ventilator days in that month	X 1000	

Annexure 12: Central Line Associated Blood Stream Infection (CLABSI) Rate Capturing Format

Ward / Department: Month..

Sr. No.	Name of the patient on central Line	IP / UHID No.	D.O.A	D.O.D	Date of insertion of central line	Date of removal of central line	Number of days patient was on central line	CLABSI 1/0 1= Positive 0= Negative	Remarks with Signature of Doctor / SN
	Total								

CLABSI rate in central line days	Total number of patients who developed CLABSI in a month	X 1000	
	Total number of central line days in that month		

Annexure 13: Peripheral Line Associated Blood Stream Infection (PLABSI) Rate Capturing Format

Ward / Department: Month..

Sr. No.	Name of the Patient on peripheral Line	IP / UHID No.	D.O.A	D.O.D	Date of insertion of peripheral line	Date of removal of peripheral line	Number of days patient was on peripheral line	PLABSI 1/0 1= Positive 0= Negative	Remarks with Signature of Doctor / SN
	Total								

PLABSI rate in peripheral line days	Total number of patients who developed PLABSI in a month	X 1000	
	Total number of peripheral line days in that month		

Annexure 14: Surgical Site Infection (SSI) Rate Capturing Format

Ward / Department: Month..

Sr. No.	Name of the patient operated	IP / UHID No.	D.O.A	D.O.D	Date of surgery	Date of on which signs and symptoms of SSI noted	SSI 1/0 1= Positive 0= Negative	Remarks with Signature of Doctor / SN
	Total							

SSI rate in percentage	Total number of patients who developed SSI in a month Total number of patients operated in that month	X 100	

Annexure 15: Antibiotic Usage Form

ANTIBIOTIC USAGE FORM

GOVERNMENT(CL&SC) SPINE INSTITUTE AND PHYSIOTHERAPY COLLEGE AHMEDABAD

Name of Ward: _____ **Data Collector** _____ **Month:** _____

Patient Information				Antimicrobial Information													
UHID	Diagnosis	Was Antimicrobial prescribed Y/N	No. of days in hospital	Was sensitivity done or not	Names of Antimicrobial (s) prescribed	Generic Names used Y/N	Anti microbial on FL Y/N	Dosage form & strength	Total number days of treatment	Dosage frequency per day	Dosage pre-scribed	Was as per Antibiotic Policy	DDD	PDD	Mono-therapy (M)/ Combi-nation Therapy (C)	Escalation E/ De-escalation D	Remarks

FL- Formulary, Y/N- Yes/ No, Monotherapy- M, Combination Therapy- C, DDD- Defined Daily Dosage, PDD- Prescribed Daily Dosage

Annexure 16: Surgical Prophylaxis Monitoring Form

SURGICAL PROPHYLAXIS MONITORING FORM

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Name of Ward: _____ **Data Collector:** _____ **Month:** _____

UHID	Diagnosis	Name of surgery	Prophylaxis Y/N	"Antimicrobial prescribed (Name, dosage form, and strength"	"Number of doses"	Was as per Antibiotic Policy	Remarks

Annexure : 17 Linen Management Audit Tool

Policy: Linen is managed and handled appropriately to prevent transmission of infection.
Date of Audit: ..... **Ward / Department:**.....

Audited by:

Sr. No.	Linen Management	Yes	No	NA	Remarks
1.	Clean linen is stored in a clean designated area separate from used linen.				
2.	Clean linen is free from stains.				
3.	Linen bags are less than full and are secured.				
4.	Linen bags are stored appropriately , prior to its disposal.				
5.	Gloves, mask and apron are worn while handling contaminated linen.				
6.	Soiled linen are transported in separate closed trolley.				
7.	Contaminated/ infected linen is disinfected as per the HCF policy.				
8.	Hazardous linen is handled as per the HCF policy.				
9.	Clean linen is transported in clean closed trolley.				
10.	A washing machine, if used, is situated in an appropriate designated area.				
11.	The staff is aware of laundry procedures / guidelines.				
12.	The washing machine and tumble dryer are under regular maintenance plan.				
13.	Hand washing facilities are available in the laundry.				

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Take the Pledge...

...to practice *all* infection prevention skills!

I pledge to keep my hands clean by performing hand hygiene according to my facility's policies to help stop the spread of germs.

I will clean my hands before and after resident contact and after certain procedures according to my facility's policies, including:

- Before I enter and after I leave a resident's room or provide care
- Before and after I touch a urinary catheter
- After I touch any blood or body fluids
- Before and after I wear a gown, mask, and gloves so I do not touch germs, blood, and body fluids

When I wash my hands with soap and water, I will:

- Wet my hands with clean, running water, applying the amount of product recommended by the manufacturer to hands
- Rub hands together vigorously for at least 20 seconds covering all surfaces of the hands and fingers
- Rinse my hands with running water
- Dry my hands using a clean disposable towel
- Turn off the faucet with the disposable paper towel

When I clean my hands with alcohol-based hand sanitizer, I will:

- Apply the product to the palm of one hand
- Rub my hands together
- Rub the product over all surfaces of my hands and fingers until my hands are dry

I welcome feedback on my hand hygiene and **will help other staff, residents, and families** practice good hand hygiene.

I pledge to keep the residents' environment and equipment clean to help stop the spread of germs from one person to another.

I know surfaces that look clean may be contaminated with germs that can get on my hands. Some germs can live on surfaces for a long time and can make me and others sick. **Cleaning and disinfecting** must be done to help remove these germs. **I understand the proper steps** and will follow the manufacturers' recommendations when I use chemicals to keep the resident's environment clean and disinfected.

Step 1: I will clean surfaces and equipment to remove visible soil before and after using it on a resident.

Step 2: I will disinfect surfaces and equipment to kill germs before and after using it on a resident.

I will explain to residents and their families that cleaning surfaces and equipment helps prevent the spread of germs.

I pledge to practice standard precautions to help stop the spread of germs from one person to another.

I will:

- Keep my hands clean by performing hand hygiene according to my facility's policies.
- Wear clean clothes every day and change my clothes if they become soiled.
- Wear personal protective equipment (PPE) such as a gown, mask, gloves, and eye protection when I need to protect myself from blood and body fluids and per our policy.
- Keep surfaces and equipment clean and sanitized.
- Tell my supervisor if I think a resident or staff member is sick.
- Keep residents who are sick with germs that can easily spread to other people in private rooms or with residents with the same germs.
- Cover my coughs and sneezes by sneezing or coughing in my elbow or upper sleeve.
- Make sure that I perform safe injection practices at all times—I will use a new syringe and needle with every injection.
- Use the resident's insulin pen for only that resident.

If a resident needs to be started on additional infection prevention precautions, **I will explain these precautions** to staff, residents, and their families so they can help prevent the spread of germs.

I pledge to understand and educate others about the appropriate use of antibiotics.

Millions of people get serious infections with germs that are resistant to antibiotics designed to treat those infections. **Thousands of people die** each year as a direct result of these antibiotic-resistant infections.

I understand that:

- Antibiotics only work to treat bacterial infections, not viral infections like a cold or flu.
- Antibiotics are generally not needed when a person feels fine.
- Antibiotics can cause harm and side effects, including nausea and diarrhea, allergic reactions, yeast infections, and antibiotic-resistant infections. I understand that it is important to properly prescribe and use antibiotics.
- It's okay to discuss alternatives to antibiotics with prescribers and residents.
- It's okay for residents to ask if an antibiotic is truly needed.

GOVERNMENT (CL&SC) SPINE INSTITUTE AHMEDABAD

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राष्ट्रीय स्वास्थ्य मिशन

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